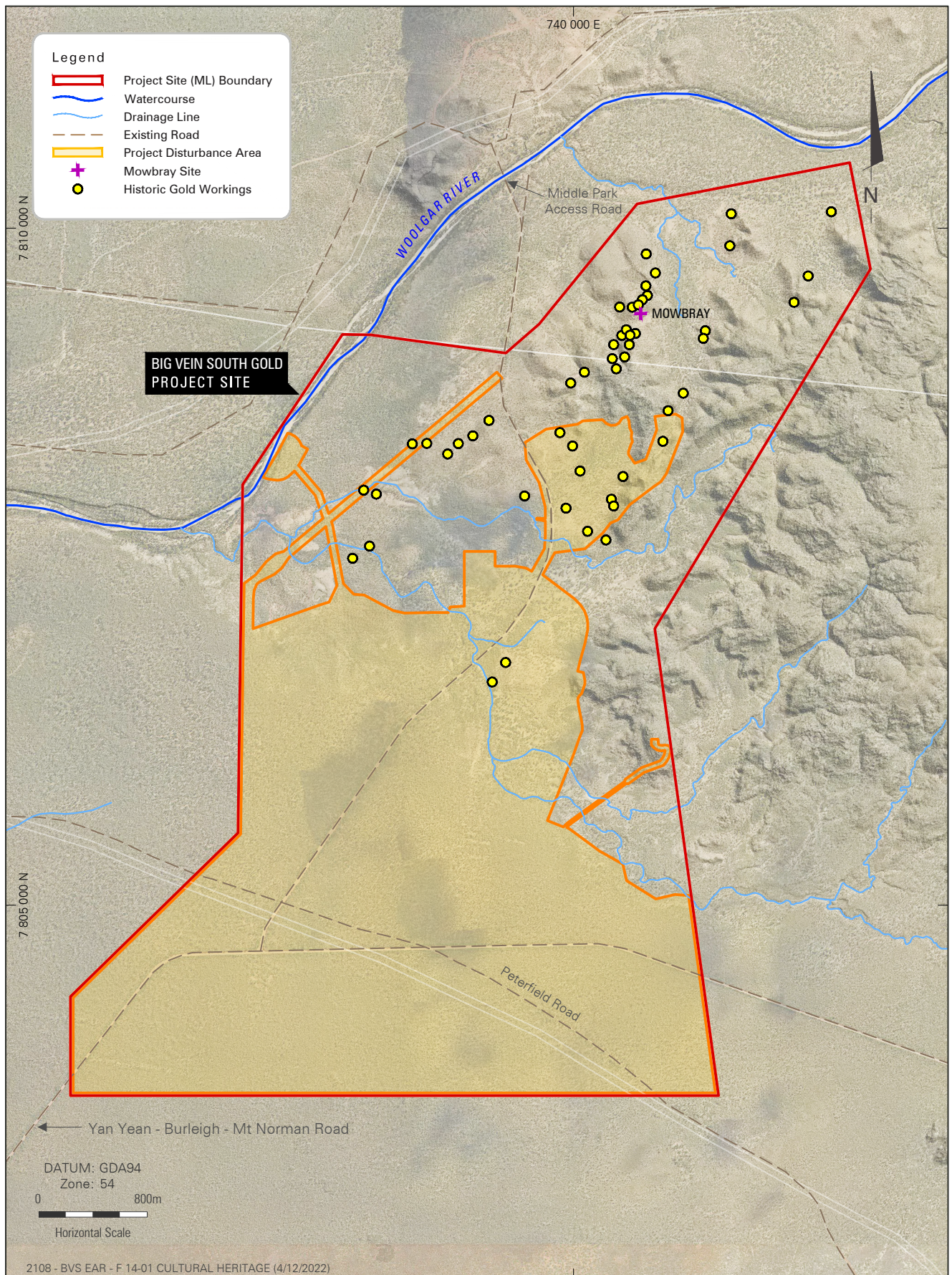




BIG VEIN SOUTH GOLD PROJECT

Non-Indigenous Cultural Heritage

FIGURE 14-1

15

NON-MINING WASTE MANAGEMENT





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15 NON-MINING WASTE MANAGEMENT

15.1 INTRODUCTION

This section describes the management of non-mining wastes (Section 15.2), sewage (Section 15.3) and land contamination (Section 15.4), relevant to the Big Vein South Gold Project (the project).

Mineral or mining wastes generated from mining and ore processing (i.e. waste rock and tailings) are discussed in Section 3 – Project Description and the Progressive Rehabilitation and Mine Closure Plan (Appendix J), and are not discussed in this section.

15.2 WASTE MANAGEMENT

15.2.1 Introduction

This section describes the regulatory framework relevant to the project's non-mining waste management and summarises the way in which wastes will be managed, the environmental values to be protected and the principles of cleaner production. The section also provides an inventory of anticipated wastes.

15.2.2 Regulatory Requirements

The *Waste Reduction and Recycling Act 2011* (WRR Act), *Waste Reduction and Recycling Regulation 2011* (WRR Regulation), *Environmental Protection Act 1994* (EP Act), and *Environmental Protection Regulation 2019* (EP Regulation) provide the legal and strategic framework for managing wastes in Queensland.

The purpose of the WRR Act is to promote waste avoidance and reduction and to encourage resource recovery and efficiency. The achievement of the objectives of this Act are guided by the waste and resource management hierarchy whereby waste management options are considered in the following structured order:

1. Waste avoidance (most preferred);
2. Waste reduction;
3. Waste reuse;
4. Waste recycling;
5. Recover waste resources;
6. Treat waste; and
7. Waste disposal (least preferred).

The WRR Act provides waste and resource management principles, which are:

- The polluter pays principle: all costs associated with the management of waste should be borne by the persons who generated the waste;
- The user pays principle: all costs associated with the use of a resource should be included in the prices of the goods and services that result from the use;



- The proximity principle: waste and recovered resources should be managed as close to the source of generation as possible; and
- The product stewardship principle: there is a shared responsibility between all persons who are involved in the life cycle of a product for managing the environmental, social and economic impact of the product.

The EP Regulation provides the framework for classifying waste types. Wastes containing certain hazardous properties are classified as regulated waste in the EP Regulation and are subject to more stringent management requirements than other waste, as they may contain contaminants or have properties that present a higher risk to the environment or human health. The categories defined by the EP Regulation are:

- Category 1 regulated waste (highest risk);
- Category 2 regulated waste (moderate risk); and
- Not regulated waste (low risk).

The EP Regulation requires tracking of certain regulated wastes known as 'trackable wastes'. Trackable wastes are listed in Schedule 11 of the EP Regulation and include waste oils, solvents, empty oil drums, tyres, etc. Waste tracking enables regulatory agencies to track certain wastes from place of generation to place of storage, recycling, treatment or disposal, under a documented chain of custody. It also enables regulators to ensure that trackable wastes are transported by suitably licensed waste transport contractors to a facility licensed to accept the waste.

15.2.3 Environmental Values

Environmental values to be protected when managing non-mining waste are:

- The life, health and well-being of people;
- The diversity of ecological processes and associated ecosystems; and
- Land use capability having regard to economic considerations.

15.2.4 Waste Inventory

The main non-mining wastes anticipated to be generated by the project include:

- General and recyclable wastes;
- Green waste;
- Sewage sludge/solids;
- Scrap metal;
- Miscellaneous hydrocarbon wastes; and
- Batteries and tyres.

Attachment 15-1 provides an inventory of the waste types and quantities estimated to be generated by the project during construction, operations and decommissioning. It indicates the source of the waste, projected quantity, the proposed management and the disposal location of each waste type. Wastes generated by the project have been grouped in accordance with Schedule 9 of the EP Regulation. Management of the waste is described in the following sections.



15.2.5 Waste Management System

Overview

The proponent will develop and implement a waste management system for the project based on the regulatory requirements, values and principles described in the previous sections. The waste management system will include the following key elements:

- Wastes will be segregated into colour coded bins, where possible. The bins will be located at strategic locations to maximise the recovery and recycling of wastes.
- For waste that is removed off-site, professional, licensed waste management contractors working within the provisions of the WRR Act, WRR Regulation and the EP Regulation will be engaged to remove waste from the site and transport it to a suitably licensed facility. The selection of off-site waste facilities will be subject to the finalisation of commercial arrangements closer to the time of disposal.
- Regulated waste will be managed in accordance with regulatory requirements which are designed to protect environmental values. This will include:
 - Segregating the regulated waste and securely containing it until removal from the site by a licensed regulated waste transporter.
 - Reprocessing, recycling or disposing of the waste in a licensed regulated waste disposal facility; and
 - Compiling and maintaining waste tracking records for all regulated waste in accordance with the EP Regulation.
- Waste will be collected, handled and stored so as to protect the health of mine site staff and the community, and prevent nuisance. Management measures that will protect health and minimise nuisance include:
 - Covering general refuse bins to contain odour, reduce leachate and exclude vermin;
 - The use of mosquito and vermin control, if necessary; and
 - The removal of wastes from site on a regular basis.
- Employee awareness will be a key part of the waste management system and will be achieved through:
 - Environmental awareness training programs; and
 - Communication of waste generation volumes, trends, performance, and management costs.
- Regular environmental auditing will be undertaken and will include:
 - Inspection systems to ensure that hazardous materials are stored and disposed of correctly; and
 - Hazardous materials auditing.
- The waste management system will be subject to a continual improvement process with the aim of identifying new opportunities for waste minimisation and addressing any new waste streams generated.

The section below describes the way in which the waste and resource management hierarchy will be addressed, whilst Attachment 15-1 summarises the proposed waste management strategies for each waste type identified for the project.



Waste and Resource Management Hierarchy

The waste management system will be designed to meet the waste and resource management hierarchy listed in Section 15.2.2. The way in which the waste management hierarchy has been considered is discussed below and summarised for each waste type identified in Attachment 15-1.

1. Waste avoidance (most preferred) – Where possible, raw materials will be delivered in bulk form. Where bulk delivery is not feasible, consideration will be given to the purchase of products based on minimalist packaging and use of biodegradable materials.
2. Waste reduction – Waste reduction strategies will be implemented based on the waste management hierarchy, to ensure minimal waste products are generated. This will include targets to reduce quantities of hazardous wastes.
3. Waste reuse – Attachment 15-1 lists the items that will be refurbished, where possible, and reused. These include hoses, pipe work and associated components such as valves, and steel mesh.
4. Waste recycling – A recycling program will be established and promoted. Examples of waste types that can be viably recycled off site include:
 - Scrap metal;
 - Paper, cardboard, plastics, glass, aluminium cans;
 - Waste oil and containers; and
 - Air filters, oil filters and batteries.
5. Recover waste resources – Segregation of waste types will be implemented to maximise recovery and recycling of wastes, where possible.
6. Treat waste – Sewage will be treated using on-site sewage treatment plants (STPs). No other waste products are proposed to be treated on the project site. Where appropriate, waste materials that require treatment will be stored on-site in secure containment areas and removed off-site by a registered waste transporter to be processed, as appropriate.
7. Waste disposal – Where disposal is required, the proponent will endeavour to minimise the quantity and/or volume of such waste materials:
 - Examples of waste items proposed to be disposed of off-site include:
 - Residual paints, sealants, solvents, and resins;
 - Contaminated soil;
 - Electrical waste and electronic equipment;
 - Grease trap wastes; and
 - Fluorescent bulbs.
 - Waste heavy vehicle tyres will be potentially removed offsite or disposed of (encapsulated) within Non-Acid Forming (NAF) waste rock areas of the three Waste Rock Dumps (WRDs), which includes tracking and quantities and surveying of locations.

The management strategies for waste tyres were developed with consideration of the DETSI Operational Policy *Disposal of scrap tyres at mine sites* (ESR/2016/2380) which is based on the waste and resource management hierarchy. The proposed potential management strategies (EAR Attachment 15-1) include:

- take-back agreement with the tyre supplier;



- recycling of tyres off-site by a licensed waste contractor; and
- on-site disposal within the WRDs.

Due to the very remote location of the project site, the feasibility of a take-back agreement with a tyre supplier or recycling of tyres off-site will only be able to be determined at the commencement of operations. In the event that these options are not feasible, waste tyres will be disposed of on-site within the WRDs.

The DETSI Operational Policy states that *Disposing of scrap tyres in spoil emplacements is acceptable, provided the tyres are placed as deep in the spoil as possible but not directly on the pit floor. Placement should ensure scrap tyres do not impede saturated aquifers and do not compromise the stability of the consolidated landform.*

These requirements are specifically designed to ensure that on-site disposal of scrap tyres within spoil emplacements does not result in any adverse impacts to environmental values. Any disposal of scrap tyres within the WRDs will be conducted in accordance with these requirements.

Waste Reporting

The proponent will maintain an inventory of all waste types and quantities produced on the site and their applicable disposal method in accordance with WRR Act and EP Regulation. The proponent will also submit annual National Pollution Inventory reports in accordance with the *National Pollutant Inventory Guide* and associated manuals (e.g. *Emission Estimation Technique Manual for Mining*).

Cleaner Production

Principles of cleaner production will form an important component of the project's waste management system and will be achieved through:

- Focusing on waste avoidance as a key outcome through selective purchasing, reuse and recycling;
- The preferential selection and use of the most appropriate processes and equipment utilising best practicable technology;
- The reuse of resources that would otherwise be classified as wastes, via a comprehensive reuse and recycling program; and
- The reuse of products for their designated purpose where safe and practicable (e.g. the reuse of wooden pallets for storage).

End of Waste

In addition to established practices for recycling waste, the Queensland Government promotes opportunities for waste to be valued as a resource. The government has legislated a framework to ensure the use of waste as a resource is done responsibly. The end of waste (EOW) framework under Chapter 8 of the WRR Act consists of EOW codes and EOW approvals. Only wastes covered by EOW codes and EOW approvals can be used as a resource.

Approved wastes listed under the EOW framework would be produced by the project, however these will be treated by licensed waste management contractors.

15.3 SEWAGE TREATMENT PLANTS

15.3.1 Overview

Three STPs will be constructed on the project site. These will be located at the main Mine Industrial Area (MIA), the Accommodation Camps and the Northern MIA (Figure 15-1). The STPs will be located a minimum of 700 m from



the project site boundary and are all located well above the 0.1% (1 in 1,000) Annual Exceedance Probability (AEP) Woolgar River flood level (Figure 15-1).

15.3.2 Sewage Treatment Plant Design

The Accommodation Camp STP is expected to have a maximum capacity of 90 kL/day, which is sufficient for 300 people, over 2 shifts. The Main MIA STP is expected to have a maximum capacity of 30 kL/day, which is sufficient for 200 people working on the project site each day, over two shifts. The Northern MIA STP is expected to have a maximum capacity of 25 kL/day, which is sufficient for 50 people working on the project site each day, over two shifts.

The daily peak design capacity, in equivalent persons (EP), was calculated for each STP using the methods outlined in the EP Regulation. Table 15-1 shows the key data used in the calculation. The daily peak design capacities for the Accommodation Camps, Main MIA and Northern MIA STPs were calculated as 1,080 EP, 360 EP and 300 EP, respectively.

Table 15-1 Daily Peak Design Capacities

SEWAGE TREATMENT PLANT	PERSONS PER DAY	SEWAGE GENERATION RATE (L/DAY/PERSON)		CALCULATED SEWAGE (L/DAY)		STP MAXIMUM CAPACITY L/DAY	DAILY PEAK DESIGN CAPACITY	
		MIN	MAX	MIN	MAX		EP ¹ (V/200)	EP ² (M/2.5)
Northern MIA	50	30	60	1,500	3,000	25,000	125	300
Main MIA	200	30	60	6,000	12,000	30,000	150	360
Accommodation Camps	300	180	200	54,000	60,000	90,000	450	1,080

¹ EP = V/200 where V is the volume (L) of the average dry weather flow of sewage that can be treated at that day.

² EP = M/2.5 where M is the mass, in grams, of phosphorus in the untreated influent that the works are designed to treat as the inlet load in a day. M was assumed to be 30 mg phosphorus per L of influent.

The influent generated by the Accommodation Camps comprises grey waters from showers, laundry, and kitchen facilities as well as sewage. The composition of the influent from the MIAs will be sewage and grey water.

The final configuration of the STP infrastructure will be determined during detailed design, however, the Accommodation Camps and main MIA STPs will likely be packaged Activated Sludge Bioreactors (ASBR). The standard treatment process includes:

- Screening – Raw influent will be screened to 2 mm via an automatic inlet screen to remove any non-biodegradable foreign material that the system cannot process.
- Balance Tank Mixing – The influent is pumped into the balance tank where it is contained in large volumes and mixed. Storing and mixing the influent in large volumes allows the natural variations in the concentrations of wastewater parameters to even out. It also ensures that sewage flows entering the STP do not exceed the peak design capacity of the STP and assists with managing variable flows.
- Aerobic Treatment – The fluid from the tank will be pumped to an aerated chamber that uses forced oxygen delivery to provide an aerobic environment for the aerobic bacteria to digest the biological waste.
- Clarification – The treated sewage will be passed into the clarifier tank to separate the clean effluent from the waste sludge. Final disinfection of the cleaned effluent will be completed using chlorine, with final effluent quality monitored using quality instrumentation for turbidity, pH and free chlorine.



- Treated Effluent Storage – The treated effluent (Class C) will be held in an above ground tanks. The treated effluent will either be:
 - Sprayed onto the dedicated effluent irrigation areas (subject to EA quality conditions); or
 - Made available to supplement dust suppression water.

The Northern MIA STP will be determined during detailed design, however, it is likely to be a small inground aerobic treatment unit. The standard treatment process includes:

- Treatment chamber – The raw influent and air are pumped into the treatment chamber, which is underground. The aerobic environment allows the aerobic bacteria to digest the biological waste. The waste is then allowed to settle into the sludge and the effluent. The sludge is left in the chamber and periodically requires removal.
- Disinfection – The effluent is pumped out of the treatment chamber into an effluent holding compartment and is disinfected using chlorine.
- The treated effluent will either be:
 - Sprayed onto the dedicated effluent irrigation areas (subject to EA quality conditions) at the northern end of the project; or
 - Made available to supplement dust suppression water.

Additional key features of the STPs include:

- The design and construction will be undertaken by appropriately qualified persons;
- The STPs will treat the project's sewage to at least a Class C standard;
- Level transmitting instruments will be used to measure tank capacity and pressure transducers will be used for monitoring the performance of the STPs;
- Excess storage is built into the design of the STPs; and
- Grease traps will be provided for camp mess facilities to reduce fats and oil load.

15.3.3 Amenity Impacts

The proposed locations for the STPs are not in close proximity to any sensitive receptors, and the STPs will be operated in accordance with the EA conditions and relevant standards. As such, the STPs are not expected to cause any odour impacts at any sensitive receptors. The noise produced by the STPs will be negligible compared to the noise from the mining operations in the areas where the STPs are proposed to be located.

15.3.4 Treated Effluent Quality

Where treated effluent is being used to irrigate, effluent quality targets will apply as detailed in the Table 15-2 (from the Model Mining Conditions), and treated effluent will be monitored against those targets.



Table 15-2 Treated Effluent Quality

PARAMETER	TARGET EFFLUENT QUALITY
5 Day Biochemical Oxygen Demand	< 20 mg/L
pH	6.0 – 9.0
<i>Escherichia coli</i> (E. coli)	< 1,000 colony forming units/100 ml
Total Suspended Solids	< 30 mg/L
Total Nitrogen	< 30 mg/L
Total Phosphorus	< 15 mg/L

15.4 LAND CONTAMINATION

15.4.1 Introduction

This section describes the control strategies to prevent land contamination from the project.

15.4.2 Regulatory Requirements

Land contamination is managed in Queensland under the EP Act. Areas known to be contaminated by a hazardous contaminant are listed on the Contaminated Land Register (CLR) by the Department of Environment, Tourism, Science and Innovation (DETSI). Activities that have been identified as having the potential to cause land contamination are called Notifiable Activities (NAs) and are defined under the EP Act. These include waste storage, petroleum or oil storage and landfilling. Properties where a notifiable activity is conducted are required to be listed on the Environmental Management Register (EMR).

The storage and handling of flammable and combustible liquids (AS 1940:2017) identifies the standards required for the storage and handling of flammable and combustible liquids in Australia. This standard sets out the requirements and recommendations for the safe storage and handling of flammable and combustible liquids including minimum acceptable safety requirements for storage facilities, operating procedures, emergency planning, and fire protection.

15.4.3 Contaminated Land Site History

A history of the project site was compiled to identify past and present potentially contaminating activities within the project site. Development of the site history was achieved through:

- A review of the CLR and the EMR;
- Analysis of aerial photography to identify historic and existing land uses with the potential to cause land contamination;
- Review of the *Non-indigenous Cultural Heritage Report* (Appendix I), which includes information on the history of the project site; and
- Discussions with the proponent to verify information concerning historical and existing land uses.

A review of the CLR and EMR was conducted for the two properties within the project site. This review indicated that neither property is listed on the CLR or the EMR.



15.4.4 Proposed Notifiable Activities

A number of activities proposed to be undertaken on the project site have the potential, if not appropriately managed, to result in land contamination. These activities, classed as NAs, are listed under the EP Act. The on-site disposal (encapsulation) of scrap mine haul truck tyres described in Section 15.2.5 is captured under NA 37 (waste storage, treatment or disposal). While the disposal of scrap tyres is not separately itemised in Schedule 3 of the EP Act, the Operational Policy Disposal of scrap tyres at mine sites (ESR/2016/2380) identifies the disposal of scrap tyres at a mine site as a notifiable activity, and it will be recorded and managed accordingly. Table 15-3 provides a list of the NAs that may be undertaken on the project site as part of the project. This list will be refined as necessary during the detailed operations planning phase of the project, and details of areas with NAs will be provided to the DETSI, in accordance with legislative requirements. Figure 15-1 shows the proposed locations of the NAs.

Table 15-3 Notifiable Activities

EP ACT SCHEDULE 3 NOTIFIABLE ACTIVITY	DESCRIPTION
NA 7 CHEMICAL STORAGE	Storing more than 10 t of chemicals (other than compressed or liquefied gases) that are dangerous goods under the dangerous goods code.
NA 14 ENGINE RECONDITIONING	Carrying out engine reconditioning work at a place where more than 500 L of any of the following are stored: ● Halogenated and non-halogenated hydrocarbon solvents; ● Dangerous goods in Class 6.1 under the dangerous goods code; or ● Industrial degreasing solutions.
NA 24 MINE WASTES	Storing hazardous mine or exploration wastes, including, for example, tailings dams, overburden or waste rock dumps containing hazardous contaminants; or Exploring for, or mining or processing, minerals in a way that exposes faces, or releases groundwater, containing hazardous contaminants.
NA 25 MINERAL PROCESSING	Chemically or physically extracting or processing metalliferous ores.
NA 29 PETROLEUM PRODUCT OR OIL STORAGE	Storing petroleum products or oil: ● In underground tanks with more than 200 L capacity; or ● In above ground tanks with - ● For petroleum products or oil in Class 3 in packaging groups 1 and 2 of the dangerous goods code – more than 2,500 L capacity; or ● For petroleum products or oil in Class 3 in packaging groups 3 of the dangerous goods code – more than 5,000 L capacity; or ● For petroleum products that are combustible liquids in Class C1 or C2 in Australian Standard 1940, 'The storage and handling of flammable and combustible liquids' published by Standards Australia (2017) – more than 25,000 L capacity.
NA 37 WASTE STORAGE, TREATMENT OR DISPOSAL	Storing, treating, reprocessing or disposing of waste prescribed under a regulation to be regulated waste, for this item (other than at the place it is generated), including operating a nightsoil disposal site or sewage treatment plant where the site or plant has a design capacity that is more than the equivalent of 50,000 persons having sludge drying beds or on-site disposal facilities. For the project, this item includes the on-site disposal (encapsulation) of scrap mine haul truck tyres within NAF waste rock areas of the three WRDs.

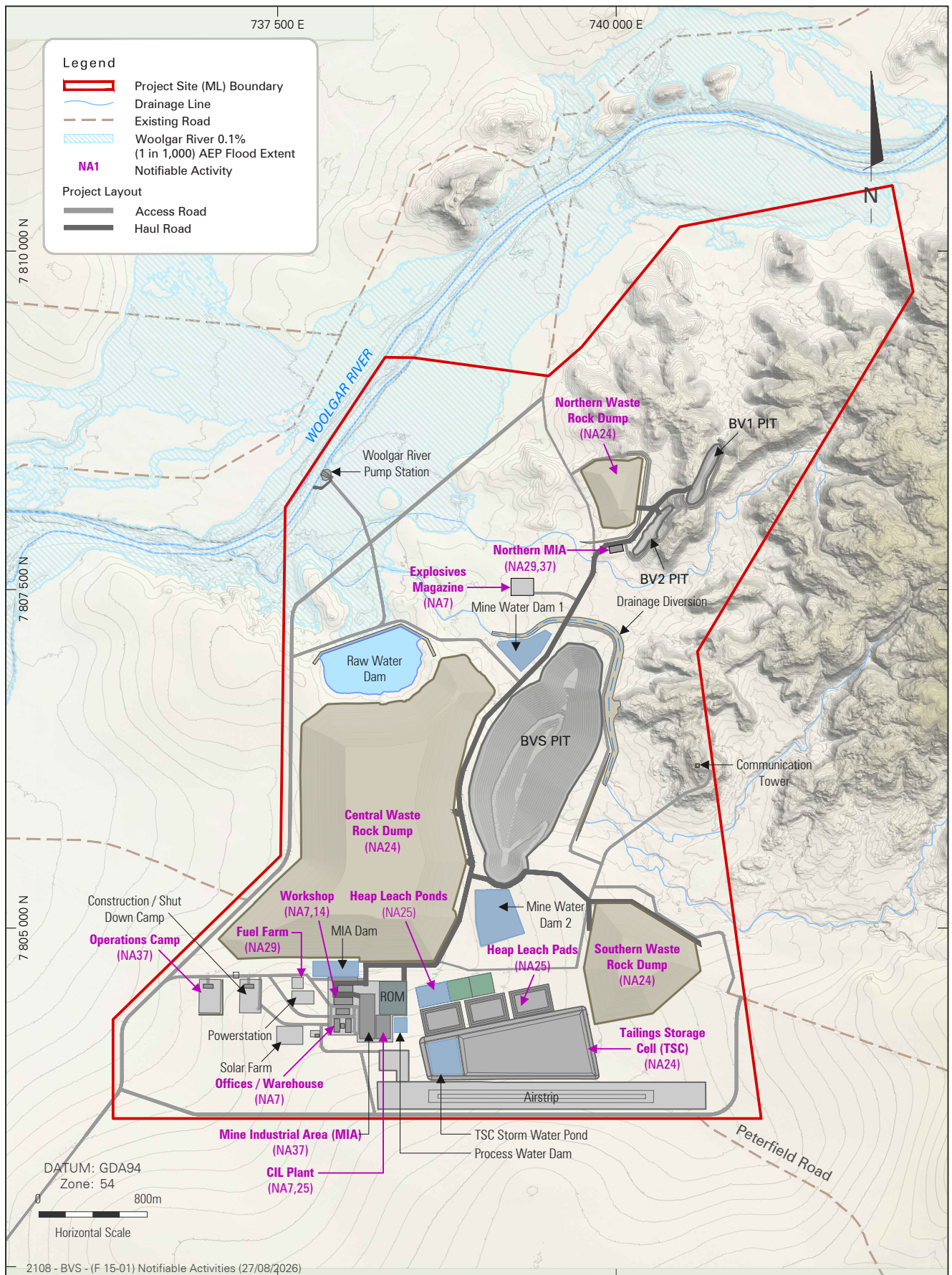


15.4.5 Contamination Prevention and Control

The risk of land contamination from project activities, including NAs, will be reduced through consideration of the design and construction of the facilities and post-mining rehabilitation. The considerations for each NA in each project phase are listed as follows:

- Construction:
 - Hydrocarbon and chemical storage areas will be designed and constructed in accordance with Australian Standard 1940 in order to contain and recover spills.
 - Bunding around hydrocarbon and chemical storage areas will allow for collection of stormwater for treatment or appropriate disposal.
- Operations:
 - Waste hydrocarbons and miscellaneous chemicals will be stored in separate sealed and bunded areas to prevent soil contamination;
 - Waste hydrocarbons and miscellaneous chemicals will be handled in accordance with standard operating procedures to minimise potential for spillage and leakage;
 - Key staff will be trained in spills prevention and clean up;
 - Oil spill cleanup kits will be provided at strategic locations as part of site emergency planning;
 - Contaminants from workshop and truck wash-down areas will be directed to an oil separator and sump for containment and subsequent treatment or appropriate disposal;
 - Abrasive blasting work will be undertaken in a way that prevents overspray from escaping the area. This will be achieved by the use of screens, enclosures and/or an exclusion zone around the work area; and
 - Key staff will be trained to ensure pesticides are stored safely and used in a manner appropriate for the eradication of pest species.
- Decommissioning:
 - Hydrocarbon and chemical storage tanks and other infrastructure will be removed and disposed of off-site in accordance with regulatory requirements.
 - Contamination assessments will be conducted by a suitably qualified specialist in all areas where NAs were conducted over the life of the mine, prior to decommissioning. Decontamination will be completed, where necessary, as part of decommissioning and final rehabilitation.
 - A risk assessment for the Heap Leach Facility (NA25), that addresses potential for contamination from this facility, is provided in Attachment 15-2.

FIGURES



BIG VEIN SOUTH GOLD PROJECT

Notifiable Activities

FIGURE 15-1

ATTACHMENT 15-1
ESTIMATED WASTE INVENTORY



Attachment 15-1 Estimated Waste Inventory

WASTE CATEGORY	GENERAL COMPOSITION	SOURCE	WASTE QUANTITIES				MANAGEMENT STRATEGIES (WASTE MANAGEMENT HIERARCHY LEVEL)
			CONSTRUCTION (TWO YEAR PERIOD)	OPERATIONS (PER ANNUM)	DECOMMISSIONING (TWO YEAR PERIOD)	UNITS	
NON-REGULATED WASTE							
General Waste	Food scraps, putrescibles	Kitchenettes, crib rooms, administration areas, workshop, etc.	35	20	35	t	General waste will be disposed of off-site at a landfill by a licensed waste contractor (7).
General Waste (plastics)	Non-class 1, 2, 5 plastics	Kitchenettes, crib rooms, administration areas, workshop, etc.	5	5	5	t	General waste (plastics) will be disposed of off-site at a landfill by a licensed waste contractor (7).
Recyclable Waste	Aluminium, steel cans, Class 1, 2 and 5 plastics, paper, cardboard, glass	Kitchenettes, crib rooms, administration areas, workshop, etc.	5	5	5	t	Recyclable waste will be stored on-site in designated bins for transport off-site by a licensed waste contractor for recycling (4) or disposal (7).
Refurbishable Items	Hoses, couplings, pipe work and associated components, valves and fittings, cabling fixings and hangers, steel mesh, conveyor rollers	Mining operations	<1	5	<1	t	The majority of items will be stockpiled within a designated area before being returned to the warehouse. If condition is acceptable, items will be reused directly (3). Other items will be transported off-site by a licensed carrier, to be refurbished by a licensed contractor (4). Where items are at the end of their useful life, they will be collected and disposed of as appropriate for that material (e.g. metal components to the scrap metal bins) (5).



WASTE CATEGORY	GENERAL COMPOSITION	SOURCE	WASTE QUANTITIES				MANAGEMENT STRATEGIES (WASTE MANAGEMENT HIERARCHY LEVEL)
			CONSTRUCTION (TWO YEAR PERIOD)	OPERATIONS (PER ANNUM)	DECOMMISSIONING (TWO YEAR PERIOD)	UNITS	
							Where items are contaminated with hydrocarbons, they will be managed as regulated waste (6,7).
Green Waste	Grass; cleared timber	Clearing of vegetation, for mining and firebreaks	10,000	500	0	t	Green waste will be mulched and/or burnt (4).
Scrap Metal	Steel, copper, brass, cast iron, stainless steel, electrical cable, wire; aluminium, any item considered to be metal (ferrous or non-ferrous) including machine parts	Equipment not suitable to be reconditioned, heavy machinery scrapping	5	10	500	t	Scrap metal will be stockpiled on-site for recycling. All grease and oil will be removed prior to placement in skips. Scrap metal will be collected by a licensed waste contractor and recycled off-site (4).
Personal Protective Equipment and Small Items	Gloves, hardhats, safety glasses, boots and water coolers	Administration areas and workshop	<1	<1	<1	t	Waste items will be collected in designated bins and cages, packed in sacks and stored in the warehouse for transport to a licensed recycling facility (4). Items unsuitable for recycling will be disposed of (7).
Air Filters	Engine air filters	Vehicle and machinery maintenance at workshop	<1	<1	<1	t	Waste items will be placed within designated air filter recycling bins for collection and transported to a licensed contractor for cleansing, testing and reuse (3), or disposal (7).



WASTE CATEGORY	GENERAL COMPOSITION	SOURCE	WASTE QUANTITIES				MANAGEMENT STRATEGIES (WASTE MANAGEMENT HIERARCHY LEVEL)
			CONSTRUCTION (TWO YEAR PERIOD)	OPERATIONS (PER ANNUM)	DECOMMISSIONING (TWO YEAR PERIOD)	UNITS	
Treated Timber	Timber including reusable pallets	Warehousing and workshop	<1	<1	<1	t	Pallets will be stockpiled for re-use on-site (3). Excess pallets will be returned to the sender (if possible) (3). Treated/painted timber will be disposed of off-site by a licensed waste contractor (7).
Concrete	Concrete from construction activities	Batch plant, concrete truck wash down area during construction. All infrastructure areas at decommissioning.	10	N/A	2,500	t	Waste concrete material will be disposed of on-site in waste rock dumps (7).
Electrical waste and electronic equipment	Intact or partially disassembled electronic equipment, substations and distribution boards	Administration areas, MIA and workshops	<0.1	<0.1	15	t	Electronic waste will either be collected by a licensed waste contractor and will be recycled (4) or disposed of off-site (7).
Sludge and residues generated from potable water treatment	Sludge and filter cake from the treatment of potable water	MIA and Accommodation Camps	12,000	25,000	12,000	kg/week	Waste sludge will either be collected on-site and then disposed of off-site by a licensed waste contractor or disposed of on-site in the tailings storage cell (7).



WASTE CATEGORY	GENERAL COMPOSITION	SOURCE	WASTE QUANTITIES				MANAGEMENT STRATEGIES (WASTE MANAGEMENT HIERARCHY LEVEL)
			CONSTRUCTION (TWO YEAR PERIOD)	OPERATIONS (PER ANNUM)	DECOMMISSIONING (TWO YEAR PERIOD)	UNITS	
Abrasive blasting media and residue	Blasting media and waste material (i.e. cured paint/powder coating)	MIA	<1	<1	N/A	t	Residual blasting media and waste material will be disposed of off-site by licensed waste contractor (7).

REGULATED WASTE – CATEGORY 1

Nil – The project will not produce Category 1 Regulated Wastes.

REGULATED WASTE – CATEGORY 2

Sewage effluent	Sewage (residential and non-residential)	MIAs and Accommodation Camps	75	25	10	kL/day	Effluent from the treatment process (6) will be irrigated to land or used to supplement dust suppression water in accordance with relevant regulatory requirements.
Sewage sludge and residues	Sewage sludge (residential and non-residential)	MIAs and Accommodation Camps	38,000	12,000	5,000	kg/week	The STPs will be containerised systems with associated raw sewage feed and treated effluent storage tanks. Waste sludge will be collected on-site and then disposed of off-site by a licensed waste contractor (7).
Lead Acid Batteries	Vehicle batteries	Vehicle maintenance	<1	<1	<1	t	Batteries will be transferred to sealable battery crates and transported off-site by a dangerous goods transport agent to a suitable waste handling facility for recycling (4) or treatment and disposal (7).



WASTE CATEGORY	GENERAL COMPOSITION	SOURCE	WASTE QUANTITIES				MANAGEMENT STRATEGIES (WASTE MANAGEMENT HIERARCHY LEVEL)
			CONSTRUCTION (TWO YEAR PERIOD)	OPERATIONS (PER ANNUM)	DECOMMISSIONING (TWO YEAR PERIOD)	UNITS	
Waste Coolant	Coolant	Vehicle maintenance	2,000	3,000	1,500	L	Used coolants and coolant additives will be stored in a waste coolant tank and transported by a licensed regulated waste contractor to a licensed regulated waste receiver for reuse (3), recycling (4) or disposal (7).
Miscellaneous Chemicals	Residual paints, sealants, solvents, resins, etc.	General maintenance, mining and workshop activities	<1	<1	<1	t	Miscellaneous chemical wastes and concentrated solutions will be segregated and stored in sealed containers to prevent overflow or spillage. Such wastes will be transported off-site by a licensed regulated waste contractor to a licensed regulated waste receiver for treatment (6) and/or disposal (7) in accordance with the Safety Data Sheets and any other legislative requirements.
Waste Oil	Waste Oil	General maintenance, mining and workshop activities	100	100	15	t	Waste oil will be collected and stored in designated waste oil containers, and transported by a licensed regulated waste contractor to a licensed regulated waste receiver for reuse (3), recycling (4) or disposal (7).



WASTE CATEGORY	GENERAL COMPOSITION	SOURCE	WASTE QUANTITIES				MANAGEMENT STRATEGIES (WASTE MANAGEMENT HIERARCHY LEVEL)
			CONSTRUCTION (TWO YEAR PERIOD)	OPERATIONS (PER ANNUM)	DECOMMISSIONING (TWO YEAR PERIOD)	UNITS	
Miscellaneous Hydrocarbon Wastes	Oily rags, absorbent and other oil spill clean-up products and containers	General maintenance, mining and workshop activities	2	1	3	t	Hydrocarbon wastes will be collected and stored in designated containers, and transported by a licensed regulated waste contractor to a licensed regulated waste receiver for recycling (4) or disposal (7).
Oily Water	Water contaminated with oil	Interceptors within industrial areas, wash pads, workshop, refuelling station and fuel storage facility	<1	<1	<1	t	Oily water will be collected and stored in designated waste oil containers, and transported by a licensed regulated waste contractor to a licensed regulated waste receiver for reuse (3), recycling (4) or disposal (7).
Oil/fuel filters	Oil filters	Vehicle and machinery maintenance at workshop	<1	<1	<1	t	Oil and fuel filters will be collected and stored in sealed disposal pods. The filters will be transported by a licensed regulated waste contractor to a licensed regulated waste receiver for treatment (solvent wash) to recover oil (5).
Tyres	Tyres	Heavy vehicles (HVs) and light vehicles (LVs)	HVs – 60 LVs – 3	HVs – 225 LVs – 5	HVs – 225 LVs – 5	t	Tyres will either be disposed (encapsulated) within NAF waste rock areas of the WRDs on-site subject to EA conditions (7), or a 'take-back agreement' with a tyre supplier will be negotiated (4); or tyres will be recycled off-site by licensed waste contractor (4).



WASTE CATEGORY	GENERAL COMPOSITION	SOURCE	WASTE QUANTITIES				MANAGEMENT STRATEGIES (WASTE MANAGEMENT HIERARCHY LEVEL)
			CONSTRUCTION (TWO YEAR PERIOD)	OPERATIONS (PER ANNUM)	DECOMMISSIONING (TWO YEAR PERIOD)	UNITS	
							Tyres will be segregated and stored in designated areas, each < 200 m ² and 3 m high, with no grass or other flammable material within a 10 m radius.
Grease	Grease trap wastes	Machinery maintenance at workshop, maintenance and shutdown work	<1	<1	<1	t	Waste grease will be collected in sealed 205 L drums and transported by a licensed regulated waste contractor to a licensed regulated waste disposal facility for recycling (4) or disposal (7).
Fluorescent bulbs	Fluorescent bulbs	Kitchenettes, crib rooms, administration areas, workshop, etc.	<0.1	<0.1	<1	t	Fluorescent bulbs will be collected and transported off-site by a licensed waste contractor for recycling (4) or disposal (7).
Contaminated Soil	Soil contaminated with hydrocarbons (grease, oil, fuel residue, etc).	Industrial areas, wash pads, workshop, refuelling station and fuel storage facility	<1	<1	20	t	Contaminated soil will be bio remediated on-site in a dedicated banded area and then disposed of (encapsulated) within WRD or the TSC (7).

ATTACHMENT 15-2 HLF RISK ASSESSMENT



HLF RISK ASSESSMENT

1 INTRODUCTION

This section presents the Heap Leach Facility (HLF) environmental risk assessment. It describes the risk assessment methodology and presents the results of the assessment. The HLF risks are assessed in the absence of mitigation measures, as well as after taking into account the application of proposed mitigation measures. The objective of the risk assessment is to ensure that significant risks from the HLF are identified and evaluated in order to ensure an appropriate level of risk treatment is applied to mitigate key risks.

2 METHODOLOGY

The HLF environmental risk assessment was undertaken through a review meeting including Strategic Minerals Corporation (SMC) project team members and Hansen Environmental Consulting (HEC) project staff, and was guided by the principles in AS/NZS ISO 31000:2009.

Individual risks were identified through:

- Considering the HLF in relation to the project setting;
- Making use of SMC's and HEC's knowledge and experience from the project site; and
- Drawing on the experience of the HEC environmental assessment staff with other similar projects.

Risks were systematically identified taking into consideration the range of HLF components/operations in relation to individual aspects of the existing environment.

Once all risks had been identified, the consequence and likelihood of each individual risk was then analysed using the risk assessment matrix in Table 3. Table 1 and Table 2 present the ratings for consequence and likelihood, respectively.

Table 1 Ratings for the Assessment of Consequence Levels

CONSEQUENCE LEVEL	ENVIRONMENT	COMMUNITY
1	Low level impact/s to land, biodiversity, ecosystem services, water resources or air	Low-level social impacts. Low-level infringement of cultural heritage or minimal disturbance to heritage structures. Minimal impact on human rights.
2	Minor impact/s to land, biodiversity, ecosystem services, water resources or air	Minor medium-term social impacts on small number of people. Repairable damage or disturbance to property, structures or items. Minor infringement of cultural heritage. Minor, temporary human rights impacts.
3	Moderate impact/s land, biodiversity, ecosystem services, water resources or air	Moderate medium-term social impacts or frequent social issues. Moderate damage to structures/items of local cultural heritage significance/sacred locations. Moderate, temporary human rights impacts.



CONSEQUENCE LEVEL	ENVIRONMENT	COMMUNITY
4	Significant impact/s (>20 years) land, biodiversity, ecosystem services, water resources or air	A breakdown of social order. Widespread damage to items of global cultural significance. Highly offensive infringements of cultural heritage. Company directly responsible or complicit in severe, long-term impacts on human rights.
5	Permanent, severe impact/s to land, biodiversity, ecosystem services, water resources or air	Complete breakdown of social order. Widespread desecration of items of global cultural significance. Company directly responsible or complicit in severe and widespread long-term impacts on human rights.

Table 2 Ratings for the Assessment

LIKELIHOOD	ENVIRONMENT
ALMOST CERTAIN	Could be incurred more than once in a year
LIKELY	Could be incurred over a 1-2 year timeframe
POSSIBLE	Could be incurred within a 5 year timeframe
UNLIKELY	Could be incurred in a 5-20 year timeframe
RARE	Less than once in 20 years

The overall risk category was determined by making use of a risk matrix provided in Table 3 which considers both consequence and likelihood.

Table 3 Risk Assessment Matrix

LIKELIHOOD	CONSEQUENCE				
	LEVEL 1 Low level impact	LEVEL 2 Minor impact	LEVEL 3 Moderate impact	LEVEL 4 Significant impact	LEVEL 5 Severe impact
ALMOST CERTAIN	High (11)	High (16)	Extreme (20)	Extreme (23)	Extreme (25)
LIKELY	Moderate (7)	High (12)	High (17)	Extreme (21)	Extreme (24)
POSSIBLE	Low (4)	Moderate (8)	High (13)	Extreme (18)	Extreme (22)
UNLIKELY	Low (2)	Low (5)	Moderate (9)	High (14)	Extreme (19)
RARE	Low (1)	Low (3)	Moderate (6)	High (10)	High (15)

Section 3 presents the results of the risk assessment.



3 RISK ASSESSMENT

Table 4 Heap Leach Facility Environmental Risk Assessment

NO	PROJECT ACTIVITY	RISK DESCRIPTION	ASSUMPTIONS RELEVANT TO ASSESSMENT OF UNMITIGATED RISK	C ¹	L ²	R ³	MITIGATION	C ¹	L ²	R ³	CERTAINTY IN RELATION TO EFFECTIVENESS OF MITIGATION ⁴
1	Construction and operation of the HLF.	Leaching solution and/or rainfall runoff containing entrained contaminants infiltrating the underlying natural strata and mixing with the underlying groundwater regime, resulting in groundwater contamination, and giving rise to impacts on downgradient groundwater users and/or groundwater dependent features.	- No liner system. - No specific monitoring or management measures.	4	A	E	- Construction of an engineered liner system including, conceptually: - A low permeability synthetic geomembrane - A leak collection/detection layer, including underdrains and leakage collection sumps, as necessary - A stable low-permeability foundation - Engineering inspections of the liner system during operations. - Operational monitoring of leakage collection sumps. - Targeted operational groundwater monitoring to detect groundwater contamination from the heap leach facility.	2	U	L	<i>High Certainty:</i> - Detailed engineering design to confirm the liner system specification and configuration, in accordance with applicable engineering guidelines and standards. - Construction quality assurance and integrity testing in accordance with applicable engineering guidelines and standards. - Engineering certification at key stages of design, construction and operation.
2	Operation of the heap leach process.	Leaching solution overflow resulting in downstream surface water contamination, with associated impacts	No operational controls on the total volume of leaching solution in the system or	4	L	E	- Leaching solution to be contained in a closed loop system - Management controls on the total volume of leaching solution in circulation to ensure the maximum	1	R	L	<i>High Certainty:</i> Mitigation measures are consistent with applicable engineering guidelines and international best



NO	PROJECT ACTIVITY	RISK DESCRIPTION	ASSUMPTIONS RELEVANT TO ASSESSMENT OF UNMITIGATED RISK	C ¹	L ²	R ³	MITIGATION	C ¹	L ²	R ³	CERTAINTY IN RELATION TO EFFECTIVENESS OF MITIGATION ⁴
		on surface water dependent environmental features.	- the pond inventories - No special consideration of pond design or storage capacities				- operating storage limits of ponds are not exceeded - Ponds designed with sufficient capacity to contain the maximum volume of leaching solution in circulation plus additional freeboard capacity for containment of direct rainfall, thereby minimising the risk of overflow - Secondary backup containment provided by the HLF Stormwater Pond in the event of unexpected overflow from the heap leach ponds - Ongoing operational monitoring of pond inventories to ensure operating levels are not exceeded				- practice guidance for operation of heap leach facilities. - Pond sizing based on processing specifications and rainfall data.
3	HLF stormwater management	Overflow of stormwater runoff containing entrained contaminants resulting in downstream surface water contamination, with associated impacts on surface water dependent environmental features.	No specific overflow controls.	4	L	E	- HLF Stormwater Pond designed with sufficient capacity to contain the maximum predicted runoff from the HLF catchment, thereby minimising the risk of overflow - Ongoing operational monitoring of pond inventory to ensure there is sufficient available storage capacity at all times	2	R	L	<i>High Certainty:</i> Pond sizing based on water balance modelling that included the worst case rainfall sequences in 133 years of daily rainfall data and assessed the effects of climate change on modelled rainfall and evaporation.



NO	PROJECT ACTIVITY	RISK DESCRIPTION	ASSUMPTIONS RELEVANT TO ASSESSMENT OF UNMITIGATED RISK	C ¹	L ²	R ³	MITIGATION	C ¹	L ²	R ³	CERTAINTY IN RELATION TO EFFECTIVENESS OF MITIGATION ⁴
4	Residual cyanide contamination of the decommissioned HLF site	HLF site is contaminated with cyanide after decommissioning and final rehabilitation. Contamination results in health hazard to the land holder and contamination of groundwater and giving rise to impacts on downgradient groundwater users and/or groundwater dependent features.	No detailed site contamination assessment/remediation	4	P	E	Detailed HLF site contamination assessment conducted during HLF decommissioning by an AQP and implementation of contamination remediation measures, where necessary.	1	U	L	<i>High certainty:</i> - HLF site contamination assessment would be informed by operational monitoring data and any necessary additional site investigation. - Any remediation measures required would be designed by an AQP and implemented. - The HLF site would need to be removed from the contaminated site register prior to return of the ML area to the land holder.

- 1 **C: Consequence** Refer to Table 4-4 for Consequence levels
- 2 **L: Likelihood** AC: Almost Certain; L: Likely; P: Possible; U: Unlikely; R: Rare
- 3 **R: Risk** E: Extreme; H: High; M: Moderate; L: Low
- 4 Level of certainty in relation to effectiveness of management/mitigation measures in reducing the risks

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16 REFERENCES

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17

GLOSSARY





17 GLOSSARY

The following terms are commonly used throughout this Environmental Assessment Report. Further explanation or a description may be provided in the main report or appendices.

TERM	DEFINITION
10H:1V	A slope of ten horizontal units to one vertical unit.
4H:1V	A slope of four horizontal units to once vertical unit.
50th percentiles	The average baseline groundwater quality.
80th percentiles	The typical upper range of baseline groundwater quality.
Aerobic	Living or occurring only in the presence of oxygen.
Aerodynamic diameter	The diameter of an idealised spherical particle, with a density of 1g/cm ³ .
Agistee	An individual who pays a fee for their horse or cattle to reside somewhere outside of their property.
Alkaline	Basic, or having a pH of 7.0 or higher. Pure water has a pH value around 7 and is neutral.
Alluvium	Sediment deposited by a flowing stream, consisting of unconsolidated materials including gravel, clay, silt and sand.
Ambient Air	The outdoor air in which humans and other organisms live and breathe.
Anabat surveys	A system used to identify and survey bats by detecting and analysing their echolocation calls.
Anion	A negatively charged ion (i.e. one that would be attracted to the anode in electrolysis).
Annual Average Daily Traffic	The total volume of traffic passing a roadside observation point over the period of a calendar year, divided by the number of days in that year.
Annual Exceedance Probability flood level	The probability of a flood event occurring in any year.
Anthropogenic Disturbance	Disturbance resulting from human activities.
Anti-Discrimination Provisions	The provisions of the Strong and Sustainable Resource Communities Act 2017 (Qld) Act make it an offence for large resource projects to discriminate against locals in the future recruitment of workers.
Apron	A thick stone cover laid on the bed to protect against erosion.
Aquatic	Relating to water.
Aquiclude	A geological formation that acts as a barrier to the flow of water.
Aquifer	Rock or sediment in a formation, group of formations or part of a formation that is saturated and sufficiently permeable to transmit economic quantities of water to wells and springs.
Arbuscular mycorrhizal fungi	A beneficial soil fungus that forms within the roots of plants.



TERM	DEFINITION
Artesian Pressure	Groundwater that is under sufficient pressure to cause the groundwater level in a well to rise above the level it was first encountered.
Associated Water	Underground water taken or interfered with, if the taking or interference happens during the course of, or results from, the carrying out of the project.
AUSRIVAS modelling	A prediction system used to assess the biological health of Australian rivers.
Australian Height Datum	The official vertical height datum of Australia and the datum to which all vertical control for mapping is to be referred.
Australian Heritage Council	The principal adviser to the Australian Government on heritage matters.
Austroroads	The association of Australian and New Zealand road transport and traffic authorities whose purpose is to contribute to the achievement of improved road transport outcomes.
Average Recurrence Interval	The long-term average number of years between the occurrences of a flood as big as, or larger than, the selected event.
Background levels	Existing concentrations of pollutants in ambient air.
Background Noise	The total noise present and continuous at a given location, excluding extraneous noise and the noise source of interest. Commonly measured using the statistical parameter, LA ₉₀ , the A-weighted noise level that was exceeded for ninety per cent of the monitoring period.
Baffles	Flow-directing vanes or panels that direct the flow of a liquid or gas.
Bank	The land alongside a body of water.
Barren Solution	A solution from which all possible valuable constituents have been removed.
Baseflow	The portion of the streamflow that is sustained between precipitation events, fed to streams by delayed pathways.
Bed	The space the waterbody covers at its fullest flow without overflowing. The ground over which a waterbody usually flows.
Biochemical Oxygen Demand	The amount of oxygen required by bacteria and other microorganisms while decomposing organic matter.
Biocondition	An assessment framework for the condition of vegetation that provides a measure of the capacity of a terrestrial ecosystem to maintain biodiversity values at a local or property scale.
Biodiversity	The diversity of different species of plants, animals and micro-organisms, including the genes they contain.
Environmental Offsets	Defined in the Queensland <i>Environmental Offsets Act 2014</i> (EO Act), environmental offset are a form of compensation for the residual adverse impacts of an action on the environment. Offsets provide environmental benefits to counterbalance the project's impacts that remain after avoidance and mitigation measures.
Biodiversity status	A measure of the number of species in a particular place or the diversity of a species in a particular place.
Bioregion	A geographically distinct biological region, which is a reporting unit for assessing the status of native ecosystems and their level of protection.



TERM	DEFINITION
Biosecurity	Measures or procedures designed to protect the population and environment against the introduction of harmful pests, diseases and weeds.
Biota	The animal and plant life of a particular region, habitat, or geological period.
Bore	A hole that is drilled into the earth.
Borrow pits	A pit dug for the excavation of construction material (e.g. gravel, clay, soil or sand).
Bunding	A structure around primary containers, machines and other sources of leaks to contain any spilled liquid.
Bureau of Meteorology	Australia's national weather, climate and water agency that provides regular forecasts, warnings, monitoring and advice across the Australian region and Antarctic territory.
BV1 and 2 Pits	Small satellite pits in the north of the project site that will operate during the first two years of the project.
BVS Pit	The main pit for the project. It will be active over the life of mine.
CALMET	A model that predicts wind and temperature fields using topography, land type and meteorological data.
CALPUFF	A model that characterises the dispersion and deposition of air pollutants in the atmosphere.
Capping	Process of covering an area with benign material.
Carbon Dioxide Equivalent (CO₂e)	A metric measure used to compare the emissions from various greenhouse gases based upon their global warming potential.
Carbon In-Leach Plant	A plant which leaches gold from ore.
Carbon storage	A method of capturing carbon dioxide emissions and storing them in spaces deep within the earth (such as aquifers or coal seams) to reduce the amount of carbon dioxide in the atmosphere.
Catchment	The surface drainage area from which a river, stream or reservoir receives its water.
Cation	A positively charged ion (i.e. one that would be attracted to the cathode in electrolysis).
Channel	A watercourse with a definite bed and banks, through which water flows.
Chemical composition	The arrangement, type and ratio of the elements making up a compound.
Circum-neutral	Approximately neutral, with a pH between 6.5 and 7.5.
Coalesce	Combine to form one mass or whole.
Combustible	The ability to catch fire easily.
Commonwealth Heritage List	A list of Indigenous, historic or natural heritage places owned or controlled by the Australian Government.
Concentration	The mass of a pollutant such as particulate matter that is suspended per unit volume of air. Suspended particulate matter in ambient air is usually measured in micrograms per cubic metre (µg/m ³).
Concrete Batching Plant	Equipment that combines various ingredients to form concrete.
Confluence	Where two or more flowing bodies of water join together to form a single channel.



TERM	DEFINITION
Connectivity	The degree to which separate patches of habitat are connected.
Contours	A way in which something varies.
Controlled Action	If a proposed action is likely to have a significant impact on one or more matters protected by the Commonwealth Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act), the action will need to be assessed and approved under the EPBC Act before it can proceed.
Crib Hut	A portable, self-contained building fitted with operational facilities.
Crown Land	Land that is leased or dedicated to the public as a road or reserve; or the subject of a permit to occupy or licence; or unallocated State land. This is also known as State land under the Land Act 1994.
Crustacean	An arthropod of the large, mainly aquatic group <i>Crustacea</i> , such as a crab, lobster, shrimp, or barnacle.
Cryptic species	Organisms that are morphologically indistinguishable biological groups that are incapable of breeding (i.e. are different species).
Culvert	A structure that directs water under a road or embankment.
Cumecs	A unit used to measure the rate of flow in cubic metres per second.
Cyanide Destruction Circuit	A process used to treat slurry from the Carbon-In-Leach Plant to remove the cyanide solution from the tailings.
dBA	A-weighted decibels, where the A weighting means frequencies below 500Hz and above 10kHz are artificially reduced to approximate the frequency response of an average human ear. Most sound monitoring instruments include an A-weighting option, enabling direct measurement of noise levels in dBA.
dB	Linear decibels, the same as dB but used to explicitly define a decibel scale in the absence of any frequency weighting.
Decant pond	A structure holding water removed from the tailings storage cells by either gravity flow or by pumping.
Decapod	Any crustacean of the order Decapoda that has five pairs of limbs such as crabs, lobsters, or prawns.
Decibels, dB	A noise level unit based on a logarithmic scale of pascals of sound pressure above and below atmospheric pressure. Human ears in good condition can typically detect sound pressures from the threshold of perception at 0 dB (20 uPa) to the threshold of pain at 140 dB (200 Pa). An increase of 10 dB is perceived as an approximate doubling of sound level by an average human ear.
Decommission	Safe removal of plant and equipment following the completion of mining operations.
Deformation	The distortion expressed in a deformed rock as a result of convergence or divergence.
Depauperate	Lacking in numbers or variety of species.
Dewater	Remove the water.
Dewatered Tailings	Tailings that have a moisture content that is less than the liquid limit.



TERM	DEFINITION
Discharge (artesian) Springs	Occurs where a confined aquifer is under hydrostatic pressure and groundwater can naturally discharge to the surface.
Dispersion modelling	Computer based software package used to mathematically simulate plume dispersion under varying atmospheric conditions; used to calculate spatial and temporal fields of concentrations due to emissions from various source types.
Dissolved solids	Organic and inorganic substances dissolved in water.
Diurnal	Of or during the day (i.e. not at night).
Drainage diversion	A constructed embankment and diversion channel to divert drainage features.
Drainage feature	A natural landscape feature, including a gully, drain, drainage depression or other erosion feature that: ● Is formed by the concentration of, or operates to confine or concentrate, overland flow water during and immediately after rainfall events; and ● Flows for only a short duration after a rainfall event, regardless of the frequency of flow events; and ● Commonly, does not have enough continuing flow to create a riverine environment.
Drilling and Blasting	A mining technique involving the controlled use of explosives and other methods to break rock for excavation.
Dust deposition rate	Deposition is the mass of particulate matter that settles per unit surface area. Deposited particulate matter is usually measured in grams per square metre per month (g/m ² /month) or milligrams per square metre per day (mg/m ² /day).
Dust or particulate matter	Terms used to define solid or liquid particles that may be suspended in the atmosphere. Particulate matter is a generic term that is commonly used interchangeably with other terms such as smoke, soot, haze and dust. The potential effect of particulate matter on the environment, human health and amenity depends on the size of the particles, the concentration of particulate matter in the atmosphere and the rate of deposition.
Dykes	A sheet of rock that is formed in a fracture in a pre-existing rock body.
Ecohydrogeological	The interaction between water and ecological systems.
Economic impact	Refers to the effect of a project on economic activity within a local area or region.
Ecosystem	An interacting system of animals, plants, other organisms and non-living parts of the environment.
Effluent	Liquid waste or discharged sewage.
Electrical conductivity	A measure of the amount of electrical current a material can carry.
Elliot trapping	Traps designed for live capture of small-medium mammals.
Elution circuit	A process to extract one material from another by washing with a solvent.
Emergency spillways	An overflow structure constructed to bypass flood water and prevent overtopping the waterbody.
Emissions Reduction Fund	The centrepiece of the Direct Action Plan, aiming to directly support CO ₂ emissions reduction activities by industry and business.
Endemic	Native and restricted to a certain place.



TERM	DEFINITION
ENM software	A general-purpose noise modelling package that combines terrain and noise source information with other input parameters such as weather conditions to predict noise levels at specific receptor locations or as contours over a specified receptor area.
Environmentally Relevant Activity	An activity that requires approval and monitoring by either Local Government or State Government due to its potential to impact the environment.
Ephemeral	Lasting for a very short time. In the case of drainage features/watercourses, where the flow only lasts for a very short time after precipitation, without any baseflow.
Epidemiological Study	Study considering the factors affecting the health and illnesses of individuals and populations.
Equivalent persons	The service demand estimated for an average occupant of an average residential dwelling.
Eromanga Basin	A large Mesozoic sedimentary basin located in central-eastern Australia that covers 1,000,000km ² .
Erosion	The wearing away of land surface by wind or water, intensified by land clearing practices related to farming, residential or industrial development, road building, or logging.
Estuary	The tidal mouth of a large river, where the tide meets the stream.
Eutrophication	A process in which a body of water becomes over-enriched with nutrients and minerals due to excessive plants and algae.
Evaporation	A process by which a liquid is transformed into vapour.
Exotic species	Organisms introduced to an area outside of their normal distribution.
Exploration boreholes	Holes dug into the earth to determine the location, depth, and amount of minerals (for exploration purposes).
Fauna	The animal life of a particular region or time.
Final void	The remaining pit after mining operations cease.
Flood Protection Levees	A man-made structure built to contain, control or divert the flow of water in order to provide protection from flooding.
Flora	The plant life of a particular region or time.
Flow events	Surface water flow that occurs as a result of rainfall.
Fly-in Fly-out	Involving or having a commute by air to a remote workplace.
Fragmentation	A landscape modification involving the separation of vegetation patches or ecosystems.
Freeboard capacity	The vertical distance between the operational water limit and the crest of the dam.
Frequency	The rate of sound pressure fluctuations per second, expressed as cycles per second or hertz (Hz). Human ears in good condition can typically detect sound in the frequency range 20 Hz to 20,000 Hz (20 kHz), depending on sound level.
Full Carbon Accounting Model	A calculation tool for modelling Australia's greenhouse gas emissions from the land sector.
Gazetted road	Roads listed on government maps that are considered to be public thoroughfare.



TERM	DEFINITION
Geocentric Datum of Australia 1994 (GDA94)	A coordinate system (latitude and longitude) for Australia.
Geochemical	Chemical compositions related to the geology of an area or sample.
Geological	Relating to the earth, the rocks of which it is composed, and the changes which it has undergone or is undergoing.
Geology	The study of the materials that make up the Earth.
Geothermal tenures	A geothermal permit or a geothermal lease.
General Ecological Significance Wetlands	Wetlands of general ecological significance that are mapped for the purpose of establishing environmental values and are not protected wetlands.
Gold doré	Solid bars containing gold alloy.
Greenfield	A site that is undeveloped, except for agricultural use.
Greenhouse Gas	A gas that may contribute to the total global warming effect. Includes carbon dioxide, methane, nitrous oxide and some fluorine containing compounds.
Groundwater Dependent Ecosystem	Ecosystems that require access to groundwater to meet all or some of their water requirements so as to maintain the communities of plants and animals, ecological processes they support, and ecosystem services they provide.
Groundwater drawdown	The lowering of the groundwater level due to an applied stress such as pumping a borehole.
Groundwater flows	The volume and direction of groundwater movement in the subsurface.
Groundwater inflows	The movement of groundwater into a place.
Groundwater Seepage	Groundwater discharge at the ground surface.
Groundwater table	The upper surface of groundwater.
Habitat	The native environment where a given animal or plant lives or grows, often described in terms of geography, climate and vegetation.
Hardstand area	A hard-surfaced area in which heavy vehicles can park or materials can be stored.
Harp trapping	A technique used to capture bats without exposing them to entanglement due to the lack of nets.
Heap Leach Pad	A large, engineered structure, lined with an impermeable layer of plastic where ore is heaped and treated with chemicals to dissolve a metal while protecting the environment.
Heap Leaching	An industrial mining process used to extract precious metals/minerals from low-grade ore using a series of chemical reactions to separate the precious metals/minerals from other materials.
High Ecological Significance Wetlands	Wetlands of high ecological significance located within Great Barrier Reef catchments.
Hydraulic groundwater gradient	The slope of the groundwater in the groundwater table.
Hydrocarbon	An organic compound consisting of only hydrogen and carbon atoms. Hydrocarbons are the principal constituents of petroleum and natural gas.



TERM	DEFINITION
Hydrogeology	The field of geology associated with the movement and distribution of water.
Hydro-stratigraphic unit	A geological formation, part of a formation, or a group of formations with similar hydrologic properties or characteristics relating to groundwater flow.
Hyporheic zone	The hyporheic zone is the region of sediment and porous space beneath and alongside a stream bed, where there is mixing of shallow groundwater and surface water.
Impermeable	A material that substances such as liquids or gasses cannot pass.
Influent	Flowing in. A stream or tributary which flows into another stream or lake.
Ions	An atom or molecule that carries a positive or negative electric charge due to losing or gaining one or more electrons.
Irrigation	The supply of water to land or crops to foster plant growth.
Isotainers	Containers used for the intermodal transport of liquids, powers and liquified gases safely.
Jaw crusher	A large piece of equipment used to crush rocks in mine and ore processing plants.
LA1	Noise level exceeded for 1% of the measurement period.
LA90	The A-weighted noise level exceeded 90% of the time (which can be thought of as the quietest 10% of the time) over a defined measurement period, usually 15 minutes or one hour, and widely accepted as the background noise level.
LAeq	The A-weighted equivalent continuous, or logarithmic average, noise level over a defined time period (usually 15 minutes or one hour) either measured or predicted at a specific location.
Lake Eyre Basin Springs Assessment Project	A two-year project that analysed the potential impacts of coal mining and coal seam gas developments on groundwater dependant ecosystems to supply up to date scientific baseline data to be used as part of the bioregional assessment.
Landholders	The owner or lessee of the land.
Leachate	The process of removing soluble matter(s) from soil or rock by water.
Leaching	The process of extracting a substance from a solid material that has come into contact with a liquid.
Levee	An embankment alongside a river constructed to prevent flooding.
LiDAR data	A remote sensing technology that creates 3D models of objects using laser lights that are reflected from the object, also known as Light Detection and Ranging.
Line of sight	A line of sight is a representative sight line drawn from a visual receptor to the project elements. Lines of sight are drawn from eye level and are used to evaluate the extent to which project elements would be visible at a receptor location.
Lithology	The general physical characteristics of the rocks in a particular area.
Macroinvertebrate	Animals without backbones large enough to be seen by the naked eye.
Macrophyte	An aquatic plant that is large enough to be visible to the naked eye.
Major ions	Elements present in natural waters at levels in the parts per million and higher range (e.g. Calcium, Magnesium, Sodium, Potassium and Sulfate).



TERM	DEFINITION
Maximum Instantaneous Charge	The total charge mass of explosives firing at one instant during a blast.
Metalliferous	Containing metal.
Metalloid	An element with chemical and physical properties that fall in between the metal and non-metal categories.
Metamorphic rock	A rock that has transformed its chemical qualities due to heat, pressure, or other natural processes.
Meteorological data	Data relating to the atmosphere such as wind, temperature, and air density.
MGA Zone 54	A coordinate system (using longitude) for Australia.
Microhabitats	A smaller part of the habitat that supports a distinct flora and fauna such as a boulder or fallen log.
Mine Life	The project mine life is approximately 11 years.
Mine Waste Material Management Plan	A plan that involves management measures for identifying, handling, storing and monitoring any potentially acid-forming mine waste materials.
Mining Lease	A license that allows you to conduct larger scale mining operations within an area.
Mitigation	The act of lessening in intensity, to prevent or make less severe.
Mount Isa to Townsville Economic Development Zone	A regional organisation representing seven LGAs across the northern parts of Queensland, including the Richmond, Flinders, McKinlay, Charters Towers and Townsville LGAs, and encompassing the towns of Mount Isa, Cloncurry, Julia Creek, Richmond, Hughenden, Charters Towers and Townsville.
Native Title	Native title is the recognition in Australian law that some Indigenous people continue to hold rights to their land and waters, which come from their traditional laws and customs.
Native Title Agreement	An agreement with the Native Title holder(s) in accordance with the provisions of the <i>Native Title Act 1993</i> (Cth).
Nearby regional community	For a large resource project, means a town: - Any part of which is within: - A 125km radius of the main access to the project; or - A greater or lesser radius decided by the Coordinator-General and notified in writing by the Coordinator-General to the owner of the project; and - That has a population of more than: 200 people; or - A smaller population decided by the Coordinator-General and notified in writing by the Coordinator-General to the owner of the project.
New economy minerals	A range of metals and mineral elements that are essential in the manufacture of emerging technologies and advanced electronics that will support the economy into the future.
Non-Indigenous Cultural Heritage	Non-Indigenous cultural heritage includes all objects or places that have cultural heritage significance unless solely through their association with Aboriginal or Torres Strait Islander Peoples' traditions or customs.



TERM	DEFINITION
Non-local workers	Any person engaged on the project who does not reside permanently in Richmond and commutes for block shift periods to the project site.
Non-use Management Area	If land cannot sustain a post-mining land use, then it is classified as a non-use management area.
Notifiable Activities	Activities that have been identified as having the potential to cause land contamination and defined under the <i>Environmental Protection Act 1994</i> (Qld).
Open-cut pit	A surface mining technique to extract rock or minerals from an open pit in the earth.
Ore	Natural rock or sediment that contains valuable minerals.
Organic	Relating to or derived from living matter.
Outcrop	Bedrock that is exposed on the Earth's surface.
Outcropping geological formations	Strata exposed at the ground surface due to erosion or other geological processes (e.g. uplift).
Overburden	Refers to the rock or soil overlying the gold deposit.
Overburden Emplacement	The area in which the waste material extracted to expose the gold deposit is stored.
Peak Particle Velocity	The maximum rate of change to ground displacement over a period of time from blasting operations.
Perennial	Living for several years (in regard to plants).
Permeability	The capacity of a material to transmit fluid.
PET Tax Richness	Equal to the number of families recorded in a sample from the orders <i>Plecoptera</i> , <i>Ephemeroptera</i> and <i>Trichoptera</i> . The three orders contain families sensitive to environmental change and, as such, low diversity of PET can imply a potential impact or a naturally depauperate system.
pH	A measure of acidity or alkalinity on a scale of 0-14. Neutral solutions have a value of 7, while acidic solutions have values less than 7, and alkaline solutions have values above 7.
Photovoltaic	The conversion of light into electricity.
Pitfall trapping	A sampling technique used to trap small animals using a wide-mouthed container that is sunk in the soil, so the opening is flush with the ground surface.
Plateau	A flat, elevated landform.
PM₁₀	Particulate matter with an aerodynamic diameter of 10 micrometres or less.
PM_{2.5}	Particulate matter with an aerodynamic diameter of 2.5 micrometres or less.
Pregnant leaching solution	A solution that contains dissolved gold.
Progressive Rehabilitation and Closure Plan	A plan that consists of a rehabilitation planning component and a Progressive Rehabilitation and Closure Plan (PRC Plan) schedule. The rehabilitation planning part provides evidence and justification to support the development of the PRC Plan schedule.



TERM	DEFINITION
Project Disturbance Footprint	The area that will be cleared for the project.
Quasi-equilibrium	A process in which the system remains nearly at equilibrium at all times.
Quaternary	The period of geological time beginning two to three million years ago and extending to the present.
Reagents	A substance or compound added to a system to induce a chemical reaction.
Recharge area	An area that supplies water to an aquifer.
Referable dam	A dam that poses risk to human life.
Regional Ecosystem	A vegetation community in a bioregion that is consistently associated with a particular combination of geology, landform and soil.
Regulated Waste	Wastes containing certain hazardous properties and classified as regulated waste in the <i>Environmental Protection Regulation 2019</i> (Qld).
Rehabilitation	Reshaping of a disturbed area to a geotechnically and geochemically stable condition, followed by revegetation.
Relative Humidity	The amount of water vapour in the air expressed as a percentage of the maximum amount that the air could hold at the given temperature.
Remnant Pools	Pools of water remaining in a channel.
Remnant Vegetation	Native vegetation remaining after an area has otherwise been cleared: consisting of more than 50% of the undisturbed predominant canopy; averaging more than 70% of the vegetation's undisturbed height; and composed of species characteristic of the vegetation's undisturbed predominant canopy.
Reporting Limit	The concentration of the chemical agent is lower than the instruments sensitivity and therefore cannot be measured.
Revegetation	The process of replanting and rebuilding the soil of disturbed land.
Riffle	A rocky or shallow part of a stream or river where the water flows brokenly.
Riparian	Pertaining to, or situated on, the bank of a body of water, such as a river.
Road Trains	A large lorry pulling one or more trailers.
Rock gabion weir	A weir constructed of a cage or box filled with rocks to protect the riverbed.
Runoff	The portion of rainfall that is not infiltrated or evaporated, and flows along the ground surface.
Sag mill	A mill used to grind rock.
Salinity	The concentration of dissolved salts within a body of water.
Scarp	A very steep bank or slope. An escarpment.
Sclerophyllus	A type of vegetation that has adapted to dry and hot conditions.
Sediment	Solid particles which tend to settle in a liquid.
Seepage	The slow escape of a liquid or gas through porous material or small holes.
Seismic surveys	A method of investigating subterranean structure.



TERM	DEFINITION
Sensitive receptors	Locations which may be sensitive to the noise and visual impacts of the project, such as residences.
Shannon-Wiener diversity index	A measure of diversity that combines species richness (the number of species in a given area) and their relative abundances.
SIGNAL index value	The Stream Invertebrate Grade Number Average Level (SIGNAL) is a biotic index for freshwater macroinvertebrates based on their sensitivity to pollution. Most freshwater macroinvertebrate families have been allocated a SIGNAL grade. These grades are then averaged over a sample to provide a SIGNAL Index Value for that sample.
Sludge	A thick, soft, and wet mud-like mixture of liquid and solid components.
Slurry	A thin mixture of an insoluble substance, as cement, clay, or coal, with a liquid, as water or oil.
Socio-economic	Of, or relating to, both social and economic considerations.
Soil amelioration	Inorganic and organic chemical soil conditioning products used as sources of calcium to increase soil quality.
Soil capillary fringe zone	The moisture saturated zone within the soil that is directly above the water table and below the boundary of saturation.
Soil Profile Class	Soils grouped into a single management unit on the basis of similar morphology, position on the landscape, substrate and chemistry.
Sound Power	Sound energy emitted by a source. Sound power levels are commonly measured in watts or expressed on a decibel scale with 1 dB representing 1 picowatt (1pW) of sound power.
Spillway	A passage for surplus water from a dam.
Spot Assessment Technique	A survey tool used to determine the presence of Koalas.
Spotter-catcher	A person qualified to take and keep protected wildlife under a current rehabilitation permit granted under the Nature Conservation (Animals) Regulation 2020 or previous regulations to authorise the take, keep or use of an animal whose habitat is about to be destroyed by human activity.
Standard Axle Repetition	A measure defining the cumulative damaging effect to the pavement of the actual traffic, it is expressed in terms of the equivalent number of 80kN axles on the pavement.
State Controlled Road	A road or land, or part of a road or land declared as such under Section 24 of the Transport Infrastructure Act 1994.
Stock route	A road that has been declared as a stock route under Queensland legislation or a route that is typically used for walking stock.
Strata	Layers of rock or soil with internally consistent characteristics that distinguish it from contiguous layers.
Stratigraphy	The structure of strata and their relationship to the geological timescale.
Stygofauna	Aquatic invertebrates that live within groundwater systems.



TERM	DEFINITION
Subsoil	The soil lying immediately under the surface soil.
Supernatant	Floating on the surface.
Surface water	Is defined in the Water Plan (Gulf) 2007 (Qld) as: water in a watercourse or lake; water in springs not connected to the Great Artesian Basin water; and overland flow water, other than water in springs connected to Great Artesian Basin water.
Tailings	The finely ground residue from ore extraction.
Taxa	A taxonomic group such as a species, family or class.
Taxonomic	Concerned with the classification of things, especially organisations.
Tertiary	The period of geological time from 63 million to 2 million years ago.
Topographic landform assessment	A type of land survey that assesses the natural or structural features of terrain such as elevation or depth.
Topography	The surface features of an area of land.
Topsoil	The upper most layer of soil where the highest concentration of organic matter and microorganisms are found. Often referred to as the "A" horizon.
Total Suspended Particles	Total suspended particles are particles that are generally up to 100 micrometres in diameter.
Trace Metals	Metals and metalloids that are present in very low (trace) concentrations.
Trackable Wastes	Regulated wastes requiring tracking in accordance with the provisions of the <i>Environmental Protection (Waste Management) Regulation 2000</i> (Qld).
Traditional Owner	An Aboriginal of Torres Strait Islander person who is a member of a local descent group having certain rights and responsibilities in relation to a tract of land or area of sea.
Transect	A straight line or narrow section through an object or natural feature or across the earth's surface, along which observations are made or measurements taken.
Transpiration	(of a plant or leaf) the exhalation of water vapour through the stomata.
Tributary	A river or stream flowing into a larger river or lake.
Taxonomic abundance	The total number of individuals of a taxa in an area, population or community.
Taxonomic richness	The number of different species present in an area, population or community.
Turbidity	A measure of the clarity of water.
Unallocated Water	Water reserved under water planning instruments for a variety of purposes (e.g. strategic or state reserve). This water can be made available for future use without compromising the security of existing water users <i>or the environmental values within a catchment</i> .
Underground water rights	Entitlement to the holder of a mining lease to take or interfere with underground water.
Vibrating wire piezometer arrays	A device used to measure pore water pressure.
Visual effects	A measure of the level of visual contrast between the project elements and the existing visual environment.



TERM	DEFINITION
Visual sensitivity	A measure of how critically the various components of a project are viewed by people utilising different land uses in the vicinity.
Waste	An unwanted by-product or surplus product, including a gas, liquid, solid or energy, from an industrial, commercial, domestic or other activity.
Waste rock	Ore that provides minimal or no economic value.
Waste Rock Dump	Areas containing an accumulation of waste rock.
Water entitlement	A water allocation, water licence or unallocated water reserve.
Water gauging station	A location on a body of water from which an observer or tool takes readings of the gauge height or discharge which is then used to make hydrological predictions and decisions.
Watercourse	As defined under the Water Act 2000 means a river, creek or other stream, including a stream in the form of an anabranch or a tributary, in which water flows permanently or intermittently, regardless of the frequency of flow events: ● In a natural channel, whether artificially modified or not; or ● In an artificial channel that has changed the course of the stream. A watercourse includes any of the following located in it: ● In-stream islands; ● Benches; and ● Bars.
Waterway Barrier Works	Structures such as culverts or dams that may inhibit fish passage.
Weathered profile	The weathered in-situ rocks of the Eromanga Basin and Proterozoic basement.
Wind direction	Australian convention is to report wind direction by the direction from which it originates. For example, wind from the east is reported with a wind direction = 90°.
Wind speed	The rate of movement of wind in distance per unit of time. When measured by an anemometer, this is a short-term average reading of horizontal wind vector magnitude, usually cited for measurement heights of 10 m.
Zone of drawdown	The area affected by a reduction in groundwater pressure or level.

ABBREVIATIONS





18 ABBREVIATIONS

The following abbreviations are commonly used throughout this Environmental Assessment Report.

ABBREVIATION/ ACRONYM	DEFINITION
% sat	Percent of saturation
µg	Micrograms
µg/l	Micrograms/litre
µg/m ³	Micrograms/cubic metre
µm	Micrometre
µS/cm	Microsiemens/centimetre
AADT	Annual Average Daily Traffic
ABS	Australian Bureau of Statistics
ACH Act	<i>Aboriginal Cultural Heritage Act 2003 (Qld)</i>
AEP	Annual Exceedance Probability
AHC	Australian Heritage Council
AHC Act	<i>Australian Heritage Council Act 2003 (Cth)</i>
AHD	Australian Height Datum
Air NEPM	Ambient Air Quality National Environment Protection Measure
Al	Aluminium
ANU	Australian National University
ANZG 2018	The Australian and New Zealand Guidelines for Fresh and Marine Water Quality (2018)
ARI	Average Recurrence Interval
As	Arsenic
AS	Australian Standard
ASBR	Activated Sludge Bioreactors
ATSIHP Act	<i>Aboriginal and Torres Strait Islander Heritage Protection Act 1984 (Cth)</i>
AUSRIVAS	Australian River Assessment System
B	Boron
BD	Business days
BIBO	Bus-in Bus-out
Biosecurity Act	<i>Biosecurity Act 2014 (Qld)</i>
BoM	Bureau of Meteorology
BPESC guidelines	Best Practice Erosion and Sediment Control guidelines



ABBREVIATION/ ACRONYM	DEFINITION
BVS	Big Vein South
BV1 and BV2	Two small satellite pits that will be mined in the first two years of operations
C&R	C&R Consulting Pty Ltd
Ca	Calcium
CALMET	Computer Aided Learning in Meteorology
CALPUFF	Advanced non-steady-state meteorological and air quality modeling system
Cd	Cadmium
CD (1-5)	Catch Dam (1-5)
CIL	Carbon-In-Leach
Cl	Chlorine
CLR	Contaminated Land Register
Co	Cobalt
CO	Carbon Monoxide
CO ₂	Carbon Dioxide
CO ₂ -e	Carbon Dioxide Equivalent
CPC	Co-placement Cell
Cr	Chromium
CSIRO	Commonwealth Scientific and Industrial Research Organisation
Cu	Copper
DAF	Queensland Department of Agriculture and Fisheries
dBA	Decibel (A-weighted)
dB	Decibel (linear)
DCCEW	Commonwealth Department of Climate Change, Energy, Environment and Water
DEH	Former Queensland Department of the Environment and Heritage
DES	Former Queensland Department of Environment and Science
DERM	Former Queensland Department of Environment and Resource Management
DETSI	Department of the Environment, Tourism, Science and Innovation
DEWHA	Former Commonwealth Department of the Environment, Water, Heritage and the Arts
DF	Drainage Feature
DLGWV	Department of Local Government, Water and Volunteers
DNRME	Former Queensland Department of Natural Resources, Mines and Energy
DO	Dissolved Oxygen
DPI	Department of Primary Industries



ABBREVIATION/ ACRONYM	DEFINITION
DRDMW	Queensland Department of Regional Development, Manufacturing and Water
DSDATSIP	Queensland Department of Seniors, Disability Services and Aboriginal and Torres Strait Islander Partnerships
DSDILGP	Former Queensland Department of State Development, Infrastructure, Local Government and Planning
DSDMIP	Department of State Development, Manufacturing, Infrastructure and Planning
DSEWPC	Former Commonwealth Department of Sustainability, Environment, Water, Population and Communities
DSITI	Former Queensland Department of Science, Information Technology and Innovation
DTMR	Department of Transport and Main Roads
EA	Environmental Authority
EAR	Environmental Assessment Report
EC	Electrical Conductivity
EcoSM	Eco Solutions & Management
EIS	Environmental Impact Statement
EMR	Environmental Management Register
ENM	Environmental Noise Model
EO Act	<i>Environmental Offsets Act 2014 (Qld)</i>
EO Regulation	<i>Environmental Offsets Regulation 2014 (Qld)</i>
EOW	End of waste
EP Act	<i>Environmental Protection Act 1994 (Qld)</i>
EP Regulation	<i>Environmental Protection Regulation 2019 (Qld)</i>
EPA	Former Queensland Environmental Protection Agency
EPBC Act	<i>Environment Protection and Biodiversity Conservation Act 1999 (Cth)</i>
EPM	Exploration Permit for Minerals (other than coal)
EPP	Exploration Permit for Petroleum
EPP	Environmental Protection Policy
EPP Air	<i>Environmental Protection (Air) Policy 2019 (Qld)</i>
EPP Noise	<i>Environmental Protection (Noise) Policy 2019 (Qld)</i>
EPP Water	<i>Environmental Protection (Water and Wetland Biodiversity) Policy 2019 (Qld)</i>
ERA	Environmentally Relevant Activity
ERF	Emissions Reduction Fund
ESCP	Erosion and Sediment Control Plan
ESE	East-south-east



ABBREVIATION/ ACRONYM	DEFINITION
ESL	Effect Screening Levels
EVNT	Endangered, Vulnerable or Near Threatened
FD	Farm Dam
Fe	Iron
FHA	Fish Habitat Area
FIFO	Fly-in Fly-out
Fisheries Act	<i>Fisheries Act 1994</i> (Qld)
FoS	Factor of Safety
FullCAM	Full Carbon Accounting Model
GAB	Great Artesian Basin
GABORA Water Plan	<i>Water Plan (Great Artesian Basin and Other Regional Aquifers) 2017</i> (Qld)
GDA94	Geocentric Datum of Australia 1994
GDE	Groundwater Dependent Ecosystem
GES	General Ecological Significance
GHG	Greenhouse Gas
GL	Giga Litre
GW	Groundwater
ha	Hectare
HEC	Hansen Environmental Consulting
HES	High Ecological Significance
HEV	High Ecological Value
Hg	Mercury
HLF	Heap Leach Facility
HRA	High-Risk Area
HSTP	Home Sewage Treatment Plant
HVs	Heavy Vehicles
Hz	Hertz
ID	Identification
IESC GDE Guideline	The Independent Expert Scientific Committee Information Guidelines Explanatory Note – Assessing Groundwater-Dependent Ecosystems
Investment Prospectus	New Economy Minerals: Investment Opportunities in Queensland's Minerals Provinces (2020)
K	Potassium
kg	Kilogram



ABBREVIATION/ ACRONYM	DEFINITION
kg/week	Kilograms per week
kL/day	Kilolitre per day
km	Kilometre
km ²	Kilometre squared
L	Litres
L/day	Litres per day
L/day/person	Litres per day per person
LA1	Noise level exceeded for 1% of the measurement period
LA1,15min	Noise level exceeded for 1% of a 15 minute period
LA90	Equivalent continuous noise level exceeded 90% of the time over a defined measurement period (i.e. usually 15 minutes or one hour)
LA90,15min	Equivalent continuous noise level exceeded 90% of a 15 minute period
LAeq	Equivalent continuous noise level over a defined time period (usually 15 minutes or one hour)
Laeq,15min	Equivalent continuous noise level over a 15 minute period
LAmx	Maximum sound level at an instant in time
LEBSA	Lake Eyre Basin Springs Assessment
LED	Light-emitting diode
LFC Tool	Landscape Fragmentation and Connectivity Tool
LGA	Local Government Area
LIDAR	Light Detection and Ranging
LOM	Life of Mine
LOR	Limit of Reporting
LSAT	Land Suitability Assessment Techniques
LVs	Light Vehicles
m	Metres
M	Million
m/s	Metres/second
m ²	Metres squared
mAHD	Metres Australian Height Datum
MAUSIMM	Member of the Australasian Institute of Mining and Metallurgy
MAX	Maximum
MERFP Act	<i>Mineral and Energy Resources (Financial Provisioning) Act 2018 (Qld)</i>
Mg	Magnesium



ABBREVIATION/ ACRONYM	DEFINITION
mg/L	Milligrams/Litre
mg/m ² /day	Milligrams/square metre/day
MGA	Metric Rectangular Grid System
MIA	Mine Infrastructure Area
MIC	Maximum Instantaneous Charge
MIN	Minimum
MITEZ	Mount Isa to Townsville Economic Development Zone
ML	Mining Lease
ML	Megalitres
ML/a	Megalitres/annum
MLpa	Megalitres per annum
ML/day	Megalitres per day
mm	Millimetres
mm/s	Millimetres per second
Mm ³	Million cubic metres
Mn	Manganese
MNES	Matters of National Environmental Significance
Mo	Molybdenum
MQSH Act	<i>Mining and Quarrying Safety and Health Act 1999</i> (Qld)
MR Act	<i>Mineral Resources Act 1989</i> (Qld)
MSES	Matters of State Environmental Significance
Mt	Million tonnes
Mtpa	Million tonnes per annum
MW	Megawatt
MWD	Mine Water Dam
MWMMP	Mine Waste Material Management Plan
N/A	Not applicable
Na	Sodium
NAF	Non-acid Forming
NAs	Notifiable Activities
NATA	National Association of Testing Authorities
NC Act	<i>Nature Conservation Act 1992</i> (Qld)
NC Animals Regulation	<i>Nature Conservation (Animals) Regulation 2020</i> (Qld)



ABBREVIATION/ ACRONYM	DEFINITION
NC Plants Regulation	<i>Nature Conservation (Plants) Regulation 2020 (Qld)</i>
NE	North-east
NEPC's	National Environmental Protection Council's
ng/m ³	Nanogram per cubic metre
NGER Act	<i>National Greenhouse and Energy Reporting Act 2007 (Cth)</i>
NGER Determination	<i>National Greenhouse and Energy Reporting (Measurement) Determination 2008</i>
NGER Regulations	<i>National Greenhouse and Energy Reporting Regulations 2008</i>
Ni	Nickel
NO.	Number
NO _x	Oxides of Nitrogen
NO ₂	Nitrogen dioxide
NPI	National Pollutant Inventory
NTU	Nephelometric Turbidity unit
NUMA	Non-Use Management Area
NW	North-west
NW Regional Plan	<i>The North West Regional Plan 2010-2031</i>
NWMP	North West Minerals Province
NWQROC	North West Queensland Regional Organisation of Councils
PAF	Potentially Acid Forming
Pb	Lead
PET	Number of Plecoptera, Ephemeroptera and Trichoptera families present at a site
pH	A measure of acidity or alkalinity on a scale of 0-14
Planning Act	<i>Planning Act 2016 (Qld)</i>
PM	Particulate matter
PM ₁₀	Particulate matter with a diameter less than 10 µm
PM _{2.5}	Particulate matter with a diameter less than 2.5 µm
PMLU	Post Mining Land Use
PPV	Peak Particle Velocity
PRCP	Progressive Rehabilitation and Closure Plan
Proponent	Strategic Minerals Corporation Pty Ltd
QEOP	<i>Queensland Environmental Offsets Policy 2020, Version 1.9</i>
QH Act	<i>Queensland Heritage Act 1992 (Qld)</i>
Qld	Queensland



ABBREVIATION/ ACRONYM	DEFINITION
QPS	Queensland Police Service
QRIDP	The Queensland Resources Industry Development Plan
R&D Roadmap	Research and Development Priorities for Minerals in Queensland
RCP	Representative Concentration Pathway
RE	Regional Ecosystem
REMP	Receiving Environment Monitoring Program
RGS	RGS Environmental Pty Ltd
ROM	Run-of-Mine
RPEQ	Registered Professional Engineer Queensland
RSC	Richmond Shire Council
SAR	Standard Axel Repetition
SAR4	Granular pavement with a load damage exponent of 4
SAT	Spot Assessment Technique
Se	Selenium
SIA	Social Impact Assessment
SIGNAL	Stream Invertebrate Grade Number – Average Level
SMC	Strategic Mineral Corporation Pty Ltd
SMP	Species Management Program
SO ₂	Sulfur Dioxide
SO ₄	Sulfate
SO _x	Oxides of Sulfur
SPRAT	Species Profile and Threats
SRI Guideline	<i>Queensland Environmental Offsets Policy: Significant Residual Impact Guideline</i>
SSRC Act	<i>Strong and Sustainable Resource Communities Act 2017 (Qld)</i>
STP	Sewage Treatment Plant
Strategic Blueprint for Queensland's NWMP	<i>Strategic Blueprint for Queensland's NWMP: Supporting Strong and Prosperous Regional Communities</i>
SW	South-west
SW (1-11)	Surface Water Monitoring Site
t	Tonnes
TAPM	The Air Pollution Model
TCEQ	The Texas Commission on Environment Quality
tCO _{2-e}	Tonnes of carbon dioxide equivalent
tCO _{2-e} /year	Tonnes of carbon dioxide equivalent/year



ABBREVIATION/ ACRONYM	DEFINITION
The project	Big Vein South Gold Project
TSC	Tailings Storage Cell
TSP	Total Suspended Particulates
Um	Ten one-thousandths
US EPA	United States Environmental Protection Agency
UWIR	Underground Water Impact Report
UWIR guideline	<i>The Department of Environment and Science guideline: Underground water impact reports and final reports</i>
VM Act	<i>Vegetation Management Act 1999 (Qld)</i>
VWP	Vibrating wire piezometer
WAD	Weak Acid Dissociable
Water Act	<i>Water Act 2000 (Qld)</i>
Water Plan	<i>Water Plan (Gulf) 2007 (Qld)</i>
WMS	Water Management System
WPA	Wetland Protection Area
WQO	Water Quality Objectives
WRD	Waste Rock Dump
WRR Act	<i>Waste Reduction and Recycling Act 2011 (Qld)</i>
WRR Regulation	<i>Waste Reduction and Recycling Regulation 2011 (Qld)</i>
WSSR Act	<i>Water Supply (Safety and Reliability) Act 2008 (Qld)</i>
Zn	Zinc

19

EAR STUDY TEAM





19 EAR STUDY TEAM

This Environmental Assessment Report (EAR) has been prepared by Hansen Environmental Consulting in association with a series of technical specialists. Table 19-1 lists the EAR components and study team members involved in researching, writing and reviewing each section.

Table 19-2 provides the qualifications and experience of the team members.

Table 19-1 EAR Study Team

SECTION	EAR COMPONENT	TEAM MEMBER	COMPANY
EAR MANAGEMENT			
	EAR Project Director	Peter Hansen	Hansen Environmental Consulting
	EAR Project Manager	Rebecca Miller	Hansen Environmental Consulting
EAR SPECIALIST REPORTS			
A	Geochemistry Report	Alan Robertson	RGS Environmental Consultants Pty Ltd
B	Soils Report	Reece McCann	GT Environmental Pty Ltd
C	Groundwater Report	Daniel Barclay	Hydrogeologist.com.au
D	Surface Water Report	Tim Wallis	Engeny Water Management
E	Terrestrial Ecology Report	Steve Marston	Eco Solutions & Management Pty Ltd (EcoSM)
F	Aquatic Ecology Report	Matthew Knott	C&R Consulting
G	Air Quality Report	Natalie Shaw	Katestone Environmental Pty Ltd
H	Noise and Vibration Report	Mark Bridges	Bridges Acoustics
I	Non-Indigenous Cultural Heritage Report	Tim Robins	Everick Heritage Pty Ltd
J	Progressive Rehabilitation and Closure Plan	Rebecca Miller Trent Cini, Craig Streatfeild	Hansen Environmental Consulting Strategic Minerals Corporation Pty Ltd (SMC)
	● Central WRD Conceptual Design Report	● John Milsom	● ATC Williams Pty Ltd
	● Final Void Stability Report	● Greg Kennedy, Alex Duran	● Pells Sullivan Meynink (PSM)
	● Mine Waste Storage Facilities Geotechnical Stability Report	● John Milsom, Ahmad Hakimi	● ATC Williams Pty Ltd
	● Final Landform Flood Modelling Assessment Report	● Andrew Vitale, Aaron Baldwin, Tim Wallis	● Engeny Water Management
K	Groundwater Dependent Ecosystems Report	Ross Edwards, Belinda Hayter	Hansen Environmental Consulting



SECTION	EAR COMPONENT	TEAM MEMBER	COMPANY
L	Greenhouse Gas Assessment Report	Alex Scholten, Carlo Bunin	Katestone Environmental Pty Ltd

Table 19-2 EAR Study Team Qualifications and Experience

TEAM MEMBER AND COMPANY	TITLE	QUALIFICATIONS	YEARS OF EXPERIENCE
Peter Hansen, Hansen Environmental Consulting	Director	BE(Hons)	31
Rebecca Miller, Hansen Environmental Consulting	Principal Environmental Scientist	BSc, MEnvSc	15
Ross Edwards, Hansen Environmental Consulting	Senior Environmental Scientist	BSc(Hons), MSc	18
Alan Robertson, RGS Environmental	Principal Geochemist / Director	PHD Pure and Applied Chemistry, MAUSIMM	28
Reece McCann, GT Environmental	Associate Environmental Scientist	BEnvTech	15+
Daniel Barclay, Hydrogeologist.com.au	Principal Hydrogeologist	BAppSC(Hons)	20+
Tim Wallis, Engeny Water Management	Principal Engineer	BEng(Hons)	12+
Steve Marston, EcoSM	Principal Ecologist	BEnvEng(Hons), MWildMgt	24
Matthew Knott, C&R Consulting	Senior Scientist (Aquatic Ecology) / Manager	BSc(Hons)	15+
Natalie Shaw, Katestone Environmental Pty Ltd	Principal Consultant	BASc, MAppSc	21
Mark Bridges, Bridges Acoustics	Principal Consultant	BE Mech(Hons) MAAS	26
Tim Robins, Everick Heritage Pty Ltd	Director	BArch(Hons), BIntPol, LLBIntLaw	15

Personnel representing the proponent were involved in providing project information, including mine plans, production rates, mine scheduling, proposed infrastructure and proposed tenement arrangements. The proponent also prepared the PRCP Public Interest Consideration Report.