BARALABA SOUTH

Baralaba South Project

Environmental Impact Statement

CHAPTER 14

Waste Management

aarc ENVIRONMENTAL SOLUTIONS

Table of Contents

14 Waste Management 14-1

14.1 Environmental objectives and performance outcomes 14-1

14.2 Waste generation 14-1

14.3 Potential impacts 14-3

14.4 Waste management principles 14-4

14.4.1. Polluter pays principle 14-4

14.4.2. User pays principle 14-4

14.4.3. Proximity principle 14-4

14.4.4. Waste management hierarchy 14-4

14.4.5. Cleaner production 14-14

14.4.6. Natural resource use efficiency: Water 14-15

14.4.7. Natural resource use efficiency: Energy 14-15

14.5 Non-mineral waste management 14-16

14.5.1. General waste 14-16

14.5.2. Regulated waste 14-16

14.5.3. Sewage 14-16

14.5.4. Non-mineral waste management plan 14-18

14.6 Mineral waste management 14-18

14.6.1. Waste rock management 14-19

14.6.2. Coal reject management 14-21

14.6.3. Mineral Waste Management Plan 14-21

14.7 Performance monitoring and review 14-22

List of Tables

Table 14.1: Waste categories detailed in other EIS chapters 14-3
Table 14.2: Anticipated waste generation and management strategies 14-6
Table 14.3: Wastewater quality estimations 14-17

List of Figures

Figure 14.1: Conceptual mine layout 14-20

14 Waste Management

This chapter describes the expected waste streams (mineral and non-mineral) from the proposed Project activities during the construction, operation and rehabilitation and decommissioning phases. This includes discussion of the expected quantities and waste characteristics, impact assessment, mitigation and management strategies and commitments.

14.1 Environmental objectives and performance outcomes

This chapter has been prepared to assist the Department of Environment and Science (DES), Queensland in carrying out the environmental objective assessment in respect of the following environmental objective prescribed in Schedule 8, Part 3, Division 1 of the *Environmental Protection Regulation 2019* (EP Regulation) (waste management environmental objective):

Any waste generated, transported, or received as part of carrying out the activity is managed in a way that protects all environmental values.

The detailed assessment presented in this chapter, and in Appendix E, Geochemical Assessment and Appendix Q, Land-Based Effluent Disposal Assessment Report, demonstrate that the Project will achieve the performance outcomes relevant to waste management, as outlined in Schedule 8 of the EP Regulation.

Specifically, the Project will achieve item 1 of the performance outcome for the waste management environmental objective, in satisfaction of section 2(4) of Schedule 8 of the EP Regulation by ensuring that:

a) waste generated, transported or received is managed in accordance with the waste and resource management hierarchy in the *Waste Reduction and Recycling Act 2011*; and

b) if waste is disposed of, it is disposed of in a way that prevents or minimises adverse effects on environmental values.

This performance outcome will be achieved as outlined in this chapter, in accordance with standard industry practices and contemporary community standards.

14.2 Waste generation

The types of waste expected to be generated at each phase of the Project include:

Construction phase:

- vegetation cleared from the infrastructure footprint of the Project;
- subsoils excavated for construction of infrastructure foundations and footings;
- regulated waste (as defined by the EP Regulation), including used oils and oily wastes, paint residues, detergents, solvents, batteries and tyres;
- recyclable waste (e.g., codes 1, 2, 3 and 5 plastics, metals, paper and cardboard);
- general waste (e.g., food scraps, non-recyclable plastics);
- re-useable and refurbishable items (e.g. pipes, fittings, pumps, etc.);
- used tyres from light and heavy vehicles; and
- primary treated sewage effluent.

Operational phase:

- vegetation progressively cleared ahead of the development of the mine and out-of-pit WRE;
- regulated waste (as defined by the EP Regulation), including used oils and oily wastes, oil- contaminated materials (used oil filters and containers), greases and oily rags, paint residues, detergents, solvents, batteries and tyres;
- recyclable waste (e.g. codes 1, 2, 3 and 5 plastics, metals, paper and cardboard);
- general waste (e.g. food scraps, non-recyclable plastics);
- reusable and refurbishable items (e.g. pipes, fittings, pumps, etc.);
- used tyres from light and heavy vehicles, conveyor belts and synthetic and natural rubber items;
- primary and/or secondary treated sewage effluent and residual sewage sludge;
- timber from packaging; and
- mineral waste (e.g. waste rock and CHPP reject materials).

Rehabilitation and decommissioning phases:

- regulated waste (as defined by the EP Regulation), including used oils and oily wastes, paint residues, detergents, solvents, batteries and tyres;
- general waste (e.g. food scraps, non-recyclable plastics);
- recyclable waste (e.g. codes 1, 2, 3 and 5 plastics, metals, paper and cardboard);
- reusable and refurbishable items (e.g. pipes, fittings, plant and equipment);
- used tyres (from light and heavy vehicles); and
- primary and/or secondary treated sewage effluent and residual sewage sludge.

The operational phase will see the generation of the greatest volumes of waste. The management of mineral waste materials is outlined in Section 14.6 with additional details specifically in relation to their placement and rehabilitation provided in Chapter 3, Rehabilitation.

Non-mineral waste generation will occur through all three phases of the Project.

On-site Project Infrastructure will be decommissioned in accordance with a detailed PRC Plan. The PRCP will incorporate binding progressive rehabilitation milestones which will be submitted to the DES for approval (refer Chapter 3, Rehabilitation). Inert construction and demolition waste will either be removed from the site or placed within one final waste rock emplacements that will be capped as part of rehabilitation activities. During decommissioning, consideration will be given to the waste management hierarchy with reuse and recycling options pursued where possible, disposing of the waste as the last option. Areas of potential contamination will be investigated and managed/remediated as required.

Estimated quantities of waste generated during the construction and operational stages of the Project, along with specific management strategies, are presented in Table 14.2.

The following waste types will not be generated by Project activities:

- coal seam gas water;
- coal seam drainage gas; and
- evaporation pond residues;

While this chapter provides an overview of waste management for the Project, some waste categories are discussed in detail in other sections of the EIS;Table 14.1 provides cross-references for relevant sections.

Table 14.1: Waste categories detailed in other EIS chapters

Waste category	Description (source and origin)	Impacts	Mitigation	Disposal
Waste rock	Chapter 2, Project Description, (section 2.5.1 and section 2.5.3)	Chapter 10, Land and Visual Amenity, (section 10.4.1) Appendix E, Geochemical Assessment, (section 4; section 5.1)	Appendix E, Geochemical Assessment, (section 5.1)	Chapter 10, Land and Visual Amenity, (section 10.4.1)
Coarse coal rejects	Chapter 2, Project Description, (section 2.5.5)	Chapter 2, Project Description, (section 2.5.5) Appendix E, Geochemical Assessment, (section 5.2)	Appendix E, Geochemical Assessment, (section 5.2)	Appendix E, Geochemical Assessment, (section 5.2)
Tailings/fine rejects	Chapter 2, Project Description, (section 2.5.5)	Chapter 2, Project Description, (section 2.5.5) Appendix E, Geochemical Assessment, (section 5.2)	Appendix E, Geochemical Assessment, (section 5.2)	Appendix E, Geochemical Assessment, (section 5.2)
Mine affected water	Chapter 4, Surface Water, (section 4.3)	Chapter 4, Surface Water, (section 4.4)	Chapter 4, Surface Water, (section 4.5)	Chapter 4, Surface Water, (section 4.3)
Sewage	Chapter 2, Project Description, (section 2.6.4)	Chapter 10, Land and Visual Amenity, (section 10.4.10) Appendix Q, Land-Based Effluent Disposal Assessment Report (section 4.2)	Appendix Q, Land-Based Effluent Disposal Assessment Report (section 1 and section 11)	Chapter 2, Project Description, (section 2.6.4) Appendix Q, Land-Based Effluent Disposal Assessment Report (section 1 and section 11)

14.3 Potential impacts

Potential impacts that may arise from inappropriate management of waste have been identified to be avoided, and include:

- increased pressure on local and regional commercial waste collection, treatment and disposal facilities;
- land, surface water and groundwater contamination from:
  - leachate or run-off originating from unsealed waste collection and storage areas;
  - seepage from WRE and coal rejects stockpiles; and
  - inappropriate and/or inadequate treatment and management of sewage effluent;
- risks to workplace health and safety resulting from unsafe or inadequate storage, containment and/or handling of hazardous wastes;
- health and hygiene issues resulting from the inadequate management of putrescible wastes;
- litter in and around the Project site impacting local visual amenity, creating a fauna entrapment hazard, increasing fire risk or creating a health risk by providing a mosquito breeding habitat;
- attraction of pest fauna species (e.g. feral pigs, rats, cats, native rodents and scavenging bird species) arising from an inadequately managed waste collection area;

- impacts to visual amenity due to the planned WRE of excavated waste; and
- resource inefficiencies arising from inadequate recycling and/or reuse of waste materials.

14.4 Waste management principles

Each potential waste stream generated by the Project, and the most appropriate and effective avoidance and management methods to deal with them consider the following principles:

- polluter pays principle;
- user pays principle;
- proximity principle; and
- product stewardship principle.

14.4.1. Polluter pays principle

The polluter pays principle is the principle that all costs associated with the management of waste should be borne by the persons who generated the waste. All costs associated with the management of Project waste will be borne by the Proponent.

14.4.2. User pays principle

The user pays principle is the principle that all costs associated with the use of a resource should be included in the prices of the goods and services (including government services) that result from the use.

All waste management costs will pass through to the user of the Project's product. No government subsidy, incentive payment or grant has been accounted for. On the contrary, the Project will contribute substantially to the regional and national economies.

14.4.3. Proximity principle

The proximity principle is the principle that waste and recovered resources should be managed as close to the source of generation as possible.

When selecting waste management and disposal contractors, wherever practicable, waste and recovered resources are proposed to be disposed of as close to the Project as possible.

14.4.4. Waste management hierarchy

Potential impacts (environmental and otherwise) of waste will be managed in accordance with established industry practices and to contemporary community standards. All forms of waste expected to be generated have been assessed for their environmental risk, and management approaches have been developed with consideration to:

- the identified environmental risk;
- the available local and regional waste management services and facilities; and
- the waste management hierarchy (as outlined below).

14.4.4.1 Waste avoidance

Where possible, raw materials will be delivered in bulk form to minimise packaging waste. Where bulk delivery is not feasible, consideration will be given to packaging and storage, and if practicable, preference given to returnable containers or containers and packaging utilising recyclable and/or biodegradable materials. The use of alternative raw materials will also be considered where this achieves waste avoidance.

14.4.4.2 Waste reduction

The amount of waste being produced throughout the Project will be reduced by limiting the amount of materials brought onto the Project site to those necessary for the operation.

Table 14.2: Anticipated waste generation and management strategies

Waste type/waste category	Form	Source	Estimated quantity (per annum)			Risk attributes	Risk of causing harm[1]	Management strategies (waste management hierarchy level)[2]	Proposed disposal methodology
			Construction	Operations	Rehabilitation /decom-missioning				
Non-regulated, mineral waste									
Excavated waste (e.g. waste rock, overburden, etc.)	Solid	Mining activities	N/A	< 36 Mbcm	N/A	Potential for erosion and saline run-off	Low	Placed as infill in the mine void behind the advancing mining operations (e.g. in-pit waste rock emplacement) (g) or placed in out-of-pit waste rock emplacement to a maximum height of approximately 160 mAHD (g).	Excavated waste will be disposed of within the approved MLA; refer section 14.6.1.
Coal rejects	Solid	Mining activities	N/A	< 1 Mbcm	N/A	Potential for erosion and saline run-off; acid formation	Low	Trucked from the CHPP and placed in compacted layers within spoil in out-of-pit emplacement areas and/or behind the advancing open cut operations (g).	Coal rejects will be disposed of within the approved MLA; refer section 14.6.2.
Dewatered Tailings	Solid	Mining activities	N/A	< 1 Mbcm	N/A	Potential for erosion and saline run-off; acid formation	Low	Moisture reduction by belt press filter and In-pit co-disposal with waste rock and/or behind the advancing open cut operations (g).	Dewatered tailings will be disposed of within the approved MLA; refer section 14.6.2.

Waste type/waste category	Form	Source	Estimated quantity (per annum)			Risk attributes	Risk of causing harm[1]	Management strategies (waste management hierarchy level)[2]	Proposed disposal methodology
			Construction	Operations	Rehabilitation /decom-missioning				
Tailings	Solid	Mining activities	N/A	< 1 Mbcm	N/A	Potential for erosion and saline run-off; acid formation	Low	Deposited into drying cells within the MIA. Once sufficiently dried, tailings will be excavated and trucked for final disposal within spoil in out-of-pit emplacement areas and/or in-pit behind the advancing open cut operations (g).	Tailings will be disposed of within the approved MLA; refer section 14.6.2.
Non-regulated, non-mineral waste									
General waste (e.g. food scraps, non-recyclable plastics)	Solid	Kitchenettes, crib rooms, administration areas, workshops, etc.	730 m^3	870 m^3	440 m^3	Putrescible; attractive to fauna	Medium	Stored on-site in bins for regular transport off-site by a licensed waste transport contractor to a licensed landfill (g).	General waste will be transported off-site by a licensed waste contractor to an approved landfill.

Waste type/waste category	Form	Source	Estimated quantity (per annum)			Risk attributes	Risk of causing harm[1]	Management strategies (waste management hierarchy level)[2]	Proposed disposal methodology
			Construction	Operations	Rehabilitation /decom-missioning				
Recyclable waste (e.g. aluminium, steel cans, recyclable plastics, paper towels, paper and cardboard)	Solid	Kitchenettes, crib rooms, administration areas, workshops, etc.	< 290 m^3	< 650 m^3	< 290 m^3	Small in size; light in weight	Low	Stored on-site in bins for regular transport off-site by a licensed waste transport contractor for recycling (d).	Recyclable waste will be transported off-site by a licensed recycling contractor to an approved materials recycling facility (Rockhampton or Brisbane).
Refurbishable items (e.g. pipe work and associated components and fittings, wing nuts, conveyor rollers and belt)	Solid	CHPP and workshops	< 10 t	< 15 t	N/A	Generally inert, contamin-ants	Low	Items stockpiled within a designated area. If condition is acceptable, items will be reused directly or sold to other parties (c); where items are at end of life, they will be collected and disposed of as appropriate (g); where items are contaminated with hydrocarbons, they will be managed as regulated waste.	Reuse or disposal off-site by a licensed waste contractor to an approved waste facility.
Green waste (e.g. grass, cleared timber and weeds)	Solid	Clearing of vegetation	< 1000 m^3	< 1000 m^3	N/A	Attractive to fauna	Low	Mulched and/or placed in timber stacks for reuse on-site during rehabilitation (c); waste vegetation will be burned if required (g).	Green waste will be disposed of within the MLA.

Waste type/waste category	Form	Source	Estimated quantity (per annum)			Risk attributes	Risk of causing harm[1]	Management strategies (waste management hierarchy level)[2]	Proposed disposal methodology
			Construction	Operations	Rehabilitation /decom-missioning				
Scrap metal (e.g. stainless steel, aluminium and any item considered to be metal [ferrous or non-ferrous] including machine and vehicle parts)	Solid	Construction activities, infrastructure maintenance and workshops	30 m^3	120 m^3	N/A	Generally inert, contaminants	Low	• Smaller items placed in scrap metal skips for collection by licensed contractor. • Larger items left in an accessible location where specific collection. arrangements can be made. • Greases and oils to be removed prior to placement in skips. Licensed contractor to remove all scrap metals for segregation at a licensed recycling facility (d).	Scrap metal will be disposed of by a licensed contractor to an approved materials recycling facility.
Air filters (e.g. engine air filters)	Solid	Vehicle and machinery workshops	< 1 t	< 1 t	< 1 t	Generally inert, contaminants	Low	Air filters temporarily stored in the appropriate air filter skip/bin; final disposal off-site (g).	Air filters will be transported off-site for refurbishment or disposal at an approved landfill.

Waste type/waste category	Form	Source	Estimated quantity (per annum)			Risk attributes	Risk of causing harm[1]	Management strategies (waste management hierarchy level)[2]	Proposed disposal methodology
			Construction	Operations	Rehabilitation /decom-missioning				
Timber/wooden pallets (e.g. reusable pallets)	Solid	Workshop and administration areas	< 1 t	< 1 t	< 1 t	Generally inert, contamin-ants, attractive to fauna	Low	Reusable pallets returned to the supplier (c); remainder sent to general waste (g).	Pallets that are not re-useable will be transported off-site by a licensed waste contractor to an approved landfill.
Waste oils	Liquid	Machinery and vehicle maintenance and workshop	240 kL	930 kL	120 kL	Liquid	Medium	Collected and stored in designated self-bunded tanks for transport by licensed regulated waste contractor to a regulated waste receiver for reuse (c), recycling (d) or disposal (g).	Waste oils will be recycled by a licensed regulated waste contractor, likely at the Northern Oil Facility.

Regulated, non-mineral waste									
Engine oil/fuel filters	Solid/ liquid	Vehicle and machinery maintenance at workshop	< 5 t	< 10 t	< 2.5 t	Liquid contents	Medium	Collected and stored in sealed oil filter disposal pod; transportation by licensed regulated waste contractor to a licensed regulated waste receiver for treatment (solvent wash) to recover oil (c).	Engine oil/fuel filters will be recycled by an approved refurbishment company.
Primary and/or secondary treated effluent	Liquid	Offices and workshops	< 20 ML	< 15 ML	< 7 ML	Liquid	Medium	Construction phase: Collection and primary treatment (septic tanks) to be pumped out by licensed contractor. Operations phase: as per construction phase or STP effluent (f) irrigated to designated area (c) compliant with relevant standards.	Off-site treatment and disposal and/or treatment by package STP and irrigated to designated effluent areas.
Empty waste oil containers	Solid	Workshop	< 3 t	< 8 t	< 1 t	N/A	Medium	Segregate drums prior to collection by licensed regulated waste contractor for transport to a licensed waste receiver for rinsing and recycling (d).	Empty waste oil containers will be recycled or disposed of by a licensed regulated waste contractor.

Regulated, non-mineral waste									
Paints (e.g. general paint, air dried insulating varnish)	Liquid /gas	Industrial area infrastructure and workshop	< 1 t	< 1 t	< 1 t	Liquid	Medium	Collected at a designated bunded area for collection by licensed regulated waste contractor for transport to a licensed regulated waste receiver for treatment (f) and disposal (g).	Paint will be disposed of off-site by licensed regulated waste contractor to an approved licensed facility.
Waste grease and hydrocarbon contaminated material (e.g. oily, greasy rags)	Solid/ liquid	Workshop servicing trucks and light/heavy vehicles	< 2 t	< 6 t	< 1 t	Semi-solid /liquid contents	Medium	Collected and stored in sealed disposal bin; transported by licensed regulated waste contractor to a licensed regulated waste receiver for appropriate disposal (g).	Disposed off-site by a licensed regulated waste contractor to an approved licensed facility.
Miscellaneous chemicals (e.g. engine coolant, solvents, sealants, etc.)	Liquid /gas	Workshop and administration	< 10 kL	< 20 kL	< 5 kL	Liquid	Medium	Collected and stored in sealed disposal bin; transported by licensed regulated waste contractor to a licensed regulated waste receiver for treatment and disposal (g).	Miscellaneous chemicals will be disposed of off-site by a licensed regulated waste contractor to an approved licensed facility.

Regulated, non-mineral waste									
Batteries (e.g. dry cell, gel cell, lead acid)	Solid	Operation of portable electrical equipment (radios, phones, etc.) within the workshop and other areas	< 1 t	< 1 t	< 1 t	Liquid contents	Medium	Segregated and stored within dedicated containers in battery storage area for collection by licensed regulated waste transport contractor to a licensed regulated waste facility for recycling (d) or disposal (g).	Batteries will be disposed of off-site by a licensed regulated waste contactor to an approved licensed facility.
Ozone depleting substance (e.g. refrigerants, air-conditioning gases)	Liquid /gas	Air-conditioning units, fridges and cars throughout site	100 kg	360 kg	100 kg	Liquid or fumes	High	Ozone depleting substances to be contained at the source in cylinders and returned to the supplier for reuse and recycling (c)(d).	Ozone depleting substances will be recycled by a licensed regulated waste contractor.
Tyres (e.g. light and heavy vehicle tyres)	Solid	Tyres from light and heavy vehicles	100	200	50	N/A	Low	Segregated and stored in a designated area with no grass or other flammable material within a 10 m radius; tyres to be transported off-site to a supplier for re-treading where practicable (c) or disposed on-site in a designated tyre disposal area in the backfilled pit (g).	Tyres will be disposed of within the approved MLA area.

Notes: [1] In consideration of potential hazards, toxicity and dispersal mechanisms.
[2] References to the waste management hierarchy as defined in section 9 of the *Waste Reduction and Recycling Act 2011*: (c) waste reuse; (d) waste recycling; (f) treat waste before disposal; (g) waste disposal. The measures identified above will be implemented only once waste avoidance and reduction measures have been exhausted.

Waste reuse, recycling and recovery

A recycling program will be established and promoted to encourage the recycling of waste materials, including paper, cardboard, ferrous and non-ferrous metals and air filters. The recycling program will utilise coloured bins and signage for waste segregation. Waste oils are expected to be re-refined through the Northern Oil Refinery at Yarwun, near Gladstone for reuse. Ferrous and non-ferrous metals will be transported to InfraBuild's facility at Gladstone. Where practicable, timber and air and oil filters will be recycled. Cardboard and general recyclables will be taken to the waste contractors' yard for sorting prior to transport to a licensed recyclable facility – most likely the material recovery facility at Rockhampton, or a facility located in Brisbane.

Other potentially recyclable materials will be reassessed at an appropriate frequency to determine if new or innovative recycling technologies can be utilised. A waste collection area will be established to facilitate the collection and separation of waste and recyclable streams and provide storage infrastructure appropriate for the various waste streams on-site.

Treatment

Apart from the collection and segregation of waste streams, the only waste treatment to occur on-site will be the treatment of sewage generated at the Project.

During the construction phase, a primary sewage treatment process consisting of septic tanks for the collection of sewage will be installed. Primary treated effluent and sludge by-products will be routinely transported off-site to existing facilities at either Biloela or Moura for further processing and disposal.

As described in Chapter 2, Project Description, section 2.6.4, during the operations phase, either the existing primary collection and treatment system will continue to be utilised or a package STP will be constructed within the MIA. Should the second option be adopted, the STP will be designed to treat 100% of the potable water (200 L per person per day), assumed to become wastewater requiring treatment in the plant. Sewage treatment under this option is discussed further at section 14.5.3.

Waste residual sludge from either option is expected to be removed for disposal every 12–18 months. This will be undertaken by a licensed waste contractor, with disposal to existing facilities at either Biloela or Moura for further processing and disposal.

Disposal

There will be no general, regulated or putrescible waste landfill on-site. Only inert materials (e.g. used mining equipment tyres, green waste, used road base, concrete etc.) will be disposed of on-site, and then within designated areas within the waste rock replacement. All other wastes will be transferred to a licensed waste disposal facility by a registered, commercial waste contractor as outlined in this chapter. In accordance with the *Operational policy – mining, disposal and storage of scrap tyres at mine sites* (DES 2014b), and where practicable, purchase agreements for mine equipment tyres will seek take-back clauses and recycling opportunities will be explored. If surplus used tyres remain, these will be disposed of at depth within the waste rock replacement.

14.4.5. Cleaner production

To embed cleaner production concepts, the environmental management system for the Project is based on preventative principles and encompasses eco-efficiency and pollution prevention, with risk reduction to humans and the environment.

There are several criteria ascribed to cleaner production, including:

- input substitution;
- product selection;

- process changes;
- reuse of resources;
- technology modifications; and
- closed-loop recycling.

The following actions satisfy cleaner production principles, and are considered appropriate and feasible for the Project:

- limiting the extent of ground to be disturbed during construction and operations through good Project planning and utilising current geological models and mine planning software;
- optimising Project and mine planning outcomes by selecting the most efficient and productive mining machinery and equipment suited to the geological structure and sequence of the mine;
- selecting efficient and practical coal extraction and processing technologies and equipment suited to the geochemical and physical characteristics of the ROM coal; and
- establishing recycling programs for used materials wherever practical and feasible.

14.4.6. Natural resource use efficiency: Water

The Project will require water to be supplied for coal processing, dust suppression, potable consumption and other minor activities. The available sources of water for the Project (excluding potable water supplies) are listed below in order of priority of use:

- mine water supplied from pit dewatering (including groundwater inflows);
- recycled process water recovered from the CHPP tailings thickener and belt press filters;
- surface run-off water captured and stored within water dams; and
- water supply 'make-up' sourced from water allocations from the Dawson River as required via a licensed agreement.

This preferential order will ensure that all water available on-site is utilised before accessing external water sources; thereby driving the efficient use of this resource for the Project. Water balance modelling for the Project (Appendix A, Surface Water Impact Assessment) indicates that with the preferential utilisation of on- site water sources., Under median conditions the Project is expected to extract 150 ML and 300 ML **raw water** per year, with a peak median annual demand of 600 ML in Year 3. Additional water supply from water use efficiency initiatives and Baralaba North allocation will be used if required by a shortfall in water demand for the Project.

Water resources and management is further discussed in Chapter 4, Surface Water.

14.4.7. Natural resource use efficiency: Energy

Power supply for the Project will be via a connection to the local grid. This includes a 22 kV feeder from a 132/22 kV substation located east of Baralaba township. A substation is proposed to be constructed to the east of the MLA 700057, from which the ETL would extend into the MLA to supply power to the mine.

Power will be reticulated around the site via a combination of 12.7 kV overhead power lines and underground cables. It is planned for the switch rooms and substations to be located strategically around the site to minimise the amount of cable installation required, and to generally be located closer to infrastructure that has a greater demand for power (e.g. the CHPP). Energy use will be reviewed for efficiency measures wherever practical.

14.5 Non-mineral waste management

A designated on-site waste collection area will allow for the temporary collection, segregation and storage of waste prior to disposal off-site. Skips, bins and other receptacles will be located at appropriate locations around the site to facilitate the collection and segregation of waste streams, prior to transfer to the waste collection area.

14.5.1. General waste

All non-recyclable general waste, including putrescible and non-recyclable/refurbishable wastes will be collected in front-lift bins for weekly collection by a licensed waste management contractor.

The management of recyclable wastes is discussed in section 14.4.4.

14.5.2. Regulated waste

Regulated wastes, including waste oils, oil filters, waste grease, paints and various hydrocarbon contaminated materials will be handled and disposed of in accordance with the properties of the specific materials. The most significant regulated waste stream is waste oil which is expected to be re-refined through the Northern Oil Refinery at Yarwun, near Gladstone for reuse. Minor regulated waste streams (refer Table 14.2) are collected and stored at the Project waste collection facility and batch disposed of to various specialist waste treatment, recycling or disposal facilities.

14.5.3. Sewage

As described in Chapter 2, Project Description, section 2.6.4, during the operations phase, either the existing primary collection and treatment system will continue to be utilised or a package STP will be constructed within the MIA. Should the second option be adopted, the STP will be designed to treat 100% of the potable water (200 L per person per day), assumed to become wastewater requiring treatment in the plant. The STP design recommended as an outcome of MEDLI modelling (Appendix Q, Land-based effluent disposal assessment report and MEDLI Modelling) is a low maintenance system with secondary treatment capability and the ability to produce at least Class C effluent. The collection system would utilise an appropriately sized pump station to minimise the retention of raw sewage and mitigate the potential for production of odour and volatile organic compounds. All equipment and control panels will be located in a control room at the MIA. Wet weather storage would be located adjacent to the plant with a capacity determined by modelling to ensure irrigation of saturated soil is avoided during wet weather periods.

Appendix Q (Land-Based Effluent Disposal Assessment Report) provides a full assessment of treated effluent characteristics which are summarised in Table 14.3. Expected effluent quality has been estimated based on the long-term limits established in the Eligibility Criteria and Standard Conditions for Sewage Treatment Works (ERA 63) – Version 2 (DEHP, 2016d). In addition, AS 1547:2012 recommends that a secondary treated effluent is achieved for irrigation systems as per Table 14.3. These limits are primarily for operational purposes (e.g. to avoid clogging up pipes/fittings and soil pore spaces with solids and biofilms).

The MEDLI modelling concluded that, for the wastewater characteristics identified, an effluent irrigation area of no greater than 1.5 ha would be sufficient for the disposal of treated effluent by irrigation at a rate that would avoid nutrient leaching, run-off or overflow issues arising, for both the construction and operational phases of the Project.

Table 14.3: Wastewater quality estimations

Quality Characteristics	Release Limit	Limit Type
Total nitrogen[1]	30 mg/L	Maximum
Total Phosphorus[1]	10 mg/L	Maximum
EC[1]	1600 µs/cm	Maximum
pH[1]	5.0–8.5	Range
Total residual chlorine (if used for disinfection)	1 mg/L	Maximum
E. coli[1]	< 1000 cfu/100 mL	Maximum
Total suspended solids (secondary treated effluent)[2]	20 mg/L	Maximum
Biochemical Oxygen Demand (secondary treated effluent)[2]	30 mg/L	Maximum

[1] Source: DEHP (2016)
[2] Source: AS/NZ 1547

An irrigation area located on Lot 11 on Plan FN153, to the west of the Moura-Baralaba Road is proposed and has been assessed. The site has been proposed as an effluent treatment area as:

- It is located on high ground well away from Banana Creek.
- It is within close proximity and similar elevation to the primary source of wastewater, therefore minimising pumping requirements.
- It will be highly accessible from the Moura Baralaba Road.
- There is sufficient space to allow for placement of the disposal area, maintaining large buffers from sensitive receptors such as waterways, ecosystems and the public.
- The area has previously been cleared, and used for grazing purposes, and therefore contains limited ecological value.

The irrigation area will be managed in accordance with the recommendations from AS/NZS 1547:2012 as appropriate, with consideration of the following parameters:

- the area will not be used for purposes that compromise the effectiveness of the system or access for future maintenance purposes;
- the area will not be used only for effluent application until the pit progress to a point at which another irrigation area is required at which point a review of the wastewater management system will be undertaken;
- the area will have boundaries clearly delineated and not accessible to livestock to minimise damage);
- the area will be constructed to capture run-off and seepage of effluent beyond the designated area; and
- the area will have appropriate buffer areas maintained.

The irrigation system will be managed in accordance with the recommendations from AS/NZS 1547:2012 as appropriate, with consideration of the following design parameters:

- the system will distribute effluent evenly in the designated area;
- the system will control the droplet size, throw and plume height so that the risk of aerosol dispersion and the likelihood of wind draft distributing any effluent beyond the designated area is negligible;

- the system will have warnings complying with AS 1319 or AS/NZS 1319, at the boundaries of the designated area, clearly visible to property users, with wording such as “Recycled Water – Avoid Contact – DO NOT DRINK”; and
- the system will have a buffer area to ensure that any potential spray drift is adsorbed within appropriate setback distances.

As the proposed effluent irrigation area is located within the footprint of the mining area, there will be a need, in the latter stages of the life of the mine, for the system to be relocated. Required investigations will be undertaken at that time. There will be an occasional need to remove sewage sludge from the sewage treatment system. Sewage sludge is classified as a regulated waste composed primarily of decayed organic matter comprising plant-based material. This material will be removed by a licensed contractor to a local sewage treatment facility.

14.5.4. Non-mineral waste management plan

A Non-Mineral Waste Management Plan will be developed for the Project and will incorporate the following principles:

- waste will be segregated into general waste, various recyclable wastes and regulated waste;
- general waste will be collected in clearly designated bins;
- waste oils, chemicals, batteries and other hazardous and/or regulated substances will be stored in bunded areas or on bunded pallets within the waste collection area;
- recyclable waste will be separated and stored for collection into streams, including paper and cardboard, metals and recyclable plastics;
- all used tyres will be managed in accordance with the operational policy ‘Disposal and storage of scrap tyres at mine sites’ (DES, 2014b). This may result in used heavy machinery tyres being disposed of within WRE if other higher order options are not feasible. In this case, the locations of WRE containing used tyres will be recorded on the Environmental Management Register;
- different forms of waste (e.g. metals, paper, oils, batteries, general waste, etc.) will be stored on-site according to waste stream. The design of the waste collection facility will consider public health, hygiene and safety standards. For example, flammable material or combustible liquid wastes will be stored in facilities designed to meet ‘AS 1940:2017, The storage and handling of flammable and combustible liquids’ (Standards Australia, 2017);
- bins located within offices and workshops will be appropriately labelled to avoid cross-contamination and provide for separation of different waste streams. Bins will be emptied regularly to minimise vermin and pests;
- regulated and/or hazardous waste will be stored in a separate storage area to ensure that the potential for environmental harm is minimised; and
- all trackable waste as defined by Schedule 11 of the EP Regulation 2019 will be tracked in accordance with the requirements of Part 9 of the EP Regulation.

14.6 Mineral waste management

The Project is estimated to generate approximately 636 Mbcm of waste rock and 9 Mt of rejects from the CHPP during its operational phase. Waste rock will be placed out of a pit while an initial mining pit is created. Then, once coal has been removed to the level of the pit floor and sufficient room exists to maintain operations, in-pit disposal of waste rock is planned to commence. Rejects from the coal washing process will be dewatered, transported back to the pit and then buried within the WRE.

14.6.1. Waste rock management

The mine schedule for waste rock is detailed in Chapter 2, Project Description, section 2.5.1 and Table 2.12. Mining operations will advance from north to south along the strike using the terrace mining method. As space becomes available, waste will be returned to in-pit dumps within the mined-out void.

A single out-of-pit WRE to the north, behind the advancing mine pit will be required to provide sufficient working space for operations to proceed (refer Figure 14.1). The WRE will have elevations approximately 60 m to 70 m above the existing surface. As operations progress, spoil will be able to be placed in-pit, commencing from the northern end of the pit and progressing southward.

Rehabilitated slopes have been designed so as not to exceed 8° (14%), while the western out-of-pit WRE has been designed with shorter but slightly steeper side slopes of 10° (18%). Slope lengths for the western WRE are typically less than 175 m, while slope lengths can occur up to approximately 500 m for the northern WRE. The in-pit WRE is comprised of relatively level areas and occasional short, stepped slopes of up to 10 m.

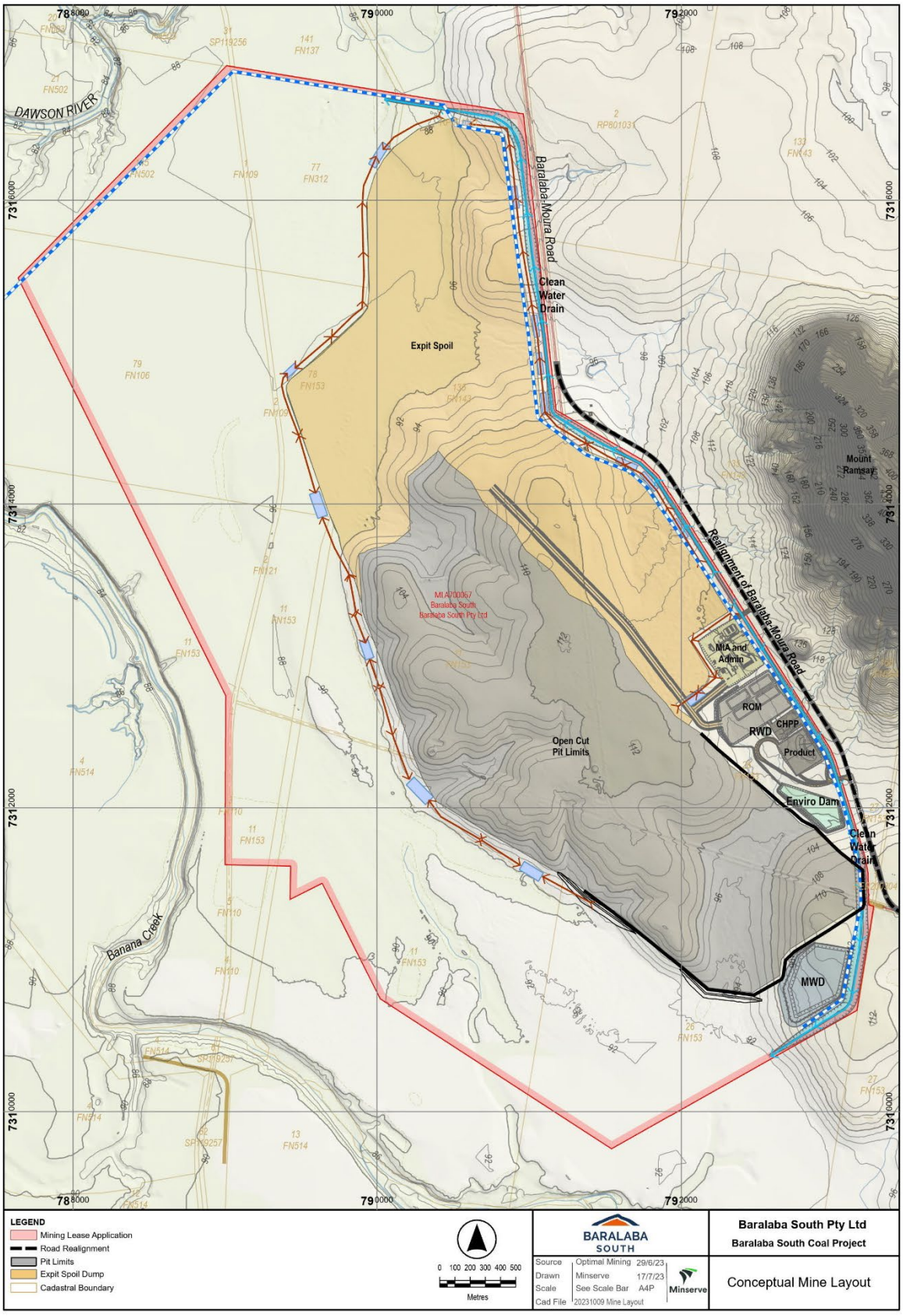

Figure 14.1: Conceptual mine layout

Progressive rehabilitation of WRE will commence in Year 6 with the final rehabilitation to be completed once final placement has occurred and areas are no longer required for mining operations. Further detail relating to the placement of mineral wastes, the final landform, post-mining land uses, and the rehabilitation of WRE is provided in Chapter 3, Rehabilitation.

The Geochemical Assessment undertaken (refer Appendix E, Geochemical Assessment) concluded that spoil material is expected to be largely non-acid forming (NAF) with excess acid neutralising capacity and a resulting negligible risk of developing acid conditions. Spoil is expected to generate pH-neutral to alkaline, generally low-salinity surface run-off and seepage, with relatively low soluble metal/metalloid and sulphur concentrations. Potential spoil materials have a wide range of cation exchange capacity (CEC) values and associated electrostatic potential (ESP) values, consequently, there exists some risk that sodic spoil materials with a potential for dispersion and possible erosion are identified. Where such materials are identified, this material will be managed so as not to report to final landform surfaces or be used in construction activities. This shall be done through spoil emplacement or capping with NAF material.

Considering the proposed management and mitigation measures, waste rock is considered to pose a low risk of environmental harm (see Appending E, Geochemical Assessment).

14.6.2. Coal reject management

The production process applies best practice to produce a low quantity of reject materials to waste rock (less than 1% by weight). Coal will be processed using a conventional Bowen Basin design using dense medium cyclones, spirals and flotation (refer Chapter 2, Project Description).

The Geochemical Assessment (Appendix E) identified just over one-third of coal reject materials as having some degree of risk associated with a potential for acid generation. However, given the low quantity of coal reject to waste rock, the reject is regarded as posing a low risk of environmental harm. It was also identified that the low sulphur (and sulphide) concentrations within the material (and the low metals/metalloids concentrations) suggests that the magnitude of any localised acid, saline or metalliferous drainage, were it to occur, is likely to be small.

It is proposed to place coal reject materials within the alkaline NAF spoil to ensure that any risk of environmental harm related to emplaced coal rejects is mitigated. The dry reject material from the CHPP will be stacked in a stockpile on the ROM pad. Coal reject materials will be trucked from the CHPP stockpile area and placed in layers within WRE before being covered by sufficient waste rock to ensure a minimum of 5 m of cover. Additional care will be taken to identify higher risk rejects and to ensure disposal occurs well within in-pit emplacements and not proximate to any rehabilitated surfaces.

The decommissioning, closure and post-closure aspects of the partially backfilled pit (and subsequent final void) will be addressed by a PRCP. However, as coal reject will be covered by a minimum of 5 m final thickness of spoil and will not report to the final landform surface, or near-surface, the proposed management of coal reject is not likely to pose an environmental risk at closure.

Water recovered from the tailings thickener and belt press filters will be recycled as general process water throughout the plant. Process water make-up will be from raw water supplied to the plant.

No separate tailings disposal facility is proposed for the Project. However, a small area is required if the belt press filter requires maintenance, or if any rejects material is not suited to treatment in the belt press filter. In both these cases, rejects will be placed in small pits to dewater through evaporation and the sludge will be transported to the pit for burial under spoil.

14.6.3. Mineral Waste Management Plan

Additional detail on spoil characteristics is provided at Chapter 3, Rehabilitation. Based on the material characteristics assessment undertaken and the management measures proposed, the methods proposed for the disposal of waste rock and coal rejects are considered to effectively minimise (if not prevent), any adverse effects on environmental values.

Despite the low risk associated with minerals management, a Mineral Waste Management Plan will be prepared to ensure the proposed controls are implemented. The Mineral Waste Management Plan will address the following aspects:

- appropriate programming (in frequency and spatial distribution) of sampling and laboratory characterisation of mineral waste to validate the characterisations already undertaken;
- documentation of field and laboratory testing requirements for material characterisation;
- utilisation of material characterisation data to classify waste rock zones and documentation of material placement requirements, particularly with respect to coal reject materials;
- ex-situ WRE, including preferred selective placement for differing material types;
- cross-references to rehabilitation and closure plans to ensure knowledge of rehabilitation and closure requirements, including rehabilitation monitoring (erosion, groundwater and surface water etc.) to ensure no off-site impacts arise; and
- continual review of the program to ensure the ongoing effectiveness of the Mineral Waste Management Plan.

14.7 Performance monitoring and review

The waste streams, quantities produced and implemented management practices will be recorded over the life of the Project and reviewed on an annual basis. Principal waste management contractors will be required to provide reports on material volumes transferred, the condition of waste collection facilities and opportunities for improvement. Waste management aspects will be included as components of regular housekeeping checklists, inspections and audits. Management reviews addressing waste management performances will form part of the annual environmental management system review.

Employees will be advised of their obligations to report incidents that have potential to cause, or threaten to cause, material or serious environmental harm, in accordance with Section 320B of the EP Act. Corrective actions will be recorded, and responsibilities will be assigned to the appropriate site personnel for action and close-out.

Adaptive management processes will be included as part of the waste management plans. Routine reviews of the waste management plans will form part of the environmental management system to be implemented on-site. If, in the review of the plans, there is an identified need, appropriate action will be taken.