

18.0 Waste management

18.1 Introduction

This chapter identifies and describes likely sources, quantities and options for management of general waste and mine waste (waste rock) generated or transported during the operation and decommissioning of the Ensham Life of Mine Extension Project (the proposed project, hereafter referred to as ‘the Project’). The main topics addressed include characterisation of the Project’s waste streams, assessment potential impacts of waste on the receiving environment and identification of measures to manage any Project impacts.

Waste water discharges, mineral waste and air emissions associated with the Project are discussed separately in the following chapters:

- **Chapter 8** (Land resources)
- **Chapter 10** (Surface water resources)
- **Chapter 15** (Air quality)
- **Chapter 16** (Greenhouse gas).

Environmental objectives and outcomes

The Project seeks to continue to manage wastes in accordance with the waste and resource management hierarchy in the *Waste Reduction and Recycling Act 2011* (Qld) (WRR Act) and in a way that protects environmental values. The Project seeks to protect environmental values in the Project Site established under the Environmental Protection Regulation 2019 (EP Regulation). The Project is not anticipated to generate waste in excess of what is currently generated at the existing underground operations at Ensham Mine.

The existing Ensham Mine currently manages impacts to land in accordance with Environmental Authority (EA) conditions in Schedule F of EA EPML00732813. Existing management measures at Ensham Mine include established plans and procedures for managing waste streams according to the waste management hierarchy (F6), and ensuring the management of mineral wastes are appropriately managed (G4). Given the nature and scale of the Project, impacts to environmental values as a result of Project waste are not considered to be significant and, therefore, are not considered a critical matter in the environmental impact statement (EIS).

18.2 Legislation and policy

18.2.1 Commonwealth legislation

National Waste Policy

The National Waste Policy: less waste, more resources (Commonwealth of Australia, 2018) provides a framework for collective action by businesses, governments, communities and individuals until 2030. The policy identifies five principles that underpin waste management, recycling and resource recovery in a circular

economy – avoid waste; improve resource efficiency; increase use of recycled material; better management of material flows; and improved information to support innovation and investment.

The policy establishes a program for coordinated action, national and common approaches that will improve the efficiency of Australia's waste and resource recovery processes, as well as grow markets for goods and infrastructure that avoid waste or contain recycled materials.

National Environment Protection (National Pollutant Inventory) Measure

The National Pollution Inventory (NPI) National Environment Protection Measure (NEPM) is a publicly accessible national database of pollutants emitted to land, air and water from various industrial facilities and diffuse sources. It holds emission estimates for 93 toxic substances and the source and location of these emissions. The NPI does not include greenhouse gas emissions.

Ensham is required to comply with the NPI NEPM. The NPI Guide provides guidance and trigger levels for reporting on emissions and contains emission estimation techniques for specific activities (DoE, 2015b). Subject to meeting thresholds, project waste emissions to air, land and water are estimated and reported annually in accordance with NPI requirements.

18.2.2 State legislation

Environmental Protection Act

The *Environmental Protection Act 1994* (Qld) (EP Act) defines “waste” as anything that is:

- left over or unwanted by-product from an industrial, commercial, domestic or other activity, or
- surplus to the industrial, commercial, domestic or other activity generating wastes.

Waste will be generated during the construction, operation and decommissioning phases of the Project. Wastes may be in solid, liquid or gaseous form and are described in terms of their physical and chemical characteristics, variability of composition and generation rates within their waste stream.

Under the EP Act, the strategic framework and regulatory requirements for managing waste are defined within the WRR Act and the Environmental Protection Regulation 2019 (EP Regulation).

Environmental Protection Regulation

Under the EP Regulation, certain waste management activities are considered to be environmentally relevant activities (ERAs) and require approval. Waste related ERAs that are conducted as part of the Project, as per Schedule 2 of the EP Regulation, include:

- ERA 60 – Waste disposal
- ERA 56 Regulated Waste Storage
- ERA 63 – Sewage treatment.

Ensham Mine's existing operations are approved under environmental authority (EA) EPML00732813, which authorises the relevant ERAs and corresponding location. Reporting is also a requirement under the EA, which includes:

- an inventory of tyre burial to record the type, number/volume and location of tyres buried
- records of regulated waste via the waste tracking system and general waste inventory.

18.2.3 Local legislation

The Project is located in the western part of the central Bowen Basin, approximately 200 km west of Rockhampton and 35 km east of Emerald along the Nogoia River in Central Queensland. Within the Central Highlands Regional Council (CHRC) local government area, development is subject to provisions established in the Central Highlands Regional Council Planning Scheme (2016), which relate to incorporating service areas and waste management processes that are efficient and maximise opportunities for reuse or recycling of waste.

18.3 Methodology

A desktop review has been undertaken to identify and characterise the likely wastes generated by the Project and the most appropriate waste management approach. The methodology adopted for the waste assessment have included:

- review of existing Ensham Mine waste generation characteristics and waste management methods (including existing arrangements for collection, treatment and disposal)
- description of relevant environmental and community values
- identification and characterisation of the waste streams relevant to the Project
- demonstration that the approximate quantity of waste likely to be generated is consistent with current operations
- assessment of the potential impacts of waste from the Project on environmental values and the mitigation of those impacts
- confirming the application of preferred waste management hierarchy for each waste stream.

To understand the chemical and physical properties of the mineral wastes generated by the Project, a desktop review was undertaken as part of the land resources assessment (**Chapter 8** (Land resources)). The geochemical assessment of coal and interburden materials generated from the Project was based primarily on previously collected drill hole data from the existing open cut mine and proposed working sections. Trends observed in the study program were used to identify and predict any potential geochemical challenges in the Project Site.

18.4 Description of environmental values

18.4.1 Environmental values

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

- human receptors (site personnel, community)
- environmental receptors (land, air, surface water, groundwater, flora and fauna)
- commercial and industrial receptors (nearby collection, recycling and disposal facilities).

The environmental values to be protected during this Project are the life, health and wellbeing of people and the diversity of ecological processes and associated ecosystems surrounding the mine. More information on these values is presented in other chapters of this EIS including **Chapter 8** (Land resources), **Chapter 10** (Surface water resources), **Chapter 13** (Terrestrial ecology), **Chapter 14** (Aquatic ecology) and **Chapter 19** (Hazards and safety).

18.4.2 Existing environment

The existing land uses and corresponding environmental values of the Project Site, described in **Chapter 7** (Land use and tenure), include resource activities, cropping, grazing land and waterways with fringing riparian vegetation. The Project Site is largely cleared of native vegetation for agricultural development, however, some areas of native vegetation and marsh/wetland remain.

18.4.3 Existing regional waste management facilities

The CHRC operates waste transfer stations and landfill sites across the region. Facilities located within the vicinity of the Project are listed in **Table 18-1**. Lochlees landfill currently accepts commercial waste from the existing Ensham Mine.

Table 18-1: Waste facilities within 50 km of the Project

Waste facility	Address
Blackwater landfill	Ardurad Road
Emerald tip shop and transfer station	Glasson Street
Lochlees landfill	Lochlees Road

18.4.4 Waste generation

Existing waste generation

Ensham Mine's existing operations produce general solid and liquid wastes that are typical of mine site operations. Waste types, annual generation rates and applied management strategies for the entire mine site (i.e. open cut and underground operations) are summarised in **Table 18-2**.

Mineral wastes produced by the Project are limited to waste rock generated during mining and removed by the dry process at the coal handling plant (CHP). Placement of waste rock into mined voids will be undertaken in accordance with current approvals.

As the coal production tonnage for the Project remains unchanged, it is not expected that these quantities will materially change.

Solid waste is currently transported and disposed of by an authorised waste management contractor at the Lochlees landfill. Recyclable materials are taken to an authorised recycling centre for initial processing, involving segregation, crushing and baling for transport to various companies for recycling. Regulated wastes are transported by a licenced waste contractor to an authorised resources recovery facility for recycling, reprocessing, treatment and disposal.

Sewage is treated at existing onsite sewage treatment plants (STPs) with effluent used for the irrigation of rehabilitated areas and plantation trees as authorised under the Ensham Mine EA.

Mineral wastes produced by the Project are limited to waste rock generated during mining and removed by the dry process at the coal handling plant (CHP). Placement of waste rock into mined voids will be undertaken in accordance with current approvals.

Table 18-2: Waste inventory (annualised)

Waste	Source and characteristics	Annual rate	Estimation	Management
Batteries	<ul style="list-style-type: none"> Mobile phones, radios, vehicles, equipment [Solid; regulated] 	3 tonnes (t)	Average waste volumes recorded for Ensham Mine since 2017.	<ul style="list-style-type: none"> Segregated for collection by a licensed waste contractor for reuse, reprocessing, recycling or disposal.
Clinical waste	Medical facilities. [Solid; regulated]	Less than 1 t	Estimated on basis of similar projects.	<ul style="list-style-type: none"> Stored in secure containers in designated area for offsite disposal by licensed contractor.
Co-mingled recycling	Workshops, administration, accommodation facilities. [Solid; general (non-putrescible)]	130 t	Average annual volume recorded for Ensham Mine between 2013 and 2018.	<ul style="list-style-type: none"> Segregated recyclables in covered bins for removal off site for recycling by licensed contractor.
Drums and empty hydrocarbon containers	Underground, dragline and service equipment workshops and storage areas. [Solid; regulated]	200 (205 litres (L)) drums: 4 t 1,000 (20L) drums: 2 t	Average waste volumes recorded for Ensham Mine since 2017.	<ul style="list-style-type: none"> Drums are stored in a covered, sealed and banded area for periodic collection by a licensed waste contractor for reuse, reprocessing, recycling (crushing and on sold as scrap metal) or disposal.
General waste,	Workshops, offices, crib rooms or accommodation facilities. [Solid; general (putrescible)]	1,300 t	Average annual volume recorded for Ensham Mine between 2013 and 2018.	<ul style="list-style-type: none"> General refuse is collected in covered bins and removed from site by licensed contractor at least once a week.
Grease waste	Workshop and mobile equipment. [Liquid; regulated]	27,000 L 130 drums (205 L) equivalent	N. Dale, personal communication, 18 November, 2019.	<ul style="list-style-type: none"> Waste grease is placed in a banded storage container, typically brown 20 L drums single layer in a banded facility. Waste grease is transported offsite by a licensed waste contractor for treatment and disposal to a bio remediation facility.

Waste	Source and characteristics	Annual rate	Estimation	Management
Green waste	Vegetation clearing. [Solid; recycling]	Nil	None expected as no surface development required.	<ul style="list-style-type: none"> If required, burning of cleared vegetation is undertaken in accordance to fire permit issued by local fire warden.
Hydrocarbon contaminated soil	Workshops, parking and spill areas. [Solid; regulated]	Less than 1 t	Estimated on basis of similar projects.	<ul style="list-style-type: none"> Hydrocarbon contaminated soil is treated onsite in the bioremediation area.
Metals, including steel	Site and building maintenance and upgrades. [Solid; general (non-putrescible)]	1,000 t	N. Dale, personal communication, 18 November, 2019.	<ul style="list-style-type: none"> Metal is segregated using marked bins. Bins are regularly monitored and serviced by the recycling contractor.
Oil filters	<ul style="list-style-type: none"> Machinery failure and routine servicing of plant, equipment and vehicles in workshops. [Solid; regulated]	5 t	Average waste volumes recorded for Ensham Mine since 2017.	<ul style="list-style-type: none"> Collected in bins stored in bunded areas. If serviceable, suppliers reuse or reprocess. If unserviceable, oil drained from filters for collection by licensed contractor for recycling. Residual waste is tracked and transported offsite by an appropriately licensed waste contractor for disposal to a regulated waste disposal facility.
Oily rags	<ul style="list-style-type: none"> Workshops. [Solid; regulated]	150 t	Average waste volume recorded for Ensham Mine since 2012.	<ul style="list-style-type: none"> Collected and segregated onsite in brown colour coded, labelled bins, in a bunded area or container. Regulated waste is tracked and transported offsite by an appropriately licensed waste contractor.
Oily water	<ul style="list-style-type: none"> Workshops. [Liquid; regulated]	7,000 L	Average waste volumes recorded for Ensham Mine since 2017.	<ul style="list-style-type: none"> Oily water is collected onsite in oily water separators and sumps before being transported offsite by a licensed waste contractor for treatment.
Printer cartridges	<ul style="list-style-type: none"> Administration buildings. [Solid; regulated]	Less than 1 t	Estimated on basis of similar projects.	<ul style="list-style-type: none"> Used or empty laser and inkjet printer cartridges are recycled.

Waste	Source and characteristics	Annual rate	Estimation	Management
Residual paints, sealants, solvents and resins	<ul style="list-style-type: none"> Workshops. [Liquid; regulated] 	Less than 1 t	Estimated on basis of similar projects.	<ul style="list-style-type: none"> Collected and segregated onsite in brown colour coded, labelled bins, in a banded area or container. Regulated waste is tracked and transported offsite by an appropriately licensed waste contractor for reprocessing or disposal of in accordance with the safety data sheet (SDS) and legislative requirements.
Sewage effluent – includes grey and black water	Amenities and accommodation. [Liquid; regulated]	26.7 ML	Metered for previous 12 months	<ul style="list-style-type: none"> Raw sewage is treated at the onsite STPs. Treated effluent retained in a series of tanks and used for watering tree plantations or rehabilitated areas.
Sewage sludge	Onsite STP. [Solid; regulated]	1 t	N. Dale, personal communication, 18 November, 2019.	<ul style="list-style-type: none"> Sludge collected and transported by a licensed waste contractor to an approved/regulated facility for treatment and disposal.
Spill absorbent	Spill clean-up [Solid; regulated]	Less than 1 t	Estimated on basis of similar projects.	<ul style="list-style-type: none"> Collected and segregated onsite in brown colour coded, labelled bins, in a banded area or container. Regulated waste is tracked and transported offsite by an appropriately licensed waste contractor for disposal of in accordance with the SDS and legislative requirements.
Timbers	Offcuts and packaging from site and building maintenance and upgrades. [Solid; regulated]	100 t	Average of monthly figures	<ul style="list-style-type: none"> Stockpiled in designated storage area for reuse on site or alternatively removed by licensed contractor for recycling.

Waste	Source and characteristics	Annual rate	Estimation	Management
Tyres	Tyre failure and routine servicing of plant, equipment and vehicles in workshop. [Solid; regulated]	100 units	Recorded volume at Ensham Mine in 2016 (sizing not specified); no prior records.	Tyres are managed in accordance with the EA: <ul style="list-style-type: none"> Scrap tyres are temporarily stored in stable stacks at least 10 m from any other scrap tyre storage area, or combustible or flammable material, including vegetation. Where practical, tyre take-back is arranged. Alternatively, scrap tyres are disposed in spoil emplacements as reasonably practicable. A record is kept of the number and location for tyres disposed onsite and GIS location is provided to the administering authority for registration on the Environment Management Register.
Waste electrical and electronic equipment (WEEE)	Administration buildings or maintenance activities. [Solid; regulated]	Less than 1 t	Estimated on basis of similar projects.	<ul style="list-style-type: none"> WEEE collection service by licensed WEEE recycling operator.
Waste oil	Workshops and routine servicing of plant, equipment and vehicles. [Liquid; regulated]	160,000 L	Average waste volumes recorded for Ensham Mine since 2017.	<ul style="list-style-type: none"> Waste oil is evacuated from machinery in the workshop using pneumatic pumps and the oil will be transferred to waste oil holding tanks contained in a bunded area. Waste oil will continue to be collected by a licensed contractor for reprocessing and recycling.
Waste rock material	Underground coal seam/s interburden removed at CHP	18,000 m ³	CHP trial data from 2020-21	<ul style="list-style-type: none"> Estimated additional volume of waste rock over the life of the mine is 225,000 m³ to be placed in Pit C and Pit D for rehabilitation purposes as approved under the existing approved EA.

Waste	Source and characteristics	Annual rate	Estimation	Management
Food Waste	Ensham Village	86,580 L	Previous 12 months	<ul style="list-style-type: none"> Food scraps from the village are pulped and used in the bioremediation of hydrocarbon contaminated soil.

18.5 Potential impacts

The Project is expected to continue to generate similar waste types at similar annual rates to the current operation as open cut mining transitions to underground mining; however, waste generation will extend for up to nine additional years.

The following sections describe the anticipated waste generation throughout the operational and decommissioning phases of the Project. Waste stream characterisation is based on the Project description **Chapter 4** (Project description and alternatives) which details the operation and decommissioning phases and historical waste records for the operational Ensham Mine. Project waste management actions were derived from the existing Waste Management and Minimisation Plan.

18.5.1 Operation

Prior to the commencement of operations, an additional four flares will be commissioned for the Project in Zone 2 and Zone 3. This will involve underground in-seam drilling into the coal seam followed by surface to in-seam drilling to establish flaring equipment, and, exclusion fencing. Flaring equipment and fencing are reusable as are the wire support stays required for the flare pipe which are usually anchored with concrete blocks or reversible earth screws. As such, waste streams will be very minor and are not expected to have any impact on the waste management described.

During operation, the Project is expected to generate waste streams that are relatively consistent with existing underground operations but will continue for up to nine additional years. Operational waste streams include:

- General domestic waste generated by the workforce including kitchen and food scraps, recyclable materials such as paper, cardboard, plastics, glass, aluminium cans and packaging
- Plant and equipment waste generated by the vehicles, plant and equipment used to undertake earthworks, building and operational activities such as transport, excavations, haulage, grading and material compaction. Typical wastes include tyres, batteries, oil filters and other hydrocarbon contaminated waste (such as spill clean-up kits).
- Oily wastes, solvents, lubricants, paints and other hydrocarbon contaminated wastes (drums and packaging) from maintenance of vehicles, plant and equipment used to undertake earthworks, building and operational activities
- Sewage, sewage effluent and sludge/biosolids generated by the workforce via package STP
- Minor amounts of clinical and related waste associated with the onsite medical facilities
- Electrical and electronic wastes, including batteries.

18.5.2 Mineral wastes

Waste rock produced by the Project will be generated from the coal handling plant and is estimated at 18,000 m³ per annum and will be placed into Pit C and Pit D. The estimated volume of waste rock from the proposed Project over the life of the mine is 225,000 m³ in total which is approximately 0.6 per cent of total approved waste rock volumes (36 million m³) currently approved for the rehabilitation of Pit C and Pit D. At less than 1 per cent of total approved rock volume for Pit C and Pit D, it is not expected that additional waste rock will impact the approved final landform outcomes in Appendix 3 of the EA including final void water heights.

Assessment of waste rock geochemistry included both static geochemical analysis (moisture content, leach testing, pH, electrical conductivity, chromium reducible sulfur, net acid producing potential [NAPP], and net acid generation [NAG]) and composite sample analysis (total metals, soluble metals, soluble chloride and sulfate, soluble ions and effective cation exchange). URS (2015) concluded that runoff and seepage water derived from overburden and waste rock materials stored in Pit C and Pit D are not considered likely to:

- Generate acid, or
- Generate readily mobilised metals, or
- Generate sulfate.

Based on this study (URS (2015) and consistent with the Appendix 3 of the current EA, the rehabilitated mining pits will remain isolated from the external receiving environment. Results of the geochemical assessments are presented in **Chapter 8** (Land Resources).

18.5.3 Decommissioning and rehabilitation

Progressive rehabilitation is currently being carried out at Ensham Mine as described in **Chapter 9** (Rehabilitation and closure). Decommissioning of the underground mine will commence in approximately 2037 on cessation of underground production and will be completed by approximately 2039.

18.6 Mitigation measures

Waste and wastewater generated as part of Project operations will continue to be effectively managed using the existing waste management systems and practices applied to the current mining operations. Ensham Mine has developed and implemented a Waste Management and Minimisation Plan that details a program for reuse, recycling or disposal of non-production wastes in accordance with the waste management hierarchy as required by the EA (EPML00732813).

The Waste Management and Minimisation Plan outlines an approach to the reuse, recycling and disposal for each waste stream and details waste management control strategies for segregation, storage, transport, monitoring and emergency response planning. This systematic and integrated approach to waste management minimises the potential for adverse impacts on environmental values and maximises efficient and cost effective mine operations. The preferred waste management hierarchy defined in the National Waste Policy is used by Ensham to identify and prioritise waste management actions to achieve desired practical, safe, environmental and economic outcomes. Application of the waste management hierarchy and controls being applied at Ensham Mine is presented in **Table 18-3**.

Table 18-3: Waste management hierarchy and controls

Hierarchy	Controls
Avoid (most preferred)	<ul style="list-style-type: none"> • avoid unnecessary or excess packaging by delivering raw materials to site in bulk form • consider purchase of products using minimal packaging and biodegradable materials • specifications for construction material quantities will be as accurate as possible to limit excess waste • Pulp master equipment to stop the kitchen waste going to landfill • mining only coal thereby continuing minimal waste rock (<1 per cent of total mine life waste rock) material requiring in-pit disposal.
Reduce	<ul style="list-style-type: none"> • the waste contractor will demonstrate best practice and environmental efficiency by minimising transportation of waste and transport routes to and from site • regular stock reviews will take place to ensure efficient stock control and limited excess wastes • encourage reuse practices and review industry developments to identify opportunities for external reuse programs.
Reuse	<ul style="list-style-type: none"> • consider reuse of materials prior to purchasing raw products directly from suppliers • treated effluent from the STPs is used for irrigation • reuse timber pallets • collect and return waste oil pods to the suppliers for reuse.
Recycle	<ul style="list-style-type: none"> • provide/construct a waste segregation and sorting area to reduce the volume of general waste and increase the volume of reusable/recyclable waste • implement and maintain a colour coding scheme to segregate recyclables into their correct bins • collect cardboard and paper for recycling • collect scrap metal and empty drums for transport by a licensed waste contractor for recycling (crushing) offsite • collect waste oil in bunded tank for transport by a licensed waste contractor to a regulated waste receiver for recycling, recovery and/or disposal offsite • timber and unusable pallets are sent offsite for recycling • collect and return printer cartridges • collect and return batteries.
Recover	<ul style="list-style-type: none"> • waste materials suitable for refinement and reprocessing, such as waste oil, are to be collected for recycling where practical to recover residual energy value • collect hydrocarbon contaminated rags, absorbent and containers for transport offsite by a licensed waste contractor to a licensed regulated waste facility for recovery • monitor developments within the industry to identify potential new opportunities for the generation of waste energy.

Hierarchy	Controls
Treat	<ul style="list-style-type: none"> waste treatment methods are selected and used based on the form, composition and quantity in order to reduce the volume and toxicity of the material by transforming it into a more convenient form for disposal effluent from the onsite STPs is treated and disposed of by irrigation a fit for purpose, banded bioremediation area has also been constructed for the bioremediation of hydrocarbon contaminated soil. The remediated soil can then be used for rehabilitation purposes
Dispose (least preferred)	<ul style="list-style-type: none"> general waste will be segregated and stored in a safe, secure manner ready for disposal of at an authorised landfill scrap tyres disposed in overburden emplacement areas in accordance with EA conditions.

Segregation and storage

To manage the segregation of wastes, waste receptacles on site are easily identifiable, including clear signage and colour coding. This includes the provision of a sufficient number of appropriately sized bins to maximise recycling opportunities and appropriately segregating hazardous wastes.

The capacity and placement of waste receptacles is the responsibility of the Primary Waste Contractor with careful consideration of workplace activities, traffic flow, impact on the environment and occupational health and safety.

Transport of waste

Waste removed from site will continue to be transported by a licensed contractor to a facility lawfully allowed to accept such waste. The Waste Management Contractor is responsible for the provision of waste tracking and reporting requirements regarding regulated waste materials at the Ensham Mine. A record of wastes removed from site is provided to Ensham by the Primary Waste Contractor via monthly reports.

Spill response

Onsite facilities for the storage of flammable and combustible materials are designed and constructed in accordance with the most current version of Australian Standard 1940 – The Storage and Handling of Flammable and Combustible Liquids (AS 1940). This conformance reduces the risk of any loss of containment.

In addition, activities at Ensham Mine are undertaken in a manner that minimises the risk of ground and water contamination through hydrocarbon and/or chemical spills (and the generation of associated waste). Management measures currently in place for the prevention of spills and to minimise the risk of harm if a spill occurs include:

- site drainage designed to facilitate retention of spills onsite
- stormwater directed away from potentially contaminated areas
- engineered hardstand above the natural ground level
- construction of appropriate spill containment facilities for all areas where process reagent and petroleum products are stored (e.g. impervious containment and bunding around stationery/fixed storage areas in accordance with AS 1940)
- regular inspection and maintenance of spillage control devices

- overfill protection
- auto-shutoff nozzles on vehicles
- procedure for the storage and handling of hazardous substances
- procedure for the refuelling and servicing of vehicles and machinery
- prompt spill clean-up and reporting
- spill kits located at points which are easily identifiable, accessible and most likely to be needed such as high-risk areas i.e. refuelling points and the workshops
- firefighting equipment readily available, easily identifiable and accessible in high risk areas associated with hydrocarbons
- appropriate personal protective equipment to be used.

The potential for underground spills is minimised by:

- storing oil drums in locations where the possibility of impacts from vehicles is minimised
- appropriate housekeeping (i.e. ensuring only the required number of oil drums are taken underground)
- capture of oil drained from machinery during maintenance in containers which will be returned to the surface and pumped into the waste oil storage facility.

18.7 Summary and conclusions

The Project will continue to generate waste streams at annual rates similar to the current operation that will be minimised through continuous improvement initiatives and through the closure of the open cut mine in approximately 2024. Waste generation will extend for up to nine years due to the extended life of mine.

Provided that the requirements of the waste management and minimisation plan are complied with, potential environmental impacts arising from waste materials associated with the Project are expected to be minor.

There will be very minor waste generated from the establishment of four additional flares in Zone 2 and Zone 3. Operational wastes will remain consistent with the current underground operations and managed using the existing waste management infrastructure, services and systems utilised by the current mine operations. The operation of the Project is not expected to increase the overall waste volumes or diversity of the waste streams compared to the existing operation, however, waste generation will extend up to an additional nine years.

The reporting and management of wastes associated with the operation and decommissioning of the Project will continue to be undertaken in accordance with relevant legislation, policy and guidelines. The existing Waste Minimisation and Management Plan will be updated to incorporate the Project. Waste will be disposed of at an authorised waste disposal and recycling facilities by a licensed waste contractor as appropriate depending on the waste type.

Waste volumes are estimated (based on current trials) to be approximately 0.6 per cent of total approved overburden waste rock volumes required to rehabilitate both Pit C and Pit D. Geochemical assessment of waste rock has been shown that the risk of acid formation or metalloid mobility to be low. Therefore, waste rock volumes are considered to have minimal impact on environmental values in the Project Site and accordingly should not impact the final landform outcomes including water heights approved in Appendix 3 of the EA.

Cumulative impacts associated with waste production are considered to be minor due to implementation of a responsible, proven waste management approach.