

31. WASTE MANAGEMENT

This chapter identifies the waste types (solid, liquid and gaseous) and quantities that will be generated by the Arrow LNG Plant, describes existing waste facilities in the region, and sets out the waste management strategies and processes to be employed to deal with waste associated with the project.

The terms 'general waste' and 'regulated waste' are used throughout this chapter and are defined as follows:

- General waste, as defined in the *Environmental Protection Act 1994*, refers to anything that is:
 - Left over, or an unwanted by product, from an industrial, commercial, domestic or other activity.
 - Surplus to the industrial, commercial, domestic or other activity generating the waste.
- Regulated waste, as defined in the *Environmental Protection Regulation 2008*, refers to waste that is:
 - Commercial or industrial waste, whether or not it has been immobilised or treated.
 - Of a type, or contains a constituent of a type, mentioned in Schedule 7 of the regulation.

The chapter is based on information contained in the waste impact assessment for the Arrow LNG Plant completed by Coffey Environments Australia Pty Ltd (Appendix 29, Waste Impact Assessment). The potential impacts of waste generated by the project on the environmental and social values in the project area are discussed where relevant in chapters 10 to 30.

Objectives for waste management have been developed based on the relevant legislative context and are set out in Box 31.1.

Box 31.1 Objectives: Waste management

- To minimise the generation of waste through avoidance, re-use, recycling, and treatment and disposal activities.
- To preserve the integrity, ecological function and environmental values of air, land and water environments through effective waste management strategies.

31.1 Legislative Context and Standards

The following section describes the Commonwealth and state legislation, policy and actions specific to waste management.

31.1.1 Commonwealth Framework

Commonwealth legislation and measures relevant to project activities involving waste management include:

- National Environment Protection (Movement of Controlled Waste between States and Territories) Measure 2004 as varied in 2010 (NEPC, 2010). The Commonwealth has established a national system to track waste transport movements between states and territories. The measure ensures controlled waste is properly identified, handled and

transported to a licensed or approved receiving facility for storage, treatment, recycling and disposal. This measure will apply to the project in the event that controlled waste is transported interstate for storage, treatment, recycling or disposal.

- *Quarantine Act 1908*. This act provides for the protection of Australia's environment, agricultural industry and the health of its population by establishing quarantine procedures to minimise the risk of exotic pests and diseases entering the country. The act will apply to the project during construction when imported building materials are transported from an offshore fabrication facility directly to Curtis Island.
- National Environment Protection (National Pollutant Inventory) Measure 1998 as varied in 2008 (NEPC, 2008). This measure establishes a National Pollutant Inventory that provides information on the quantities of certain substances emitted to air, land and water. In Queensland, this measure is implemented under the Environmental Protection Regulation 2008. The project is required to report annually on the pollutants it emits, in accordance with this measure. Non-compliance with a reporting requirement may result in a financial penalty.

31.1.2 State Legislation, Policies and Strategies

State legislation, policies and strategies relevant to project activities involving waste management include:

- *Environmental Protection Act 1994*. This act provides for the protection of Queensland's environment by promoting ecologically sustainable development. Subordinate to the act are:
 - Environmental Protection Regulation 2008, which provides for the effective administration and enforcement of the objectives and provisions of the Environmental Protection Act.
 - Environmental Protection (Waste Management) Policy 2000, which provides a framework for managing waste in Queensland and establishes waste management principles. The principles relevant to the Arrow LNG Plant are the 'polluter pays principle' and the 'product stewardship principle'. The policy also describes the waste management hierarchy as an optimal tool for managing waste.
 - Environmental Protection (Waste Management) Regulation 2000, which identifies the requirements for handling specific waste streams, with the objective to minimise the impact of waste on the environment and human health. This regulation will apply to the project when transporting and disposing of regulated wastes.
- Queensland's Waste Reduction and Recycling Strategy 2010–2020 (DERM, 2010b). This is a ten year plan that aims to achieve the state government's vision of a low waste Queensland. The strategy outlines a substantial waste reform program including new legislation and stronger regulation. The strategy will have future implications for the project, largely relating to the cost of disposal of waste to landfill sites. Future benefits may arise from the establishment of recycling and resource recovery facilities in regional Queensland, increasing the opportunities for resource recovery for the project.

31.2 Environmental Values

Environmental values are a quality or physical characteristic of the environment that is conducive to ecological health, public amenity or safety; and they are a measure of how we value the environment in which we live (*Environmental Protection Act 1994*).

The Environmental Protection (Waste Management) Policy 2000 defines three environmental values to be enhanced or protected. These are:

- The life, health and wellbeing of people.
- The diversity of ecological processes and associated ecosystems.
- The land-use capability, having regard to economic considerations.

31.3 Waste Types

Wastes expected with the construction, operation and decommissioning are described in this section.

31.3.1 Construction

Waste types generated by the project during construction will largely comprise waste from vegetation clearing and site preparation activities, left over, off-specification or quarantined construction materials, and domestic waste.

The construction of the LNG plant and ancillary facilities will generate the following wastes:

- Green waste, timber, topsoil and acid sulfate soils from site preparation works.
- Timber packaging.
- Scrap metal.
- General waste including putrescible wastes from offices and crib rooms.
- Recyclable wastes (aluminium, cardboard, glass, paper, plastics and tin).
- Waste concrete.
- Batteries.
- Hydrostatic test water from pipeline and LNG storage tank testing.
- Vehicle and equipment washdown water.
- Sewage and greywater.
- Stormwater runoff.
- Effluent treatment plant discharge.
- Waste oils, sludges and oily water.
- Brine from the reverse osmosis water treatment plant.
- Paint, chemical residues and containers.
- Quarantine wastes, including washwater, clinical and biohazard wastes.
- Dredging material.

The construction of the tunnel and feed gas pipeline will generate the following wastes:

- Green waste, timber, topsoil, spoil and acid sulfate soils from site preparation works.
- Scrap metal, e.g., pipe off-cuts.
- General waste including putrescible wastes from portable offices and crib rooms.
- Waste chemicals, paints and adhesives.
- Oil and chemical containers.
- Recyclable wastes (aluminium, cardboard, glass, paper, plastics and tin).
- Waste oils and sludges e.g., from pipeline pigging.
- Sewage and greywater.
- Hydrostatic test water from pipeline testing.
- Gaseous and particulate emissions from earthworks and vehicle movements.
- Tunnel spoil material.

31.3.2 Operation

Waste types generated by the project during operations will largely comprise waste from:

- Maintaining the plant and equipment.
- The liquefaction of feed gas.
- Wastewater from drainage of potentially contaminated areas around the plant.
- Domestic waste.
- Abnormal operating conditions.

The operation of the LNG plant and ancillary facilities will generate solid, liquid and gaseous wastes as described below. Low quantities of waste will be generated from the operation of the feed gas pipeline, and will be limited to sludge produced when the pipeline is pigged.

Solid Wastes

The solid wastes expected to be generated during the operation of the LNG plant and ancillary facilities include:

- General wastes e.g., domestic, putrescible, clothing.
- Sludge from pigging operations and tank cleaning.
- Paper, cardboard and timber packaging.
- Ceramic balls, molecular sieve and activated carbon adsorbents.
- Ferrous and non-ferrous metals from maintenance activities.
- Spent batteries.
- Contaminated soil from accidental spillages.

Liquid Wastes

The liquid wastes generated during the operation of the LNG plant and ancillary facilities include:

- Potentially contaminated runoff from facility process areas, which will be routed to the controlled discharge facility. The quality of the runoff water will be monitored and either discharged with the uncontaminated stormwater runoff to the sea or diverted to the effluent treatment plant for treatment.
- Oil-contaminated water from the bottom of the slops oil tank.
- Waste triethylene glycol from the dehumidifying process.
- Sewage and greywater from office buildings and the canteen.
- Brine from the reverse osmosis water treatment plant.
- Hydrostatic test water from pipeline and LNG storage tank testing.
- Waste oils, coolants and sump fluids from maintenance activities.
- Ballast water from shipping activities.
- Effluent from the demineralisation plant.
- Wastewater effluent produced when washing the gas turbines.
- Amine solvent or hydrochloric acid and caustic from liquid spills.

Gaseous Wastes

Gaseous wastes during operation will be generated from the combustion of carbon-based fuels including nitrogen oxide (NO_x), carbon monoxide (CO), carbon dioxide (CO₂) and particulate matter (PM₁₀ and PM_{2.5}). Other sources of gaseous waste include the venting of process units used for the removal of impurities such as CO₂ and nitrogen (N₂).

Abnormal Operating Conditions or Unplanned Events

Abnormal operating conditions or unplanned events, such as plant shutdown, start-up and emergency conditions, fires and storms, may occur during operations. The wastes generated during these unplanned events may include:

- Plant shutdown, start-up and emergency conditions. Emissions to air from flares and release of liquid wastes such as contaminated bund water, LNG, waste oil and potentially contaminated runoff.
- Fire. In the event of a fire, the following wastes may be generated:
 - Air emissions from combustion of flammable material. The toxicity of the emissions will vary depending on the material that is combusting.
 - Firewater used in sprinkler systems and for the flooding and cooling of tanks.
 - Wastewater generated from use in extinguishing fires.
 - Combusted waste residue.
- Storms. In the event of a storm, bunded areas that are not roofed may collect stormwater and overflow, potentially releasing contaminated water. The volume of releases depends on the size of the rainfall event and the capacity of the bunds. Stormwater management is described in Chapter 13, Surface Water Hydrology and Water Quality.

31.3.3 Decommissioning

General and regulated waste will be produced during the decommissioning of the feed gas pipeline and the LNG plant and ancillary facilities. A detailed assessment of the waste type and quantity, including a decommissioning plan will be developed at this time.

Wastes produced during the decommissioning phase of the project will include:

- Process and chemical pumps.
- Above-ground storage tanks.
- Compressors and process equipment.
- Gas and diesel engine power generators.
- Demountable and modular buildings.
- Building steel frames, cladding and concrete bases and footings.
- Electrical switchgear and cables.
- Control systems equipment.
- Above-ground pipelines, gathering lines and manifolds.
- Fencing and miscellaneous steelwork.
- Plastic and glass fibre reinforced plastic tanks.
- Sludge from pipelines and equipment.
- Contaminated soil generated from spills or leaks during dismantling of equipment.

31.4 Waste Quantities

An estimate of the solid and liquid waste quantities that will be generated during construction and operation is shown in Table 31.1. The quantities are annual averages and do not reflect variations that may occur on a daily, weekly or monthly basis.

The quantity of gaseous waste that will be generated during construction and operation are given in Appendix 13, Greenhouse Gas Impact Assessment and Appendix 14, Air Quality Impact Assessment.

The largest quantities of solid wastes generated will be green, general and concrete wastes. The source locations of this waste will be at site preparation areas, offices and workshops, accommodation camps and canteens, and construction and infrastructure areas.

The largest quantity of liquid waste generated will be approximately 80 tonnes per annum (tpa) of used grease, lubricants and oils. The majority of these wastes will be generated during maintenance activities.

31.5 Existing Waste Facilities

Waste management infrastructure in the Gladstone Regional Council area is well established. The local domestic market is serviced via residential kerbside collections, and the commercial market through local waste management facilities and contractors. Commercial users include small businesses, the health industry, schools, industrial facilities (including mining and manufacturing), port and rail facilities, and the construction and demolition industry.

Further details of local landfills, wastewater treatment, recycling facilities and commercial waste contractors are provided below.

31.5.1 Licensed Landfills

There are several landfills within or surrounding the project area. The largest, the Benaraby Regional Landfill, is located on the Bruce Highway approximately 20 km south of Gladstone's central business district.

The Benaraby Regional Landfill is operated by Gladstone Regional Council. The landfill has an operating life of approximately 30 years plus potential for an additional 30 years at the current maximum licensed disposal rate of 50,000 tpa (Doherty, pers. comm., 2010). The landfill receives approximately 43,000 tpa of waste.

A minimum of approximately 1,364,100 t of solid waste (over a period of 30 years) will be generated by Arrow Energy and other commercial waste generators in the area. Approximately 1.64% of this waste is predicted to be generated by the Arrow LNG Plant. Assuming that all solid waste will be disposed of at the Benaraby Regional Landfill, the operating life is unlikely to be reduced below the current licensed life span of 30 years (i.e., the landfill has the capacity to accept waste from the Arrow LNG Plant and other proposed projects in the area).

The licensed disposal rate of 50,000 tpa will only be compromised if construction of the proposed multiple projects occurs simultaneously, as the majority of waste will be generated during construction activities. Should this occur, waste generators will need to find temporary storage or alternative options for disposal. Alternatively, disposal charges may be incurred to compensate for the additional resources required to manage the waste.

Smaller landfills in the Gladstone Regional Council area accept largely domestic waste and will not generally be available for use by Arrow Energy or other commercial waste generators.

Table 31.1 Construction and operation waste generated, estimated quantities, management and disposal methods

Waste Type	Generation Point or Source	Waste Group	Construction		Operation	Management Strategies	Disposal Methods
			Trains 1 and 2	Trains 3 and 4	Trains 1 to 4		
Solid Waste							
Green waste	Site preparation activities.	General waste	16,186 t	Minimal	Minimal	Mulched or chipped for use on site.	Re-use on site.
General waste (including food waste)	Offices and workshops, accommodation and canteen.	General waste	1,200 tpa	781.3 tpa	76.3 tpa	Non-recyclable waste will be stored in wheelie bins at the accommodation camp and lidded Merrill or skip bins at other locations. Waste will be collected on a weekly basis and removed by a licensed contractor.	Licensed landfill.
Medical wastes	LNG plant and accommodation.	Regulated	0.75 tpa	0.625 tpa	Minimal	Stored in clearly labelled sharps and clinical waste containers for periodic removal by a licensed waste contractor.	Licensed medical waste disposal facility by a commercial waste management contractor.
Waste clothes and fabric	Personal protective equipment.	General waste	3.75 tpa	3.125 tpa	0.75 tpa	Collected for removal.	Licensed landfill.
Waste polyethylene lining	Construction of pipelines and storage vessels.	General waste	20 tpa	18.75 tpa	12 tpa	Re-used or recycled where possible. Excess waste will be collected for removal.	Licensed landfill.
Waste photographic and x-ray film	Construction of pipelines and storage vessels.	General waste	8 tpa	8 tpa	Minimal	Collected for removal.	Licensed landfill.
Paint and adhesive wastes	Construction and general maintenance of plant and equipment.	Regulated	1.2 tpa	1.25 tpa	2 tpa	Waste paint and adhesives will be stored in bunded areas on site (in clearly labelled sealed containers) for removal by a licensed contractor.	Licensed waste disposal facility by a commercial waste management contractor.

Table 31.1 Construction and operation waste generated, estimated quantities, management and disposal methods (cont'd)

Waste Type	Generation Point or Source	Waste Group	Construction		Operation	Management Strategies	Disposal Methods
			Trains 1 and 2	Trains 3 and 4	Trains 1 to 4		
Solid Waste (cont'd)							
Process wastes (e.g., molecular sieve, ceramic balls, spent activated carbon, silica gel filters, waste zeolite)	Dehydration unit, acid-gas removal unit and mercury removal unit in the liquefaction process.	Regulated	Minimal	Minimal	154 tpa	Spent filtration/adsorption materials will be replaced in their units periodically. Waste will be collected from units, stored in sealed containers in a bunded area, and removed from site by a licensed waste contractor.	Analysis of the material may need to be undertaken to ascertain acceptable disposal location.
Concrete wastes	Construction of infrastructure.	General waste	2,000 tpa	1,000 tpa	30 tpa	Stockpiled in laydown area until there is a sufficient quantity to mobilise the plant to site to crush and screen waste.	In order of preference: <ul style="list-style-type: none"> • Re-use as fill for road base on site. • Recycling facility. • Licensed landfill.
Glass	Offices, workshops, accommodation.	Recyclable	4 tpa	3 tpa	0.6 tpa	Dedicated collection bins will be located at the LNG plant and accommodation. Bins will be collected as required by a contractor.	Recycling facility in Gladstone or southeast Queensland, if feasible.
Dust	Mercury removal unit in the liquefaction process.	Regulated	Minimal	Minimal	Minimal	Collected for removal.	Licensed landfill.
Oily rags and filters (drained)	General maintenance of plant and equipment.	Regulated	Minimal	Minimal	3 tpa	Stored in bunded areas on site (in clearly labelled sealed containers) for removal by a licensed contractor.	Licensed waste disposal facility by a commercial waste management contractor.
Ferrous and non-ferrous metal	Maintenance activities.	Recyclable	37.8 tpa	26.2 tpa	151.3 tpa	Collected on site and stored in collection bins or at a laydown area (for larger items) until there is a sufficient quantity to transport.	Recycling facility (specifically a scrap metal recycler).

Table 31.1 Construction and operation waste generated, estimated quantities, management and disposal methods (cont'd)

Waste Type	Generation Point or Source	Waste Group	Construction		Operation	Management Strategies	Disposal Methods
			Trains 1 and 2	Trains 3 and 4	Trains 1 to 4		
Solid Waste (cont'd)							
Tyres	Vehicles.	Regulated	20 tpa	12.5 tpa	7.5 tpa	Stored in dedicated waste management area until there is a sufficient quantity for a licensed waste contractor to transport.	Licensed waste disposal facility by a commercial waste management contractor.
Batteries (wet cell and alkaline)	Plant and equipment.	Regulated	2.2 tpa	1.25 tpa	4.1 tpa	Alkaline batteries to be stored separately from wet cell batteries in lidded and sealed containers in a bunded area.	Recycling facility.
Timber	Packaging and carpentry off-cuts.	General waste	40 tpa	24 tpa	36 tpa	Mulched or chipped for use on site. Millable timber may be made available to local community if there is a demand.	In order of preference: <ul style="list-style-type: none"> • Re-use or recycling on mainland. • Licensed landfill (subject to approval).
Oil-contaminated steel drums	Packaging.	Regulated	2 tpa	1.25 tpa	Minimal	Drums to be emptied and stored in a covered bunded area for periodic removal by waste contractor.	Re-use or licensed waste disposal facility by a commercial waste management contractor.
Insulation and slag wool	Insulation for cryogenic pipelines, tanks, ducts and load out lines to jetty.	General waste	0.75 tpa	0.5 tpa	Minimal	Collected for removal.	Licensed landfill.
Quarantine waste	Importation of materials during construction.	Quarantine	Unknown	Unknown	Unknown	Stored and managed in approved facility.	Supervised deep burial or incineration by a commercial waste management contractor.

Table 31.1 Construction and operation waste generated, estimated quantities, management and disposal methods (cont'd)

Waste Type	Generation Point or Source	Waste Group	Construction		Operation	Management Strategies	Disposal Methods
			Trains 1 and 2	Trains 3 and 4	Trains 1 to 4		
Solid Waste (cont'd)							
Paper and cardboard	Offices, workshops and accommodation.	Recyclable	80 tpa	50 tpa	30 tpa	Dedicated collection bins will be located at the accommodation camp and the LNG processing facility. Bins will be collected as required by a contractor.	Recycling facility in Gladstone or southeast Queensland, if feasible.
Biosolid sludge (dewatered)	Effluent treatment plant.	Regulated	812 to 1,280 tpa	812 to 1,280 tpa	550 to 1,100 tpa	To be pumped out periodically and tested to determine if the biosolids meet landfill disposal criteria, then transported off site by a licensed contractor.	Licensed waste disposal facility by a commercial waste management contractor.
Topsoil	Site preparation activities.	General waste	867,000 m ³	86,000 m ³	Minimal	Stored in stockpiles for use during rehabilitation.	Re-use on site.
Overburden	Site preparation activities.	General waste	43,000 m ³	Minimal	Minimal	Excess to be stockpiled on site and managed to ensure runoff is controlled and erosion is minimised.	Re-use on site.
Liquid Waste							
Used grease, lubricants and oils	Maintenance activities.	Regulated	80 tpa	40 tpa	42.3 tpa	Stored on site at the LNG plant in a bunded containment tank for removal by a licensed contractor.	Recycled at a licensed waste disposal facility by a commercial waste management contractor.
Grease trap waste	Accommodation.	Regulated	57.4 tpa	57.4 tpa	10.3 tpa	Pumped out of grease trap sump once a month, or more regularly if required, by a licensed waste contractor.	Licensed waste disposal facility by a commercial waste management contractor.
Sulfuric acid	Batteries.	Regulated	1.6 tpa	1 tpa	0.4 tpa	Stored in bunded areas on site (in clearly labelled sealed containers) for removal by a licensed contractor.	Licensed waste disposal facility by a commercial waste management contractor.

Table 31.1 Construction and operation waste generated, estimated quantities, management and disposal methods (cont'd)

Waste Type	Generation Point or Source	Waste Group	Construction		Operation	Management Strategies	Disposal Methods
			Trains 1 and 2	Trains 3 and 4	Trains 1 to 4		
Liquid Waste (cont'd)							
Hydrochloric acid	Spills in demineralisation plant.	Regulated	Minimal	Minimal	Minimal	Spills will drain to the controlled discharge facility where the first flush will be monitored.	Diverted to the effluent treatment plant or discharged to the marine outfall, depending on the quality of the effluent.
Regeneration effluent	Demineralisation plant.	Regulated	Nil	Nil	216 m ³ /d	Diverted to observation pond where it is monitored regularly.	Untreated effluent discharged to Port Curtis.
Spent triethylene glycol, engine coolant, cleaning agents and water treatment chemicals	Vehicle, plant and equipment maintenance and operation.	Regulated	40 tpa	32 tpa	111.6 tpa	Waste chemicals will be stored in bunded areas on site (in clearly labelled sealed containers). Incompatible chemicals will be separated. Chemicals will be transported off site by a licensed contractor and treated if necessary.	Licensed waste disposal facility by a commercial waste management contractor.
Sewage and greywater	Pioneer camp on Curtis Island (60 people).	Regulated	60 m ³ /d	Nil	Nil	Collected for disposal.	Licensed wastewater treatment plant.
	Construction workforce in Gladstone and at temporary workers accommodation facility (TWAF).	Regulated	300 m ³ /d	300 m ³ /d	Nil	Collected for disposal.	Licensed wastewater treatment plant.
	Construction workforce for tunnel, feed gas pipeline and dredging (215 people).	Regulated	64.5 m ³ /d	Nil	Nil	Collected for disposal.	Licensed wastewater treatment plant.
	Construction workforce on Curtis Island (2,500 people at peak).	Regulated	750 m ³ /d	750 m ³ /d	Nil	Pumped or gravity fed to the effluent treatment plant.	Effluent treatment plant for treatment, and subsequently irrigated to land.

Table 31.1 Construction and operation waste generated, estimated quantities, management and disposal methods (cont'd)

Waste Type	Generation Point or Source	Waste Group	Construction		Operation	Management Strategies	Disposal Methods
			Trains 1 and 2	Trains 3 and 4	Trains 1 to 4		
Liquid Waste (cont'd)							
Sewage and greywater (cont'd)	Typical operational workforce on Curtis Island (450 people).	Regulated	Nil	Nil	170 to 350 m ³ /d	Pumped or gravity fed to the effluent treatment plant.	Effluent treatment plant for treatment, and subsequently irrigated to land.
Effluent treatment plant effluent for irrigation (design flow rate)	Effluent treatment plant.	Regulated	1,246 m ³ /day	1,246 m ³ /day	1,246 m ³ /day	Stored in a tank then treated to a level suitable for irrigation to land (Class A quality) by the effluent treatment plant, then discharged to land via irrigation system or used for toilet flushing.	Irrigation system discharge to land or re-used for toilet flushing.
Brine	Reverse osmosis facility.	Regulated	1,872 m ³ /d	3,744 m ³ /d	3,744 m ³ /d	Discharged to Port Curtis via a diffuser pipeline. Discharge will be a sufficient distance offshore to promote effective dispersion of effluent.	Diffuser pipeline discharge to Port Curtis.
Hydrostatic test water	Testing LNG storage tanks and pipeline.	Regulated	97,000 m ³ per tank	97,000 m ³ per tank	Nil	Stored in pipelines or tanks that are being tested. Water will be re-used on site for additional hydrotesting (where necessary) and discharged to Port Curtis (if water quality meets discharge guidelines) or to the effluent treatment plant for treatment.	Re-used on site and discharged to Port Curtis or effluent treatment plant.
Gas turbine washwater	Periodic gas turbine washing.	Regulated	365 m ³ /d	365 m ³ /d	730 m ³ /d	Diverted to the effluent treatment plant for treatment.	Effluent treatment plant.
Ballast water	Shipping.	Regulated	Unknown	Unknown	Unknown	Managed in compliance with the International Convention for the Prevention of Pollution from Ships (MARPOL) and the Australian Quarantine and Inspection Service's Australian Ballast Water Management Requirements (AQIS, 2008).	As per MARPOL and AQIS (2008) requirements.

Note: tpa = tonnes per annum.

31.5.2 Wastewater Treatment Facilities

The base case for management of wastewater (including sewage) generated at the LNG plant will be to treat the wastewater in the LNG plant effluent treatment plant prior to re-use in amenities or as irrigation water, or discharged (excluding treated sewage) to Port Curtis. Arrow Energy is also considering an alternative option of exporting domestic sewage, greywater and effluent generated at the LNG plant to Gladstone Regional Council's sewerage system. Arrow Energy is working with Gladstone Area Water Board, the council and the other LNG proponents to assess the feasibility of this option.

Sewage generated at the mainland temporary workers' accommodation facility (during project construction) and sewage generated at the mainland launch site (during operations) will be directed to the nearest sewer main, sewage treatment plant, or trucked to a licensed disposal facility.

There are two main wastewater treatment facilities located in the City of Gladstone; the Calliope River Sewage Treatment Plant and the South Trees Sewage Treatment Plant, both operated by Gladstone Regional Council. The Calliope River Sewage Treatment Plant treats approximately 97% of Gladstone's wastewater. There are several smaller facilities including those at Yarwun, Aldoga, Boyne Island, Tannum Sands and Calliope town. These facilities are almost at operating capacity or are located outside Gladstone.

It is estimated that, in the Gladstone region, a minimum of approximately 6,120 ML/a of liquid waste (sewage) will require treatment and disposal over a period of five years, and 5,983 ML/a thereafter for an additional 25 years. Of the waste requiring treatment and disposal in the first five years, approximately 2.2% is predicted to be generated by the Arrow LNG Plant.

Both the Calliope River Sewage Treatment Plant and the South Trees Sewage Treatment Plant have capacity available to take Arrow Energy's waste, and are planning upgrades to increase their capacity. These upgrades will provide ample capacity to handle liquid waste from the Arrow LNG Plant and from other proposed projects in the area.

31.5.3 Recycling Facilities

Recycling collection facilities exist within the Gladstone Regional Council area for wastes such as oils, concrete, tyres, paper and cardboard, glass, and some plastics. Collection points are located at transfer stations and landfills and are generally for the domestic market. Recyclable waste from commercial producers is typically collected by waste contractors who transport the recyclables for a fee to locations designated by the client, or store the recyclables at their depots until there is sufficient quantity to transport to processing facilities in southeast Queensland.

There are limited recycling processing opportunities in Gladstone. Several local scrap metal merchants receive scrap ferrous and non-ferrous metal for processing. Glass, plastic, paper and cardboard is either transported to the Central Queensland Materials Recovery Facility in Rockhampton for compaction, baling and sale, or transported by train or truck to southeast Queensland to processing facilities located in and around Brisbane. Table 31.2 summarises the opportunities available for recycling in Gladstone and the marketability of the waste material and is further discussed in Appendix 29, Waste Impact Assessment.

A minimum of approximately 41,600 t of recyclable waste (over a period of 30 years) will be generated by Arrow Energy and other commercial waste generators in the area. Approximately 11.9% of this waste is predicted to be generated by the Arrow LNG Plant.

Table 31.2 Recycling opportunities in Gladstone and market potential

Waste Material	Marketability	Opportunities for Recycling in Gladstone
Waste oil	High marketability in Queensland and is reprocessed in two locations at Brisbane and Townsville.	There are several licensed waste contractors in Gladstone that collect and transport waste oil to reprocessing facilities.
Construction and demolition waste such as earthen spoil, concrete, bricks/pavers, timber and plaster board.	Limited marketability in regional areas of Queensland due to distance from reprocessing facilities, located largely in southeast Queensland.	Limited opportunities available in Gladstone. Most wastes would have to be collected and transported to southeast Queensland by third-party contractors.
Paper and cardboard	Moderate marketability.	Queensland has two paper mills that receive and process paper and cardboard collected within the state; both located in Brisbane. The Gladstone region is currently serviced by a waste contractor that collects and transports recyclable materials to a recycling facility in Brisbane.
Glass	Moderate to low marketability.	Some opportunity may exist for recycling in Rockhampton as part of road base trial. Glass would otherwise need to be transported to southeast Queensland for reprocessing.
Ferrous metals	High marketability with high global demand.	Steel and other scrap metals are collected from across the state for processing in southeast Queensland. There are several local scrap metal merchants in Gladstone that could service the needs of the LNG plant.
Non-ferrous metals	High marketability with high global demand.	Steel and other scrap metals are collected from across the state for processing in southeast Queensland. There are several local scrap metal merchants in Gladstone that could service the needs of the LNG plant.
Tyres	Moderate to low marketability.	Limited opportunities available in Gladstone. Used tyres are currently collected and transported to southeast Queensland where they are shredded. Some of the shredded material is recovered for processing; however, the majority of used tyres are landfilled. Most wastes would have to be collected and transported to southeast Queensland by third party contractors.
Plastics	Moderate to low marketability.	Mixed plastics are transported to southeast Queensland and exported (EPA, 2007).

While there are limited opportunities for recycling waste materials in Gladstone, waste contractors will be consulted to organise temporary storage and alternative options for disposal.

31.5.4 Commercial Waste Management Contractors

Several large commercial waste management contractors currently service the needs of large industrial operations located in and around Gladstone. Collectively, these contractors provide the following services:

- Grease trap cleaning.
- Septic tank cleaning.
- Commercial waste collection.
- Collection and processing of recyclables (oil, batteries, glass, paper and cardboard).
- Collection and processing of ferrous and non-ferrous metals.

- Disposal of hazardous waste, construction and industrial waste.
- Disposal of medical waste.
- Onsite waste facility management.
- Industrial cleaning.

A minimum of approximately 563,200 t of waste generated by Arrow Energy and other commercial waste generators in the area is estimated to require disposal by a licensed waste management contractor over a period of 30 years. Approximately 1.3% of this waste is predicted to be generated by the Arrow LNG Plant.

Some of the waste collected by commercial waste management contractors will be disposed of at the Benaraby Regional Landfill or the Calliope River and South Trees sewage treatment plants. Recyclable materials will be distributed to recycling facilities, and hazardous wastes will be processed either by the commercial waste management contractor that collected the waste or by a waste management contractor licensed to process or dispose of hazardous wastes.

At the time of preparing this EIS, it was not possible to determine the existing capacity of licensed waste contractors because this information is considered commercial-in-confidence by contractors. Licensed waste contractors will be consulted prior to construction in order to establish suitable disposal options.

31.6 Waste Management

The following hierarchy will be adopted for the management of general and regulated waste generated through construction, operations and maintenance activities for the project:

- Avoidance. Avoid, eliminate, change or reduce practices that result in the generation of wastes.
- Re-use. Re-use waste materials that are in their original form.
- Recycling. Convert waste into other useable materials.
- Treatment and disposal. Render wastes safe by neutralisation or other treatment methods and dispose of waste products that can no longer be re-used or recycled to an approved landfill.

The management approaches and methods that the project will adopt for managing its waste within this hierarchy are discussed below. Contractors will be required to comply with the Arrow's Health, Safety and Environmental Management System (HSEMS) and produce and implement a waste management plan in accordance with the system.

31.6.1 Avoidance and Minimisation

Processes and equipment will be designed and operated to avoid or minimise wastes and associated hazards. The following waste avoidance strategies will be adopted for the project:

- Implement employee training and other programs that encourage employees to reduce waste. [C31.01]
- Ensure that contractors comply with Arrow's Health, Safety and Environmental Management System (HSEMS) and implement a waste management plan in accordance with the procedure. [C31.02]
- Substitute raw materials or inputs with an equivalent, less hazardous or toxic material, where practical. [C31.03]

- Institute good housekeeping and operating practices, including substituting materials for an equivalent and more environmentally friendly option and inventory control to reduce the amount of waste resulting from materials that are out of date, off specification, contaminated, damaged, or excess to project needs. [C31.04]
- Implement stringent waste segregation processes to prevent the co-mingling of water and waste streams. [C31.05]
- Clear the smallest construction footprint practical, thereby reducing the generation of green waste, acid sulfate soils, overburden, topsoil and greenhouse gases. [C31.06]

31.6.2 Recycling and Re-use

Strategies and processes, along with equipment and facilities, will be designed and operated to re-use and recycle relevant wastes generated by the project as follows:

- Evaluate waste production processes and identify potentially recyclable materials. [C31.07]
- Identify and recycle products that can be reintroduced into the process or activity at the site. [C31.08]
- Establish recycling objectives and formal tracking of waste generation and recycling rates. [C31.09]

Specific waste recycling and re-use measures include:

- Install dedicated skip bins for designated wastes around the construction site. [C31.10]
- Establish a dedicated waste sorting or laydown area early in the project. Store inert material such as concrete in this area, and periodically crush and screen when sufficient quantity has been gathered. Use crushed material as rock base and fill, or dispose to landfill. [C31.11]
- Mulch leaves, branches and timber on site and use this for site stabilisation or erosion control and landscaping. [C31.12]
- Collect and recycle ferrous and non-ferrous metals, paper and cardboard, glass, spent sulfuric acid and batteries, and waste oils. Dispose of solid wastes that cannot be recycled or re-used at a landfill or licensed facility. [C31.13]
- Require suppliers to consider measures and options to reduce packaging and increase recycling. Include this requirement in the tendering and contracting process. [C31.14]

31.6.3 Storage and Handling

Strategies and processes to store and handle equipment and facilities will be designed and operated to minimise the risk of accidental releases to air, soil and water resources, and will include:

- Store wastes in a manner that prevents the co-mingling of, or contact between, incompatible wastes and that allows for inspection between containers to monitor leaks or spills. [C31.15]
- Provide adequate ventilation where volatile wastes are stored. [C31.16]
- Provide hardstanding surfaces at oil storage areas, fuel filling points and the mechanical repair shop. [C31.17]
- Store fuels, chemicals and hazardous wastes in appropriately sized, bunded storage facilities (in leak-proof sealed containers). [C14.04]

- Install drainage and sump systems in appropriately sized, bunded compounds to assist with the removal of any waste materials released into the containment system. [C31.18]
- Locate stockpiles of waste materials (such as concrete, tyres and waste polyethylene) in dedicated laydown areas with appropriate drainage. [C31.19]
- Label all storage containers for clear identification of the contents, as per the appropriate regulations. [C31.20]
- Develop appropriate spill prevention and response plans to cover project activities and the types and quantities of fuel, oil and chemicals held at each site. [C13.12]
- Train all relevant personnel in spill response and recovery procedures. [C13.13]
- Cover waste storage bins for domestic and food wastes. [C31.21]
- Use an appropriately licensed contractor to collect (on a regular basis) waste generated from accommodation quarters. [C31.22]
- Strip topsoil from areas of planned soil disturbance to provide material for rehabilitation, where practical. [C31.23]
- Stockpile excess overburden (that is not suitable for hardstand use or site fill) on site, where practical. Overburden will be managed to ensure runoff is controlled and erosion is minimised. [C31.24]
- Handle waste chemicals in accordance with the appropriate material safety data sheet (MSDS). [C31.25]
- Provide sufficient space to allow for the segregation and storage of wastes. [C31.26]

31.6.4 Treatment

Strategies, processes, equipment and facilities will be designed and operated to treat wastes and minimise the risk of accidental releases to air, soil and water resources.

The following wastes will be treated in the effluent treatment plant, with the exception of sewage from the pioneer camp and the TWAF:

- Contaminated or potentially contaminated stormwater from process areas at the LNG plant.
- Dry weather flow such as water from wash down bays and liquids wastes from the laboratory.
- Effluent from LNG operations such as wastewater and slops oil from the boil-off gas compressor area and the flare knock-out water.
- Gas turbine wash water.
- Oily water from the slops oil tank.
- Sewage and greywater from the accommodation areas and the LNG plant. [C31.27]

Sewage and greywater generated from the pioneer camp will be collected in portable disposal units or other mobile collection facilities. A licensed waste contractor will be used to service the sewage facilities and dispose of effluent at a licensed waste management facility. Sewage from the mainland TWAF will be disposed of through a connection to the local sewerage network or will be collected in portable disposal units or other mobile collection facilities. [C14.08]

The following waste treatment measures will be implemented:

- Design the effluent treatment plant package units to meet the final effluent discharge requirement. [C31.28]
- Design the effluent treatment plant based on the first 30 minutes of peak rainfall flow estimation from process areas. [C31.29]
- Monitor treated effluent and reroute any discharge that is off-specification back to the effluent treatment plant for retreatment. [C31.30]
- Make alternative storage and disposal options available during times of system failure and in conditions preventing discharge to land such as rain events. Distribute the effluent treatment plant discharge to tanks for re-use on site. The tanks can be by passed and the treated effluent discharged to the marine outfall if necessary. [C31.31]
- Maintain records of inspection, maintenance, sampling, and cleaning of the effluent treatment plant. [C31.32]

31.6.5 Disposal

Strategies, processes, equipment and facilities will be designed and operated to dispose of wastes in order to minimise the risk of accidental releases to air, soil and water.

Waste will be disposed of on Curtis Island and off site. Management measures at both of these locations are described below.

Waste Disposal on Curtis Island

Three waste streams will be disposed of on Curtis Island including liquid waste treated on site and discharged to land, untreated liquid waste discharged to Port Curtis, and solid waste re-used on land. The following disposal measures will be implemented:

- Do not dispose of any waste in landfills or by incineration on Curtis Island. [C31.33]
- Irrigate to land or re-use on site treated wastewater from the effluent treatment plant. [C31.34]
- Develop a recycled water management plan for the project. Undertake a site assessment and desktop study to select appropriate sites, vegetation and irrigation methods to support the development of the plan. [C31.35]
- Direct brine from the reverse osmosis plant into Port Curtis via a diffuser outfall pipe located a sufficient distance offshore to ensure free flowing current conditions to adequately disperse the brine. [C31.36]
- Collect the clean catchment runoff through peripheral drains at the LNG plant site discharging to Port Curtis. [C31.37]
- Design of the discharge outfall from the LNG plant will include a three-port diffuser at the end of the pipeline located close to the water surface (or the ports angled towards the surface) to maximise dilution of the negatively buoyant discharge stream. [C16.01]
- Install signs on site clearly indicating drains that discharge directly to the marine environment. [C31.38]
- Transport excess concrete to the mainland for disposal or re-use if there is no use for the material on site. [C31.39]

- Manage all surface water generated from the LNG plant site by a stormwater treatment system to ensure discharged water complies with regulatory requirements. [C13.10]

Waste Disposal Off Site

The liquid waste streams that will be disposed of by licensed waste contractors include waste solvents, engine coolants, spent triethylene glycol, and waste chemicals. The following disposal measures will be implemented to manage these wastes:

- Engage a licensed waste contractor (on an as-required basis) to remove from site those specific liquid wastes that cannot be processed on site. [C31.40]
- Engage an appropriately licensed waste contractor to transport off site all solid waste that cannot be reprocessed or recycled on site, for disposal at a recycler, reprocessor or other waste management facility such as a landfill. The majority of the solid waste will be disposed of at the Benaraby Regional Landfill. Agreement for the disposal of solid waste at this landfill will be obtained from Gladstone Regional Council. [C31.41]

31.6.6 Transportation

Strategies, processes and equipment for the transportation of waste will be designed and operated to reduce the risk of spills, releases and exposure to employees, the community and the environment. These include the following:

- Ensure all vehicles entering and leaving Curtis Island are clean, and loads securely stowed, and covered where practical. [C31.42]
- Record all regulated wastes removed from the site in a waste register. [C31.43]

31.6.7 Other Management Measures

Strategies, processes, equipment and facilities for managing regulated wastes and wastes from unplanned events are identified below. Mitigation measures for managing wastes from marine activities, including dredge and tunnel spoil and hydrostatic test water, are discussed in Chapter 16, Marine Water Quality and Sediment, and Chapter 19, Marine and Estuarine Ecology.

Regulated Wastes

The following management measures are proposed for regulated wastes:

- Dispose of all regulated wastes at licensed waste management sites within Queensland, unless a specialised treatment is required that is not available in Queensland at the time treatment and disposal is required. [C31.44]
- Transport all regulated wastes by a waste transporter with the appropriate DERM authority to collect and dispose of the waste. [C31.45]
- Ensure that vehicles transporting regulated waste are licensed to carry the particular type of waste and that operators complete appropriate waste tracking documentation. [C31.46]

Spills

- Develop an emergency response plan for the project and include spill contingency or emergency measures. Make material safety data sheets available at the LNG plant and other project sites to aid in the identification of appropriate spill clean-up and disposal methods. [C31.47]

- Ensure that specific spill prevention procedures cover the unloading and loading activities at the LNG jetty and MOF in accordance with applicable international standards and guidelines. Spill prevention procedures will specifically address advanced communications and planning with the receiving terminal. [C31.48]

Fire

- Manage combustible wastes and ignition sources appropriately to eliminate fire hazards. [C31.49]
- Divert firewater generated in process areas or other areas draining to the controlled discharge facility to the effluent treatment plant. Additional firewater will be directly discharged through the marine outfall. [C31.50]

31.7 Inspection and Monitoring

Inspection and monitoring strategies and processes designed to reduce the potential impacts generated from project wastes will include the following:

- Record and report the wastes generated by the project, including tracking of regulated wastes and reporting on National Pollutant Inventory substances.
- Review the actual quantities and types of wastes compared to predicted waste streams and quantities, with a view to implementing improvements to waste management practices.
- Undertake internal audits as both scheduled and unscheduled activities, for implementation of agreed measures and compliance with performance criteria.
- Regularly inspect waste storage, containment and laydown areas, waste segregation bins and stockpiles, and levels of windblown litter. Document the findings of such inspections.

31.8 Commitments

The measures (commitments) that Arrow Energy will implement to manage impacts relating to waste are set out in Table 31.3.

Table 31.3 Commitments: Waste management

No.	Commitment
C31.01	Implement employee training and other programs that encourage employees to reduce waste.
C31.02	Ensure that contractors comply with Arrow's Health, Safety and Environmental Management System (HSEMS) and implement a waste management plan in accordance with the procedure.
C31.03	Substitute raw materials or inputs with an equivalent, less hazardous or toxic material, where practical.
C31.04	Institute good housekeeping and operating practices, including substituting materials for an equivalent and more environmentally friendly option and inventory control to reduce the amount of waste resulting from materials that are out of date, off-specification, contaminated, damaged, or excess to project needs.
C31.05	Implement stringent waste segregation processes to prevent the co-mingling of water and waste streams.
C31.06	Clear the smallest construction footprint practical, thereby reducing the generation of green waste, acid sulfate soils, overburden, topsoil and greenhouse gases.

Table 31.3 Commitments: Waste management (cont'd)

No.	Commitment
C31.07	Evaluate waste production processes and identify potentially recyclable materials.
C31.08	Identify and recycle products that can be reintroduced into the process or activity at the site.
C31.09	Establish recycling objectives and formal tracking of waste generation and recycling rates.
C31.10	Install dedicated skip bins for designated wastes around the construction site.
C31.11	Establish a dedicated waste sorting or laydown area early in the project. Store inert material such as concrete in this area, and periodically crush and screen when sufficient quantity has been gathered. Use crushed material as rock base and fill, or dispose to landfill.
C31.12	Mulch leaves, branches and timber on site and use this for site stabilisation or erosion control and landscaping.
C31.13	Collect and recycle ferrous and non-ferrous metals, paper and cardboard, glass, spent sulfuric acid and batteries, and waste oils. Dispose of solid wastes that cannot be recycled or re-used at a landfill or licensed facility.
C31.14	Require suppliers to consider measures and options to reduce packaging and increase recycling. Include this requirement in the tendering and contracting process.
C31.15	Store wastes in a manner that prevents the co-mingling of, or contact between, incompatible wastes and that allows for inspection between containers to monitor leaks or spills.
C31.16	Provide adequate ventilation where volatile wastes are stored.
C31.17	Provide hardstanding surfaces at oil storage areas, fuel-filling points and the mechanical repair shop.
C14.04	Store fuels, chemicals and hazardous wastes in appropriately sized, bunded storage facilities (in leak-proof sealed containers). Common with Chapter 14, Groundwater.
C31.18	Install drainage and sump systems in appropriately sized, bunded compounds to assist with the removal of any waste materials released into the containment system.
C31.19	Locate stockpiles of waste materials (such as concrete, tyres and waste polyethylene) in dedicated laydown areas with appropriate drainage.
C31.20	Label all storage containers for clear identification of the contents, as per the appropriate regulations.
C13.12	Develop appropriate spill prevention and response plans to cover project activities and the types and quantities of fuel, oil and chemicals held at each site. Common with Chapter 13, Surface Water Hydrology and Water Quality, and Chapter 14, Groundwater.
C13.13	Train all relevant personnel in spill response and recovery procedures. Common with Chapter 13, Surface Water Hydrology and Water Quality, and Chapter 16, Marine Water Quality and Sediment.
C31.21	Cover waste storage bins for domestic and food wastes.
C31.22	Use an appropriately licensed contractor to collect (on a regular basis) waste generated from accommodation quarters.
C31.23	Strip topsoil from areas of planned soil disturbance to provide material for rehabilitation, where practical.
C31.24	Stockpile excess overburden (that is not suitable for hardstand use or site fill) on site, where practical. Overburden will be managed to ensure runoff is controlled and erosion is minimised.
C31.25	Handle waste chemicals in accordance with the appropriate material safety data sheet (MSDS).
C31.26	Provide sufficient space to allow for the segregation and storage of wastes.

Table 31.3 Commitments: Waste management (cont'd)

No.	Commitment
C31.27	<p>Treat the following wastes in the effluent treatment plant, with the exception of sewage from the pioneer camp and the TWAF:</p> <ul style="list-style-type: none"> • Contaminated or potentially contaminated stormwater from process areas at the LNG plant. • Dry weather flow such as water from washdown bays and liquids wastes from the laboratory. • Effluent from LNG operations such as wastewater and slops oil from the boil-off gas compressor area and the flare knock-out water. • Gas turbine wash water. • Oily water from the slops oil tank. • Sewage and greywater from the accommodation areas and the LNG plant.
C14.08	<p>Collect sewage and greywater generated from the pioneer camp in portable disposal units or other mobile collection facilities. Use a licensed waste contractor to service the sewage facilities and dispose of effluent at a licensed waste management facility. Dispose of sewage from the mainland TWAF through a connection to the local sewerage network or ensure that it is collected in portable disposal units or other mobile collection facilities. Common with Chapter 14, Groundwater.</p>
C31.28	<p>Design the effluent treatment plant package units to meet the final effluent discharge requirement.</p>
C31.29	<p>Design the effluent treatment plant based on the first 30 minutes of peak rainfall flow estimation from process areas.</p>
C31.30	<p>Monitor treated effluent and reroute any discharge that is off-specification back to the effluent treatment plant for retreatment.</p>
C31.31	<p>Make alternative storage and disposal options available during times of system failure and in conditions preventing discharge to land such as rain events. Distribute the effluent treatment plant discharge to tanks for re-use on site. The tanks can be bypassed and the treated effluent discharged to the marine outfall if necessary.</p>
C31.32	<p>Maintain records of inspection, maintenance, sampling, and cleaning of the effluent treatment plant.</p>
C31.33	<p>Do not dispose of any waste in landfills or by incineration on Curtis Island.</p>
C31.34	<p>Irrigate to land or re-use on site treated wastewater from the effluent treatment plant.</p>
C31.35	<p>Develop a recycled water management plan for the project. Undertake a site assessment and desktop study to select appropriate sites, vegetation and irrigation methods to support the development of the plan.</p>
C31.36	<p>Direct brine from the reverse osmosis plant into Port Curtis via a diffuser outfall pipe located a sufficient distance offshore to ensure free flowing current conditions to adequately disperse the brine.</p>
C31.37	<p>Collect the clean catchment runoff through peripheral drains at the LNG plant site discharging to Port Curtis.</p>
C16.01	<p>Design of the discharge outfall from the LNG plant will include a three-port diffuser at the end of the pipeline located close to the water surface (or the ports angled towards the surface) to maximise dilution of the negatively buoyant discharge stream. Common with Chapter 16, Marine Water Quality and Sediment.</p>
C31.38	<p>Install signs on site clearly indicating drains that discharge directly to the marine environment.</p>
C31.39	<p>Transport excess concrete to the mainland for disposal or re-use if there is no use for the material on site.</p>
C13.10	<p>Manage all surface water generated from the LNG plant site by a stormwater treatment system to ensure discharged water complies with regulatory requirements. Common with Chapter 13, Surface Water Hydrology and Water Quality.</p>
C31.40	<p>Engage an appropriately licensed waste contractor (on an as-required basis) to remove from site those specific liquid wastes that cannot be processed on site.</p>

Table 31.3 Commitments: Waste management (cont'd)

No.	Commitment
C31.41	Engage an appropriately licensed waste contractor to transport off site all solid waste that cannot be reprocessed or recycled on site, for disposal at a recycler, reprocessor or other waste management facility such as a landfill. The majority of the solid waste will be disposed of at the Benaraby Regional Landfill. Agreement for the disposal of solid waste at this landfill will be obtained from Gladstone Regional Council.
C31.42	Ensure all vehicles entering and leaving Curtis Island are clean, and loads securely stowed, and covered where practical.
C31.43	Record all regulated wastes removed from the site in a waste register.
C31.44	Dispose of all regulated wastes at licensed waste management sites within Queensland, unless a specialised treatment is required that is not available in Queensland at the time treatment and disposal is required.
C31.45	Transport all regulated wastes by a waste transporter with the appropriate DERM authority to collect and dispose of the waste.
C31.46	Ensure that vehicles transporting regulated waste are licensed to carry the particular type of waste and that operators complete appropriate waste tracking documentation.
C31.47	Develop an emergency response plan for the project and include spill contingency or emergency measures. Make material safety data sheets available at the LNG plant and other project sites to aid in the identification of appropriate spill clean-up and disposal methods.
C31.48	Ensure that specific spill prevention procedures cover the unloading and loading activities at the LNG jetty and MOF in accordance with applicable international standards and guidelines. Spill prevention procedures will specifically address advanced communications and planning with the receiving terminal.
C31.49	Manage combustible wastes and ignition sources appropriately to eliminate fire hazards.
C31.50	Divert firewater generated in process areas or other areas draining to the controlled discharge facility to the effluent treatment plant. Additional firewater will be directly discharged through the marine outfall.

Environmental Impact Statement
Arrow LNG Plant