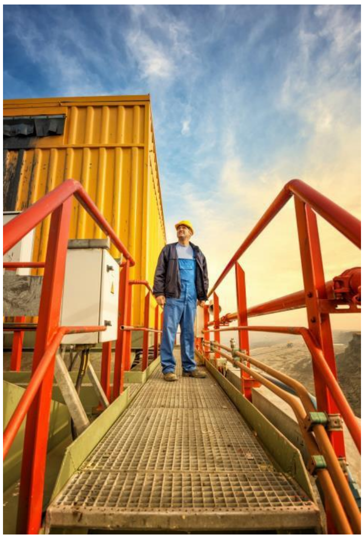

Taroborah Coal Project

Environmental Impact Statement

Section 4.4 – Environmental Values and Management of Impacts – Waste

Prepared for:

Shenhuo International Group Pty Ltd

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4.4 WASTE

This section describes the types of wastes generated by Project activities, the waste treatment and minimisation strategies employed on the Project site, together with proposed emission, discharge and disposal criteria.

4.4.1 Description of Environmental Values

The Project site is characterised by undulating plains and hills supporting cropping and cattle grazing. The Project site lies within the Fitzroy Basin catchment and is traversed by several ephemeral drainage lines and two primary ephemeral creeks.

The main watercourse in the north of the Project site is Retreat Creek and in the south, Taroborah Creek. Both of these waterways flow in an easterly direction and ultimately flow into the Nogoa River, downstream of Fairbairn Dam, which creates Lake Maraboon. The Project site is also situated in an area of substantial groundwater resource.

Without appropriate management, wastes associated with the Project may interact with existing environmental values creating water and / or land contamination, habitat destruction from waste stockpiles and storage areas and air pollution from mining and processing activities.

It is anticipated that waste will be produced at all stages of the Project, including construction, operation and decommissioning. Anticipated waste streams include:

- Solid wastes – spoil, dewatered coarse and fine rejects, domestic waste, tyres, batteries, scrap metal, oil and hydrocarbon drums;

- Liquid wastes – waste water, storm water run-off, sewage, waste oils, hydrocarbons and solvents; and

- Atmospheric wastes – particulate matter, dust and greenhouse gases.

4.4.1.1 Objectives of Waste Management

The objective of waste management on the Project site is to identify the type and amount of waste generated by the Project and to correctly manage this waste, reducing potential impacts on the environment.

Waste management also aims to identify and implement opportunities to minimise the amount of waste generated, promote efficiency in the use of resources and constantly improve the waste management practices employed on site.

4.4.1.2 Waste Management Hierarchy

Prioritising waste and resource management practices on the Project site is conducted with regard to the Waste Management Hierarchy. The Waste Management Hierarchy is a nationally and internationally accepted guide for managing waste and provides an effective framework for dealing with the waste generated from mining activities.

The hierarchy sets out the preferred order of management options concerning waste, stating that waste reduction is the preferred option, followed by reuse, recycling, other recovery mechanisms and disposal.

The Waste Management Hierarchy as outlined within *Queensland's Waste Reduction and Recycling Strategy 2010-2020* (DERM 2010) is provided below (in order of most preferred to least preferred management technique) along with a description of how the Project intends to adopt this strategic framework.

Waste Avoidance

Waste avoidance relates to preventing the generation of waste or reducing the amount of waste generated.

Waste production shall be avoided on the Project site by:

- Seeking bulk supply of hydrocarbons, chemicals and other products to minimise packaging materials;
- Avoiding materials that cannot be reused or recycled when there are alternatives to those materials;
- Implementing regular checks and maintenance of equipment, machinery and vehicles to minimise the need for replacement;
- Seeking 'cradle to grave' management of products from suppliers; and
- Storing chemicals and hydrocarbons in accordance with Australian Standards.

Waste Re-use

Waste re-use refers to re-using the waste but without first substantially changing its form i.e. minimal energy output.

The re-use of materials on the Project site will be maximised by:

- Segregating materials in purpose-provided storage areas for storing reusable materials;
- Recovering and reusing solvents and process chemicals, where practicable; and
- Seeking off-site contractors to collect and re-use wastes that cannot be safely stored on site and/or re-used on site (for example waste oil collection by a waste contractor who treats the waste so it may be used again).

Waste Recycling

Waste recycling will effectively process the waste into a new usable product.

Recycling streams promoted by the Project include scrap metal, general mine rubbish and hydrocarbons.

Waste Disposal

Where recycling is not an option, wastes generated by the Project will be disposed of in a way that causes the least environmental harm.

The treatment and disposal of waste shall be managed by:

- Ensuring only general waste that cannot be dealt with by any of the strategies above is disposed of and removed by a licensed contractor;
- Ensuring only designated waste disposal areas are utilised for the Project operations;
- Ensuring regulated waste is disposed of by a certified regulated waste transporter and received by a certified facility;
- Treating wastes where possible to minimise the amount requiring disposal; and
- Not allowing any waste generated outside the mine to be received at the mine for storage, treatment, processing or disposal.

A waste inventory, including estimated quantities and proposed waste handling methods, addressing the waste management hierarchy above, has been compiled for the Project and is detailed in Table 4.32. Table 4.32 also provides a reference to the relevant sections of the EIS where detailed information of potential impacts on environmental values and subsequent mitigation measures are discussed further.

Table 4.32 Waste Quantities and Treatment Methods

	Estimated Waste Quantities	Waste Management					Potential Impacts	EIS Reference
		Minimise / Avoid	Re-use	Recycle	Disposal	Criteria		
Solid Wastes								
Excavated Waste (Spoil)	Opencut: Estimated annual average quantity up to 22 million loose cubic metres (lcm) (Annual max. 33 million lcm)		Use where possible to support mine infrastructure		Disposal in out-of-pit spoil dumps will mainly occur in Years 1 and 2 of the mine life. In-pit dumping is expected to commence in earnest by Year 3 and will continue for the mine life. Waste which exhibits acid/neutral/alkaline mine drainage will be stored in engineered spoil dumps to ensure that this waste does not become oxidised or release acid and/or heavy metals.	Excavated waste must be characterised and selectively placed within out-of-pit and in-pit spoil dumps. Spoil characterised as PAF must be encapsulated with NAF material	Contamination of land, groundwater and/or surface water (e.g. acid mine drainage)	Land Section 4.2 Water Section 4.5
Coarse and Fine Coal Preparation Plant (CPP) Rejects	Opencut: Estimated annual average quantity up to 212,000 tonnes (t) (Annual max. 280,000 t)			Process water will be recycled back through the CPP				
	Underground Longwall: Estimated annual average quantity up to 36,000 tonnes (Annual max. 72,000 t)			Process water will be recycled back through the CPP				
Cleared Vegetation	1000 cubic metres (m^3)/ 200t during construction, 100 m^3/20t per annum during opencut operations	Stands of timber avoided by design	Mulch, landscape borders, fence posts, natural habitat for rehabilitation	Native species may be replanted as part of landscaping following construction	Weeds managed and disposed of in accordance with Weeds and Pest Control Management Plan	Permit required to harvest State-owned timber resources	Fire hazard, Regional Ecosystem disturbance	Conservation Section 4.8
General	200t during construction, 75 tpa during operations,	Bulk supply ordered where available to reduce packaging	Re-use packaging where appropriate.	Recyclable materials will be segregated and collected for recycling by a licensed waste management contractor	Non-recyclables are stored in allocated refuse bins and collected by a licensed waste management contractor.	Refuse bins must be collected at regular intervals	Land disturbance	Conservation Section 4.8
Scrap Metal	100t during construction, 50 tpa during operations		Re-use where appropriate	Store in mine laydown area for recycling	Scrap is sold and removed by a licensed contractor.	Scrap metal will be segregated and stored prior to removal	Land disturbance	Conservation Section 4.8
Batteries	20 during construction, 40 per annum during operations	Generators are also used on-site	Re-use where appropriate	Collection for recycling by licensed waste management contractor		Batteries are to be stored in 250 kg bundles (maximum) prior to removal	Land contamination	Land Section 4.2 Conservation Section 4.8
Drums of oil, hydrocarbons and chemicals	10 drums per annum	Bulk supply ordered where available to	Re-use absorbents	Recycle to supplier or another licensed waste management contractor	Disposal off-site by licensed contractor to a facility licensed to accept such waste.	Maximum volumes to comply with storage areas which are designed to contain at least 110% of a single storage	Land contamination	Land Section 4.2

	Estimated Waste Quantities	Waste Management					Potential Impacts	EIS Reference
		Minimise / Avoid	Re-use	Recycle	Disposal	Criteria		
		reduce packaging				tank or 100% of the largest storage tank plus 10% of the second largest storage tank in multiple storage areas		
Tyres	20 tyres per annum		Re-use where appropriate	Segregated and stores for collection by licensed waste management contractor for recycling		Tyres are to be stockpiled in volumes less than 3 m in height and 200 m^2 and at least 10 m from any other tyre storage area awaiting collection	Fire hazard Visual amenity	Hazard and Risk Section 4.13 Land Section 4.2
Liquid Wastes								
Sewage	Up to 5ML produced during construction, and up to 10.15ML per annum during operations			Following construction of the sewage treatment plant,wastes will be treated and spray irrigated on site	Sewage wastes generated during initial construction will be removed from site and managed by a licensed waste management contractor.	Sewage effluent quality parameters as defined in Section 3.5.5, Table 3.19 must be within acceptable limits	Land, groundwater and surface water contamination	Land Section 4.2 Water Section 4.5
Mine Affected Water	Average of 2,400 ML produced per annum over the life of the Project		Dewater coarse and fine rejects and store in CPP Water Recycle Dam	Recycle through CPP	Temporarily stored in CPP Water Recycle Dam prior to recycling	Dam to meet Mandatory Reporting Level (MRL) during annual inspection	Land, groundwater and surface water contamination	Land Section 4.2 Water Section 4.5
Groundwater	Between 220 ML and 2,100 ML of groundwater will be captured per annum		Excess groundwater is treated and released for Beneficial Use	Recycle through mine operations use and CPPWRD make-up supply	Temporarily stored in MWD prior to recycling	Dam to meet Mandatory Reporting Level (MRL) during annual inspection	Land and surface water contamination	Land Section 4.2 Water Section 4.5
Waste oils, hydrocarbons and solvents	60,000 L per annum		Re-use where appropriate	Waste oils, hydrocarbons and solvents will be removed from site by a licensed waste disposal operator to a licensed waste storage facility	Waste oils etc. are to be collected and stored in clearly marked containers for recycling. Records to be kept.	Maximum volumes to comply with storage areas which are designed to contain at least 110% of a single storage tank or 100% of the largest storage tank plus 10% of the second largest storage tank in multiple storage areas	Land contamination	Land Section 4.2

4.4.2 Potential Impacts and Mitigation Measures

Preferred methods of waste management as described in Table 4.32 come with inherent risks associated with the nature of the waste described.

For example, disposal of spoil and rejects in out-of-pit dumps and in-pit disposal has the potential to contaminate surface water runoff and groundwater, potentially leading to adverse effects on riparian communities and ecosystems in the receiving environment.

Other solid waste disposal will require vegetation to be cleared to make way for storage areas to reduce the likely fire hazard. Storage of hydrocarbons and other chemicals are also associated with potential, localised, land contamination.

The following is a summary of the potential impacts from waste streams associated with the Project that may emerge without appropriate management:

- Contamination of land, surface water and groundwater as a result of:
  - Contaminated runoff or seepage from the opencut pit, spoil dumps, ROM or product coal stockpiles;
  - Contaminated runoff from processing areas;
  - Sewage;
  - Spillage of waste chemicals, fuel or oil; and
  - Accumulation of waste, such as oil and grease, tyres, batteries and scrap metal.
- Impacts on visual amenity due to the size of out-of-pit spoil dumps and exposure of rubbish;
- Attraction of scavenging fauna, including feral cats, foxes, scavenging birds and rodents;
- Generation of GHG emissions as a result of fossil fuel burning and energy consumption; and
- Generation of dust emissions as a result of Project construction and operation activities.

The following sections provide a description of the preferred methods of waste disposal on the Project site together with the potential impacts and subsequent mitigation measures that will be employed to protect the environmental values associated with the Project.

4.4.2.1 General Waste

General waste has the potential to attract feral animals, which may out-compete native animals for other natural food sources in the area.

The preferred option of general waste management on the Project site will ensure sealed refuse bins are collected by a licensed contractor at regular intervals to reduce establishment of feral animals to the area.

4.4.2.2 Scrap Metal, Batteries and Tyres

The environmental impacts associated with the storage and handling of scrap metal, batteries, tyres and other general mine waste is related to land disturbance. Tracks of vegetation will need to be removed, not only to create room for storage of mine waste but to also reduce fire hazard associated with flammable materials such as tyres.

Tyres will be stored in a segregated tyre storage area which will be established for the Project. Tyres awaiting disposal will be stockpiled in volumes less than 3m in height and 200m^2 and at least 10m from any other tyre storage area. Tyres will be removed by a licensed waste disposal contractor.

In the future, on-site tyre processing may be employed to limit the amount of waste to off-site landfill. Management may include burial in-pit or within the underground mine, avoiding the impediment of aquifers.

Scrap metal shall be segregated and stored awaiting collection. These storage areas will be limited in size to minimise vegetation clearances. Once nearing capacity scrap metal shall be sold, collected and recycled by a licensed contractor.

Batteries will be stored in 250 kg bundles in purpose built crates, which will be collected by a licensed contractor for recycling and processing.

4.4.2.3 Hydrocarbons

Hydrocarbons and consumables in the form of diesel and grease together with hoses, filters, absorbent pads and rags which have been used in machine fitting and other general mechanical operations have the potential to create localised land contamination through accidental spillages and surface water contamination if inappropriately stored.

To reduce the risk of environmental impacts from hydrocarbon use and storage on the site, all hydrocarbon storage sites will be bunded to Australian Standards by either concrete or earth bunds. Waste oils will be removed from site by a licensed regulated waste contractor.

Maximum volumes of waste oils must comply with storage areas, which are designed to contain at least 110% of a single storage tank or 100% of the largest storage tank plus 10% of the second largest storage tank in multiple storage areas.

In addition, hydrocarbon storage areas will be fitted with sumps and / or oil / water separators to collect runoff that is potentially contaminated with hydrocarbons.

4.4.2.4 Waste Water

Waste water from coal processing will be collected in a purpose built dam (CPP Wastewater Recycle Dam) where it will be recycled back through the CPP and reused during processing.

Like all regulated dams, dam failures and subsequent surface water contamination via uncontrolled releases of mine water pose an environmental hazard. Construction of regulated dams on the Project site will be in accordance with EHP (2012) Guideline EM635 - *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams,* which will determine the standard of reliability required for design, construction and operation of the dam.

Furthermore, the dam will be assessed against EHP (2013) Guideline EM634 – *Structures which are Dams or Levees Constructed as Part of Environmentally Relevant Activities* to ensure the standards

used for the design, construction, operation, modification and decommissioning of regulated structures mitigate the hazards arising from potential failure or collapse.

Once the dam is in operation, annual assessments of the dam's structural stability will be conducted by a suitably qualified person, at which time the MRL will also be assessed, to ensure there is adequate available storage over the wet season. In addition, dam water quality will also be assessed against livestock drinking water guidelines (ANZECC & ARMCANZ 2000) and appropriate measures will be taken to prevent access by livestock and other fauna if water quality parameters do not meet these guidelines.

4.4.2.5 Sewage

Sewage will be treated by an on-site sewage treatment plant (STP) and spray irrigated to a segregated section of the Project site. Sewage effluent will be maintained within quality parameters to reduce the risk of surface and groundwater contamination.

The STP will be designed to achieve Class A effluent quality in accordance with the *Queensland Water Recycling Guidelines* (2005) target parameters. Three levels of STP treatment will be undertaken in order to achieve Class A effluent quality including primary settlement, aeration, clarification, chlorine dosing (if required), filtration and ultraviolet (UV) disinfection.

Quality parameters such as biochemical oxygen demand (BOD), pH and faecal coliforms will be monitored monthly to protect the environmental values associated with the Project site.

4.4.2.6 Spoil

Over the life of the mine, the total volume of excavated waste from opencut activities (i.e. overburden and interburden) is expected to be approximately 159 million lcm.

The physical and chemical characteristics of overburden and interburden have been determined through geochemical testing of samples from exploration boreholes. Rock samples underwent Acid Base Accounting (ABA) assessment, allowing sampled geologies to be classified into non-acid forming (NAF), potentially acid forming (PAF) and uncertain (UC) categories. The results of this classification process are summarised in Table 4.33, which provides the number of samples tested for the different overburden lithologies and the percentage of the samples that fall into the three AMD categories.

Table 4.33 Geochemical Classification of Materials to be Mined

Material Source	Number of Samples	AMD Category and % composition		
		NAF inc UC (NAF)	PAF-LC inc UC (PAF-LC)	PAF inc UC (PAF)
Weathered Basalt	10	100	0	0
Weathered Sedimentary Rock	71	100	0	0
Fresh A Seam Overburden	78	40	40	20
Fresh A Seam	3	0	0	100
Fresh A-B Seam Interburden	70	29	44	27
Fresh B Seam	12	0	0	100
Fresh B Seam Floor	9	14	72	14

The results indicate that, based on the length of borehole represented by the various samples tested, approximately 66.6% of the overburden and interburden material is likely to exhibit NAF characteristics, whilst the remainder (33.3%) is likely to be PAF and PAF-LC.

Further details of the geochemical characterisation of spoil are provided in Appendix 12 and Section 3.6.3.4 of the EIS.

Construction

Geotechnical investigations will be conducted at specific locations around the MIA in order to identify materials with geotechnical properties that are suitable for constructing spoil dumps. The geotechnical characteristics of soil in each of the proposed mine infrastructure development areas will also be assessed to ensure that they are not erodible, but possess geotechnical characteristics which are suitable for construction. Due to the fact that rejects exhibit strong acid mine drainage (AMD) characteristics the construction of the out-of-pit and in-pit rejects storage cells will require more engineering than the spoil dumps.

Three out-of-pit spoil dumps will be developed within three years of opencut operations, located around the western and south-western edge of the opencut pit. It is anticipated no out-of-pit spoil dump will exceed 90m in height above the natural ground level. As soon as the opencut pit is large enough to accommodate waste, this material will be transferred directly to in-pit spoil dumps. The design parameters of these spoil dumps are summarised in EIS section 3.6.3.2.

Initially, construction of the out-of-pit spoil dumps will involve a base layer consisting of a 0.5m gravel foundation layer, a 0.3m clay liner to prevent the vertical permeation of drainage, a 0.5m protective layer of sand and gravel and a boulder and crushed limestone drainage layer (approximately 1 m thick providing further neutralisation capacity) below the NAF horizon. This NAF horizon will separate any PAF material which is placed in spoil dumps from water which may flow between the base of the spoil

dump and natural ground. Further details of dump design are provided in Section 3.6.3.

Selective handling will be employed to isolate PAF spoil, which will be set back from the face of the dump and compacted during dumping, reducing the transport of oxygen and thereby limiting the potential for AMD. PAF material will be encapsulated by constructing the base and outer faces of the dump with NAF / ANC waste material and crushed limestone (as necessary), further reducing the production and drainage of acid/ neutral / alkaline mine drainage.

Mitigation Strategies

The majority of the exposed overburden and interburden material is expected to be NAF; however, selective handling will be employed to isolate PAF material and mitigate potential AMD generation. As spoil will be combined with rejects material, all of the strategies described in Section 4.4.2.7 for the management and disposal of rejects will also apply to the management of spoil.

In order to track and manage the generation of AMD on site, the following routine monitoring programmes are recommended:

Overburden and Interburden

Initial screening of these materials for AMD production via on-site analysis of total S and NAGpH during mining operations, so that waste material placement is managed effectively is recommended. A conservative total S value of 0.1% and NAGpH of 4.5 represents suitable screening thresholds for on-site NAF (total S <0.1% and NAGpH >4.5) / PAF (total S >0.1% and NAGpH <4.5) differentiation. Note that the CPP rejects material would require additional laboratory testing, due to interferences from organic S species and organic acid generation;

Seepage and Run-off

AMD monitoring of seepage and run-off from opencut pit walls and floors, ROM stockpiles, product coal stockpiles, spoil dumps and rejects storage areas is required in order to assess the performance of on-site waste rock management strategies, define / modify NAF / PAF blending ratios and limestone buffering; and

Acid, Neutral and Alkaline Mine Drainage

Assessment of on-site and discharge water quality (pH, EC, acidity / alkalinity and metals) is to be undertaken to monitor potential impacts of AMD.

Land Management

Data from routine monitoring will be used to assess the likely implications in regards to land management and maintenance following mine cessation / rehabilitation and subsequent relinquishment to the post mining landholder.

Further information can be found in the AMD management recommendations provided in Appendix 12 of this EIS.

4.4.2.7 Rejects

Dewatered coarse and fine rejects will be combined and disposed of in the south-west and south-east out-of-pit spoil dumps initially and later when the opencut pit is large enough, in-pit dumping of the

rejects will be employed.

Samples of reject material have undergone geochemical testing to determine their physical and chemical characteristics. Coarse and fine rejects sampled from the A seam and B seam are PAF material with a high risk of AMD production following rapid oxidation. This will potentially result in low pH eluate with high concentrations of metals and metalloids. Further details are provided in Section 3.6.3.4 of the EIS.

The on-site rejects storage areas (engineered cells) have been designed for the life of the Project. The capacities of the Project's rejects disposal areas are detailed in Table 4.34. An estimated 1.2 Million lcm of rejects (from both opencut and underground operations) will be disposed of over the life of the Project. Throughout mining operations, sampling of the combined rejects stream will be conducted to determine its chemical characteristics and facilitate selective handling of reject and spoil material to ensure mitigation of AMD.

Table 4.34 Rejects Storage Capacity

Reject Disposal	Operational Year(s)	Capacity (loose m^3)
South West Waste Spoil Dump – out of pit *	1	47,343
South East Waste Spoil Dump – out of pit *	2	130,849
In-pit disposal **	3 to 21	1,012,537
Total Rejects Design Volume		**1,190,729**

* from opencut operations
** from opencut and underground operations

Construction

Construction of purpose-built rejects isolation cells will be utilised for rejects disposal. Similar to the dump design, these cells will also include a 50 mm thick geosynthetic clay liner (GCL) along the base, side walls and as a capping to further restrict oxygen ingress and seepage from this material. Blending the rejects material with limestone will help to increase acid production lag times and reduce rejects oxidation rate. Following the recovery of groundwater levels, the inundation of the rejects storage cells will also help to reduce AMD production as oxidation rates will be reduced when this material is covered in groundwater.

Initially, the rejects cells will be located in the out-of-pit spoil dumps. Once the opencut pit has progressed, in-pit dumping of reject material will be utilised. Rejects cells will be placed preferentially in–pit below the groundwater recovery level, and treated with crushed limestone for operational control of AMD where required in order to prevent long-term exposure to atmospheric oxidation (refer to Figure 4.58).

Rejects material that is placed in-pit and out-of-pit above the final groundwater recovery level will include a thick outer zone of NAF material (preferably high ANC) and will be engineered to limit oxygen transfer and fluctuating moisture conditions during rehabilitation Refer to Section 3.6.4.4 for details of these rejects cells.

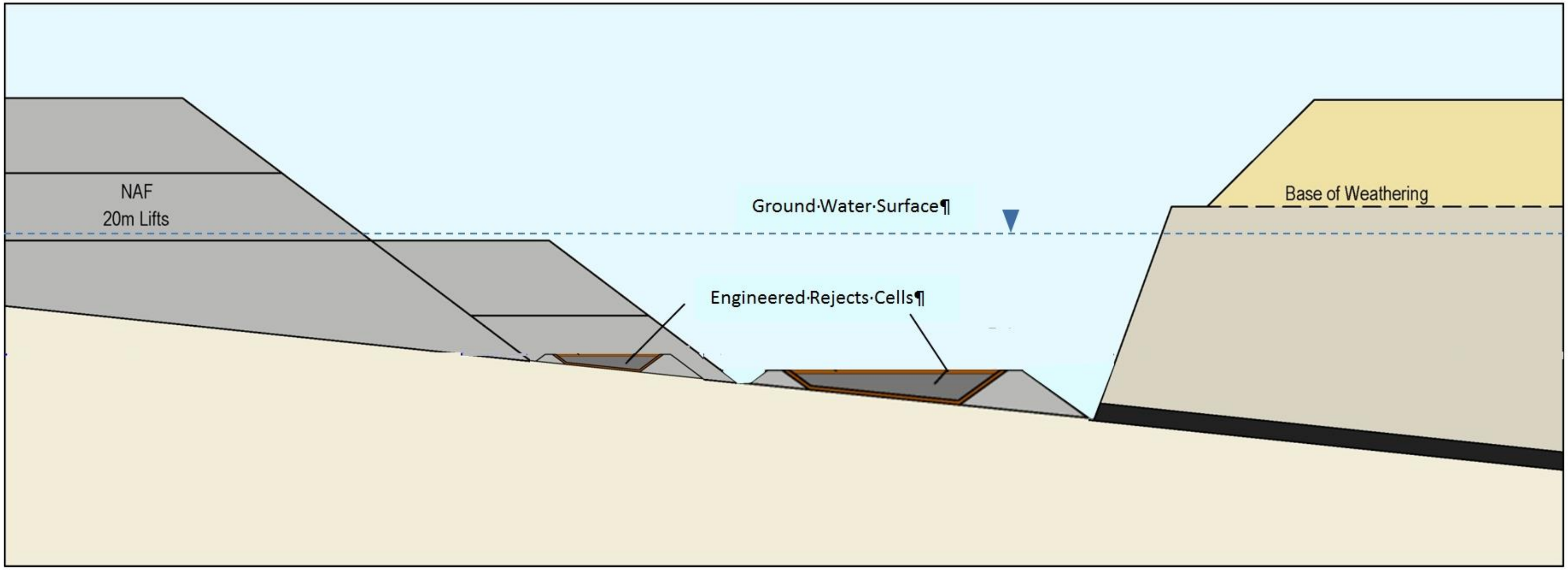

Figure 4.58 Final Void Rejects Placement

4.4.2.8 Rehabilitation of Spoil Dumps

The rehabilitation strategy applied to both in-pit and out-of-pit spoil dumps aims to reduce hydraulic conductivity, prevent capillary movement of moisture and encourage the growth of vegetation suitable for the post-mine land use. Rehabilitation strategies applied to spoil dumps are described below and further details can be found in Section 3.7 of this EIS.

In-pit and out-of-pit spoil dumps will be progressively engineered to achieve the following performance criteria:

- A NAF / ANC waste layer will encapsulate PAF waste to reduce the generation of acid/neutral/alkaline mine drainage;
- A 0.5m thick clay capping will prevent water ingress, thereby reducing the volume of water draining through the spoil dump. Clay with hydraulic conductivity of less than 10^6 metres per second (m/s) will be used to ensure the low permeability of the barrier;
- A capillary break layer (gravel) 0.4m thick will be installed either side of the clay layer to prevent capillary movement of moisture; and
- A vegetative layer will be established to reduce soil erosion, minimise visual amenity impacts, facilitate water evaporation from surface soils, and create a permanent, robust capping layer. Hardy, local native species requiring minimal maintenance will be used.

4.4.3 Waste Minimisation and Cleaner Production

The application of cleaner production technologies is a preventative environmental strategy applied to processes, products and services associated with the Project. The aim of cleaner production is to increase overall efficiency and reduce the risk to the environment.

Where possible, the Project aims to use less energy and water and generate less waste which is less harmful to the environment.

During construction and operation, cleaner production strategies will be incorporated into the Project design wherever possible. Cleaner production waste management planning has identified the following strategies to prevent or minimise environmental impacts:

- The site water management system will be designed to ensure maximum possible recycling of water. The water balance for the Project is discussed in Section 4.5.2.3;
- Waste minimisation strategies will be implemented across all Project activities wherever possible. For example, the STP will treat raw sewage to Class A effluent quality, allowing this waste to be reused as spray irrigation;
- A Greenhouse Gas (GHG) Management Plan will be developed for the Project, which will identify opportunities and provide measures to minimise GHG production; and
- Minimisation of vehicle emissions by ensuring all vehicles and earthmoving equipment utilised on the Project site are well-maintained and regularly serviced, thereby obtaining optimal fuel use efficiency.

Energy Efficiency

A GHG Management Plan will be developed for the Project, which will define a number of specific management objectives, namely:

- Utilise best practice technologies (where practicable and feasible) during the design, construction and operation phases of the Project in order to reduce energy consumption and subsequent greenhouse gas emissions;

- Regularly measure, monitor, audit and review the effectiveness of GHG emission reduction strategies; and

- Undertake registering and reporting activities as required under the NGER and EEO Acts.

Energy efficiency strategies that will be undertaken at the Project may include the following:

- The use of energy-efficient lighting and installation of light-sensitive switches on lighting equipment;

- Variable speed pumps will be used at the CPP and high efficiency electrical motors will be used throughout the site; and

- Energy-saving devices will be used in buildings that are located on the Project site.

Water Efficiency

A Site Water Management Plan (SWMP) and water balance have been developed for the Project and are provided in Appendix 13. Water conservation strategies will be implemented on the Project site, where practicable, and may include the following:

- The Project's SWMP will include processes for water collection and recycling. This includes the monitoring, capture and recycling of runoff and leachate from ROM and product coal stockpiles. Captured water will be recycled back into the CPP for processing; and

- Water circuits will be maintained by directing contaminated water to appropriate dams, allowing settlement of solids prior to recycling.

Production Processes

Production processes will be continuously reviewed over the life of the Project to identify opportunities to improve resource use and production efficiency. Cleaner production measures identified throughout Project construction and operation will be implemented, where feasible, to ensure that the Project operates in an efficient, economical and environmentally-sensitive manner.

4.4.4 Monitoring and Auditing

This section describes how nominated quantitative standards and indicators will be monitored, audited and managed to ensure the achievement of waste management objectives.

4.4.4.1 Waste Management Plan

The objectives of waste management will be implemented through a Waste Management Plan (WMP), which will be developed for the Project to manage the potential environmental and health risks that may arise from the generation, handling, storage and disposal of waste during construction and operation of the Project.

The WMP will be included in the Plan of Operations for the Project, allowing for effective assessment and auditing of the waste management indicators and criteria employed on the Project site. The WMP will be updated with each subsequent replacement of the Plan of Operations and may be audited by a third party in accordance with Project approvals where appropriate.

The Project's WMP will be based on state and Commonwealth legislation, including:

- *Environmental Protection Act 1994 (EP Act);*
- *Environmental Protection Regulation 1998 (EP Regulation);*
- *Waste Reduction and Recycling Act 2011;*
- *Waste Reduction and Recycling Regulation 2011;*
- *Environmental Protection (Waste Management) Regulation 2000; and*
- *Queensland's Waste Reduction and Recycling Strategy 2010-2020.*

The waste management hierarchy as described in Section 4.4.1.2 will be adopted on the Project site and waste management practices will aim to achieve more efficient and sustainable use of resources, resulting in more efficient, more cost-effective Project operations.

The WMP will identify all waste streams and sources that may occur on the Project and propose appropriate strategies to manage their generation, handling, storage and disposal to ensure minimal impact on human health and the environment.

4.4.4.2 Monitoring

The success of waste management will be monitored and assessed against performance indicators such as:

- Records of trackable waste;
- Quality of surface water;
- Quality of groundwater; and
- Air quality of the surrounding environment.

Waste Tracking

All general and regulated waste must be removed from the site to a facility that is lawfully able to accept the waste under the EP Act. Trackable waste is a type of regulated waste mentioned in Schedule 1 of the *Environment Protection (Waste Management) Regulation 2000* (Waste Regulation).

Under Queensland's waste management legislation, waste handlers are required to submit waste tracking information to EHP as part of the system for tracking waste types listed in Schedule 1 of the Waste Regulation.

Where regulated waste is removed from the site, records must be kept of the following:

a) The date, quantity and type of waste removed;

b) Name of the waste transporter that removed the waste; and

c) The intended treatment/disposal destination of the waste

The waste tracking system employed on the Project site is an accredited management system designed to monitor and report the waste or materials leaving the site. Records of wastes leaving the site shall be recorded and made available to EHP on request.

Environmental Monitoring

To determine the impact of wastes on the environment and human health, monitoring of surface water, groundwater and air will be conducted regularly and is further discussed in Sections 4.5 and 4.6 respectively.

Routine monitoring programmes will also be undertaken to manage AMD generation over the life of the Project and will include:

- Screening of overburden, interburden and rejects to facilitate selective handling of waste material; and
- Monitoring of seepage and runoff from ROM and product coal stockpiles, the opencut pit and spoil dumps to determine the performance of waste rock management strategies, review NAF/PAF blending ratios and limestone buffering.

In addition, GHG emissions will be assessed and reported in accordance with the *National Greenhouse and Energy Reporting Act 2007* (NGER Act).