CHAPTER 20

Waste Management

INLAND RAIL—BORDER TO GOWRIE ENVIRONMENTAL IMPACT STATEMENT

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

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20.1 Introduction

The purpose of this chapter is to describe the baseline conditions of the impact assessment area, as relevant to waste management, to assess potential waste impacts associated with the Inland Rail—Border to Gowrie Project (the Project) and nominate mitigation measures for implementation during the detail design, construction and operation phases of the Project. The management of spoil from the Project is further addressed in Appendix Y: Spoil Management Strategy.

This chapter provides an assessment of the applicable regulatory framework, waste management strategies and waste stream composition and volumes for the Project. The assessment focuses on the additional waste impacts that may arise due to the Project, in the context of the existing waste management conditions of the impact assessment area.

20.2 Terms of Reference requirements

This chapter has been prepared to address sections 11.158 to 11.165 of the Terms of Reference (ToR). A compliance check of this chapter against each of the relevant components of the ToR is presented in Table 20.1. Compliance of the Environmental Impact Statement (EIS) against the full ToR is documented in Appendix B: Terms of Reference Compliance Table.

TABLE 20.1 COMPLIANCE AGAINST RELEVANT SECTIONS OF THE TERMS OF REFERENCE

Waste Terms of Reference requirements		EIS section
11.158	For wastes, besides wastewater (which is addressed in the Water Section of this ToR), describe and quantify all expected significant waste streams (including spoil) from the proposed project activities during the construction and operational phases of the Project. Reference should be made to the DES Application requirements for activities with waste impacts (refer Appendix 1).	Section 20.6 Wastewater is discussed in Chapter 12: Surface Water and Hydrology
11.159	Describe potential spoil disposal sites and their ability to service the Project.	Section 20.7 Appendix Y: Spoil Management Strategy For this Project spoil is primarily regarded as a resource, not a waste.
11.160	Define and describe the objectives and practical measures for protecting or enhancing environmental values from impacts by wastes. Take into account best practice waste management strategies as outlined in the National Waste Policy 2009 and the WRR Act and the EP Regulation 2008	Section 20.3 Section 20.8.1
11.161	Describe the quantity, and physical and chemical characteristics of waste rock, any attributes that may affect its dispersal in the environment, and its associated risk of causing environmental harm.	Section 20.2 (refer to text that follows this table) Characteristics of geological units, including acid rock, is further described in Chapter 8: Land Resources Re-use of rock is further discussed in Appendix Y: Spoil Management Strategy
11.162	Assess the proposed management measures against the preferred waste management hierarchy, namely: avoid waste generation; cleaner production; reduce; recycle; reuse; reprocess and reclaim; waste to energy; treatment; disposal. This includes the generation and storage of waste.	Section 20.8.1
11.163	Describe how nominated quantitative standards and indicators may be achieved for waste management, and how the achievement of the objectives would be monitored, audited and managed.	Section 20.8.1

Waste Terms of Reference requirements		EIS section
11.164	Detail waste management planning for the proposed project especially how these plans would be applied to prevent or minimise environmental impacts due to waste at each stage of the Project.	Section 20.8.1
11.165	Provide details on natural resource-use efficiency (such as energy and water), integrated processing design, and any co-generation of power and by-product reuse as shown in a material/energy flow analysis.	Integrated processing design and the co-generation of power is not applicable to the Project in a waste and resource management context. Natural resource use efficiency is discussed in Section 20.8.1 and in Chapter 6: Sustainability

Section 11.161 of the ToR for the Project requires the quantity, and physical and chemical characteristics of waste rock to be described. 'Waste rock' is a term that is primarily associated with the exploration and mining industry, relating to overburden, interburden or coarse rejects from those activities. Waste rock in that sense is not relevant to this Project. The potential for acid rock to occur within the Project footprint and the associated impacts if it is encountered are addressed in Chapter 8: Land Resources.

Alternatively, a literal interpretation of the term could refer to rock that is waste. All rock generated through excavation works for the Project is expected to have a reuse value within the Project footprint; therefore, rock is regarded as a beneficial by-product of construction for the Project and not a waste material. For this reason, waste rock is not assessed further in this chapter. Additional details on the reuse of rock for the Project are discussed in Appendix Y: Spoil Management Strategy.

20.3 Policies, standards and guidelines

Waste and resource management is primarily administered by the State Government, with the Australian Government providing broad policy guidance based on national-level outcomes and international obligations. Local governments, and commercial and industrial generators of waste are responsible for managing waste within their local areas and/or from their activities, as required by the State Government regulatory framework.

Local governments play an important role in providing household waste collection and recycling services, managing landfill sites, delivering education programs, and providing and maintaining litter infrastructure. Commercial and industrial generators also play an important role in ensuring that the waste generated from their activities is dealt with in a manner consistent with environmental regulations and broader waste management principles.

The policy and guidelines relevant to waste management for the Project are summarised in Table 20.2. Further guidance on legislation and potential approvals associated with the Project is provided in Chapter 3: Legislation and Project Approvals Process.

TABLE 20.2 POLICIES, STANDARDS AND GUIDELINES RELEVANT TO THIS ASSESSMENT

Policy, standard or guideline	Relevance to the Project
Commonwealth	
2018 National Waste Policy: Less waste, more resources [2018 National Waste Policy] (Department of Agriculture, Water and the Environment (DAWE), 2018)	The *2018 National Waste Policy* provides a framework for collective action by businesses, governments, communities and individuals. The policy identifies five overarching principles underpinning waste management in a circular economy. These include: ▸ 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.

Policy, standard or guideline	Relevance to the Project
National Environment Protection Measures (NEPM), made under the *National Environment Protection Measures (Implementation) Act 1998* (Cth) (NEPM)	NEPM related to the Project include: ▸ The *National Environment Protection (Used Packaging Materials) Measure 2011* supports the Australian Packaging Covenant, which is the principal national instrument to reduce the environmental impacts of consumer packaging in Australia. It outlines sustainable packaging design, recycling of used packaging and reduction of litter from packaging. Where possible, the packaging from materials used in the Project will be recycled or managed to reduce litter. ▸ The *National Environment Protection (Assessment of Site Contamination) Measure 1999* establishes a nationally consistent approach to the assessment of site contamination to ensure sound environmental management practices. Chapter 8: Land Resources details the potential for contamination in the vicinity of the Project. Where required, contaminated land within the Project will be assessed in accordance with principles of this NEPM. The *National Environment Protection (National Pollutant Inventory) Measure 1998* provides the framework for the development and establishment of the National Pollutant Inventory (NPI), which is an internet database designed to provide publicly available information on the types and amounts of certain substances being emitted to air, land and water. Mobile emission sources (e.g. moving rollingstock) operating outside the boundaries of a fixed facility are excluded from reporting under the NPI NEPM. ARTC will only need to report emissions from Inland Rail to the NPI if fixed facility emissions exceed reporting thresholds. There are no fixed facilities included in the Border to Gowrie section of Inland Rail. The *National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 1998* provides a basis for ensuring that controlled wastes that are to be moved between states and territories are appropriately identified, transported and handled. This NEPM is not considered to be relevant as there is not expected to be any movement of controlled wastes between Queensland and NSW during the construction or operation of the Project.
Construction and Demolition Waste Guide—Recycling and reuse across the supply chain (Department of Agriculture, Water and the Environment (DAWE), 2012)	This guide outlines opportunities for business and industry to invest in activities that will create profit and improve environmental outcomes, by extracting valuable resources from the construction and demolition waste stream.
State	
Waste Management and Resource Recovery Strategy (Queensland Government, 2019d)	In early 2018, the State government announced the development of a comprehensive new waste strategy to increase recycling and recovery and create new jobs. From 1 July 2019, a waste levy commenced under the *Waste Reduction and Recycling Act 2011* (Qld) (WRR Act) and the *Waste Reduction and Recycling Regulation 2011* (WRR Regulation). The new laws provide for Queensland to be divided into a levy zone and a non-levy zone. Under the new laws, waste disposal from the Project will be subject to a fee, as the Project is located within a levy zone. Some waste types are automatically exempt from the levy under Section 26 of the *Waste Reduction and Recycling (Waste Levy) Amendment Act 2019* (Qld), including clean earth. The *Waste Management and Resource Recovery Strategy* is underpinned by the waste levy. The strategy focuses on transitioning to the principles of a circular economy. It provides the framework to help deliver coordinated, long-term and sustained growth for the recycling and resource recovery sector, while reducing the amount of waste produced and ultimately disposed of, by promoting more sustainable waste-management practices for business, industry and households.

Policy, standard or guideline	Relevance to the Project
End of waste framework [Chapter 8 and Chapter 8A of the WRR Act]	The end of waste (EOW) framework promotes resource recovery opportunities and aims to transform the perception of waste from being seen as waste to being valued as a resource. The EOW framework consists of: ▸ EOW codes: related to registered resource producers and resource users ▸ EOW approvals: considered on a trial basis for reusing waste as resources for which an EOW code has not been developed for the waste. A waste can be approved as a resource if the Department of Environment and Science (DES) considers that it meets specified quality criteria for its specific use. It is the registered resource producer's responsibility to ensure that the resource meets the specified criteria and quality characteristics prior to supplying the resource to the user for approved use. If a waste is approved as a resource under the EOW framework, it is no longer considered a waste under Section 13 of the EP Act. However, if the resource is not used in accordance with the EOW code or approval, it is deemed to be a waste. Operating under an EOW code can have the following benefits: ▸ Less regulation for the reuse of waste, e.g., approvals relating to regulated waste are not required ▸ Volumes of waste disposed to landfill are reduced, reducing the cost associated with disposal.

Construction of the Project may involve a reliance on the undertaking of Environmentally Relevant Activities (ERAs), as defined in Schedule 2 of the Environmental Protection Regulation 2019 (refer Chapter 3: Legislation and Project Approvals Process). One such ERA may be for regulated waste transport (ERA 57), which is the transporting of regulated waste in a vehicle. Rather than obtain approval to transport regulated waste, ARTC and/or its Principal Contractor will engage a licensed waste transportation contractor to transport regulated waste from the Project footprint to appropriately licensed disposal facilities.

No other ERAs for the collection, transportation or disposal of solid wastes are expected to be required in support of construction of the Project.

20.4 Methodology

20.4.1 Impact assessment area

The impact assessment for waste management has primarily focused on conditions and activities within the Project footprint; however, consideration has also been given to impacts on environmental values and sensitive receptors beyond this area, as a result of waste generation and management. For example, offsite disposal at existing waste management facilities. Combined, these areas comprise the impact assessment area for waste.

20.4.2 Approach

The following tasks have been undertaken for assessing potential waste impacts, as a result of the Project:

1. **Establishing a basis of significance for waste generated from the Project to give quantitative definition to the ToR**

ToR 11.158 requires the identification and assessment of significant waste streams that may arise from the Project. To aid the assessment of impact, a determination on significant waste streams has been made as follows:

- Waste at a broad category level that comprises less than 10 per cent of current waste generation within the region for that category, is deemed to be insignificant and able to be managed under current waste management arrangements within the region. Mitigations for these wastes are deemed to be covered under standard industry practice that is executed and modified to comply with statutory requirements and policy changes. These industry standard practices are not described within this chapter.
- Waste at a broad category level that comprises greater than 10 per cent of current waste generation within the region for that category is deemed to be significant and requires specific mitigations. These wastes and their mitigations are presented within this chapter.

The 10 per cent increase in volume of waste generation has been adopted as a significance threshold as this value is commonly adopted in materiality assessment.

2. Identifying environmental values

The Project has been identified as being in proximity to a number of environmental values as defined under the *Environmental Protection Act 1994* (Qld) (EP Act). These values are further discussed in Section 20.5.1 and are associated with aspects of the receiving environment, which include human receptors, environmental receptors and commercial and industrial receptors.

3. Identifying existing waste facilities

The location of existing waste-management facilities, their current capacity and waste acceptance criteria have been investigated, to assess the appropriateness of resource recovery and waste disposal options in the impact assessment area (refer Section 20.5.3).

4. Identifying potential waste generation during construction and operation phases of the Project

The potential types and volumes of waste that may be generated by the Project has been derived from several sources, including review of typical construction methods adopted on linear infrastructure projects, reference design documentation, bill of quantities and concept constructability assessment for the Project.

Wastewater that may be generated by the Project has been assessed separately in Chapter 12: Surface Water and Hydrology.

5. Identifying potential impacts on environmental values

The potential impacts that may arise from the Project during construction and operation phases are described in Section 20.8. The potential impacts have been derived from an appreciation for waste generation and management issues that typically arise during the development of large-scale linear transport infrastructure.

6. Assessment of risk and likelihood of identified impacts

The potential impacts to sensitive receptors have been assessed using a risk assessment methodology, which considers the likelihood and consequence of a potential impact and its resultant level of risk before and after mitigation measures are implemented. The risk assessment methodology applied through this draft EIS is described in further detail in Chapter 4: Assessment Methodology.

7. Identifying mitigation measures

Mitigation measures have been identified in Section 20.8.1 to avoid or reduce the scale of potential impacts from the Project on environmental, social and economic values. Mitigation measures have been developed in accordance with relevant legislative requirements identified in Chapter 3: Legislation and Project Approvals Process, aligning with the 2018 National Waste Policy and the WRR Act hierarchy (refer Figure 20.1).

In alignment with the waste and resource management hierarchy, waste management has interwoven linkages with sustainable initiatives for the Project. This includes the sustainable procurement of construction materials and efficient use of resources to minimise carbon footprint. A detailed discussion on the sustainability principles and initiatives for the Project is presented in Chapter 6: Sustainability.

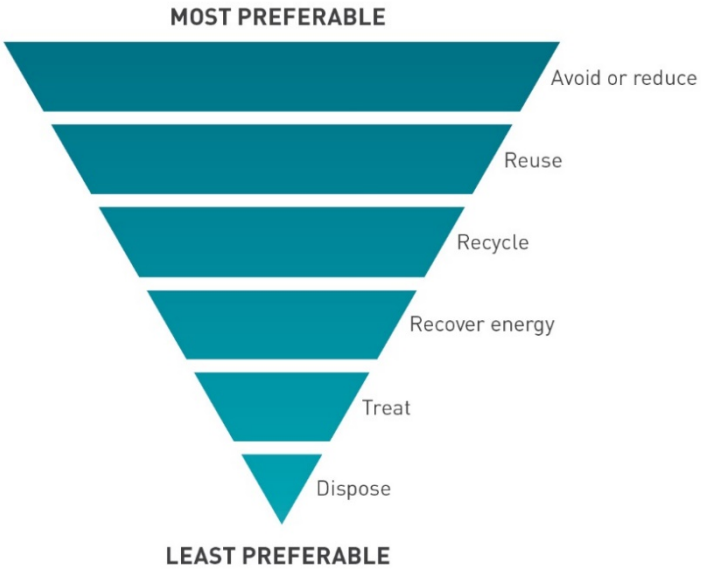


FIGURE 20.1 WASTE AND RESOURCE MANAGEMENT HIERARCHY

Source: *Waste Reduction and Recycling Act 2011* (Qld)

20.5 Existing environment

This section describes existing environmental values, geological setting and waste management operations in proximity to the Project.

20.5.1 Environmental values

Under Section 9 of the EP Act, an environmental value is a quality or physical characteristic of the environment that is conducive to ecological health, public amenity or safety. In accordance with this definition, the following environmental values have been identified as being in proximity to the Project:

- Human receptors, including:
  - Workforce or maintenance personnel
  - Landowners and communities adjacent to the Project
  - Drivers, pedestrians and residents who use roads and footpaths within the impact assessment area.
- Environmental receptors, including:
  - Receiving natural environments surrounding the Project, such as land, surface water and air
  - Areas of recognised ecological significance (i.e. State forests, remnant vegetation).
- Commercial and industrial receptors, including:
  - Existing land uses and the productive capacity of land (i.e. its potential for use for cropping activities and animal husbandry)
  - Vehicle operators travelling on the State-controlled road and local government road networks
  - Waste collection, recycling and disposal facilities within a reasonable transportable distance of the Project.

20.5.2 Geological setting

The geology within the Project footprint consists of the following groups:

- Quaternary age unconsolidated sediments comprising clay, sand and gravel
- Tertiary age basalt and associated pyroclastic rocks
- Tertiary age poorly consolidated and locally lateritised sedimentary rocks, comprising mudstone, siltstone and fine-grained sandstone
- Mesozoic age sedimentary rocks, comprising mudstone, siltstone and sandstone, which are typically deeply weathered and locally kaolinitised
- Permian to Triassic age porphyritic granite and granodiorite
- Carboniferous age Texas beds—interbedded mafic volcanics and sedimentary rocks comprising volcanoclastic arenite, siltstone, mudstone and slate, locally phyllite and lenses of jasper, chert, limestone and rare conglomerate. The Carboniferous age rocks are reported to have been metamorphosed to lower greenschist grade, which typically comprises in increase of silica content and development of chlorite, albite and green amphibole minerals, together with slight development of foliation.

Neither of these last two units have been encountered in geotechnical boreholes completed to inform the reference design and draft EIS.

Acid rock occurs when sulphide minerals are exposed to air and water. This process is accelerated through excavation activities that increase rock exposure to air, water, and microorganisms. Acid rock has potential to produce neutral-to-acidic drainage, which may occur with dissolved heavy metals and significant sulfate levels. Based on the geological conditions within the impact assessment area, the likelihood of encountering acid rock is considered to be low.

Visual examination of surface outcrops along the Project alignment for sulphide minerals or remnant products, indicative of sulphide mineralisation, will occur prior to the commencement of construction.

Further details on the geological setting of the Project and the physical and chemical characteristics of rock that may be encountered is discussed in Chapter 8: Land Resources and supported by information presented in Appendix G: Geotechnical Investigation Data.

20.5.3 Licensed waste contractors and waste facilities

Waste collection, recycling and disposal facilities and services for domestic uses are provided by local governments within the impact assessment area. Commercial and industrial land uses primarily rely on private waste transportation contractors for the collection and offsite transportation of wastes.

Goondiwindi Regional Council (GRC) is in the process of preparing a waste strategy in response to the reinstatement of the Queensland State Landfill Levy in July 2019. Through this strategy, GRC expects to retain two designated landfill sites, located in Goondiwindi and Inglewood. Both of these sites will have weighbridges. Under the strategy, a transfer station would also be established in Yelarbon.

Details of the existing waste management facilities in proximity to the Project, which have potential to accept waste from commercial operations, are listed in Table 20.3. The proximity of existing waste-management facilities to the Project has been considered based on a commonly adopted haul route distance of 50 km for bulk waste and 15 km for municipal waste, collected in domestic collection vehicles. The locations of these existing waste management facilities in relation to the Project is shown on Figure 20.2.

Many of the waste management facilities listed in Table 20.3 may accept spoil material; however, due to the anticipated material deficit for the Project, it is a core principle of the Project that the offsite disposal of spoil be avoided, unless material is encountered that cannot be treated for reuse within the Project footprint (refer Section 20.7). Therefore, none of the facilities listed in Table 20.3 have been specifically identified as potential spoil disposal sites for the Project. This principle of retaining material onsite is reflected in the spoil management hierarchy presented in Appendix Y: Spoil Management Strategy.

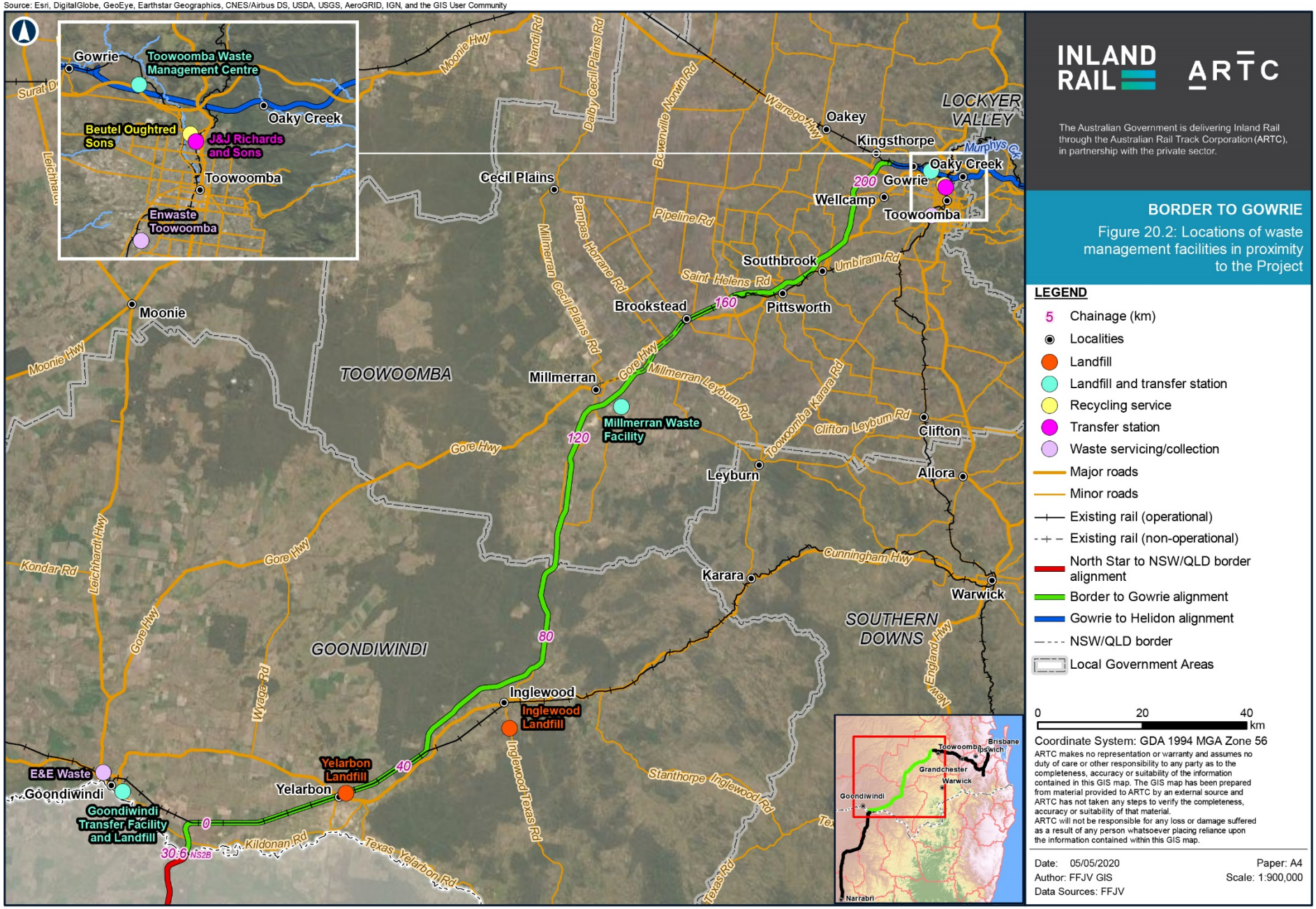
Traffic impacts associated with the offsite disposal of waste have not been assessed, as waste volumes generated during construction and operation of the Project are not expected to be significant (refer Section 20.6.3 and Section 20.6.4). Consequently, the number of vehicular movements to transport waste from construction laydown areas to established waste facilities is not expected to significantly increase the number of vehicles per day using the road network. The traffic impact assessment for the Project is discussed in Chapter 18: Traffic, Transport and Access.

TABLE 20.3 WASTE MANAGEMENT FACILITIES IN PROXIMITY TO THE PROJECT

Facility	Type	Operator	Contact details	Services performed	Waste accepted	Environmental authority
Toowoomba Waste Management Centre	Landfill and transfer station	TRC	155–175 Hermitage Road, Cranley QLD (07) 13 18 72	▸ Green waste stockpiling and shredding ▸ C&D waste recycling ▸ Limited regulated waste disposal ▸ Municipal solid waste disposal	▸ C&I waste ▸ C&D waste ▸ Green waste ▸ General (putrescible and non-putrescible) ▸ Regulated waste	EPPR00625013
Millmerran Waste Facility	Landfill and transfer station	TRC	Owens Scrub Road, Millmerran QLD (07) 13 18 72	▸ Green waste stockpiling and shredding ▸ Limited C&D waste recycling ▸ Limited regulated waste disposal ▸ Municipal solid waste disposal	▸ C&I waste ▸ C&D waste ▸ Green waste ▸ General (putrescible and non-putrescible) ▸ Regulated waste (no solid regulated waste)	Landfill airspace is projected to be exhausted by 2021. Available airspace will need to be confirmed in consultation with Toowoomba Regional Council (TRC) as the detail design progresses, post-EIS.
Goondiwindi Transfer Facility and Landfill	Landfill and transfer station	GRC (Proterra Group)	Rubbish Tip Road, Goondiwindi QLD (07) 4671 7400	▸ Green waste stockpiling and shredding ▸ C&D waste recycling ▸ Limited regulated waste disposal ▸ Municipal solid waste disposal	▸ C&I waste ▸ C&D waste ▸ Green waste ▸ General (putrescible and non-putrescible) ▸ Regulated waste	EPPR00809313
Inglewood Landfill	Landfill	GRC (Proterra Group)	Inglewood-Texas Road, Inglewood QLD (07) 4671 7440	▸ Green waste stockpiling and shredding ▸ Limited C&D waste recycling ▸ Limited regulated waste disposal ▸ Municipal solid waste disposal	▸ C&I waste ▸ C&D waste ▸ Waste oils ▸ Green waste ▸ General (putrescible and non-putrescible) ▸ Scrap metal ▸ Regulated waste	EPPR00809313
Yelarbon Landfill	Landfill	GRC (Proterra Group)	East of Sawmill Road, Yelarbon QLD (07) 4671 7440	▸ Green waste stockpiling and shredding ▸ Limited C&D waste recycling ▸ Municipal solid waste disposal	▸ C&I waste ▸ C&D waste ▸ Green waste ▸ General (putrescible and non-putrescible) ▸ Scrap metal	EPPR00809313

Facility	Type	Operator	Contact details	Services performed	Waste accepted	Environmental authority
E&E Waste	Waste Servicing/ Collection	E&E	81 Hungerford Street, Goondiwindi QLD (07) 4671 2403	▸ Collection service only	▸ C&I waste ▸ C&D waste ▸ Green waste ▸ General (putrescible and non-putrescible) ▸ Regulated waste	Not applicable
Enwaste Toowoomba	Waste Servicing/ Collection	Enwaste	18 Spalding Street, Toowoomba City QLD (07) 4638 2245	▸ Skip bin hire	▸ C&I waste ▸ Regulated waste (only liquid regulated waste)	Not applicable
Beutel Oughtred Sons	Recycling Services	Beutel Oughtred Sons	38-72 Griffiths Street, Toowoomba QLD (07) 4638 4438	▸ C&D waste recycling	▸ C&I waste ▸ C&D waste ▸ Green waste	EPPR00230213
J&J Richards and Sons	Transfer Station	J&J Richards and Sons	51 Wilkinson Street, Harlaxton QLD (07) 4634 1062	▸ Acceptance and transfer of C&I waste, C&D waste, municipal solid waste and limited regulated waste ▸ Operates adjacent to Orgro, where green waste can be re-purposed into organic mulches and conditioned soils	▸ C&I waste ▸ C&D waste ▸ Green waste ▸ General (putrescible and non-putrescible) ▸ Regulated waste	EPPR02157614

Table notes:
C&I = Commercial and industrial, C&D = Construction and demolition



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20.6 Waste generation

The generation of waste will occur throughout construction and operation phases of the Project. The waste streams and quantities for the Project identified in this assessment are indicative and have been estimated for the purpose of determining potential impacts and waste and resource management options. Waste types and volumes that may be generated by the Project will be confirmed once the construction methodology is finalised during detail design. These confirmed details will be incorporated into the Waste Management Sub-plan, as a component of the Outline EMP.

20.6.1 Existing waste generation

An estimate of regional waste generation (without the Project) for Darling Downs–Maranoa has been established to inform the impact assessment presented in Section 20.8.1. An estimate of regional waste generation characteristics by waste stream, on an annual basis, as sourced from *Recycling and Waste in Queensland 2018* (DES, 2018c) is presented in Table 20.4.

TABLE 20.4 REGIONAL WASTE GENERATION CHARACTERISTICS FOR DARLING DOWNS–MARANOA

Waste stream	Darling Downs–Maranoa
Commercial and industrial waste (C&I)	36,353 tonnes
Construction and demolition waste (C&D)	27,660 tonnes
General waste (municipal waste)	114,250 tonnes
Green waste[1]	53,232 tonnes
Regulated waste (including asbestos, contaminated soil)	Not reported regionally

Table note:

1. Denoted amount managed by local authorities and accounts for approximately 90 per cent of total green waste collected and managed within the region.

20.6.2 Waste types

Construction and maintenance activities for the Project are expected to result in the production of various waste streams. The waste stream that may be generated, and the potential Project source for each, is summarised in Table 20.5. The waste stream classifications that have been adopted are consistent with those established under the EP Regulation and used by the State Government for policy and planning purposes.

TABLE 20.5 WASTE STREAMS, DEFINITION AND POTENTIAL PROJECT SOURCES

Waste stream	Definition	Potential Project source
C&I waste	Waste that is produced by business and commerce and includes waste from schools, restaurants, offices, retail and wholesale businesses, and manufacturing industries. In the case of green waste, it includes material delivered by commercial operations.	▸ Non-resident workforce accommodation ▸ Site offices
C&D waste	Non-putrescible waste arising from the construction or demolition activities. C&D waste includes materials such as brick, timber, concrete and steel	▸ Demolition/removal of existing structures ▸ Work fronts ▸ Demobilisation of construction facilities, e.g. site offices
General waste	Wastes not defined as regulated waste under legislation. General wastes comprise putrescible wastes (easily decomposed, treated by composting) and non-putrescible wastes (not easily decomposed, may be recyclable).	▸ Kitchen and general waste from non-resident workforce accommodation ▸ Site offices ▸ Work fronts ▸ Laydown areas
Green waste	Includes grass clippings, tree, bush and shrub trimmings, branches and other similar material resulting from landscaping or maintenance activities	▸ Clear and grubbing activities ▸ Site preparation works
Recyclable waste	Waste types that can be reconditioned, reprocessed or reused. What constitutes recyclable waste may change between LGAs, as it depends what the local government has declared to be recyclable waste for the area.	▸ Non-resident workforce accommodation ▸ Site offices ▸ Work fronts ▸ Laydown areas

Waste stream	Definition	Potential Project source
Regulated waste	Waste that is commercial or industrial and is of a type or contains a constituent of a type mentioned in Schedule 9 Part 1 Column 1 of the *Environmental Protection Regulation 2008* (Qld) (EP Regulation). Regulated wastes require specific controls or actions as defined by legislation. Listed hazardous, regulated, controlled or trackable wastes typically have unique handling and disposal requirements in order to manage specific hazards associated with them. Regulated waste includes asbestos, pesticides, a range of chemicals and other industrial wastes (i.e. grease trap waste).	▸ Used containers and residues of hazardous chemicals and dangerous goods ▸ Kitchen waste from non-resident workforce accommodation (e.g. food processing waste, grease trap waste etc.) ▸ Vehicle, plant and equipment maintenance (e.g. tyres, lead acid batteries, etc.) ▸ Demolition/removal of existing structures (e.g. asbestos, lead-based paint etc.)

20.6.3 Construction wastes

Early works for the Project are planned to start in 2021, with construction scheduled to be completed by the beginning of 2026. Inland Rail, and the Project, are scheduled to be operational in 2026.

Key stages and activities undertaken within the construction phase of the Project will include:

- Site preparation
  - Vegetation clearing and grubbing
  - Topsoil stripping
  - Demolition of existing infrastructure
  - Establishment of laydown areas and work fronts
  - Establishment of construction compounds
  - Establishment of site offices
  - Installation of temporary and permanent fencing
  - Installation of drainage and water management controls
  - Construction of site access roads.
- Civil works:
  - Bulk earthworks
  - Construction of cuts and embankments
  - Installation of permanent drainage controls
  - Construction of bridges and watercourse crossings
  - Road and rail corridor works.
- Track works:
  - Installation of ballast, sleepers and rails
  - Rail systems infrastructure and wayside equipment
  - Signals
  - Turnouts
  - Asset monitoring infrastructure.
- Commissioning and integration testing
- Construction demobilisation/decommissioning:
  - Removal of construction site facilities (e.g. site offices, amenities and associated infrastructure)
  - Removal of temporary access/haul roads
  - Removal of laydown areas and hardstands.

Approval to establish and operate non-resident workforce accommodation (including sewage treatment) is being sought separately to the EIS process, which is further detailed in Chapter 3: Legislation and Project Approvals Process.

A detailed discussion of construction activities required to establish the Project is presented in Chapter 5: Project Description.

The wastes types and volumes that are expected to be generated during the construction phase of the Project are presented in Table 20.6. It has been assumed that site office and non-resident workforce accommodation infrastructure used during the construction phase of the Project, will be demountable in nature and returned to suppliers for reuse upon demobilisation.

Quantities of wastes have been estimated based on information from the constructability assessment, reference design documentation and bill of quantities for the Project. Where uncertainty exists regarding waste quantities, estimates have been rationalised through reference to *Integrated Solid Waste Management: Engineering Principles and Management Issues Report* (Tchobanoglous et al.,1993). These details will be subject to further refinement during progression of the detail design as the construction approach is confirmed.

All procured material (i.e. concrete, steel, timber and ballast) will be required to meet material specifications and adopted quality assurance criteria. Inevitably, some procured materials will fail to comply with material specifications and adopted quality assurance criteria. For the purpose of this waste assessment, it has been assumed that two per cent of the total quantity of material procured will be non-compliant with quality requirements and therefore may be waste, if an alternative use cannot be identified. This percentage has been adopted based on the waste allowance made in the bill of quantities for the Project.

Estimated waste quantities have been used to approximate the proportion of waste generated by the Project compared to the total volumes for the Darling Downs–Maranoa region.

TABLE 20.6 CONSTRUCTION WASTE QUANTITIES

Waste/ resource description	Waste type	Estimated quantity produced over construction duration	Residual as proportion of existing annual waste generation in the region	Potential reuse
Vegetation	Green waste	14,641,267 m^2	Not applicable—to be reused within the Project	Yes
Topsoil	C&D waste (topsoil for onsite reuse)	100 mm depth: 274,587 m^2 200 mm depth: 5,265,173 m^2 300 mm depth: 55,510 m^2	Not applicable—to be reused within the Project	Yes All topsoil is expected to be reused on the Project.
Steel (existing rail)	C&D waste	5,822 t	5%	Yes Where practical, opportunities for reuse will be explored
Timber sleepers	Regulated waste (regarded as contaminated)	361,700 count	Data on regional proportion of regulated waste is not available	Yes Opportunities for reuse will be considered consistent with the intent of EOW Code: Chemically Treated Solid Timber (ENEW07503218)
Ballast	Regulated waste (regarded as contaminated)	400,100 m^3	Data on regional proportion of regulated waste is not available	Yes Opportunities for reuse will be considered consistent with the intent of *Draft EOW Code: Recycled Aggregates (ENEW07604819)*
Occupying workforce accommodation	General waste	115 t	<0.1%	No
Occupying site offices	General waste	26 t	<0.1%	No
Concrete culverts	C&D waste	Assume 2% of 20,721 m^3	0.5%	Yes Opportunities for reuse will be considered consistent with the intent of *EOW Code: Returned Concrete (ENEW07278517)*
Concrete (in situ)	C&D waste	Assume 2% of 91,076 m^3	2.5%	Yes Opportunities for reuse will be considered consistent with the intent of *EOW Code: Solid Concrete Washout (ENEW07602819)*

Waste/ resource description	Waste type	Estimated quantity produced over construction duration	Residual as proportion of existing annual waste generation in the region	Potential reuse
Concrete (pre-cast)	C&D waste	Assume 2% of 24,125 m^3	0.5%	Yes Opportunities for reuse will be considered consistent with the intent of *EOW Code: Returned Concrete (ENEW07278517)*
Oils, lubricants and greases	Regulated waste	Cannot be determined at present. Waste quantity is dependent on confirmed construction method and the numbers and types of plant and vehicular fleet.	Unknown	No
Packaging	General waste	Cannot be determined at present. Waste quantity is dependent on confirmed construction method, material requirements and packaging of received goods.	Unknown	Yes Opportunities for reuse will be considered consistent with the intent of the *Used Packaging Materials NEPM*

None of the Project waste streams included in Table 20.6 are expected to result in a 10 per cent increase in volume of regional waste generation. Most of the Project waste streams are expected to result in a contribution of less than 1 per cent to existing regional waste generation (i.e. practically immeasurable); therefore, in accordance with the definition established in Section 20.4.2, no significant waste streams have been identified for the Project.

20.6.4 Operation wastes

Site-maintenance activities will be undertaken during the operation phase of the Project and will typically include inspections of rail track and structures, vegetation management, rail track replacement/upgrade and general asset upkeep.

The waste types anticipated to be generated during the operation phase of the Project are shown in Table 20.7. These waste types have been identified based on what is typically generated during the undertaking of maintenance activities on ARTC's existing freight railway networks. Once operational, the Project will be incorporated into the broader Inland Rail network. There are no railway yards or maintenance depots proposed between the NSW/QLD border and Gowrie; therefore, railway operations for the Project will involve movement of trains through the region between adjoining sections of Inland Rail and there will be no locomotive-derived waste produced during operation.

The quantities of waste produced by each maintenance activity will depend on the frequencies of planned and unplanned maintenance tasks, which will vary with the age of asset components and the occurrence and intensity of natural and Project hazards (refer Chapter 19: Hazard and Risk). Therefore, the quantities of waste produced by maintenance activities cannot be established at this stage of Project development. Regardless, typical volumes generated on ARTC's existing freight railway networks indicate that none of the waste types specified in Table 20.7 would be considered significant in accordance with the definition established in Section 20.4.2 and will be removed from the Project by a licensed waste contractor and disposed of at a licensed waste disposal facility.

TABLE 20.7 OPERATION PHASE WASTE TYPES AND WASTE STREAMS

Activity	Waste type	Waste stream
Vegetation management	Green waste	General waste (non-putrescible)
Re-profiling of landforms, e.g. embankments	Potentially contaminated solid waste	Regulated waste
General upkeep	Debris, litter/rubbish	General waste (non-putrescible)
Rail track replacement/upgrade	Scrap metal	General waste (non-putrescible)
	Potentially contaminated solid waste	Regulated waste
Infrastructure maintenance	Waste paints and solvents	Regulated waste
General maintenance of rail corridor	Empty chemical containers	Regulated waste
Maintenance of erosion and control devices and culverts	Silt and sediment	General waste (non-putrescible)
	Vegetative debris	General waste (non-putrescible)

20.6.5 Waste storage areas

Waste storage areas will be located and managed to ensure that risks to the environment are avoided or minimised. As required, designated areas will be made available for the storage of general waste and contaminated material.

As a minimum, the following will be considered when determining the locations of waste storage areas within the Project footprint:

- Waste characteristics and leachability
- Potential for nuisance and pollution generation (odour, dust and litter)
- Proximity to, and the sensitivity of, the surrounding environments and receptors
- Potential for impacts to human health
- Site conditions, duration of storage and climatic conditions.

The siting and management of waste storage areas will be contingent on confirmation of the construction methodology, workforce planning and earthworks sequencing.

20.6.5.1 General waste storage areas

Designated areas with sufficient space for waste storage, handling and collection activities will be provided at each construction work front. These waste storage areas will enable the sorting and segregation of waste prior to collection by appropriately licensed contractors. Each storage area will be provided on hardstand or within suitable bunding for the waste stream being stored.

Good housekeeping and regular removal of residual waste would be practiced at waste storage areas to maintain safety, facilitate identification of reusable items and minimise opportunities for pests to proliferate in the area.

20.6.5.2 Contaminated material storage areas

If required, appropriate storage areas for contaminated soil will be identified subject to findings of site contamination investigations undertaken during the detail design phase. The potential for contaminated soil to be encountered within the Project footprint is discussed in Chapter 8: Land Resources.

Contaminated soil that is identified in advance and is to be excavated will be subject to a site management plan that is prepared in accordance with the requirements of the EP Act. Depending on the type and levels of contamination encountered, contaminated material may be reused for construction activities within the rail corridor, such as through encapsulation within zoned embankment. In some instances, contaminated material may require treatment prior to being suitable for reuse. The onsite management and remediation of contaminated soil would be further informed by a review of sampling results, exposure risks, onsite treatment or encapsulation opportunities and requirements for ongoing management.

A disposal permit from DES would also be required for the transportation of contaminated soil by a licensed service provider to an appropriately licensed facility.

20.7 Spoil management

20.7.1 Spoil management

The reference design for the Project has, where possible, endeavoured to achieve a net balance of cut and fill, to avoid the need for offsite disposal of spoil. Where possible, materials won from excavation, such as cuttings, will be reused as fill; however, materials may be encountered that are deemed to be unsuitable without treatment, for various reasons, including:

- Moisture content: Based on the natural moisture content, the material may either be too wet or too dry in its current condition to meet the required specifications or consistency
- Organic content: Materials with organic content are typically considered unsuitable due to being highly compressible, degradable and susceptible to collapse
- Dispersive: The material is found to be dispersive and therefore highly prone to erosion and piping. Dispersive materials are typically unsuitable, as usage can compromise the structural integrity of the earthworks and lead to long-term maintenance issues.
- Compaction requirements: Materials that are unsuitable to be re-compacted to a suitable density to achieve the minimum design requirements or to achieve the required engineering design characteristics
- Reactivity: Highly reactive materials with significant shrink–swell characteristics may lead to movement within the fill
- Contamination: Contaminants may be present in the material due to several factors, including agricultural activity, waste disposal and acid sulphates
- Oversize materials: Blasted or ripped rock with particles larger than 150 mm are typically excluded from earthworks, as they cannot be adequately compacted. The oversize material can be considered for use as rock fill or rip-rap.

The estimated volumes of cut and fill for the Project are presented in Table 20.8. This shows that if all fill requirements can be sourced from material generated by the Project, there will remain a requirement of approximately 822,332 m^3 of fill material for the construction of road and rail.

TABLE 20.8 CUT-AND-FILL REQUIREMENT FOR THE PROJECT

Earthworks	Volume
Cut	
Unusable cut (without treatment)	148,905 m^3
Useable cut (without treatment)	12,376,132 m^3
Total cut (rail)	12,525,037 m^3
Fill	
General (rail)	9,595,807m^3
Structural (rail)	2,070,678 m^3
Capping (rail)	584,214 m^3
Fill requirement (rail)	12,250,699 m^3
Fill requirement (road)	1,096,670 m^3
Total fill requirement	13,347,369 m^3
Balance	**822,332 m^3 material deficit**

The total fill requirement (i.e. rail, road and supporting infrastructure) based on the reference design for the Project is 13,347,369 m^3. If all unusable cut material is able to be treated for reuse, then the total material deficit for the Project will be 822,332 m^3; however, this deficit may be up to 971,237 m^3 depending on the feasibility and success of material treatment options. The fill deficit for the Project will be met through the importation of appropriate material types from operational licensed quarries or from borrow pits established for the Project.

Where practicable, spoil will be reused within the Project footprint through treatment, amelioration or drying. Offsite reuse options may also be considered, subject to compliance with a current EOW code under the WRR Act. Material that cannot be treated for appropriate reuse may be disposed offsite; however, offsite disposal to landfill will only occur as a last resort, if the material is considered unsuitable for other uses, e.g. due to geotechnical, contamination or saturation reasons. The need for offsite disposal of spoil is not foreseen at the stage of Project planning.

It is anticipated that spoil will be transported from the point of generation to stockpiles, via access tracks and temporary haul roads established within the rail corridor. The transportation routes for the movement of cut-and-fill material, including spoil, have been assessed in Chapter 18: Traffic, Transport and Access. It is anticipated that the movement of all cut-and-fill material will be confined to Queensland.

A draft Spoil Management Strategy has been prepared to guide the decision-making process for the management of spoil material generated by the Project. The purpose of the Spoil Management Strategy is to provide overarching principles to guide the storage, treatment, reuse or disposal of material generated during construction of the Project. The draft Spoil Management Strategy for the Project is provided in Appendix Y: Spoil Management Strategy and will be reviewed and finalised before the commencement of construction.

20.7.2 Spoil storage areas

In the first instance, excess spoil will be directly transported to a point of reuse within the Project footprint to avoid stockpiling and double handling. In the event that immediate transportation is not possible, the material will be stockpiled along the right of way established for construction of the Project or within designated laydown areas. Laydown areas that may be used for the temporary stockpiling of material have been identified in the draft Spoil Management Strategy (refer Appendix Y: Spoil Management Strategy) and in Chapter 5: Project Description. Stockpiles will be located as close as possible to the source of the excavated material or its intended destination and will be separated by material type.

20.8 Potential impacts

Waste generation during the construction and operation phases of the Project may result in the following potential impacts on the environmental values identified in Section 20.5.1:

- Waste disposal, additional to current levels, resulting in increased consumption of airspace and reduction of community access to waste facilities within the region
- 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 Project
- Increased transportation of waste materials on and offsite, resulting in:
  - The increase of greenhouse gas (GHG) emissions due to the combustion of hydrocarbons from the operation of vehicles/plant
  - Decreased amenity of land uses adjacent to the Project 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 20.9 provides a summary of the potential impacts associated with each of the waste streams identified in Section 20.6.2. The proposed management approach and relationship to the waste management hierarchy for each waste stream is presented in Table 20.12.

TABLE 20.9 POTENTIAL IMPACTS FROM PROJECT WASTE STREAMS

Waste stream	Disposal to landfill	Contamination of surrounding environments	Increase in vermin	Reduced visual amenity	Increased transportation	Risks to human health
C&I waste	✓			✓	✓	
C&D waste	✓	✓		✓	✓	✓
General waste	✓	✓	✓	✓	✓	
Recyclable waste				✓	✓	
Green waste	✓		✓	✓	✓	
Regulated waste	✓	✓		✓	✓	✓

The construction of the Project will generate several waste streams that will be managed by maximising opportunities to avoid or reduce, reuse and recycle; however, there will be waste streams for which this cannot be achieved, e.g. municipal solid waste arising from non-resident workforce accommodation. In these instances, wastes will be disposed of at appropriately licensed facilities (refer Table 20.3).

As established in Table 20.6, the waste volumes likely to be produced by the Project are insignificant in the context of broader waste generation practices in the region. The ability of waste-receiving facilities listed in Table 20.3 to receive wastes generated by the Project has been determined based on initial consultation with operators, a review of environmental authority licensing under the EP Act and consideration of the Project's contribution to the regional waste management network. Feedback from consultation with TRC and GRC has indicated that the facilities listed in Table 20.3, which are owned and/or managed by these councils, are expected to have sufficient combined capacity to accept waste materials generated by the Project. The confirmation of waste-acceptance criteria and available/permissible annual disposal rates will be undertaken in consultation with the relevant operator once the construction schedule and sequencing is confirmed.

Table 20.10 identifies corresponding chapters of the draft EIS where the potential impacts that may arise from waste on environmental values are discussed.

TABLE 20.10 ENVIRONMENTAL VALUES POTENTIALLY IMPACTED BY THE PROJECT

Environmental value	Potential impacts	EIS chapter
Adjacent land uses and productive capacity of land (i.e. its potential for use for cropping activities and animal husbandry)	▸ Release of contaminants including litter/debris, fuels, hydrocarbons and chemicals ▸ Spread of pests and disease ▸ Reduced visual amenity ▸ Waste disposal additional to current levels	Chapter 7: Land Use and Tenure Chapter 8: Land Resources Chapter 9: Landscape and Visual Amenity
Receiving environments surrounding the Project (i.e. land, surface water and air quality) and areas of recognised ecological significance, including Whetstone State Forest and Bringalily State Forest	▸ Release of contaminants including litter/debris, fuels, hydrocarbons and chemicals ▸ Loss of operational railway space from the stockpiling of spoil and waste materials ▸ Reduced visual amenity	Chapter 8: Land Resources Chapter 9: Landscape and Visual Amenity Chapter 10: Flora and Fauna Chapter 11: Air Quality Chapter 19: Hazard and Risk
Health and safety of site personnel, adjacent landowners and communities	▸ Release of contaminants including litter/debris, fuels, hydrocarbons and chemicals ▸ Spread of pests and disease	Chapter 15: Social

20.8.1 Mitigation measures

This section describes the measures that either have been, or will be adopted by the Project to avoid, minimise or mitigate potential impacts attributed to waste. The mitigation measures have been developed to consider best practice management measures as outlined in:

- 2018 National Waste Policy
- WRR Act
- EP Regulation.

Cross-references to these guidelines are provided within the mitigation measures in Section 20.8.2 and Section 20.8.3, where applicable.

A hierarchical approach to waste management will be implemented for the Project from the most preferable, avoidance, to the least preferable, disposal (refer Figure 20.1). Waste management strategies that avoid the generation of waste materials in the first instance will be prioritised. Where waste cannot be avoided, waste materials will be segregated by type for collection and removal by licensed contractors.

Resource-use efficiency and by-product reuse is a core principle of the Inland Rail Environment and Sustainability Policy (refer Appendix B: Corporate Environment and Safety Policies), which underlies the waste management and mitigation measures that are proposed for the Project. There are both environmental and economic benefits to investigating and maximising opportunities for resource use efficiency and by-product reuse, while also unlocking potential for innovation. It is in ARTC's interest to investigate and implement reuse and recycling initiatives, given the relative remoteness of some sections of the Project and the costs involved in the transportation and disposal of waste.

The approach to resource efficiency that will be adopted for the Inland Rail Program, and this Project, is summarised in Figure 20.3.

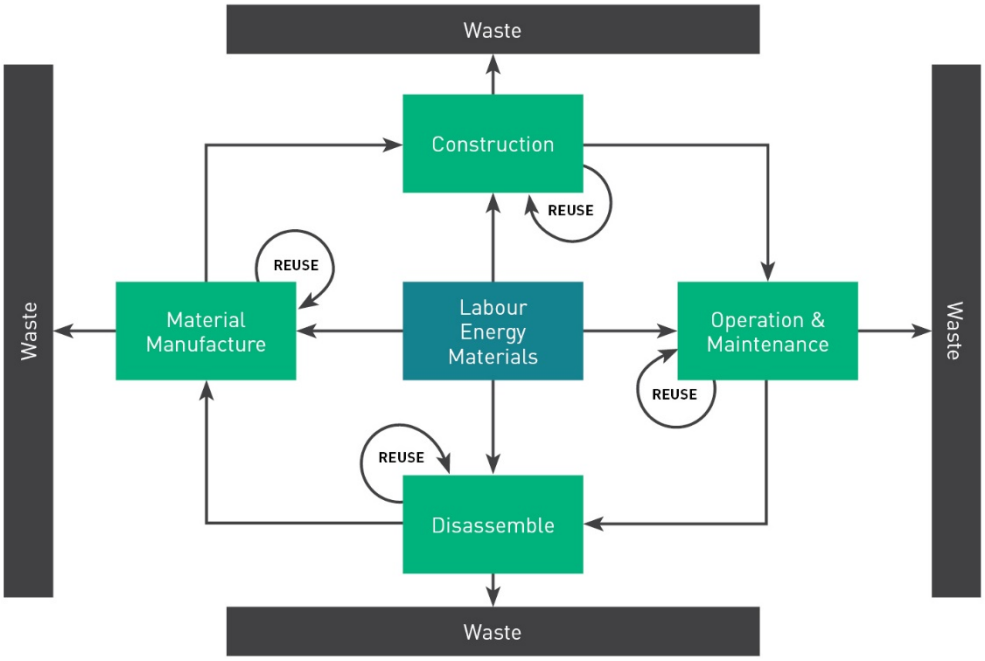

FIGURE 20.3 APPROACH TO RESOURCE USE EFFICIENCY AND BY-PRODUCT REUSE

20.8.2 Mitigation through the reference design phase

Development of the reference design for the Project has progressed in parallel with the impact assessment process. As a result, design solutions for avoiding, minimising or mitigating impacts have been incorporated into the reference design as appropriate and where possible.

Mitigation measures and controls that have been factored into the reference design for the Project, or otherwise implemented during the reference design phase for the Project, are as follows:

- The quantity of excess spoil to be generated by the Project has been reduced through development of the reference design to achieve as close to a net balance in earthworks as is practicable. For the most part, this has been achieved through:
  - Aligning the Project to avoid, where possible, steep terrain and topographical constraints to minimise earthworks and provide for more efficient track geometry and grade
  - Considering the shape and size of batters to encourage cut-and-fill balancing
  - Optimising the number, width and depth of cuts to avoid the generation of material that would be considered surplus to Project requirements.
- A draft Spoil Management Strategy (refer Appendix Y: Spoil Management Strategy) has been developed to guide the decision-making process for the management of spoil material generated by the Project. The purpose of the Spoil Management Strategy is to provide overarching principles to guide the storage, treatment, reuse or disposal of material generated during construction of the Project.
- A value management process has been implemented that focuses on identifying potential opportunities for defining, maximising and achieving efficiencies through the design, construction and operation of the Project
- Consideration of the following:
  - Reuse of local sources of aggregate and treatment of dispersive and reactive materials to improve mass haul
  - Reuse of material excavated below the rail embankment for less critical parts of infrastructure
  - Reuse of excavated material as a stabilised structural fill
  - Viability of the reuse of ballast as high-quality general fill or structural fill to minimise the import of rock amour.
- Consultation has commenced with the owners and operators of existing waste management facilities in proximity to the Project (refer Table 20.3) to determine the wastes accepted, waste acceptance criteria and capacity to receive wastes from the Project during construction
- Initial discussions have been had with the Department of Natural Resources, Mines and Energy (DNRME) to identify opportunities for State forest timber salvage to supply local timber mills prior to commencement of rail construction.

20.8.3 Proposed mitigation measures

In order to manage and mitigate Project risks, several mitigation measures have been developed for implementation in future phases of Project delivery. These mitigation measures have been identified to address Project-specific issues and opportunities including legislative requirements and accepted government plans, policy and practices.

Table 20.11 identifies the relevant Project phase, the aspect to be managed and the proposed mitigation measure. The mitigation measures presented in Table 20.11 have then been factored into the assessment of residual risk, as documented in Table 20.13.

Further context and the framework for implementation of these proposed mitigation and management measures is provided in Chapter 22: Outline Environmental Management Plan.

TABLE 20.11 MITIGATION MEASURES FOR WASTE MANAGEMENT

Phase	Aspect	Proposed mitigation measures

Detail design	Generation of waste	▸ Aim to maximise the reuse of local sources of aggregate and treatment of dispersive and reactive materials to improve mass haul
		▸ Aim to maximise the reuse of material excavated below the rail embankment for less critical parts of infrastructure
		▸ Aim to maximise the reuse of excavated material as a stabilised structural fill
		▸ Optimise the number, width and depth of cuts to avoid the generation of material that would be considered surplus to Project requirements
		▸ Continue to investigate the viability of the reuse of ballast as high-quality general fill or structural fill to minimise the import of rock amour
		▸ Refine the horizontal and vertical design and alignments to minimise the quantity of offsite fill required
		▸ Review the cut-and-fill balance for the Project based on the detail design, to minimise reliance on the external sourcing of fill
		▸ Review and update the draft Spoil Management Strategy (refer Appendix Y: Spoil Management Strategy) for the Project to reflect anticipated cut-and-fill quantities at the end of the detail design process. The Spoil Management Strategy will be finalised prior to the commencement of construction.
		▸ Undertake a waste reduction review to identify opportunities to meaningfully achieve the waste reduction targets through detail design, construction and operation of the Project
		▸ Assess and confirm opportunities for beneficial use of materials under the EOW framework. If appropriate to do so, ARTC and/or its construction contractors will register as a resource producer to operate under an EOW code
		▸ Develop a Waste Management Sub-plan, as a component of the Construction Environmental Management Plan (CEMP). As a minimum, the sub-plan will establish:
		  ▸ Waste targets (or waste reduction targets) to be achieved for the Project, in accordance with the WRR Act
		  ▸ 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
		  ▸ Confirmation of waste streams and estimated volumes
		  ▸ Temporary waste storage areas and disposal locations on and offsite (refer Table 20.3)
		  ▸ Waste disposal and National Environmental Protection Measure (NEPM) criteria for disposal sites, in accordance with the environmental authority conditions for operational facilities (refer Table 20.3)
		  ▸ Methods for survey of infrastructure that will be removed or disturbed by the Project prior to the commencement of construction, to identify asbestos-containing materials and other hazardous materials
		  ▸ Requirements for waste segregation e.g. green waste, C&I waste, C&D waste, general waste, regulated waste and recyclables, in accordance with the EP Regulation
		  ▸ Requirements for secure temporary storage, collection frequency and disposal/recycling requirements, in accordance with the EP Regulation
		  ▸ Procedures and reporting/documentation requirements for ensuring waste transporters and receivers are appropriately licensed according to the type of waste, in accordance with the EP Regulation
		  ▸ 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.

	Disposal of waste	▸ Waste generated by the Project is to be disposed of at licensed waste-management facilities. ▸ Waste generated by the Project are to be transported by licensed waste transportation services.

Phase	Aspect	Proposed mitigation measures
Pre-construction	Hazardous waste	▸ Where identified, asbestos-containing materials will be removed prior to the commencement of construction. Asbestos removal and handling will be conducted in accordance with: ▸ *National Environmental Protection (Assessment of Site Contamination) Measure 2013* (National Environment Protection Council, 2013) ▸ *Guidelines for the Assessment, Remediation and Management of Asbestos-Contaminated Sites in Western Australia* or equivalent ▸ *Model Code of Practice—How to Manage and Control Asbestos in the Workplace 2016* (Safe Work Australia, 2016) ▸ *Safe Work Australia Model Code of Practice—How to Safely Remove Asbestos* (Safe Work Australia, 2018a). ▸ If removal of more than 10 m^2 of asbestos is required, the necessary licence will be obtained from Workplace Health and Safety Queensland, as follows: ▸ A Class Licence—Removal of loose (friable) asbestos ▸ B Class Licence—Removal of bonded asbestos ▸ Asbestos-containing materials will be transported by a licensed service provider and disposed of at an appropriately licensed facility, in accordance with the requirements of the WRR Act, *Work Health and Safety Act 2011* (Qld) (WHS Act) and the EP Act.
Construction	Waste generation	▸ Monitor waste generation to ensure adherence to waste reduction targets established in construction contract documentation ▸ Contractors to adhere to the practices of the WRR Act waste and resource management hierarchy, which sets out options for managing waste, from avoiding, to reusing, recovering, treating and disposing of waste ▸ All cut material of appropriate suitability as per ARTC Earthworks Material Specification (ETC-08-03) should be stockpiled separately and reused on site where possible, with or without treatment ▸ Portable toilets and amenities to be serviced and maintained to ensure efficient operation and minimise environmental risks associated with their operation and decommissioning ▸ Grease trap and interceptor wastes will be pumped out and removed by a licensed regulated waste transporter ▸ Appropriate waste bins will be located in general waste storage areas to facilitate segregation and appropriate containment of waste materials ▸ Each storage area will be provided on hardstand or within suitable bunding for the waste stream being stored.
	Disposal of waste	▸ Wastes to be disposed of at appropriately licensed facilities where disposal to landfill is unavoidable ▸ Waste tracking documentation to be retained by the Principal Contractor for materials removed from site for disposal.
	Hazardous waste	▸ Regulated wastes and contaminated soils or other materials must be transported and disposed in accordance with the EP Act and procedures within the Waste Management Sub-plan ▸ Asbestos-containing materials will be transported by a licensed service provider and disposed of at an appropriately licensed facility, in accordance with the requirements of the WRR Act and the EP Act.
Operation	Waste generation	▸ Operators and maintenance crews to adhere to the practices of the WRR Act waste and resource management hierarchy, which sets out options for managing waste, from avoiding, to reusing, recovering, treating and disposing of waste ▸ Waste management commitments in accordance with the WRR Act waste and resource management hierarchy and procedures will be developed for inclusion in the Operation environmental management plan (EMP) for the Project.
	Disposal of waste	▸ Wastes to be disposed of at appropriately licensed facilities where disposal to landfill is unavoidable ▸ Waste tracking documentation to be retained by the maintenance supervisor for materials removed from site for disposal.
	Hazardous waste	▸ The transportation of regulated wastes and contaminated soil or other materials will be conducted by appropriately licensed contractors for disposal at licensed facilities in accordance with the EP Act.

Further consultation with operators of landfills and other waste-receival facilities in proximity to the Project will be undertaken during the detail design process (post-EIS) to inform the assignment of waste disposal destinations from construction work fronts. This information will be used to develop the Waste Management Sub-plan, as a component of the CEMP for the Project.

Management of specific waste types that are expected to be generated by the Project are further detailed in Table 20.12, as per the waste management hierarchy shown in Figure 20.1 and the approach to resource use efficiency shown in Figure 20.3.

TABLE 20.12 MANAGEMENT OF WASTE TYPES GENERATED BY THE PROJECT

Waste type	Waste stream	Avoid/reduce	Reuse/recycle/recover	Treat/dispose
Cleared vegetation	Green waste	Where practical, minimise the extent of disturbance and clearing required to enable construction of the Project.	Reuse logs, stumps and mulch in rehabilitation. Identify opportunities for beneficial reuse of material or reprocess at a licensed facility for reuse.	No treatment or disposal proposed
Concrete	C&D waste	Detail design is to specify material requirements to avoid overestimation during procurement. Construction specifications to be established to maximise life expectancy of concrete structures. Minimize offcuts by 'ordering to size', e.g. ordering pre-cast concrete where possible.	Crushed concrete may be used as aggregate for fill, drainage aggregate, construction fill or road base Opportunities for reuse will be considered consistent with the intent of *EOW Code: Returned Concrete (ENEW07278517)* and *EOW Code: Solid Concrete Washout (ENEW07602819)*	Transportation of waste by appropriately licenced operator to a licensed facility
Topsoil	C&D waste	Where practical, minimise the extent of disturbance and clearing required to enable construction of the Project.	Topsoil to be temporarily stockpiled for reuse on batters/used for revegetation. Immediate reuse of topsoil is preferred to long-term stockpiling. Clean material will be accepted by GRC landfills free of charge for use as day cover.	No treatment or disposal proposed
Debris and litter	General waste (non-putrescible)	Buy consumable products in bulk to minimise packaging waste. Procurement protocols to be established to include waste minimisation principles.	Reduce, reuse or recycle wastes where possible. Provision of separate waste disposal vessels onsite to enable the segregation of wastes.	Appropriate provision of waste-disposal vesicles onsite. Collection in covered bins/containers with appropriate signage. Service regularly to avoid vermin and pests. Transportation of waste by appropriately qualified personnel to licensed facility.
Recyclable materials (e.g. aluminium, cardboard and glass)	Recyclable	Buy consumable products in bulk to minimise packaging waste. Procurement protocols to be established to include waste minimisation principles.	Provide for segregation of recyclable materials	No treatment or disposal proposed

Waste type	Waste stream	Avoid/reduce	Reuse/recycle/recover	Treat/dispose
Metal	C&D waste	Detail design is to specify material requirements to avoid overestimation during procurement. Construction specifications to be established to maximise life expectancy of structures.	Where possible, salvage reusable metal for reuse or recycling, including stakes, drums and wire, and disused railway track. Segregate and store onsite in designated areas for removal to licensed facility for recycling.	Waste metals that are surplus to requirements should be disposed of via a licensed metal recycling/recovery contractor.
Timber	C&D waste	Detail design is to specify material requirements to avoid overestimation during procurement. Construction specifications to be established to maximise life expectancy of structures.	Reuse or repurpose for applications onsite. Opportunities for reuse will be considered consistent with the intent of EOW Code: Chemically Treated Solid Timber (ENEW07503218) Segregate and store onsite in designated areas for removal by appropriately qualified personnel to licensed facility for recycling.	Waste timber that is surplus to requirements should be disposed of via a licensed recycling/recovery contractor.
Ballast	Regulated waste	The Project uses approximately 71.2 km of existing rail corridor, in which the existing rail formation will need to be modified; therefore, the disturbance of existing ballast cannot be avoided.	Reuse or repurpose for applications onsite. Opportunities for reuse will be considered consistent with the intent of *Draft EOW Code: Recycled Aggregates (ENEW07604819)*.	No treatment or disposal proposed.

20.9 Impact assessment summary

Potential construction and operation phase associated with the generation and management of waste are outlined in Table 20.11. These impacts have been subject to a risk assessment as per the methodology in Section 20.4.2 and Chapter 4: Assessment Methodology.

The initial risk assessment is undertaken on the assumption that the design considerations (or initial mitigation measures) factored into the reference design phase (refer Section 20.8.2) have been implemented.

Additional mitigation and management measures were then applied as appropriate to the phase of the Project to reduce the level of potential impact (refer Table 20.11). The residual risk level of the potential impacts was then reassessed.

The pre-mitigated risk levels are presented next to the residual risk levels in Table 20.13 to demonstrate the effectiveness of the mitigation and management measures.

TABLE 20.13 WASTE RISK ASSESSMENT

			Initial risk			Residual risk		
Aspect	**Potential Impact**	**Phase**	**Likelihood**	**Consequence**	**Risk**	**Likelihood**	**Consequence**	**Risk**
Disposal of wastes	Municipal waste disposed to landfill (additional to current levels)	Pre-construction and construction	Likely	Not significant	Low	Unlikely	Not Significant	Low
		Operation	Likely	Not Significant	Low	Unlikely	Not Significant	Low
	C&D waste disposed to landfill (additional to current levels)	Pre-construction and construction	Likely	Moderate	High	Unlikely	Moderate	Low
		Operation	Unlikely	Moderate	Low	Unlikely	Moderate	Low
Waste generation	Uncontrolled release of waste (may cause contamination)	Pre-construction and construction	Possible	Moderate	Medium	Unlikely	Moderate	Low
		Operation	Possible	Minor	Low	Unlikely	Minor	Low
	Increase in greenhouse gas emissions arising from waste transportation activities	Pre-construction and construction	Likely	Not Significant	Low	Likely	Not Significant	Low
		Operation	Likely	Not Significant	Low	Likely	Not Significant	Low
	Decrease in air quality due to waste traffic increases	Pre-construction and construction	Possible	Minor	Low	Unlikely	Minor	Low
		Operation	Unlikely	Minor	Low	Rare	Minor	Low
	Release of pollutants and risks to human health and safety	Pre-construction and construction	Possible	Moderate	Medium	Unlikely	Moderate	Low
		Operation	Possible	Moderate	Medium	Unlikely	Moderate	Low
Hazardous wastes	Loss of containment of dangerous goods during handling and transportation	Pre-construction and construction	Possible	Moderate	Medium	Unlikely	Moderate	Low
		Operation	Possible	Moderate	Medium	Unlikely	Moderate	Low

20.10 Cumulative impacts

It is a requirement of the ToR for this Project that the potential for cumulative impacts be considered. This section provides a discussion on the potential for cumulative impacts in relation to waste management. Further details on the potential for cumulative impacts to arise as a result of the Project, in combination with others, is presented in Chapter 21: Cumulative Impacts. Details on the assessment methodology for cumulative impacts is presented in Chapter 4: Assessment Methodology.

Cumulative impacts arising from waste management activities on surrounding environmental values and sensitive receptors will largely be as a result of waste disposal contributing to the accelerated consumption of available capacity, or airspace, of local waste management infrastructure, thereby reducing the local community's access to such services.

Based on the reference design, the Project is expected to have a total material deficit between 822,332 m^3 and 971,237 m^3, depending on the ability to treat and reuse unsuitable material. Therefore, cumulative impacts associated with the offsite disposal of spoil are not anticipated to be a result of the Project.

Cumulative impacts have been assessed based on the potential to decrease the lifespan of waste and resource management infrastructure in the region. In part, the potential for the Project to contribute to cumulative impacts has already been assessed through the comparison of predicted waste-generation rates for the Project, against waste generation rates for the region (refer Table 20.6).

Twenty-three projects were initially identified as having potential to contribute to cumulative impacts in combination with the Border to Gowrie Project. These projects are either currently operational, expected to undergo future expansion or are currently going through an approval process. A full list of the 23 projects, with a description of each, is presented in Chapter 21: Cumulative Impacts.

For the purposes of waste management, projects that will have overlapping construction timeframes and shared demand on existing waste-management facilities are regarded as having potential to result in cumulative impacts. Only 2 of the initial 23 projects identified meet these criteria. These projects are listed in Table 20.14.

TABLE 20.14 PROJECTS CONSIDERED FOR THE CUMULATIVE IMPACT ASSESSMENT

Projects	Location	Description	Construction dates
North Star to NSW/QLD Border (Inland Rail)	▸ Rail alignment from North Star, NSW to the NSW/QLD border ▸ Adjoins the Project at its southern limit	New 37 km rail corridor to connect North Star (NSW) to the QR South West Rail Line just north of the NSW/QLD border.	2021–2024
Gowrie to Helidon (Inland Rail)	▸ Rail alignment from Gowrie to Helidon, Queensland ▸ Adjoins the Project at its northern limit	New 26 km dual-gauge track between Gowrie (north–west of Toowoomba) and Helidon (east of Toowoomba), extending through the local government areas (LGAs) of Toowoomba and Lockyer Valley. The Project includes a 6.38 km tunnel to create an efficient route through the steep terrain of the Toowoomba Range.	2021–2025

Both of the projects listed in Table 20.14 are part of the broader Inland Rail Program. Therefore, despite the potential for cumulative impact on receiving waste-management facilities, ARTC will be able to liaise with the relevant operators, in order to negotiate appropriate waste disposal arrangements. Furthermore, the negotiation of spoil reuse across different projects represents a Project opportunity that will have a tangible benefit on the need for offsite (outside project) management/disposal.

An assessment of cumulative impacts that may arise from these projects in combination with the Project is presented in Table 20.15.

Cumulative impacts relating to waste management are considered to be of low significance. Where cumulative impacts have been assessed as 'low significance' there are unlikely to be long-term cumulative impacts, providing that all assessable projects apply mitigation measures that are consistent with those proposed for this Project (refer Table 20.11).

TABLE 20.15 ASSESSMENT OF WASTE MANAGEMENT CUMULATIVE IMPACTS

Project	Potential cumulative impact	Aspect	Relevance factor	Sum of relevance factors	Impact significance	Comments and management measures
North Star to NSW/QLD Border (Inland Rail)	Airspace consumption of local waste management infrastructure, thereby reducing the local community's access to such services	Probability of the impact	Medium (2)	5	Low	Will be managed through: ▸ ARTC to secure agreements with owners and operators for disposal of waste at licensed waste disposal facilities once the construction schedule for both Inland Rail projects is confirmed ▸ ARTC to ensure that construction contract documentation for adjoining projects have consistent clauses regarding waste management, including reduction targets ▸ ARTC to ensure that Waste Management Sub-plans (or equivalent) are prepared for both adjoining Inland Rail projects, and that these sub-plans are complementary and are consistent with the Inland Rail Environment and Sustainability Policy, the Inland Rail Sustainable Procurement Policy and the Inland Rail Environmental Management System.
		Duration of the impact	Low (1)			
		Magnitude/intensity of the impact	Low (1)			
		Sensitivity of the receiving environment	Low (1)			
Gowrie to Helidon (Inland Rail)	Airspace consumption of local waste management infrastructure, thereby reducing the local community's access to such services	Probability of the impact	Medium (2)	5	Low	Will be managed through: ▸ ARTC to secure agreements with owners and operators for disposal of waste at licensed waste disposal facilities once the construction schedule for the for both Inland Rail projects is confirmed ▸ ARTC to ensure that construction contract documentation for adjoining projects have consistent clauses regarding waste management, including reduction targets ▸ ARTC to ensure that Waste Management Sub-plans (or equivalent) are prepared for both adjoining Inland Rail projects, and that these sub-plans are complementary and are consistent with the Inland Rail Environment and Sustainability Policy, the Inland Rail Sustainable Procurement Policy and the Inland Rail Environmental Management System.
		Duration of the impact	Low (1)			
		Magnitude/intensity of the impact	Low (1)			
		Sensitivity of the receiving environment	Low (1)			

Table notes:
Relevance factors between 1 and 3 were determined using professional judgement to select most appropriate relevance factor for each aspect and summing the relevance factors.
Sum of relevant factors definition:

- Low (1–6): Negative impacts need to be managed by standard environmental management practices. Monitoring to be part of general project monitoring program.
- Medium (7–9): Mitigation measure likely to be necessary and specific management practices to be applied. Targeted monitoring program required, where appropriate.
- High (10–12): Alternative actions should be considered and/or mitigation measures applied to demonstrate improvement. Targeted monitoring program necessary, where appropriate.

20.11 Conclusions

This chapter has been prepared to address sections 11.158 to 11.165 of the ToR.

In the first instance, this chapter has identified and discussed existing conditions within the adopted impact assessment area in relation to waste management, including the locations of existing licensed waste contractors and waste management facilities. The potential waste types, streams and volumes that may be generated during construction and operation of the Project have also been established, with comparison to regional waste generation.

Project impacts that relate to waste management have then been identified. The potential impacts identified were as follows:

- Waste disposal additional to current levels, resulting in increased consumption of airspace and reduction of community access to waste facilities surrounding the impact assessment 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 Project
- Increased transportation of waste materials on and offsite, resulting in:
  - The increase of GHG emissions due to the combustion of hydrocarbons from the operation of vehicles/plant
  - Decreased amenity of land uses adjacent to the Project 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.

Development of the reference design for the Project has progressed in parallel with the impact assessment process. As a result, design solutions for avoiding, minimising or mitigating impacts have been incorporated into the reference design as appropriate and where possible. Responses of the reference design and Project planning to waste management issues has been detailed in Section 20.8.2.

Where potential waste management impacts have not been fully avoided or mitigated through reference design and Project planning, additional mitigation measures have been nominated for implementation in future phases of the Project. These proposed mitigation measures have been detailed in Section 20.8.3. The general intent of these proposed mitigation measures is to:

- Minimise double handling during resource recovery activities and promote segregation of materials, by providing sufficient area for storage and segregation of materials
- Separate and segregate the different material types onsite, where practicable
- Manage movement of excavated material within the Project footprint and external to the Project
- Develop procedures to record, monitor, audit and report the offsite destination of each load of excavated material, resource recovered materials and residual waste.

A risk assessment of potential impacts both without (initial risk) and with the application of proposed mitigation measures (residual risk) has been undertaken (refer Section 20.9). This assessment concluded that all identified waste management impacts associated with the Project are expected to have a low residual risk rating. Therefore, waste and resource recovery activities associated with the Project are not anticipated to pose a significant risk to the environment or public health with the implementation of effective control measures. The volumes of waste and timing of generation will be further refined during the detail design phase, once the construction approach is confirmed, to more accurately assess the appropriate receiving waste management facilities and waste disposal options for the Project.

All potential waste management impacts will be managed through adherence to the Outline EMP (refer Chapter 22: Outline Environmental Management Plan).