9 Waste Management

9.1 Introduction

Environmental values considered in relation to waste management at the McArthur River Mine Phase 3 Development Project (the Project) include identification of potential waste streams and volumes, potential impacts of waste generation, together with management measures applied to minimise impacts.

The existing on-site Waste Management System will manage waste streams for the Project, which will be similar to those already produced at the existing McArthur River Mine (MRM).

9.2 Waste Management Legislation and Regulations

The regulatory requirements governing waste management in the Northern Territory are contained within the following legislation:

- *Waste Management and Pollution Control Act (1998)*
- *Waste Management and Pollution Control (Administration) Regulations (2001)*
- *Code of Practice for Small On-site Sewage and Sullage Treatment Systems and the Disposal or Reuse of Sewage Effluent (1996)*
- *AS 1940-2004: The storage and handling of flammable and combustible liquids*
- *Guidelines for the Siting, Design and Management of Solid Waste Disposal Sites in the Northern Territory (2003)*
- *Water Act (1992)*
- *Mining Management Act (2009).*

9.3 Waste Management Values

Waste management refers to the actions taken to reduce the effect of unwanted materials produced by human activity (solid, liquid, gaseous or energy) on health, the environment or aesthetics. Waste management can also be an opportunity to recover valuable resources from otherwise waste material.

Waste management practices vary with industry and location depending on the waste streams produced and the waste management facilities available. The metalliferous mining industry produces a range of wastes that are typical of heavy industry and manufacturing, as well as specific wastes generated by the mining and processing of ore. Waste products include overburden (material between the topsoil and the economic ore body) and tailings (which are by-products of the processing plant). Due to the relative isolation of mining sites such as MRM, waste management options are often limited.

The processes and procedures for managing site-generated wastes at MRM are detailed in the existing Waste Management Plan (WMP) (2006). This document contains management procedures associated with the generation, handling, storage and transport of waste materials.

The existing MRM waste management system in place will continue to be utilised. The Project will not introduce any new wastes into the waste management system, but will increase the volume of the waste types that have already been identified. The potential impacts and management of any waste emissions to air, including gaseous wastes and greenhouse emissions are described in Chapter 11-Air Quality and Greenhouse Gases.

9.4 Waste Management Principles

MRM is committed to minimising the impact of waste on the environment and the community by adopting appropriate waste management principles.

The following waste management principles are prioritised by preferred order of adoption to achieve the best environmental outcome:

- minimising waste generation
- maximising waste re-use
- maximising recycling
- safely treating and disposing of all non-recyclable materials.

These principles underlie the WMP currently in place and as proposed for the Project. Leading practice waste management is incorporated into MRM through the ongoing assessment and application of cleaner production waste management opportunities over the life of operations.

9.5 Waste Management Strategies

MRM has incorporated standard waste management principles into their waste management practices and strategies (Table 9-1). In addition to waste minimisation through the waste hierarchy, all waste management practices currently in place at MRM will continue during all phases of the Project, with appropriate strategies as detailed in the WMP.

Cleaner production, pollution prevention and waste minimisation are important components of the overall waste management strategy. MRM already conducts segregation of different waste types during their generation, storage and transportation. Some waste management areas may be relocated during the life of the Project to be closer to the operational activities and facilities. Availability of recycling facilities is determined largely by the cost of recycling and the market for recycled goods. If additional recycling facilities become available and accessible to MRM, recycling of those waste products will be assessed and, where practicable, implemented.

Some wastes, such as oil, scrap metal and timber pallets will be re-used or recycled, while others will be disposed of on-site. Waste planning, such as the separation of components of the waste stream at the generation point, will continue to be implemented during all Project phases. This practice allows for the recovery of reusable or recyclable waste materials, such as pallets, which will otherwise be disposed of or destroyed.

MRM's waste planning strategy has the added advantage of reducing the level of risk associated with pollution generation, both on-site and off-site, that may otherwise result from inappropriately managed wastes. MRM personnel regularly review the marketability of wastes for recycling and re-use.

Table 9-1 MRM Existing Waste Management Practices and Strategies

Waste Management Practice	Waste Management Strategy
Waste minimisation, re-use and recycling	Manage waste in accordance with the waste principles outlined below: • minimise waste generation – assess waste reduction opportunities for identified waste and have practices introduced into all aspects of the operation to avoid or reduce the amount of wastes produced • maximise waste re-use – implement waste stream characterisation and separation so re-use practices are encouraged. Regularly monitor industry developments to identify opportunities for external re-use programs • maximise recycling – maintain a recycling program with the aim of recycling all waste materials of value where recycling options are available. Potential wastes such as drums, metals, oils and solvents, glass, paper and plastic materials will be assessed for recycling options • safely treat and dispose of all non-recyclable materials – if no other options are available, non-recyclable wastes generated will be disposed in the refuse facility located on-site.
Waste storage and handling	• maintain the location and quantity of hazardous substances stored on site in the existing Xstrata Sustainability database • implement safe work practices to minimise the risk of spillage • all site employees and contractors are made aware of the requirements for waste storage and handling by initial site inductions.
Waste transport, disposal and tracking	• all site employees and contractors will be made aware of requirements for waste transport, disposal and tracking by initial site inductions • registered waste management contractors will be engaged to provide a complete waste management service that includes appropriate receptacles and removal to off-site specialist treatment/disposal facilities.

Table 9-1 MRM Existing Waste Management Practices and Strategies (cont)

Waste Management Practice	Waste Management Strategy
Spill response and reporting	• construction of appropriate spill containment facilities for all areas where process reagents and petroleum products are stored or used • spill prevention and containment will consist of bunds around the bulk fuel, aboveground oil storage tanks and waste oil tanks to comply with AS 1940 • all site employees and contractors will be made aware of requirements for spill response and reporting in initial site inductions • relevant training will be provided to personnel and contractors in the management of chemicals, hydrocarbons and wastes • spill management kits will be retained in the workshop and on service vehicles. Sites that become contaminated will be investigated and managed in accordance with the requirements of the contaminated land provisions of the Waste Management and Pollution Control Act (1998) • develop remediation plans for any contaminated sites. The remediation plan and contaminated land investigation report for contaminated areas will be presented in the Final Rehabilitation Report for MRM upon cessation of mining • encapsulate soil affected by minor spills in waste rock material • preparation of emergency response plans in the event of a spill.
Waste monitoring and reporting	• make all site employees and contractors aware of requirements for waste monitoring and reporting by initial site inductions • undertake regular auditing to review the effectiveness of waste management programs • subject all contract work to conditions so adequate controls are maintained for waste management.

9.5.1 Cleaner Production

Cleaner production refers to the continuous development and implementation of practices and procedures to prevent or minimise waste generation, so as to reduce the risks to public health and safety and the environment. Furthermore, a cleaner production approach aims to minimise the energy and materials used and the waste generated in processes, products and services to meet these objectives.

MRM recognises that cleaner production has both economic and environmental benefits. Consequently, appropriate waste minimisation techniques will be continued for the Project, together with techniques to maximise reuse and recycling of waste products with appropriate refinements based on operational experience.

Applicability of cleaner production techniques to the Project include:

- production process modification – waste management will be reviewed on an ongoing basis to determine feasible waste avoidance or reduction opportunities
- product selection – wherever practicable, non-hazardous products are selected in preference to hazardous materials

- improved operation and maintenance –involves the selection and use of the most appropriate and practicable fixed and mobile plant and equipment for use in ore extraction, transportation and processing (including vehicles). Plant, equipment and vehicles will undergo frequent maintenance to facilitate optimum operational efficiency
- reuse of resources otherwise classified as wastes is the most common cleaner production technique (e.g. reuse of cleared vegetative material, wooden pallets, metals)
- closed-loop recycling – where a product is recycled and used again in the same form (e.g. wooden pallets).

A continuous improvement approach implemented for MRM will be adopted for the Project over the life of the mine. This approach involves reviewing and modifying processes, materials and operating practices when required. Quantifiable key performance indicators will be developed for inclusion in the WMP.

9.5.2 Waste Monitoring

The purpose of monitoring the activities and outcomes related to waste management include:

- providing baseline data for the continuous development of ameliorative measures, from which basis waste management and waste minimisation decisions will be made
- assessing actual waste results against forecasted waste volumes
- monitoring for potential environmental impacts.

Monitoring will include the recording of waste types and volumes generated on-site (e.g. general waste, contaminated waste, scrap metal and recyclables) and being transported off-site. Records will be maintained in order to determine where large quantities of certain wastes are being produced. Records will be reviewed on a regular basis and appropriate corrective actions formulated to reduce or eliminate waste generation or impacts associated with waste.

9.5.3 Waste Reporting

In addition to the Northern Territory Government's regulatory requirements for waste management, the Project will be required to comply with relevant National Environmental Protection Measures (NEPM) developed by the National Environmental Protection Council (NEPC). The relevant NEPM for the Project is the National Pollutant Inventory (NPI), under which emissions and wastes are reported. All NPI information is accessible to the community, industry and government through the NPI website.

The NPI is a database designed to provide the community, industry and government with information on the types and amounts of certain substances being emitted to land, air and water. The NEPM provides the framework for the establishment of the NPI and sets out the requirements for reporting, including how a facility triggers a reporting obligation and what substances are on the reporting list.

MRM triggers a reporting obligation under the NPI and consequently, is required to estimate and report mine emissions to the NPI annually, in accordance with the *National Pollutant Inventory Guide* (SEWPAC, 2010) and associated manuals (e.g. *Emission Estimation Technique (EET) Manual for Mining* (SEWPAC, 2001)).

Gaseous emissions are also discussed in Chapter 11 – Air Quality and Greenhouse Gases and Chapter 19 – Environmental Management Plan.

Key NPI activities related to MRM are:

- mining
- storage of fuel and organic liquid
- detonation of explosives
- generation and usage of electric power
- combustion engines
- fugitive emissions.

9.5.4 Waste Commitments and Targets

Waste commitments and targets have been developed by MRM to assist in effective waste management to:

- reduce the total amount of, and environmental impacts from waste
- recover and recycle 10% more than currently recycled over the next five years
- increase personnel and contractors' awareness of the waste management strategy and waste commitments/targets
- optimise re-use and recycling systems.

MRM is committed to achieving the targets and actions listed above by managing the wastes generated in a safe, effective and sustainable manner.

9.5.5 Existing Waste Facilities

9.5.5.1 Refuse Facility

The existing refuse facility currently receives uncontaminated waste from on-site operational activities. Additional construction wastes will be received during the 2012 and 2013 dry seasons when the construction phase is scheduled to commence. The refuse facility is expected to maintain its predicted operational life with the additional wastes from the Project and current waste volumes from MRM.

The refuse facility has been located at a site approximately 500 m east of the accommodation village for the following reasons: The location:

- is above the 100 year average recurrence interval (ARI) flood level
- is in a disused borrow pit that does not have a steep slope, thereby reducing the risk of soil erosion
- has clay rich soils, which are favourable due to their low permeability
- has suitable all weather road access from the main entrance route from the Carpentaria Highway to the existing operational area.

The MRM refuse facility has been constructed and is managed in accordance to the *Guidelines for the Siting, Design, and Management of Solid Waste Disposal Sites Northern Territory* (2003).

9.5.5.2 Recycling Facilities

Due to its geographical isolation, there are few waste recycling facilities available for MRM. However, recyclables such as paper, cardboard, aluminium, steel and ink cartridges are segregated and sorted for recycling off-site. The lifespan of the current refuse facility being utilised at MRM will be prolonged by recycling these items off-site and potential for on-site environmental harm will be reduced.

9.5.5.3 Contaminated Waste Facilities

Disposal of contaminated wastes, including materials that have been in contact with lubricants and greases occurs at a designated area at the Tailings Storage Facility (TSF). The area is signed with corresponding waste disposal information to display the location of the waste disposal area. Management of the contaminated waste disposal area is detailed within an on-site procedure.

Grease and lubricants are removed off-site by a licensed waste management service provider for either disposal at an appropriately licensed facility, or processing for solvent recovery

9.5.5.4 Sewage Treatment Facilities

Sewage at the accommodation village is currently treated through an intermittent extended aeration type treatment plant. Treated water from the plant is irrigated onto an area away from the village. Construction of a new sewage treatment plant, including a reverse osmosis (RO) water filtration plant, has been recently completed. The RO plant has the capability to produce 150 kilo litres per day (klpd) and is expandable to 200 klpd if required. The rotating disc sewage plant is capable of treating 150 klpd to the required effluent standard (class A).

9.6 Potential Impacts and Mitigation Measures

9.6.1 Construction and Operational Wastes

The objective of waste management will be to minimise the impacts of waste on the environment by managing the following aspects of the operation effectively:

- mine wastes
- ore processing waste (tailings and rejects)
- general construction and operational wastes.

Waste management undertaken throughout the life of the Project will aim to promote sustainable waste management practices in accordance with MRM's existing WMP. Although no new waste streams will be introduced, the volume of waste currently produced will increase as a consequence of the Project's increased rate of mining, the upgraded throughput at the processing plant and additional workforce.

Potential adverse impacts associated with waste include:

- degradation of water quality through contact with waste products in operational areas, including potentially saline or acid generating waste rock material
- increased cost associated with incorrect waste disposal
- loss of potentially recyclable resources
- gross waste accumulation
- introduction of pest fauna species
- spread of weed species
- loss of aesthetic value
- degradation of air quality, including dust and odours
- risk of vector-borne diseases from waste disposal sites
- land contamination as a result of inappropriate storage and handling of wastes.

The type, source and estimated volume of wastes produced during the Project's construction and operational phases are detailed in Table 9-2 and Table 9-3 respectively, along with proposed measures to mitigate and/or manage the potential impacts of waste. Volumes of waste have been estimated based on current waste production at MRM and similar industrial developments.

Mitigation and management measures will be further detailed in Chapter 19 - Environmental Management Plan (EM Plan). The EM Plan will assess management options by applying guidelines for waste management on mine sites. Little or no change to current waste management practices and capacities at MRM are considered necessary in order to manage the proposed increase in Project waste volumes.

Table 9-2 Waste Management: Project Construction Phase

Type	Waste description	Estimated quantity of waste	Source(s)	Management
Timber/Wooden Pallets	A wide range of materials are transported to the mine site on timber pallets, which are re-used until they are no longer safe, at which time they become waste	30 m^3	Workshop and administration offices	Majority of timber/wooden pallets are re-used on-site Any unserviceable or contaminated pallets are sent to designated area of the TSF
Tyres	Tyres from trucks and associated mining vehicles	800 tyres	Workshops	Light vehicle and heavy vehicle tyres are stored in designated areas until they are buried in the Potentially Acid Forming material (PAF) cells at the North Overburden Emplacement Facility (OEF) Some tyres will go off-site with the vehicles in the construction phase
Liquid hazardous waste	Chemicals used for assaying of concentrate, tailings, ore, reagents and wastes	320 L	Laboratory	Liquid hazardous waste is directed to the concentrator runoff pond whereby the wastes are diluted to concentrations harmless to the surrounding environment

Table 9-2 Waste Management: Project Construction Phase (cont)

Type	Waste description	Estimated quantity of waste	Source(s)	Management
Waste oil	Used hydrocarbons are collected as part of regular maintenance of equipment	200,000 L (waste oil)	Processing plant and workshops	Waste oil is removed off-site by a licensed waste management service provider for either disposal at an appropriately licensed facility, or processing for solvent recovery
Grease and lubricants	Used hydrocarbons are collected as part of regular maintenance of equipmen.	66,000 L	Processing plant and workshops	Grease and lubricants are removed off-site by a licensed waste management service provider for either disposal at an appropriately licensed facility, or processing for solvent recovery
Contaminated material	All material that has been contaminated by hydrocarbons, including oily rags, must be treated as a contaminated waste	30,000 t	Processing plant and workshops	Wastes which have come into contact with contaminants from the processing plant and workshops which may include reagent bags, wooden pallets and crates, workshop/hydrocarbon contaminated materials are all disposed of within the designated area of TSF A contaminated waste collection area is located at Bing Bong. Contaminated waste is stored in a bunded collection point and transported to the designated area at the TSF as required

Table 9-2 Waste Management: Project Construction Phase (cont)

Type	Waste description	Estimated quantity of waste	Source(s)	Management
Jet A1 fuel	Waste Jet A1 fuel is generated from test samples when refuelling the daily regional link charter flight	4,000 L	Fuel farm	Small quantities of jet fuel are re-used on-site at the workshops as a cleaning fluid for parts and equipment. If there is excess, this becomes part of the waste oil stream and is disposed of off-site
Recyclables – cardboard, paper, Ink cartridges and aluminium cans	Cardboard and paper from packaging and office works. Ink cartridges from any printer, fax or copier machine Aluminium cans which are generated on-site	12 t Cardboard and paper 850 Ink cartridges 170,000 Aluminium cans	Construction offices, kitchenettes, crib rooms, administration area, workshop and accommodation village	Cardboard, paper, aluminium cans and ink cartridges are transported off-site by a waste contractor for off-site recycling at appropriate recycling facilities

Table 9-2 Waste Management: Project Construction Phase (cont)

Type	Waste description	Estimated quantity of waste	Source(s)	Management
Waste cooking oil	Waste cooking oil which is deemed out of date or unsafe to use	12,000 L	Accommodation village kitchen	Waste cooking oil is stored in 205 L drums behind the accommodation village at MRM. When the drums are full, the waste cooking oil is transported to Darwin for recycling
General Waste	Kitchen (putrescible) waste	1,500 m^3	Construction offices, kitchenettes, crib rooms, administration area, workshop and accommodation village	Putrescible waste is first burnt and disposed in the designated area at the south-eastern end of the water management dam at the TSF. The putrescible waste is disposed by the trench method
	Clean/dry and garden wastes	4,900 m^3		Clean/dry wastes are disposed in the general waste disposal area at the site refuse facility above the 100 year ARI flood level. The clean/dry wastes is regularly compacted and covered

Table 9-2 Waste Management: Project Construction Phase (cont)

Type	Waste description	Estimated quantity of waste	Source(s)	Management
Vehicle batteries	Batteries that are no longer viable for their allocated use are classified as a contaminated waste. Recycling of the battery or some materials within the battery may be possible	8 t	Workshops	Transported off-site by waste transporter to a licenced receiver for recycling
Scrap metal	Any metal-based equipment or scraps that meet the quality requirements for recycling	1,280 t	Processing plant and workshops	Transported off-site for recycling and where possible scrap metal is re-used on-site
Sewage waste	Sewage wastes	60 ML	Accommodation village and mine, including showers, toilets and crib room facilities	Treated on-site by sewage treatment plant through a process of intermittent aeration and settlement The treated effluent water is disposed on-site by irrigation to nearby designated land
Sewage sludge	Sewage treatment plant sludge	42 t	Sewage treatment plant	The sewage sludge which accumulates at the sewage treatment plant is disposed on-site to the designated area at the TSF

Table 9-3 Waste Management: Project Operation Phase

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Mining Wastes				
Overburden/Waste Rock	Waste rock material between the topsoil and the economic ore	An additional 530 Mt for the Project's life (annual amounts will vary between years) will be stored on the surface in new and existing OEFs	Mining	Any overburden material that is found to have high sodicity, salinity or positive net acid producing potential values is encapsulated within the OEFs. The PAF material will be contained within non-acid forming material (NAF) material to reduce any deleterious effects on the receiving environment through leaching. The final landform will be physically stable and suitable for the agreed post mining land use so as not to affect the receiving environment Specific measures to promote the stability of the OEFs are included in Chapter 5-Rehabilitation and Decommissioning and Appendix E2 – Overburden Emplacement Facility Management Plan. The landform is shaped to manage runoff and minimise any potential leaching, without promoting erosion.

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Mining and Metallurgical Wastes				
Tailings	Tailings will be produced by the processing of the ore	4 Mt at full production.	Processing plant	Tailings are removed from the processing plant as slurry and pumped to the TSF for storage Net Acid Generation (NAG) pH testing of the tailings is conducted monthly. Surface and groundwater sampling is also conducted to determine if leaching from the tailings is occurring As described in Chapter 7-Land Resources, tailings material generated at MRM exhibit NAF characterisations A Tailings Storage Facility Management Plan (Appendix E1) has been developed to accompany the Mine Closure Plan (Appendix E4). The aim of this plan is to provide sufficient monitoring, treatment and storage capacity of tailings waste for the remainder of the mine life
Rejects	Rejects will be produced in the processing of the ore	450,000 t	Heavy media plant	

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Blasting Waste (detonating cord)	Blasting is generally undertaken using ammonium nitrate/fuel oil (ANFO) and initiated with boosters and detonators. The main waste product from blasting is fragments of expired detonating cord	Minimal	Blasting	No specialist management is proposed as most detonating cord becomes buried during blasting and is disposed of in the OEFs during the overburden removal process
Timber/Wooden Pallets	A wide range of materials are transported to the mine site on timber pallets, which are re-used until they are no longer safe, at which time they become waste	20 m^3	Workshops, administration offices and Bing Bong	Majority of timber/wooden pallets are re-used Any unserviceable or contaminated pallets are sent to the designated area at the TSF

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Tyres	Tyres from trucks and associated mining vehicles	200-400 tyres (stored)	Workshops	Light vehicle tyres are segregated, stored and stacked in a designated tyre storage area located within the site refuse facility. Heavy vehicle tyres are segregated, stored and used for barricading at the mining services area or buried in the North OEF. Some excess tyres may be transported off site for disposal The tyre storage area is located further than 10 m from any combustible or flammable material The size of the scrap tyre stacks are managed by storing for the least amount of time possible prior to disposal off-site Other options for recycling will be investigated as they arise
Liquid Hazardous Waste	Chemicals used for assaying of concentrate, tailings, ore, reagents and wastes	160 L	Laboratory	Liquid hazardous wastes are led to the concentrator runoff pond whereby the wastes will be diluted to concentrations harmless to the surrounding environment

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Waste oil, grease and lubricants	Used hydrocarbons are collected as part of regular maintenance of equipment	100,000 L (waste oil) 33,000 L (malleus GL400 grease) 33,000 L (lubricants)	Processing plant, workshops and Bing Bong	All chemicals on-site have a Material Safety Data Sheet (MSDS) to provide details of the chemical and safety requirements relevant to use and disposal Strategies are in place to reduce wastes generated and maximise recovery of wastes. Segregation of waste (e.g. separation of grease, waste oils, jet fuel and lubricants etc.) All hydrocarbon and chemical storage areas are designed and constructed in accordance with *AS1940*. Storage of labeled 205 L drums are placed within designated areas of workshops and around fuelling depots Waste oil is removed off-site by a licensed waste management service provider for either disposal at an appropriately licensed facility, or processing for solvent recovery In the event of a spillage, spill containment material (e.g. absorbent materials) and spill cleanup kits located at workshops and/or on vehicles are used to control spills and assist in spill clean-up Grease (Malleus GL400) is disposed of by mixing into tailings thickening tanks and then pumping to the designated area at the TSF

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Contaminated materials	All material that has been contaminated by hydrocarbons, including oily rags, oil filters and contaminated soils must be treated as a contaminated waste	15,000 t (other contaminated materials)	Processing plant, workshops and Bing Bong	Wastes which have come into contact with contaminants from the processing plant and workshops which may include reagent bags, wooden pallets and crates, workshop/hydrocarbon contaminated materials are disposed of within the designated area at the TSF Strategies are in place to reduce wastes generated and maximise recovery of wastes Hydrocarbon contaminated soils are placed within the designated area at the TSF

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Fuel contaminated water	Fuels and hydrocarbons are stored within bunded areas to contain any minor spills and prevent contamination of land or waterways. Bunds also collect rainfall which needs to be drained out for the stored materials to be accessed. This collected rainfall contains small proportions of the stored materials and cannot be released directly to the land or waterways	2,000 L (Diesel/water mix)	Refuelling operations at the refuelling bay and fuel storage areas	All chemicals on-site have a Materials Safety Data Sheet (MSDS) to provide details of the chemical and safety requirements relevant to use and disposal The information provided on the MSDS is reviewed prior to handling and disposal of any chemicals Strategies are in place to reduce wastes generated and maximise recovery of wastes. Segregation of waste (e.g. separation of grease, lubricants, oily absorbents, oily rags, contaminated soil, etc.) All hydrocarbon and chemical storage areas are designed, constructed and stored in accordance with AS 1940. Stored in labeled 205 L drums placed within designated areas of workshops and around fuelling depots Removal off-site by an appropriately licensed waste management service provider for either disposal at an appropriately licensed facility, or processing for solvent recovery In the event of a spillage, spill containment material (e.g. absorbent materials) and spill clean-up kits located at workshops and/or on vehicles are used to control spills and assist in spill clean-up

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Jet A1 fuel	Waste Jet A1 fuel is generated from the test samples when refuelling the daily regional link charter flight	2,000 L	Fuel farm	All chemicals on-site have a Material Safety Data Sheet (MSDS) to provide details of the chemical and safety requirements relevant to use and disposal The information provided on the MSDS is reviewed prior to handling and disposal of any chemicals All hydrocarbon and chemical storage areas are designed, constructed and stored in accordance with AS 1940. Stored in labeled 205 L drums placed within designated areas of workshops and around fuelling depots Small quantities of Jet fuel are re-used on-site at the workshops as a cleaning fluid for parts and equipment

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Recyclables – cardboard, paper, ink cartridges , aluminium cans	Cardboard and paper from packaging and office Ink cartridges from any printer, fax or copier machine Aluminium cans which are generated from staff	7 t Cardboard and paper 500 Ink cartridges 100,000 Aluminium cans	Construction offices, kitchenettes, crib rooms, administration area, workshop, accommodation areas and Bing Bong	Source point segregation has been implemented to achieve maximum economic waste recovery. Labeled bins for ink cartridges and aluminum cans are placed in all appropriate locations on-site Cardboard/paper and ink cartridges are transported off-site by a waste contractor for off-site recycling at appropriate recycling facilities Aluminium cans are donated to local Roper Gulf Shire Council. The aluminium cans are either collected by the Council or delivered by the environmental section to the Council Workshop in Borroloola
Waste cooking oil	Waste cooking oil which is deemed out of date or unsafe to use	7,100 L	MRM kitchen, Bing Bong	Waste cooking oil is stored in 205 L drums behind the accommodation camp at MRM and Bing Bong. When the drums are full, the waste cooking oil is transported to Darwin for recycling

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
General Waste	Kitchen (putrescible) waste Clean/dry and garden waste Cleared vegetation in mining area	900 m^3 2,900 m^3 Minimal	Construction offices, kitchenettes, crib rooms, administration area, workshop, accommodation village and Bing Bong	Source point segregation has been implemented to achieve maximum economic waste recovery. Labeled bins for general wastes will be placed in all appropriate locations on-site Putrescible wastes are first burnt and disposed in the designated area at TSF Clean/dry and garden wastes are disposed in the general waste disposal area at the site refuse facility Cleared vegetation is windrowed away from mining operations and stockpiled from where it can be used further in rehabilitation. Excess timber is burnt if not required Cleared vegetation will be used in rehabilitation works (e.g. spread on the final landform as a natural habitat feature)

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Vehicle Batteries	Batteries that are no longer viable for their allocated use are classified as a contaminated waste. Recycling of the battery or some materials within the battery may be possible	4 t	Workshops and Bing Bong	Collected and stored in segregated container Transported off-site by waste transporter to a licenced receiver for recycling
Scrap Metal	Any metal-based equipment or scraps that meet the quality requirements for recycling	640 t	Processing plant, workshops and Bing Bong	Minimise waste by producing/procuring only the amount necessary Segregation and collection on-site Transportation off-site for recycling

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Process Water	Any water that has been used or contaminated by mining operations, including mine runoff water or water that has been used at the processing plant	Refer to Chapter 10- Water Resources for the breakdown of waste water volumes	Processing plant and potentially contaminated drainage	Where practicable, runoff water (i.e. 'clean water') is diverted away from mining operations and re-directed back into existing drainage and creek systems Runoff that cannot be diverted away from mining operations (i.e. 'dirty water') is collected in sediment ponds or sumps and where practicable, re-used for operational purposes (e.g. at the processing plant, for dust suppression on haul roads or for vehicle wash-down). Excess water is evaporated The consumption of raw water is kept to a minimum by the implementation of water efficient work practices and recycling where possible Decanted water from the TSF is re-used in the processing plant to reduce water consumption and assist in the consolidation of tailings

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Sewage	Sewage wastes	35 ML (based on 630 personnel)	Accommodation village and mine, including showers, toilets and crib room facilities and Bing Bong	Treated on-site by a sewage treatment plant through a process of intermittent aeration and settlement The treated effluent water is disposed of on-site by irrigation to nearby designated land
Sewage sludge	Sewage treatment plant sludge	25 t	Sewage treatment plant and Bing Bong	The sewage sludge which accumulates at the sewage treatment plant is disposed of on-site to the designated area at the TSF

Table 9-3 Waste Management: Project Operation Phase (cont)

Type	Waste description	Estimated quantity of waste (annual)	Source(s)	Management
Other Wastes				
Asbestos	Asbestos containing material	Unknown	Old offices, houses, Bing Bong	The removal and disposal of asbestos may be required for some old offices and houses Asbestos containing material is placed in unused bags which are at least 200 µm thick and then double bagged once outside the work area. The bags are disposed in a 2 m pit then backfilled at the designated asbestos disposal point, which is sign posted and located at the refuse facility. Asbestos is disposed of in accordance with the *National Code of Practice for the Safe Removal of Asbestos 2nd Edition* (NOHSC;2002 [2005])

9.6.2 Decommissioning Wastes

Table 9-4 describes the estimated volumes of waste generated from the decommissioning of the Project, including the mine infrastructure area such as offices and the processing facilities. More detail is provided in Chapter 5 - Rehabilitation and Decommissioning and Appendix E4 – Mine Closure Plan.

Amounts of decommissioning waste may change depending on the amount of salvageable material and legislation applicable at the time. Some infrastructure areas may remain after decommissioning with agreement from the post mine landowner.

Table 9-4 Waste Management: MRM Decommissioning Phase

Type	Source(s)	Management	Quantity
Scrap Metal	Mine infrastructure area	Segregation and collection on site Transportation off site for recycling	20,000 t
Concrete	Mine infrastructure area	Disposal in OEFs/final voids, or covered with waste rock and rehabilitated	7,500 t
Wooden Pallets	Workshop, offices, conveyor	Those that are recyclable are reused or returned to the supplier. Any unserviceable pallets are sent to general waste	<1 t
Tyres	Vehicles	Tyres will either be buried on-site or removed off-site	300 each
Waste oil and containers	Vehicle and plant maintenance operations, workshop	Collected in a bunded tank and taken off-site by registered transporter	300,000 L
Oily sludge, absorbent, grease and oily rags	Workshop	These will be collected on-site before being transported off-site by a licensed regulated waste contractor	40,000 L
Paper and cardboard, glass, plastics and aluminium cans	General office and site waste material	Collection and transported off-site by a licensed regulated waste receiver. Recycling is proposed	700 m³
Domestic Waste	Offices and workshop	Transported to on-site landfill	400 m³
Batteries	Vehicles	Collected and stored in segregated container. Transported off-site by regulated waste transporter to a licensed receiver for recycling	200 each