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## Document control

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## Executive summary

This report provides a hazardous substances assessment ("HSA") to support the resource consent application for the Macraes Phase Four Project ("MP4"), proposed by OceanaGold (New Zealand) Limited ("OGNZL"). MP4 seeks to extend the operational life of the Macraes Operation through open pit and underground mine expansions, tailings and waste rock management, water infrastructure upgrades, and associated ancillary works. The assessment was prepared by Tonkin & Taylor Ltd (T+T) to evaluate the effects associated with the storage and use of hazardous substances on and around the site.

Hazardous substances will be stored and used at existing and proposed facilities including the Processing Plant, the Golden Point Underground Mine ("GPUG") explosives and oxidiser storage areas, bulk diesel refuelling areas distributed across the mine, the relocated Open Pit Workshop, and the proposed WTP. The activities include the storage and use of explosives and oxidisers for blasting, sodium cyanide and corrosive or oxidising process reagents for gold recovery, corrosive and toxic substances for water treatment, workshop gases, fuels, maintenance oils, and greases. Hazardous substance storage in the proposed ecological enhancement areas will be limited to small quantities of agrichemicals and fuel for maintenance activities.

The storage and use of hazardous substances in New Zealand are primarily governed by the Health and Safety at Work (Hazardous Substances) Regulations 2017, which specify control measures triggered by the volumes and types of substances used. Additional provisions apply under the Hazardous Substances and New Organisms Act 1996 and the Resource Management Act 1991, as implemented through Chapter 16 (Hazardous Substances) of the Operative Waitaki District Plan ("WDP") and the relevant rules of the Dunedin City second-generation District Plan ("2GDP") for activities in the northernmost mine areas.

The proposed activities require resource consent as a Discretionary activity under the WDP, as quantities of explosives, oxidisers, bulk gases, flammable and corrosive liquids, and self-heating substances at the Processing Plant, GPUG Class 1 explosives storage facility, diesel storage at the Open Pit Workshop and across the mine areas, Class 5 reload depot, and proposed WTP exceed the permitted activity thresholds set out in Schedule 1 of the WDP. Two proposed bulk diesel tanks in the Coronation and Coronation North mining areas require resource consent as a Restricted Discretionary activity under the 2GDP, as they exceed the permitted exemption threshold for above-ground diesel storage.

This assessment has evaluated hazards and risks in accordance with the Ministry for the Environment's Guidance for Hazardous Facilities (2000) and with supplementary reference to the New South Wales Department of Planning's Hazardous Industry Planning Advisory Paper series. The key risks identified for MP4 include:

- Risk to people or property from fire or detonation at the Class 1 explosives magazine, Class 5 oxidiser reload depot, Processing Plant, or bulk diesel refuelling areas;
- Risk to ecosystems from spills of diesel during tank filling or in-situ mobile refuelling operations; and
- Risk to ecosystems from spills or leaks of environmentally hazardous liquids, such as cyanide solution, processing reagents, corrosive water-treatment chemicals, or maintenance products, during storage, delivery, and use.

The risks to people, property, and the environment from an unintended detonation at the Class 1 explosives storage facility at GPUG are assessed as low.

This is due to detonation risks being controlled through design (including separation distances, certified relocatable magazine construction, lightning protection, and segregation from the Class 5 reload depot) and management procedures (including independent compliance certification, restricted access to certified handlers only, and emergency response planning). While the Golden Point Historic Reserve falls partially within the 2–3.5 kPa blast overpressure radius, the injury probability at this level is described as very low by HIPAP-4 and the reserve is not permanently occupied. The large separation distances provided between the hazardous substances storage activities and dwellings and the MP4 boundary mean that the effects of the explosive materials on people and property are less than minor.

The risks associated with fire at the fuel storage, bulk oxidiser, or Processing Plant areas are likewise low, and are mitigated through separation of incompatible substances, restriction of ignition sources, personnel access restrictions, security monitoring, provision of fire-fighting equipment and staff emergency response training. All storage areas in designated areas with restricted public access within the MP4 landholding and are more than 2 km from the nearest dwellings.

The off-site environment is sensitive to the ecotoxic effects of a spill of diesel, cyanide, corrosive liquids or packaged ecotoxic liquids reaching nearby natural waterways including Murphys Creek, Highlay Creek, Waikouaiti River (North Branch) and Tipperary Creek. These risks will be managed through engineered and operational controls, including:

- The use of double-skinned or bunded tanks and storage areas for all bulk hazardous liquids;
- Automated shut-off devices on dispensing pumps and interlocked control systems to prevent tank overflows;
- Surface water collection via sumps, silt ponds, and the Enviro Pond for containment of runoff arising from around the bulk hazardous substances storage areas; and
- Procedures for hazardous substances handling, inventory management, spill response, and waste disposal, as detailed in the Principal Hazard Management Plan – Hazardous Substances and associated site management plans.

Taking into account these controls, the overall effects on the environment from the use and storage of hazardous substances as part of MP4 have been assessed as less than minor.

# 1 Introduction

## 1.1 Overview

OceanaGold (New Zealand) Limited (“**OGNZL**”) currently undertakes open pit and underground gold mining operations at the Macraes Operation located at Golden Point Road, Macraes Flat, East Otago. As part of their ongoing operations, OGNZL continually review the remaining life of the Macraes Operation in light of updated knowledge of the gold resource and the economics of mining.

Reflecting recent exploration success and optimisation work, together with higher gold prices, the Macraes Phase Four Project (“**MP4**” or “**the Project**”) seeks to extend the life of mining at the Macraes Operation until at least 2039. The Project, which will enable ongoing gold production at a rate of approximate 130,000 ounces per annum, is identified as a Listed Project in Schedule 2 of the Fast-track Approvals Act 2024 (“**FTAA**”) as a project providing significant national or regional benefits.

To support the development of the substantive application for the Project, OGNZL has engaged **Tonkin & Taylor Limited**<sup>1</sup> to provide an assessment of the Project’s effects associated with storage and use of hazardous substances and, to the extent required, identify any necessary management and operational measures to address any such effects.

This scope of this report is set out in Section 1.4.

## 1.2 Site description

OGNZL owns and operates the Macraes Operation at Macraes Flat, approximately 30 km northwest of Palmerston in the Otago Region. The Macraes Operation is the largest gold mine in New Zealand and, since commissioning in 1990, has produced more than 5 million ounces of gold.

Macraes Flat is situated on an elevated plateau at approximately 500 m above sea level. The plateau is flanked by the Taieri Ridge to the northwest, Shag Valley and Horse Range to the east, and the coastal hills and extinct volcanic cones of Palmerston and Waikouaiti to the southeast. Macraes Road provides access to Macraes Flat and the Macraes Operation, connecting to State Highway 85 to the east and State Highway 87 (SH87, the Middlemarch–Hyde Road) to the west.

The environment within and surrounding the Macraes Operation has been shaped by historic and current mining activities. Figure 1.1 shows the arrangement of the major mine features at the Macraes Operation. In summary, the current components of the Macraes Operation include:

- Numerous open pits (both operational and non-operational);
- Two underground mines (Fraser’s, now closed, and Golden Point, which is actively mined);
- Waste rock stacks at various stages of operation and rehabilitation;
- A network of haul roads and general mine service tracks;
- A Processing Plant;
- Five tailings storage facilities (three inactive, one active but nearing capacity, and one under construction and currently receiving tailings);
- An extensive network of water management infrastructure, including diversion drains, silt ponds, sumps, pit lakes, and freshwater storage reservoirs;
- Two consented but not yet constructed water storage reservoirs (Camp Creek Dam and Coal Creek Dam); and

<sup>1</sup> Variation Order – Macraes Phase 4 Fast Track Application – Hazardous Substances, dated 25 February 2026 and Master Consulting Agreement (reference: OGN-3269) dated 11 April 2022.



- Associated infrastructure supporting ongoing operations, including district roads, powerlines, workshops, offices, and associated water and amenity facilities.

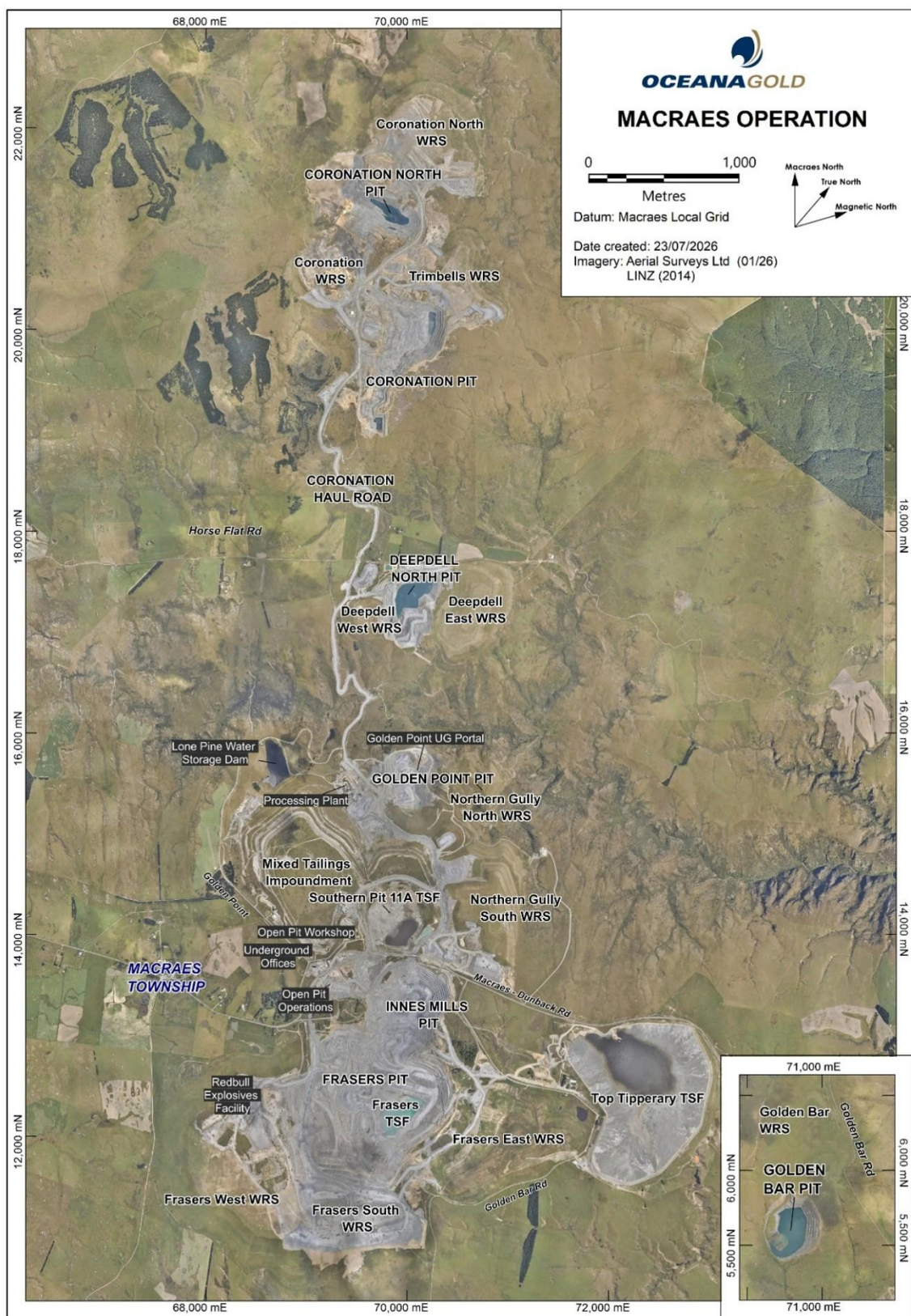


Figure 1.1: Existing site layout at the Macraes Operation.

### 1.3 Project summary

The Project is made up of the following proposed key activities:

- **Open pit extensions** at Coronation, Coronation North Innes Mills and Golden Bar.
- **Underground mine expansion** through further development of the Golden Point Underground mine (“GPUG”).
- **Tailings management**, including:
  - Construction of the Frasers Tailings Storage Facility (“FTSF”) Stage 3 to accommodate a total tailings storage of up to 153 Mt; and
  - Hydraulic mining and relocation of tailings from the Mixed Tailings Impoundment (“MTI”), Southern Pit Option 10 TSF (“SP10”), and Southern Pit Option 11A TSF (“SP11”) to FTSF.
- **Waste rock disposal**, including increased storage capacity within open pits and at existing waste rock stacks at Coronation, Coronation North, Innes Mills, Golden Bar, Golden Point, and Frasers.
- **Water management infrastructure and operations**, including:
  - Construction of Camp Creek and Coal Creek water storage dams for flow and water quality management;
  - Construction, operation and maintenance of a Water Treatment Plant; and
  - Ongoing operation and management of the Mine Water Management System (“MWMS”).
- **Infrastructure and roading works**, including:
  - Realignment of Macraes Road in two stages; and
  - Relocation of the Open Pit Mining Workshop.
- **Ecological enhancements**, including establishment of:
  - Establishment of the Murphys Ecological Enhancement Area (“MEEA”) near Murphys Creek, including predator-proof fencing, access tracks, and site facilities;
  - Mt Highlay restoration area;
  - Cranky Jims Link shrubland enhancement area;
  - Murphys Link tussock protection area; and
  - Additional compensation measures for residual ecological impacts.
- **Mine closure and rehabilitation activities**, including rehabilitation of mining landforms, creation of pit lakes, dry capping of tailings storage facilities, and revegetation in accordance with existing closure objectives.

In relation to the above components of the Project, resource consent is being sought for the continued use and storage of hazardous substances at this site, include in connection with operation of the Processing Plant. The Processing Plant is not described in detail in Section A.06 of the substantive application, due to its status as an operational consented activity. Aspects of the operation of the Processing Plant relevant to hazardous substances risks are described in Section 3.2.1 of this report.

## 1.4 Scope of hazardous substances assessment

The purpose of this report is to describe the existing and proposed activities associated with the Project that involve the storage or use of hazardous substances, and to provide a technical assessment of their actual and potential effects. The assessment includes consideration of both direct and cumulative impacts.

The assessment has been prepared following guidance contained in the listed reference documents below:

- Assessment Guide for Hazardous Facilities, Ministry for the Environment, 2000.
- Hazardous Industry Planning Advisory Paper No.4, Risk Criteria for Land Use Safety Planning. State of New South Wales through the Department of Planning, 2011.
- Hazardous Industry Planning Advisory Paper Assessment Guideline Multi-level Risk Assessment. State of New South Wales through the Department of Planning, 2011.
- Land Use Planning Guide for Hazardous Facilities, Ministry for the Environment, 2002.

MP4 extends the operational life of the Macraes Operation and involves the ongoing use and storage of hazardous substances in connection with the mining operations. This assessment addresses the hazardous substances aspects of the existing Macraes Operation facilities including the Processing Plant, refuelling bays, workshops and explosives storage but excludes Redbull Powder Company Limited (“Redbull”) operated facilities as discussed below. While existing resource consent provide for the use and storage of hazardous substances at the site OGNZL is applying for resource consent as part of MP4 to provide for the ongoing use and storage of hazardous substances for the lifetime of the MP4 works. Therefore, the existing facilities are included in this assessment alongside key changes to site operations arising as part of MP4 include the relocation of the existing Open Pit Workshop facilities, establishment of a new Water Treatment Plant and new refuelling facilities to support open pit mining activities. We note that there are no changes to the operation of the Processing Plant proposed as part of MP4.

The Redbull explosives manufacturing and magazine storage areas on the western side of the Frasers West Waste Rock Stack are authorised by land use consent LRC 201.2012.210 held by OGNZL. Therefore, these facilities are not assessed directly in this assessment but are considered in relation to potential cumulative effects.

Key changes to site operations arising as part of MP4 include the relocation of the existing Open Pit Workshop facilities and establishment of new refuelling facilities to support open pit mining activities.

## 2 Environmental setting

### 2.1 Sensitivity of developed land use

Macraes Village is located approximately 1.2 km west of the Macraes Operation. There are land uses within the village that are sensitive to the effects of inappropriate use and storage of hazardous substances including residential properties, a school and recreational space. In addition to sensitive land uses within Macraes Village, there are also other sensitive land uses in the form of rural residential dwellings in the area surrounding the Project. These are identified in Figure 2.1 and Figure 2.2.

The greatest concentration of residential receptors in the vicinity of the Project is the Macraes Village. OGNZL owns a number of properties within the township, while others are privately owned. In addition to the Macraes Village, rural residential dwellings are also located around the various Project sub-areas. Notwithstanding this, the residential dwellings owned by OGNZL within Macraes Village are located in between privately owned residences, including the closest residence to the Mine at 1668 Macraes Road. Accordingly, the impacts at the OGNZL-owned properties will be of a similar or lower magnitude of effect than at the privately owned receptors.

The Golden Point Historic Reserve is located within the wider Macraes Operation area on land owned by the Department of Conservation (“DOC”). It includes historical gold mining machinery and buildings, it is open to the public for recreational use, although overnight camping is not allowed. The closest hazardous substances storage and use activities to the Reserve include diesel tanks (approximately 250 m southwest of the Reserve boundary), the proposed Water Treatment Plant (150 m south), the Class 5 reload depot at the GPUG portal (200 m southeast) and the Processing Plant (420 m southwest). Given the Reserve’s context as a historical mining location within a wider operational mining site, and the short-term nature of people’s visits, the Reserve has been characterised as having a low sensitivity to effects on human health in the event of a spill or release of hazardous substances and moderate sensitivity to effects on property from hazardous substances.



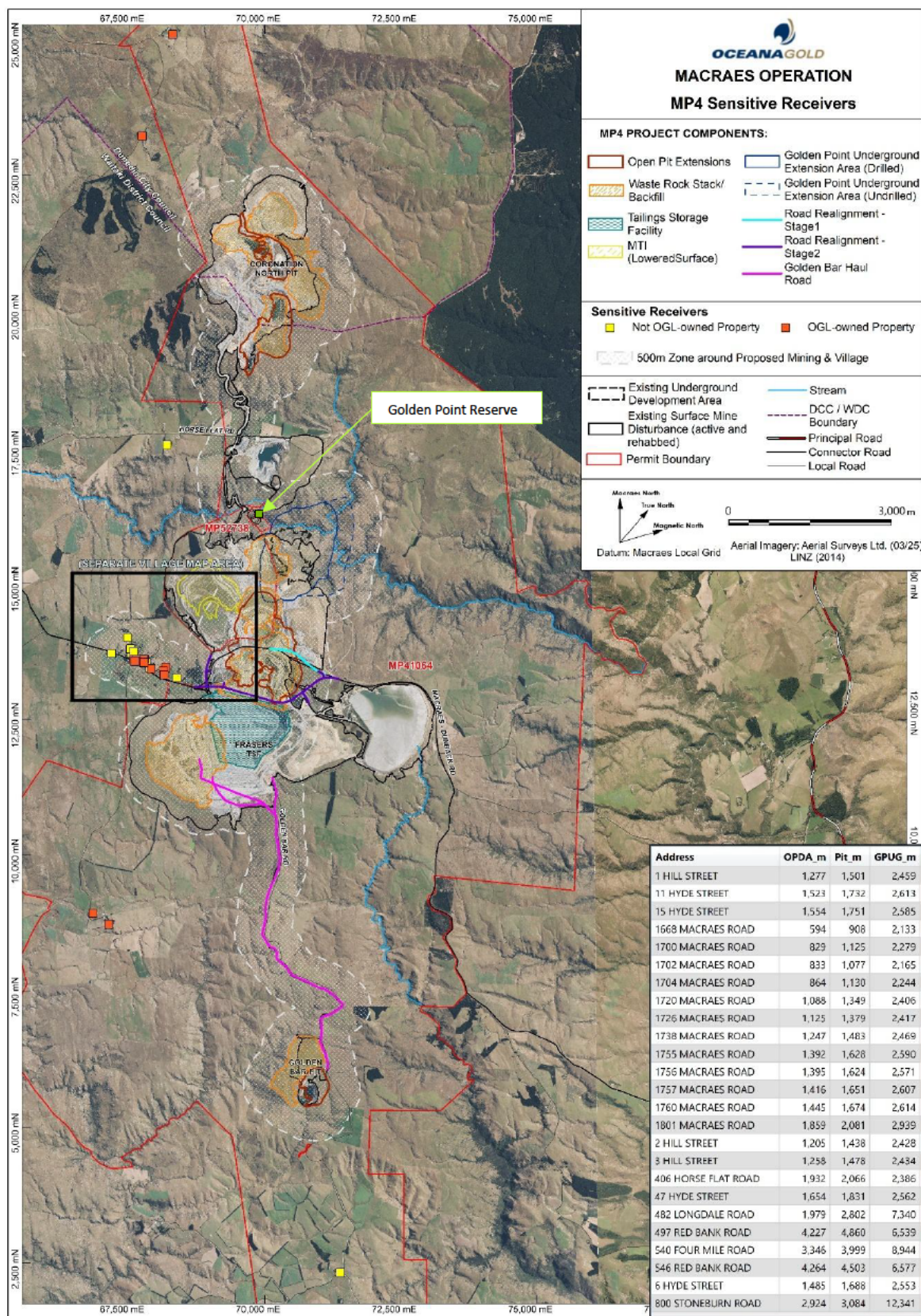


Figure 2.1: Sensitive receptors surrounding the Macraes Operation.



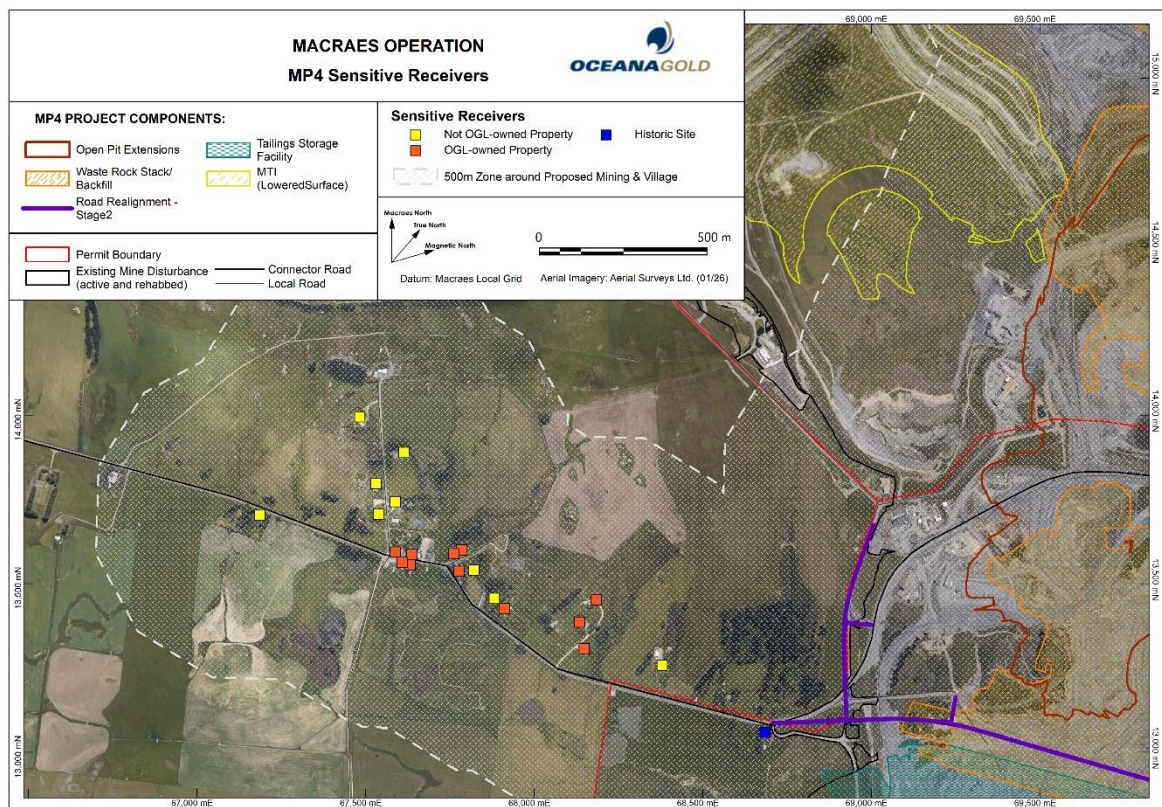


Figure 2.2: Sensitive receptors within Macraes Village.

## 2.2 Sensitivity of local ecology

The areas currently used for hazardous substances storage within the Macraes Operation are highly modified by land disturbance associated with mining activity, or historic disturbance associated with farming.

The nearest natural waterways are Deepdell Creek, Murphys Creek, Highlay Creek, Waikouaiti River (North Branch) and Tipperary Creek. Of these, Deepdell Creek is closest to the existing hazardous substances activities; its nearest tributary is approximately 300 m from the Processing Plant. In the areas likely to be part of mine development, the waterways have been identified as having limited aquatic value. However, the middle and lower reaches of the affected catchments generally have higher quality aquatic values, with healthier invertebrate and fish communities. For the purpose of this assessment, while waterways close to the Macraes Operation are modified, it is considered that they should be treated as having a high sensitivity to the effects of an uncontrolled spill of hazardous substances.

We understand that the open pits in the Macraes Operation produce only a small quantity of groundwater, which is managed by pumping to the surface water management network. Natural flow of groundwater follows the topography and discharges to the local surface waterways described above.

As part of the MP4 project, OGNZL propose to install a Water Treatment Plant<sup>2</sup> to manage the mine-influenced water (see Section 3.3.2) and facilitate removal of metals and sulphates.

<sup>2</sup> Process Flow Limited, *Macraes Phase Four Project (MP4) – Active Water Treatment Study*. August 2026.

### 3 Activity description

#### 3.1 Overview

The key activities relevant to the storage and use of hazardous substances include:

- The Processing Plant area, which includes the equipment and reagents for extracting gold from the ore material and the BOC Oxygen Plant;
- The Open Pit Workshop, which will be relocated as part of MP4;
- The proposed new Water Treatment Plant, which is likely to use corrosive reagents for pretreatment and cleaning products for maintenance of the equipment;
- Surface storage of Class 1 bulk explosives at GPUG;
- The Class 5 oxidising solid reload depot ("Class 5 reload depot") for storage of precursors to explosives; and
- Bulk diesel and oil storage for refuelling heaving mining machinery.

Facilities that are separately authorised are not included in the scope of the assessment.

**Table 3.1: Overview of hazardous substances storage and use associated with each area**

| Area                                            | Relevant hazardous substances activity                                                                                                                                                                                                                                                |
|-------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coronation and Coronation North Pit Extension   | Bulk diesel tanks and refuelling bay for supply of fuel to equipment.<br>Use of fuels in mobile refuelling tankers for delivery to equipment in-situ.<br>Use of explosives (Class 1) and explosives precursors (Class 5) for blasting.                                                |
| Proposed Water Treatment Plant                  | Storage and use of bulk corrosive reagents and low hazard flocculants and coagulants for pretreatment.<br>Small tanks for cleaning products (e.g. caustic soda, sodium hypochlorite) for maintenance of the reverse osmosis plant.                                                    |
| Processing Plant                                | Storage and use of bulk reagents for ore processing, bulk LPG and bulk liquefied oxygen.<br>Collection of mercury from the ore for safe disposal.<br>The Processing Plant area also contains maintenance workshops, a laboratory and office activities.                               |
| Innes Mill Open Pit Extension                   | Bulk diesel tanks and refuelling bay for supply of fuel to equipment.<br>Use of fuels in mobile refuelling tankers for delivery to equipment in-situ.<br>Use of explosives (Class 1) and explosives precursors (Class 5) for blasting.                                                |
| Golden Point Underground Extension              | Bulk diesel tanks and refuelling bay for supply of fuel to equipment.<br>Use of fuels in mobile refuelling tankers for delivery to equipment in-situ.<br>Storage and use of explosives (Class 1) and explosives precursors (Class 5) for blasting in the existing GPUG service areas. |
| Frasers Open Pit/Frasers Tails Storage Facility | Use of fuels in mobile refuelling tankers for delivery to equipment in-situ.<br>Use of explosives (Class 1) and explosives precursors (Class 5) for blasting.<br>No ongoing storage of hazardous substances.                                                                          |
| Hydraulic mining of SP11 and MTI mining         | Bulk diesel tanks and refuelling bay for supply of fuel to equipment.<br>Use of fuels in mobile refuelling of equipment in-situ.                                                                                                                                                      |
| Waste Rock Disposal areas                       | Various locations across the Macraes Operation.<br>Use of fuels in mobile refuelling tankers for delivery to equipment in-situ.<br>No ongoing storage of hazardous substances.                                                                                                        |

| Area                         | Relevant hazardous substances activity                                                                                                                                                                       |
|------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Golden Bar Mining Area       | Use of fuels in mobile refuelling tankers for delivery to equipment in-situ.<br>Use of explosives (Class 1) and explosives precursors (Class 5) for blasting.<br>No ongoing storage of hazardous substances. |
| Ecological Enhancement Areas | Storage and use of fuels for refuelling equipment.<br>Storage and use of agrichemicals (herbicides, pesticides) for pest management.                                                                         |
| Dams and reservoirs          | No ongoing storage of hazardous substances.                                                                                                                                                                  |

## 3.2 Existing facilities

### 3.2.1 Processing plant

The Processing Plant treats sulphide ore from open-pit and underground operations using physical and chemical processes involving crushing, grinding, flotation, pressure oxidation ("POX"), Carbon-in-Leach ("CIL"), elution, electrowinning, and smelting. Tailings streams from the flotation and detoxified CIL are discharged to the tailings storage facility ("TSF"), with decanted water recovered and recycled to the Processing Plant. A flow schematic is shown as Figure 3.1.

As well as the main ore processing facilities, the Processing Plant area includes an Air Separation Unit ("Oxygen Plant") operated by BOC for generation of compressed oxygen and nitrogen, a metallurgical laboratory for quality control, workshops for plant maintenance and staff offices.

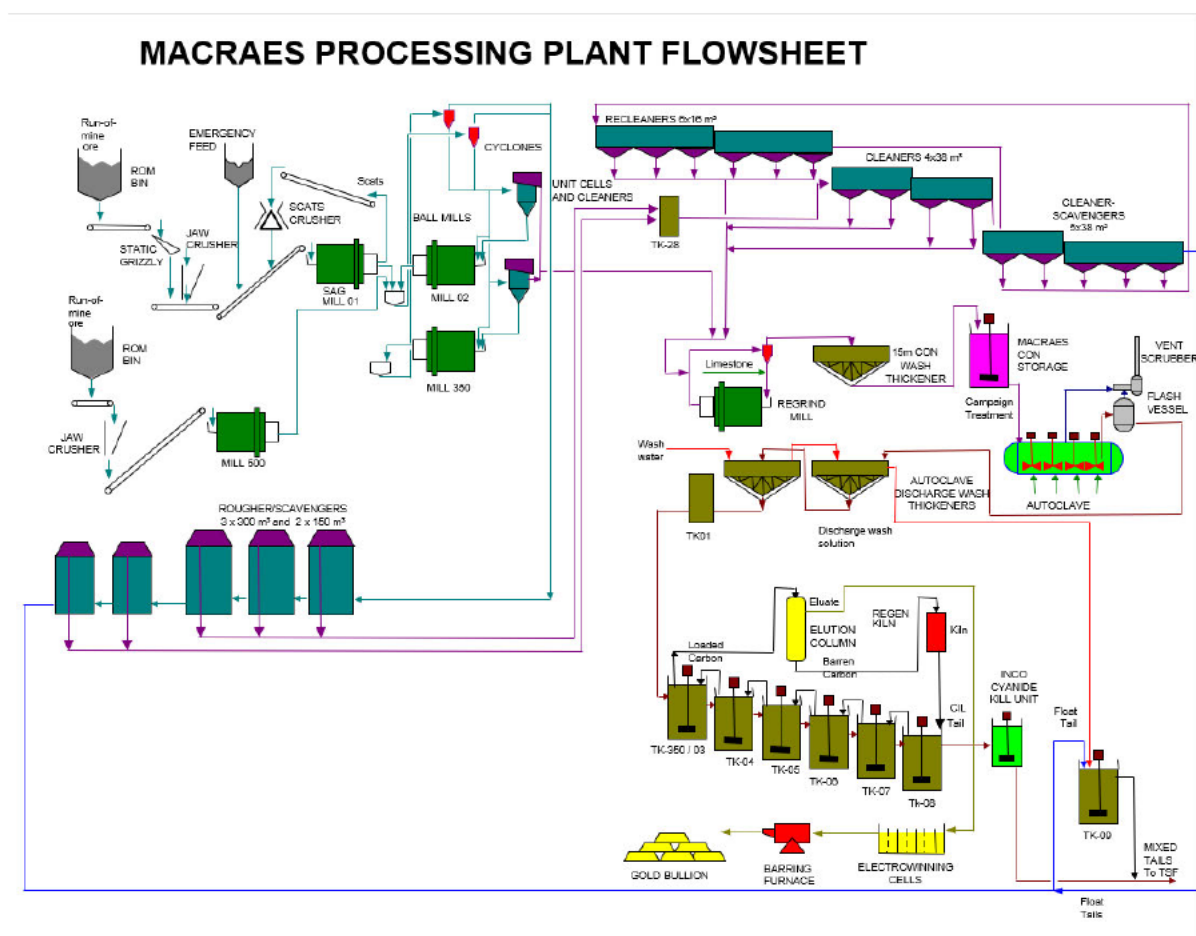


Figure 3.1: Schematic Flow Sheet for Macraes Processing Plant.

Source: OGNZL.



Key substances used in the Processing Plant include:

- **Bulk gas storage:**
  - Oxidising gas (liquefied oxygen) produced in the air separation unit operated by BOC in the Processing Plant area. The BOC plant holds 162 tonnes of oxygen across three pressure vessels and dispenses compressed oxygen into packs of ten cylinders (87 m<sup>3</sup> per pack) for use on site. Compressed nitrogen is a by-product of the air separation unit and is stored in a pressure vessel holding 5 tonnes.
  - Highly flammable Liquefied Petroleum Gas (“LPG”) in a 50-tonne (100,000 L) pressure vessel.
  - Cylinder storage areas for flammable gases (acetylene and LPG), oxygen, nitrous oxide and non-hazardous compressed gases (nitrogen, argon).
- **Bulk hazardous solids storage:**
  - Corrosive High-Calcium Quicklime (150 tonnes) and soda ash (sodium carbonate) (100 tonnes) each in a silo.
  - Highly acute toxic and ecotoxic solid sodium cyanide (120,000 kg).
  - Low acute or chronic toxicity solids copper sulphate pentahydrate, sodium metabisulphite, sulphamic acid, borax.
  - Self-heating solid sodium isobutyl xanthate (“SIBX”).
  - Oxidising solid potassium nitrate.
- **Hazardous liquid tanks**
  - Bulk tanks and mixing tanks of varyingly toxic and corrosive liquids including cyanide solution, copper sulphate pentahydrate solution, sodium metabisulphite solution, SIBX solution, soda ash (sodium carbonate solution), caustic soda (sodium hydroxide solution) and nitric acid.
- **Packaged hazardous substances:**
  - Frothing agents for use in the flotation circuit.
  - Laboratory chemicals (smaller units of reagents, acids, fluxing agent).
  - Flammable liquids (e.g. paints, kerosene).
  - Packaged corrosive and oxidising liquids (e.g. hydrochloric acid and nitric acid).
  - Cleaning products and maintenance oils.

In addition to gold and silver, some other metals and metalloids are found at elevated concentrations in the geology in and around Macraes Flat. Without effective management, mercury within the ore would be released to the environment through stack discharges at the Processing Plant<sup>3</sup>. OGNZL operate a mercury retort oven in the Gold Room of the electrowinning building to condense mercury vapour from the waste gas stream and retain it as a liquid for safe disposal, minimising the discharges to air.

An overview of the dedicated storage areas at the Processing Plant are shown in Figure 3.2.

No new hazardous substances are proposed to be used in the Processing Plant as part of the MP4 Project.

<sup>3</sup> Discharges to air from this activity are the subject of a separate assessment prepared by Tonkin & Taylor Limited, *Macraes Phase 4 Project - Fast-track Approvals Act 2024 application – Air Quality Assessment*, dated August 2026.

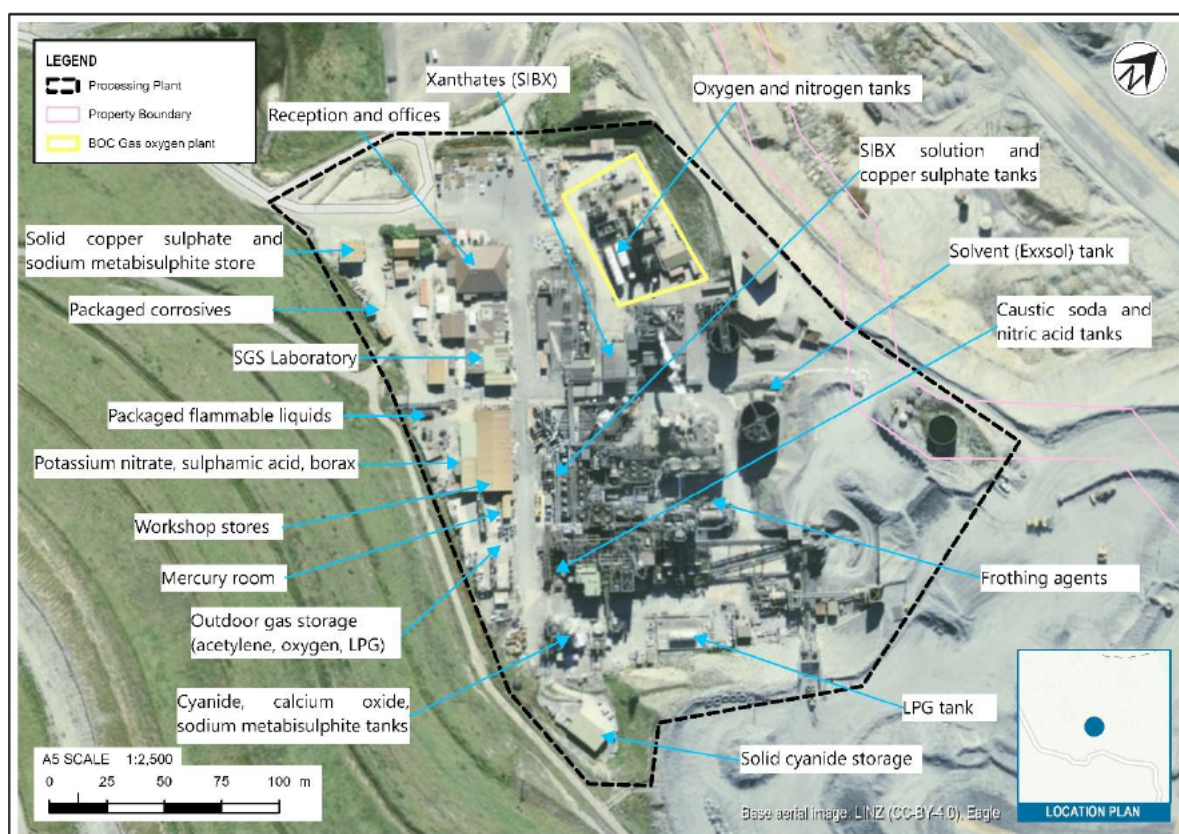


Figure 3.2: Processing Plant.

### 3.2.2 Explosives

OGNZL operates a Class 1 explosives storage facility to service ongoing mining operations at the Golden Point Underground Mine. Table 3.2 details the existing explosives storage quantities, which are not proposed to change as a result of the MP4 project. These are identified for the purpose of evaluating the potential for cumulative effects.

The Class 1 explosives storage site consists of a levelled area of road base on which relocatable magazines (storage containers) are located within a perimeter of secure alarmed fencing. Bulk oxidisers (precursors for explosives) are stored at the GPUG Class 5 reload depot area, over 650 m northwest of the Class 1 magazine.

Table 3.2: Explosives magazine operated by OGNZL

| Location                                     | Substances stored                                | Quantity                                              |
|----------------------------------------------|--------------------------------------------------|-------------------------------------------------------|
| GPUG Mine Explosive Reserve, Macraes Flat    | Mass explosion blasting explosives (Class 1.1D). | 20,000 kg across two approved magazines.              |
|                                              | Mass explosion detonators (Class 1.1B).          | 70 kg (70,000 units) across three approved magazines. |
| GPUG Mine Class 5 Reload Depot, Macraes Flat | Ammonium nitrate emulsion (ANE) (Class 5.1.1B).  | 63,000 kg.                                            |
|                                              | Sodium nitrite (Class 5.1.1C).                   | 2,500 kg.                                             |

Redbull operate a Class 1 storage area, Class 5 oxidiser storage and explosives reload depot locations west of Frasers Pit as shown in Figure 3.3. This is currently consented, not proposed to change as part of MP4, and is sufficiently separated (over 1.3 km) from other hazardous substances activities at the Macraes Operation that cumulative effects are not considered further.

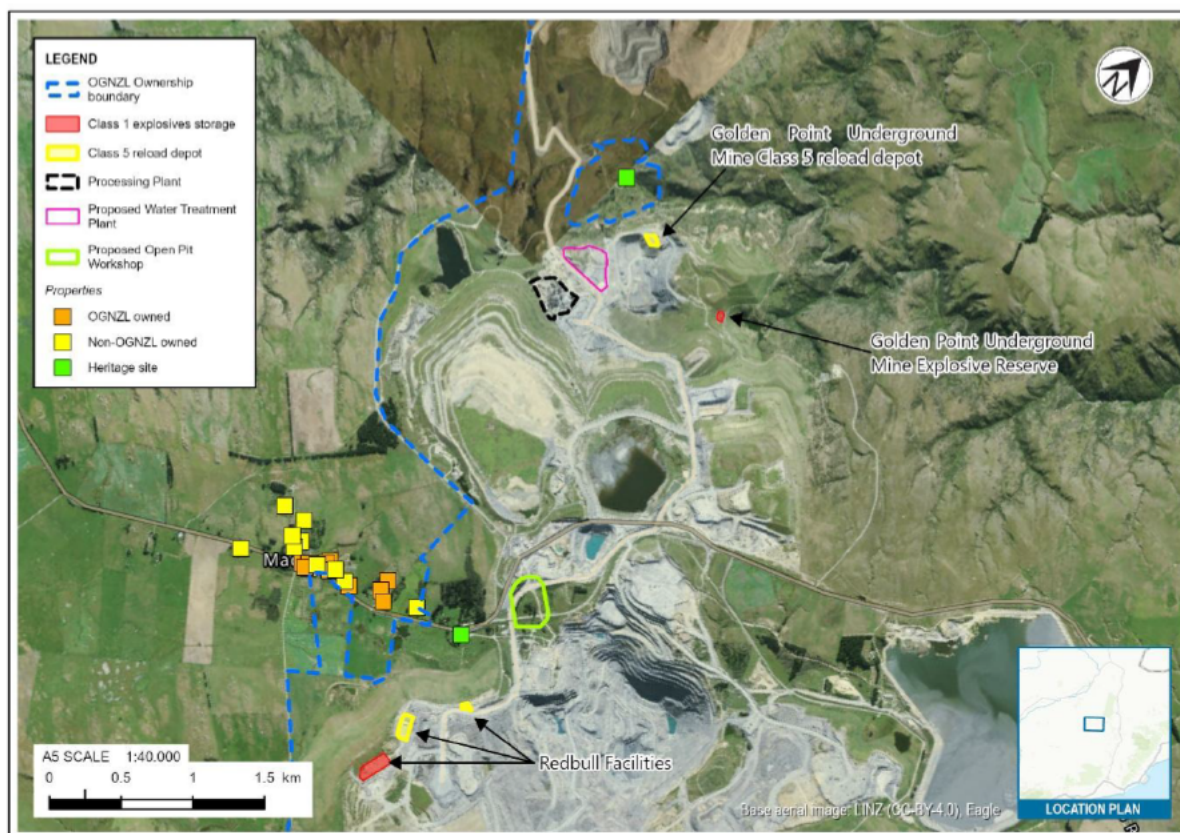


Figure 3.3: Explosives storage at the Macraes Operation.

### 3.2.3 Diesel storage and refuelling sites

Bulk diesel tanks are distributed across the mining areas for large equipment refuelling, as summarised in Figure 3.4. The power source for each tank is shown on the figure for operational purposes, this detail is not relevant to this assessment.

Currently, most of the diesel tanks are located within the Waitaki District Council boundary. There are two tanks proposed for the Coronation Mine area that will be within the Dunedin City Council boundary. However, the tanks are portable and may be relocated as the mining progresses.

Table 3.3: Bulk diesel refuelling tanks – OGNZL

| Location                        | Tank name  | Volume (L) | District     |
|---------------------------------|------------|------------|--------------|
| Coronation North Pit            | FT4        | 40,000     | Dunedin City |
| Coronation Pit                  | FT18       | 60,000     | Dunedin City |
| Golden Point Underground Portal | FT7 – GPUG | 40,000     | Waitaki      |
| Round Hill                      | FT1        | 54,000     | Waitaki      |
| Round Hill                      | FT3        | 54,000     | Waitaki      |
| Open Pit Workshop               | FT5        | 43,500     | Waitaki      |



| Location              | Tank name | Volume (L) | District |
|-----------------------|-----------|------------|----------|
| North of Frasers West | FT2       | 50,000     | Waitaki  |
| North of Frasers West | FT6       | 43,500     | Waitaki  |
| Redbull               | FT9       | 20,000     | Waitaki  |
| Frasers East          | FT8       | 55,000     | Waitaki  |

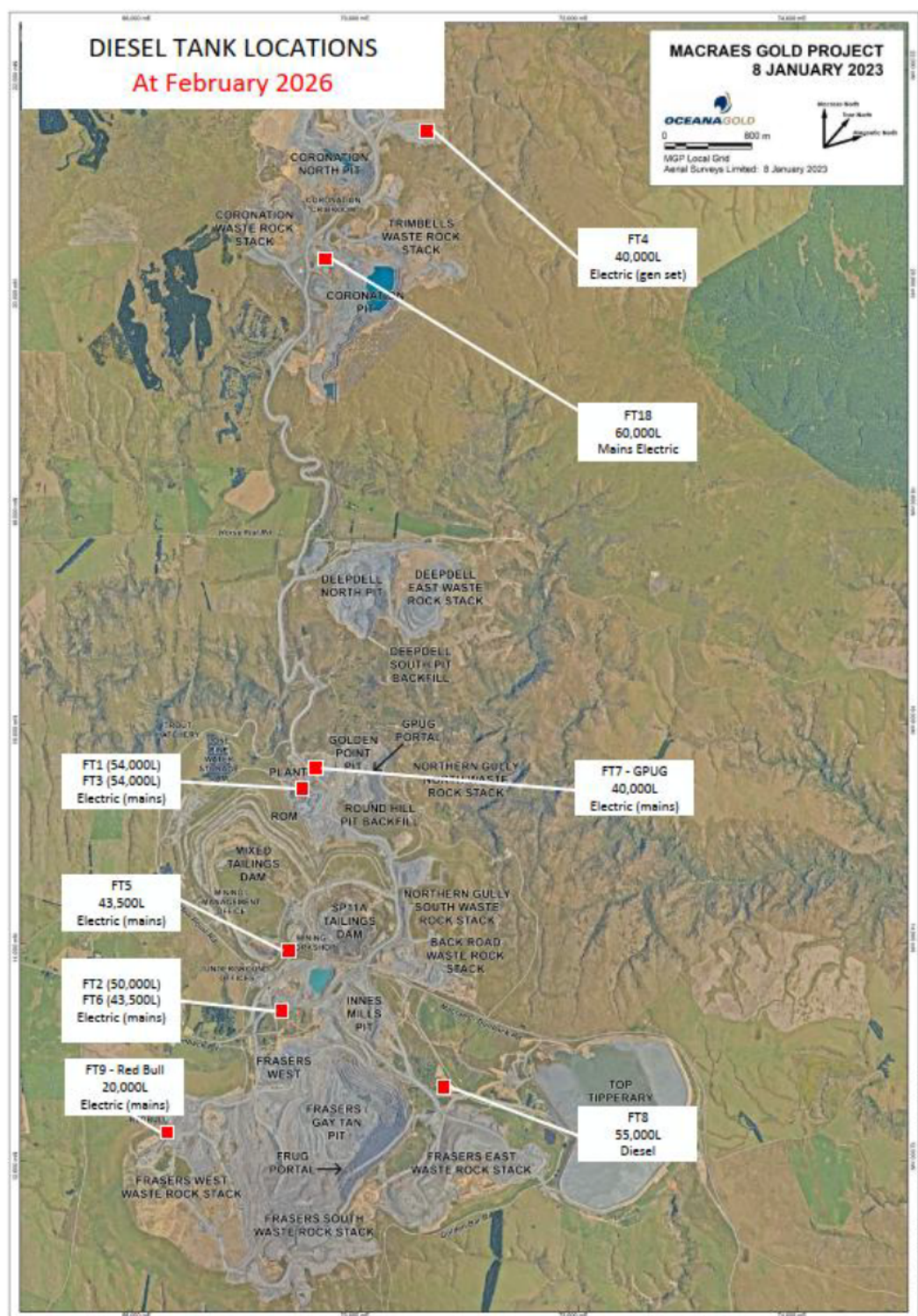


Figure 3.4: Bulk diesel tanks at the Macraes Operation.



### 3.3 Proposed changes

#### 3.3.1 Open Pit Workshop relocation

As part of the MP4 Project, the Open Pit Workshop will be relocated approximately 600 m south of its current location, as shown on Figure 3.5.

The bulk and shape of the proposed Open Pit Workshop will be generally as per the existing Open Pit Workshop. The existing Open Pit Workshop covers an area of approximately 4,000 m<sup>2</sup>, excluding the surrounding hardstand and carpark area. As per the existing Open Pit Workshop, the proposed location will provide for refuelling and hazardous substance storage associated with vehicle and equipment maintenance. The concept plans are attached as Appendix A.

Activities carried out at the Open Pit Workshop include heavy and light vehicle maintenance, welding and cutting, vehicle washing and parts cleaning, painting and the associated storage of fuel, paints, cleaning products, oils, coolants, aerosols and cutting gases. There will be a refuelling bay with one 53,000 L diesel tank. These activities will be provided for in the proposed location.

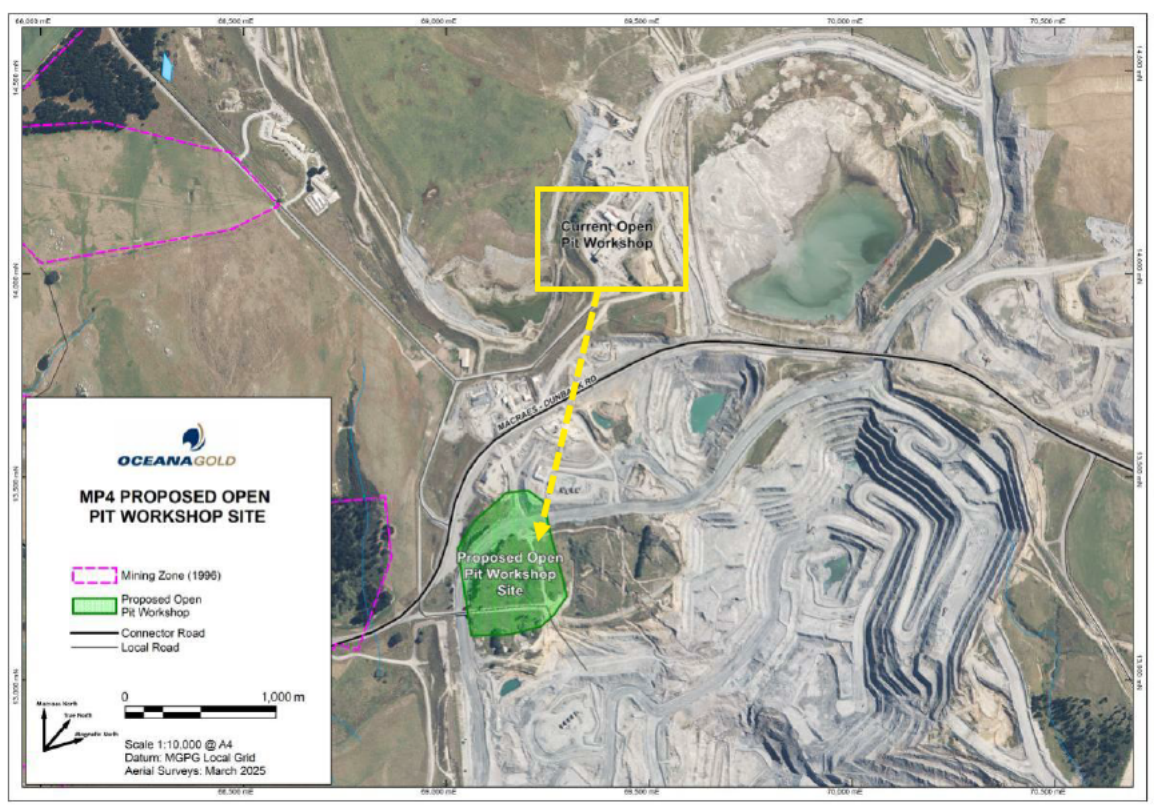


Figure 3.5: Relocation of the Open Pit Workshop.

Source: OGNZL.

#### 3.3.2 Water Treatment Plant

As part of the MP4 project, a new water treatment plant (WTP) is proposed north of the Processing Plant (Figure 3.6) for active treatment of mine influenced water (MIW), including seepage from waste rock stacks, tailings storage facilities and pit lakes. The final treatment process is expected to be refined through further trials, but in general the proposed methods include:

- Pretreatment dosing of quicklime (calcium oxide (CaO)) and flocculant-aided settling, for adjustment of pH and metal precipitation;

- Reverse Osmosis (RO), which involves passing the MIW through semi-permeable membranes for removal of solids, sulphates, nitrates and metals; and
- Chemical precipitation via a two-stage 'Ettringite' process for removal of dissolved sulphate, heavy metals, and other scaling compounds (like calcium). This process involves CaO dosing followed by addition of a flocculant, such as polyaluminium chloride.

In addition to quicklime, reagents that are likely to be used in the treatment processes include sulphuric acid and caustic soda for pH trimming, ferric chloride and polyaluminium chloride for coagulation and flocculation. An indicative inventory has been provided for the pretreatment and reverse osmosis plant<sup>4</sup>, it is anticipated that the nature of the substances used in an Ettringite plant will involve comparable substances.

Hazardous liquids associated with the water treatment processes will be stored in bunded containers or tanks, and solid calcium oxide will be stored in an enclosed silo. The reagent storage area is anticipated to cover approximately 3.3 ha of the indicative 47.4 ha highlighted in Figure 3.6.



Figure 3.6: Location of the proposed Water Treatment Plant.

Source: OGNZL

<sup>4</sup> Email from Gary Smith at Process Flow on 21 August 2026. "RE: Water Treatment Plant - General Arrangement".

### 3.3.3 Ecological enhancement areas

The proposed ecological enhancement areas may provide storage for agrichemical products (herbicides, pesticides, fungicides) and small quantities of fuel (petrol) for maintenance activities. These substances are typically toxic and ecotoxic, while petrol is highly flammable and ecotoxic, with chronic exposure human health hazards.

Where required, storage is proposed to be provided within a dedicated shed equipped with secondary containment, spill kits and fire extinguishers. The scale of agrichemical and fuel storage proposed in these locations is proposed to be below the permitted quantities set in the Operative Waitaki District Plan (see Section 5.2).

### 3.4 Hazardous substances

The hazardous substances inventory for each activity as described above is attached as Appendix B.

The classifications for hazardous substances are assigned under the Globally Harmonised System (seventh revised edition) ("GHS7"), which was adopted in New Zealand in 2021. Both the former classifications assigned under the Hazardous Substances and New Organisms Act 1996 ("HSNO") from the safety data sheets and the equivalent GHS7 classification are presented in the inventory tables attached in Appendix B,. The HSNO classifications are still commonly used and understood in New Zealand and are referred to within the relevant health and safety regulations.

Hazard classifications address:

- Physical hazards: flammable, explosive, oxidizing substances (Classes 1 – 5).
- Human health hazards: toxic, corrosive, sensitizing, carcinogenic substances (Classes 6 and 8), hazards may be acute or chronic.
- Environmental hazards: aquatic toxicity, ecotoxicity to soil or air organisms (Class 9), hazards may be acute or chronic.

The degree of the hazard is denoted by the letter in HSNO (A is highest and D is lowest) or Category in the GHS system (1 is highest and 4 is lowest).



## 4 Control and management of hazardous substances

### 4.1 Regulatory framework

The key legislation in New Zealand for management of hazardous substances within the broader regulatory framework is:

- Health and Safety at Work (Hazardous Substances) 2017 Regulations (“HSW-HS”), which is administered by WorkSafe and sets rules for the storage and use of hazardous substances in the workplace, including risks to workers.
- Health and Safety at Work (Major Hazard Facilities) 2016 Regulations (“HSW-MHF”) which is also administered by WorkSafe and mandates specific duties relating to process safety that apply to facilities that exceed specified volumes of hazardous substances. These regulations manage the health and safety of workers and communities near large scale hazard facilities and do not apply to a mining operation to which the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016 apply.
- Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016, also administered by WorkSafe for matters concerning worker health and safety in mining operations, including competency requirements in relation to safety-critical roles. These regulations include requirements to prepare principal hazard management plans for explosives (among other hazards) that detail the monitoring requirements, specific controls, and worker protection measures in place.
- HSNO Act and Regulations, which set minimum controls under the Environmental Protection Authority’s Hazardous Property Controls Notice 2017 (EPA Notice) to manage the hazards and risks related to all hazardous substances use within domestic environments and from ecotoxic substances in both workplaces and domestic settings.
- Resource Management Act (“RMA”), under which District Councils are responsible for the control of actual or potential effects of the use, development, or protection of land.

The Resource Legislation Amendment Act 2017 (“RLAA”) removed the explicit function of regional and territorial authorities under section 30 and 31 to control the adverse effects of the storage, use, disposal and transportation of hazardous substances to ensure that RMA controls do not duplicate controls in the HSNO Act and HSW Act.

The controls under the HSNO Act and HSW Act provide the minimum protection standards for both on-site and off-site people and environments from the potential adverse effects. However, we note that the controls do not take into account the site-specific context, such as the proximity to sensitive waterways or density of nearby residential developments.

The controls applicable under the HSW-HS are described in Appendix C. These include requirements for signage, security, hazardous areas, segregation of incompatibles, emergency response planning, separation distances and compliance certification. A summary of the key structural controls for management of risks to off-site people, property and ecosystems are outlined in Section 4.2 below.

The operational management plans and emergency response plans that will apply to the Macraes Operation are summarised in the following subsections.

### 4.2 Key structural controls and separation

Key controls in place at the hazardous substances storage areas to limit the risks to sensitive off-site locations include use of secondary containment systems to retain leaked material for recovery, segregation of incompatible substances to avoid adverse reactions in a spill or fire and diversion of run off from handling areas (e.g. workshops, around diesel tanks) to collection sumps.



Considerable separation distances are provided between facilities and sensitive off-site locations, notably:

- The Processing Plant is over 2 km from the closest residences to the south in Macraes Village or north on Horse Flat Road. It is approximately 390 m from the boundary of the Golden Point Reserve.
- The Class 1 explosives store at the GPUG Explosive Reserve (at the surface) is over 2.8 km from the closest residences to the southwest in Macraes Village, and approximately 980 m to the boundary of the Golden Point Reserve.
- The GPUG Class 5 reload depot is over 2.5 km from the nearest residence and approximately 200 m from the Golden Point Reserve boundary.
- The diesel tanks are more than 200 m from OGNZL landholding boundaries to other properties, and in some cases within 50 m of the public road reserve through the mine areas.
- The proposed relocated Open Pit Workshop is more than 650 m from the nearest MP4 boundary and dwelling in the Macraes Village to the west (1668 Macraes Road).
- The proposed WTP is 160 m from the nearest MP4 boundary with Golden Point Reserve to the north and over 2 km from the nearest dwelling to the northwest (406 Horse Flat Road).

These separation distances limit the potential for a release, fire or explosion at these locations to impact people or property beyond the boundary.

## 4.3 Hazardous substances management plans

### 4.3.1 Principal Hazard Management Plan – Hazardous Substances

OGNZL operates with strict hazardous substance management procedures in place, which are detailed in the Principal Hazard Management Plan – Hazardous Substances<sup>5</sup> (“PHMP-HS”) attached as Appendix D. These procedures ensure that staff are trained to identify the hazards associated with each substance and implement measures to prevent spills or fires (depending on the nature of the hazard), minimising the chance of adverse effects at off-site locations.

The procedures include:

- Development and maintenance of a hazardous substances register via the ChemAlert database. ChemAlert provides information on the substances identification, classification and substance specific emergency response guidance.
- Substance Safety Data Sheets (“SDS”) are kept accessible in hardcopy to all employees on-site, and training is provided in interpreting the information provided on the SDS to enable operators to identify the correct actions to take in an emergency.
- Requirements for construction of vessels and pipework used for storage and hazards substances, and minimum requirements for secondary containment.
- Requirements for safe transport, tracking and disposal of hazardous substances used in the Macraes Operation.
- Spill response kits are available in all work areas where hydrocarbons and other substances are stored or handled. Staff are trained in spill prevention and recovery.

<sup>5</sup> OGNZL, *Principal Hazard Management Plan – Hazardous Substances MAC-257-PHM-007-10*, (June 2025).

### 4.3.2 Principal Hazard Management Plan – Explosives

The Principal Hazard Management Plan for Explosives<sup>6</sup> (“PHMP-E”) sets out the details of management of all aspects of storage, handling and use of explosives at the Macraes Operation.

Hazard management to minimise the risk of an unintended detonation is critical to worker safety on-site, as well as for prevention of on-site property damage. These measures to manage the risk of a detonation incident will also minimise the potential for effects on off-site receptors.

The PHMP-E is attached as Appendix E.

The key roles with responsibilities for control of hazards associated with explosives storage and use on-site include:

- Superintendents and supervisors – Responsible for handling, transport, charging, firing and re-entry operations and ensuring compliance with procedures and approved charging plans. Inspection of explosives areas and preparation of explosives documentation, ensuring all persons working with explosives hold current Certified Handler and Controlled Substances Licence qualifications.
- Certified handlers – Certified for safe handling of explosive substances by a WorkSafe accredited external certifier; responsible for supervising all movements of explosives and equipment on-site.
- Designated shotfirer – The only operator authorised to fire the explosives, which may only be carried out with approval of the shift supervisor. Responsible for safekeeping of keys used to secure explosives transport lock boxes and for handling, transporting, and conducting charging operations in compliance with procedures and approved charging plans.

### 4.3.3 Hydrocarbon delivery, storage and use

The Macraes Operation operates under a Hydrocarbon Management Plan<sup>7</sup> which outlines the risks, legal requirements, storage locations, handling procedures, effluent treatment, waste collection, spill management, monitoring and measurement and training.

Above ground bulk storage facilities for diesel are designed, installed and maintained by OGNZL. All tanks are provided with secondary containment, either integral (double skinned) or a bund with capacity for 110 % of the tank volume.

The Hydrocarbon Management Plan provides an overview of the refuelling procedure which requires supervision at all times and active observation of the fuel lines. Dispensing pumps are installed with automatic shut-off valves and non-return valves to reduce spills and overfilling.

The drainage systems at the workshops and Processing Plant include sumps, baffle tanks or oil water separators providing primary sediment capture and treatment to surface water runoff. These are maintained by regular cleaning out with vacuum trucks, or other mechanical means to ensure functionality of the systems.

<sup>6</sup> OGNZL, *Principal Hazard Management Plan –Explosives MAC-257-PHM-006-15*. July 2025.

<sup>7</sup> OGNZL, *Hydrocarbon Management Plan MAC-206-PLN-003*. September 2024.

#### 4.3.4 Waste management

The Waste Management Plan<sup>8</sup> covers the site-wide procedures to ensure waste is collected, stored, handled, transported and disposed of appropriately and in accordance with legislative requirements. It sets a requirement for internal audits of waste storage and disposal practices on a quarterly basis.

The Waste Management Plan requires disposal to be undertaken by one of OGNZL's approved contractors as documented on the Waste Disposal Agencies Register (MAC-206-REG-003).

OGNZL also has a standard operating procedure for Hazardous Waste, Destruction and Removal from Site for the Macraes Operation<sup>9</sup>. It outlines the procedures for waste identification and segregation, disposal, transport of waste off-site, tracking of waste, and the auditing and reporting required.

Further specific waste disposal procedures are referenced, including:

- Cyanide, disposal of Contaminated Boxes, MAC-458-PRO-001.
- Reagent Tank, Overfilled, MAC-458-PRO-007.
- Cyanide, Clean up a Spill, MAC-PRO-014.
- META, (Sodium Metabisulphite), Clean up a Spill, MAC-458-PRO-015.
- SIBX, (Sodium Isobutyl Xanthate), Clean up a Spill, MAC-458-PRO-017.
- Flocculant, Clean up a Spill, MAC-458-PRO-018.
- Mercury, Spill Clean Up MAC-456-PRO-014.
- Mercury, Collection, Packaging and Shipping, MAC-456-PRO-015.
- Lead Contaminated Material Disposal, MAC-451-PRO-041.
- Copper Sulphate, Mixing, MAC-458-PRO-002.
- META, (Sodium Metabisulphite), Mixing, MAC-458-PRO-008.

Liquid hydrocarbon waste (e.g. waste oil) can be used for heat generation in burners on site. Solid waste such as (crushed oil filters, hoses, pads, booms, rags and contaminated soils or other material) are collected in a dedicated skip and removed by an approved contractor.

#### 4.3.5 Surface water management

The Water Quality Management Plan<sup>10</sup> describes the mine water management across the Macraes Operation, which principally involves:

- Diverting clean water away from active working areas; and
- Collecting runoff water from the operational areas in pit sumps or silt ponds for use in dust suppression or as process water at the Processing Plant.

A water storage pond ("Enviro Pond") immediately northwest of the Processing Plant collects runoff from the adjoining plant areas. Water collected in the Enviro Pond is pumped back to the Processing Plant systems for reuse.

The proposed relocated Open Pit Workshop will have an oil-water separator and sediment settling sump for preliminary treatment of water generated at the vehicle wash bay. Runoff from the wider workshop area will be collected in sumps and discharged to the Mixed Tailings Impoundment.

<sup>8</sup> OGNZL, *Waste Management Plan MAC-206-PLN-002*, (September 2024).

<sup>9</sup> OGNZL, *Standard Operating Procedure- Safe Work Instruction: Hazardous Waste, Destruction and Removal from Site, MAC-455-PRO-056*, (December 2022).

<sup>10</sup> OGNZL, *Water Quality Management Plan MAC-207-EMP-000*, (Macraes April 2025).

Seepage from the Mixed Tailings Impoundment is collected in concrete lined sumps and pumped back to the Processing Plant for reuse. As part of mine development, it is proposed that mine affected water seepage will be treated at a new plant described in the following section.

#### 4.3.6 Proposed water treatment

The proposed WTP will be designed to treat mine-influenced water prior to discharge to off-site waterways. Pre-treatment reagents are likely to include bulk storage of corrosive lime products, sulphuric acid, polyaluminium chloride, ferric chloride and non-hazardous coagulants and flocculants. Small (100-300 L) tanks of caustic soda, sodium hypochlorite, sodium metabisulphite and antiscalant will also form part of the proposed reverse osmosis plant.

Solid quicklime (CaO) is proposed to be stored in a silo at the WTP and may be mixed into water to make high calcium hydrated lime (Ca(OH)<sub>2</sub>) slurry or dosed directly into the pretreatment tanks. This process is exothermic (releases heat), and therefore it is not recommended that the tanks be double-skinned, as the double-walled construction can prevent heat dissipation.

All storage of liquids will be either in double-skinned tanks or situated within chemically impervious bunding with capacity for 110 % of the largest tank.

#### 4.3.7 Spill and emergency control plan

The Macraes Emergency Management Principal Control Plan<sup>11</sup> ("EMPCP") attached as Appendix F outlines the emergency management procedures for OGNZL's mining activities at the Macraes Operation. In the event of an emergency, the relevant operation will alert Mine Control via telephone or through a dedicated radio channel. Mine Control will then notify the Emergency Response Team and initiate emergency procedures, which are set out in the Trigger Action Response Plans ("TARP")<sup>12</sup>. These detail the emergency response coordination for a variety of foreseeable incident types. The following scenarios are relevant to the hazardous substance activities:

- Explosives emergency and explosives fire emergency.
- Process Plant chemical spill or gas leak.
- Fire at the surface or underground facilities.

Each TARP outlines three response levels based on the severity of the incident:

- Level 1 is localised response managed by the mine staff;
- Level 2 will involve the dedicated emergency response team with external support on stand-by; and
- Level 3 warrants external assistance from emergency services and implementation of the OGNZL crisis management plan.

Should a spill and/or gas leak occur, staff will implement the procedures in the TARPs. Spill kits are also located across the areas of the Macraes Operation which will hold or store hazardous substances, including at each refuelling station, the workshops and in the Processing Plant.

Spill kits and fire extinguishers will be provided on site for emergency response, and any clean-up material will be removed from site to a facility authorised for the disposal of hazardous substances. All staff will be trained in the EMPCP and drills for potential scenarios will be held periodically to test the site response.

<sup>11</sup> OGNZL, *Macraes Emergency Management PCP MAC-253-PCP-000.20.1*, (June 2026).

<sup>12</sup> OGNZL, *Standard Operating Procedure – Macraes Emergency Trigger Action Response Plans (TARPs) MAC-253-TRP-003*, (January 2024).



#### 4.4 Fire protection and emergency response systems

The Principal Hazard Management Plan for Fire & Explosion<sup>13</sup> (“PHMP-FE”) details the methods implemented at the Macraes Operation to manage the risk of fire at the facilities. These include:

- Early warning systems for fire detection and prevention including smoke detectors, temperature shutdown devices and use of Very Early Smoke Detection (“VESDA”) systems at the Motor Control Centres at the Processing Plant.
- Fire suppression systems including:
  - Fire extinguishers are located within all buildings, at all flammable or oxidising substance storage areas and are provided to mobile equipment and fixed plant.
  - In the Processing Plant, there are also hydrant systems and specific suppression and water deluge systems installed in MCCs, high-voltage (HV) switching rooms and the LPG bulk tank area.
  - The Macraes Operation has two fire-fighting trucks, one located at the Processing Plant and one at the Golden Point Underground surface facilities, for deployment to respond to fires.
- An Emergency Response Team is trained to manage emergency events in accordance with the TARPs.

The mobile equipment used in the mines are fitted with automated fire suppression systems that use firefighting foam concentrate mixed into water<sup>14</sup>.

#### 4.5 Transport of hazardous substances

The delivery of hazardous substances to OGNZL’s activities in the Macraes Operation will be primarily via State Highway 85 or 87, part of the main freight network, and via Macraes Road to the mine areas. Transport within the mine areas utilise the haul roads. Relocation of the hazardous substances associated with the workshop relocation will be undertaken in accordance with standard procedures for transport of hazardous substances on site.

The PHMP-HS provides that any transport of hazardous substances will also be in accordance with the Land Transport Rule: Dangerous Goods 2005, which specifies requirements for placarding, separation of incompatible substances, emergency response equipment and staff training. The substances will be handled in accordance with the label and SDS directions where applicable.

<sup>13</sup> OGNZL, *Principal Hazard Management Plan for Fire & Explosion MAC-257-PHM-005-14*, (Macraes, October 2025).

<sup>14</sup> The fire suppression foam concentrate stored at the Open Pit Workshop is Sandvik Eclipse Sustain for mobile equipment. This fire-fighting foam is fluorine-free and is not classified as ecotoxic.

## 5 Resource consent status

### 5.1 Overview

The activities require evaluation against the provisions of the Operative Waitaki District Plan (WDP)<sup>15</sup>. Chapter 16 (Hazardous Substances) of the WDP specifies quantities of hazardous substances above which consent is required as a Discretionary activity. A threshold above which the activity is Non-complying is also provided for LPG.

The northernmost areas of the mine (Coronation and Coronation North pits) are in the Dunedin City District. Bulk diesel storage at refuelling facilities will be subject to the rules of the second-generation Dunedin City Plan (2GDP).

### 5.2 Waitaki District Plan

#### 5.2.1 Consent status

The permitted activity quantity thresholds for hazardous substances storage in the Macraes Mining Zone are specified in 'Table 1: quantity limits for hazardous substances identified in Schedule 1'. The correlation between the WDP classification system and the HSNO and GHS classification systems is included in Appendix G.

The quantities of hazardous substances at the Macraes Operation are compared with the permitted and discretionary thresholds in Table 5.1 below. We note that only Class 2.1 (LPG) has a discretionary threshold, above which the status of the activity is Non-complying.

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<sup>15</sup> We understand that Waitaki District Council has been granted an exemption by the Minister Responsible for RMA Reform to continue with certain parts of its Proposed Waitaki District Plan. The proposed Hazardous Substances chapter has been withdrawn.

**Table 5.1: Comparison of Macraes Operation inventory with the consent thresholds for the Macraes Mining Zone**

| District plan category | Rural and Macraes Mining Zone threshold | Quantity at the Macraes Operation                            | Activity at the Macraes Operation                                                                                       | Consent status       |
|------------------------|-----------------------------------------|--------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------|----------------------|
| 1a                     | 2.5 kg                                  | 20,000 kg (high Explosives)<br>70 kg (Initiating Explosives) | Class 1 explosives stored at GPUG Mine store.                                                                           | <b>Discretionary</b> |
| 1b                     | 15 kg                                   | None                                                         | Not applicable.                                                                                                         | Not applicable       |
| 2.1a                   | 12,000 litres / 40,000 L <sup>A</sup>   | 100,000 L                                                    | LPG storage at the Processing Plant.                                                                                    | <b>Non-complying</b> |
|                        |                                         | 45 – 360 kg                                                  | LPG cylinder storage at the Open Pit Workshop and Processing Plant.                                                     | Permitted            |
|                        |                                         | 120 L                                                        | Aerosols at the Open Pit Workshop.                                                                                      | Permitted            |
| 2.1b, 2.2, 2.3         | 250 litres                              | 5,000 L                                                      | Nitrogen gas tank at the BOC Oxygen Plant in the Processing Plant.                                                      | <b>Discretionary</b> |
|                        |                                         | 183 m <sup>3</sup>                                           | Acetylene and non-flammable non-toxic gases at the Open Pit Workshop.                                                   | Permitted            |
|                        |                                         | 188.6 m <sup>3</sup>                                         | Acetylene and non-flammable non-toxic gases at the Processing Plant.                                                    | Permitted            |
| 3a                     | 2,000 litres                            | 100 L                                                        | Ecological enhancement areas.                                                                                           | Permitted            |
| 3b, 3c                 | 3,000 litres                            | 460,000 L                                                    | Bulk diesel tanks across the Macraes Operation areas including at the Open Pit Workshop.                                | <b>Discretionary</b> |
|                        |                                         | 20,000 L                                                     | Solvent (Exxsol D40) tank at the Processing Plant.                                                                      | <b>Discretionary</b> |
|                        |                                         | 18,300 L                                                     | Other packaged flammable liquids at the Processing Plant (lab reagents, frothing agents, methyl isobutyl carbinol etc). | <b>Discretionary</b> |
|                        |                                         | 760 L                                                        | Flammable or combustible solvents, degreasers and paints at the Open Pit Workshop.                                      | Permitted            |
| 3u                     | 10,000 litres                           | None                                                         | -                                                                                                                       | Not applicable       |
| 4.1                    | 10 kg                                   | None                                                         | -                                                                                                                       | Not applicable       |
| 4.2, 4.3               | 1,000 kg                                | 18,000 L                                                     | SIBX tanks at the Processing Plant.                                                                                     | <b>Discretionary</b> |
|                        |                                         | 102,000 kg                                                   | SIBX solid storage at the Processing Plant.                                                                             | <b>Discretionary</b> |
| 5.1                    | 1,000 kg                                | 162,000 kg                                                   | Bulk oxygen tanks at the BOC Oxygen Plant.                                                                              | <b>Discretionary</b> |
|                        |                                         | 32,000 L                                                     | Nitric acid tank at the Processing Plant.                                                                               | <b>Discretionary</b> |
|                        |                                         | 1,200 kg                                                     | Potassium nitrate storage at the Processing Plant.                                                                      | <b>Discretionary</b> |

| District plan category | Rural and Macraes Mining Zone threshold | Quantity at the Macraes Operation | Activity at the Macraes Operation                                                                                                  | Consent status       |
|------------------------|-----------------------------------------|-----------------------------------|------------------------------------------------------------------------------------------------------------------------------------|----------------------|
|                        |                                         | 98 m <sup>3</sup>                 | Gas storage areas at the Processing Plant.                                                                                         | Permitted            |
|                        |                                         | 30.8 m <sup>3</sup>               | Gas storage at the laboratory in the Processing Plant.                                                                             | Permitted            |
|                        |                                         | 93 m <sup>3</sup>                 | Gas storage at the laboratory at the Open Pit Workshop.                                                                            | Permitted            |
|                        |                                         | 65,500 kg                         | Class 5 reload depot.                                                                                                              | <b>Discretionary</b> |
| 5.2                    | 10 kg                                   | None                              | -                                                                                                                                  | Not applicable       |
| 6                      | 100 litres                              | 241,000 L                         | Corrosive liquid tanks (cyanide solution, nitric acid, caustic, hydrated lime solution) at the Processing Plant.                   | <b>Discretionary</b> |
|                        |                                         | 5,220 L                           | Packaged corrosive liquids at the Processing Plant (boiler treatment, biocides, frothing agents, mercury).                         | <b>Discretionary</b> |
|                        |                                         | 270,000 kg                        | Corrosive solids at the Processing Plant (quicklime and solid cyanide).                                                            | <b>Discretionary</b> |
|                        |                                         | 20,500 L                          | Corrosive liquids (caustic soda, quicklime slurry, sulphuric acid, sodium hypochlorite, ferric chloride) used in the proposed WTP. | <b>Discretionary</b> |
|                        |                                         | 90 m <sup>3</sup>                 | Corrosive liquids (quicklime) used in the proposed WTP.                                                                            | <b>Discretionary</b> |
|                        |                                         | <100 L                            | Packages of corrosive substances used at the Open Pit Workshop.                                                                    | Permitted            |
| 7                      | 1,000 litres                            | 250 L                             | Agrichemicals at the Open Pit Workshop.                                                                                            | Permitted            |
|                        |                                         | 800 L<br>100 kg                   | Agrichemicals at the ecological enhancement areas.                                                                                 | Permitted            |
| 8.1                    | 20 litres                               | None                              | -                                                                                                                                  | Not applicable       |
| 8.2                    | 20 litres                               | None                              | -                                                                                                                                  | Not applicable       |

Note:

A. Class 2.1 has a discretionary threshold above which the status of the activity is non-complying.

In summary:

- The Class 1 storage area at GPUG exceeds the permitted threshold for storage of explosives and is therefore a discretionary activity.
- The Open Pit Workshop diesel tank exceeds the permitted threshold for combustible liquids and is therefore a discretionary activity. All other hazardous substances storage are below the specified thresholds at the workshop.
- The Processing Plant and associated activities exceed the permitted threshold for nitrogen and oxygen gas storage at the BOC Oxygen Plant, flammable or combustible liquids in tanks or packaged quantities, bulk storage of self-heating substances (SIBX), corrosive solids and liquids in tanks or packaged quantities. These are discretionary activities. The bulk LPG tank exceeds the discretionary threshold and is therefore a non-complying activity.



- The Class 5 reload depot exceeds the permitted threshold for oxidising substances and is therefore a discretionary activity.
- The proposed WTP exceeds the permitted threshold for corrosive liquids and solids and is therefore a discretionary activity.

### 5.2.2 Standards

The site development standards set in Section 16.2 of the WDP apply to all permitted activities. These are commented upon in Table 5.2 below.

**Table 5.2: Site development standards 16.2**

| Ref | Standard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1   | Primary and secondary containment systems shall be employed whenever hazardous substances (including hazardous waste) are used or stored on all or part of a site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Comment against the specific methods for achieving 16.2(1) are provided below.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 2   | <p>To achieve 16.2 (1), the following specifications shall apply:</p> <p>a) The volume of any secondary containment system shall be 100 % of the maximum volume of the hazardous substance to be stored, used, loaded or unloaded when the site is roofed or;</p> <p>b) The volume of any secondary containment system shall be 120 % of the maximum volume of the hazardous substance to be stored, used, loaded or unloaded when the site is unroofed;</p> <p>c) The secondary containment system shall be designed in such a way as to ensure containment of any hazardous substance that spills due to the collapse of any container (e.g. tank), and the containment from the direct leakage from any primary container;</p> <p>d) The primary and secondary containment systems shall be sealed with impervious materials that are resistant to breakdown from the particular hazardous substances which they are designed to contain; and</p> <p>e) The integrity of the primary and secondary containment systems shall be maintained at all times.</p> | <p><b>Partially complies</b> – The hazardous liquid storage areas are designed to comply with the HSW-HS regulations and EPA Notice, which require that secondary containment volumes provide 25-100 % of the total pooling potential for packages (dependent on the classification). Hazardous liquid tanks must have 110 % secondary containment capacity or be double-skinned (100 % containment capacity). It is anticipated that not all storage at the Macraes Operation will comply with the minimum secondary containment volumes set in 2a) and b), but that the containment volumes are consistent with other regulations in place to prevent release of hazardous substances to the environment.</p> <p>Secondary containment systems used at the Macraes Operation are required to be made of impervious materials, able to recover spillage, and are maintained in accordance with OGNZL's management procedures.</p> |
| 3   | The storage of petrol or diesel in above ground tanks in Rural Zones shall be exempt from Rules 16.2 (1) and (2), providing the tank is at least 20 m away from any natural water course or water race.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | <b>Complies</b> – 16.2 (1) and (2) are complied with for diesel storage in accordance with OGNZL Hydrocarbon Management Plan (MAC-206-PLN-003)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |
| 4   | The storage of diesel in above ground tanks in association with residential activities shall be exempt from Rules 16.2 (1) and (2).                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <b>Not applicable.</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

| Ref | Standard                                                                                                                                                                                                         | Comment                                                                                                                                                                                                                                                                                                                                                                   |
|-----|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 5   | Collection of hazardous substances for disposal purposes, or for subsequent use, shall be in containers that seal and contain the hazardous substances collected, and shall be clearly and correctly identified. | <b>Complies</b> – Hazardous substances waste disposal procedures require waste products to be stored in sealed labelled containers, complying with this standard.                                                                                                                                                                                                         |
| 6   | All hazardous substance sites shall be adequately signposted according to the Code of Practice for "Warning Signs for Premises Storing Hazardous Substances" of the New Zealand Chemical Industry Council.       | <b>Complies</b> – Signage is provided in accordance with the requirements of the HSW-HS Clause 2.6.                                                                                                                                                                                                                                                                       |
| 7   | Any use, storage of radioactive material, including radiation machines, comply with conditions set by the National Radiation laboratory.                                                                         | <b>Complies</b> – OGNZL's Radiation Safety Management Plan (MAC-250-PLN-008) details the requirements for where sources of radiation are used and stored in accordance with the Radiation Safety Act 2016, including responsibilities for Radiation Officers at the site, and procedures for isolation, inspection, maintenance and decommissioning of radiation sources. |
| 8   | The use and mixing of agrichemicals in the field shall be exempt from Rules 16.2 (1) and (2), providing that all mixing of agrichemicals comply with the Agrichemical Users Code of Practice.                    | <b>Complies</b> – Use of agrichemicals at the Macraes Operation is undertaken in accordance with the following procedures: <ul style="list-style-type: none"> <li>• Standard Operating Procedure – Safe Work Instruction for Knapsack Sprayer (MAC-209-PRO-010).</li> <li>• Standard Operating Procedure Vehicle Mounted Spray Unit (MAC-209-PRO-009).</li> </ul>         |

## 5.3 Dunedin City Plan

### 5.3.1 Consent status

The northernmost areas of the Macraes Operation are within the Rural Zone of the Dunedin 2nd Generation District Plan ("2GDP"). The only hazardous substances storage proposed for these areas are the bulk diesel tanks for refuelling of equipment at the Coronation Pit and Coronation North mining areas.

Table 5.3 identifies the consent status of the diesel storage with consideration of the permitted thresholds for each of the applicable hazard classifications.

There is one relevant exemption from the permitted thresholds in Rule 9.3.4.1:

*1.) the above-ground storage and use of a maximum of 5000 Litres of diesel in certified double skin tanks.*

However, the diesel tanks used in the Coronation Pit and Coronation North mining areas are larger than the 5,000 L maximum.

Overall, operation of the proposed two diesel tanks is a restricted discretionary activity.

**Table 5.3: Comparison of diesel inventory with the relevant permitted thresholds for the Rural Zone**

| District plan category | Rural Zone threshold (Table A6.2)         | Quantity at the Macraes Operation | Activity at the Macraes Operation              | Consent status                  |
|------------------------|-------------------------------------------|-----------------------------------|------------------------------------------------|---------------------------------|
| 3.1D                   | No limit                                  | 100,000 L                         | Diesel storage across two tanks (FT4 and FT18) | <b>Restricted discretionary</b> |
| All 6.1D and 6.1E      | 1,000 kg                                  |                                   |                                                |                                 |
| All 6.7A and B         | 1,000 kg                                  |                                   |                                                |                                 |
| All Class 9            | 5,000 L in a secondary containment system |                                   |                                                |                                 |

### 5.3.2 Matters of discretion

Matters to which Council has restricted its discretion are provided in Section 9.5.3 of the 2GDP, which are commented upon in Table 5.2 below.

**Table 5.4: 9.5.3 Assessment of performance standard contraventions**

| Ref    | Standard                                                                                                                                                                                                     | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|--------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7a i   | Objective 9.2.2: Land use, development and subdivision activities maintain or enhance people's health and safety.                                                                                            | The effect of diesel on human health or property is assessed in Section 8.2.                                                                                                                                                                                                                                                                                                                                                                         |
| 7a ii  | Hazardous substances are stored and used in a way that ensures residual risks of adverse effects on the health and safety of people are managed to acceptable levels (Policy 9.2.2.10).                      | The hazard presented by diesel to human health requires direct exposure (skin contact or aspiration of droplets). The use of diesel for refuelling in the mine areas has a limited pathway to affect off-site people.                                                                                                                                                                                                                                |
| 7a iii | Hazardous substances are stored in a way that meets HSNO requirements and Hazardous Substances Regulations.                                                                                                  | Diesel storage is certified to comply with the HSW-HS regulations for Stationary Container Systems.                                                                                                                                                                                                                                                                                                                                                  |
| 7a iv  | There is little or no risk of any discharge of hazardous substances into the public stormwater infrastructure.                                                                                               | The site does not discharge to the public stormwater network.                                                                                                                                                                                                                                                                                                                                                                                        |
| 7a v   | The proposed hazardous site or hazardous sub-facility is located an appropriate distance from sensitive activities including population, services, schools, emergency services, hospitals or arterial roads. | The diesel tanks in the Coronation mining area are substantially separated from the boundary and any sensitive activities. The nearest property boundary is over 800 m from the tanks and the nearest off-site building over 2.8 km away.                                                                                                                                                                                                            |
| 7a vi  | A site management plan and emergency response plan appropriately addresses any potential adverse effects on health and safety (see Special Information Requirements - Rule 9.9.1).                           | <p>OGNZL's operations are governed by a suite of management plans relevant to diesel storage including:</p> <ul style="list-style-type: none"> <li>Principal Hazard Management Plan Hazardous Substances MAC-257-PHM-007.</li> <li>Principal Control Plan Emergency Management MAC-253-PCP-000.</li> <li>Standard Operating Procedure – Hydrocarbon Spill Response MAC-209-PRO-014.</li> <li>Hydrocarbon Management Plan MAC-206-PLN-003.</li> </ul> |

| Ref     | Standard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Comment                                                                                                                                                                                                                                                                                                                                                                                               |
|---------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 7a vii  | In considering whether residual risk is of an acceptable level, Council will be guided by the New South Wales Government Risk Criteria for Land Use Safety Planning (refer to <a href="http://www.dunedin.govt.nz/2nd-generation-district-plan/supporting-documents">www.dunedin.govt.nz/2nd-generation-district-plan/supporting-documents</a> ).                                                                                                                                                                                                                                                                                               | The risk assessment in Section 7 of this report follows the NSW assessment framework.                                                                                                                                                                                                                                                                                                                 |
| 7a viii | In assessing the potential effects from hazardous substances, Council will consider: <ul style="list-style-type: none"> <li>Any additional risk from natural hazards;</li> <li>Implications on the future use of the site through any associated HAIL classification;</li> <li>Cumulative effects from other hazardous substances stored on-site, or the storage of hazardous substances on adjacent sites, and whether they are incompatible when considered holistically;</li> <li>The nature and size of the proposed development or activity; and</li> <li>The sensitivity of other activities on the same or surrounding sites.</li> </ul> | The mine areas are already HAIL sites.<br>The tanks are significantly separated from other hazardous substances storage such that cumulative impacts are negligible, and the sensitivity of the area to effects from fire or a spill of diesel has been identified as low.                                                                                                                            |
| 7a ix   | Council may require the development of a site management plan and emergency response plan (see Rule 9.9.1) which outlines how the activity will respond to a potential emergency arising from the hazard facility.                                                                                                                                                                                                                                                                                                                                                                                                                              | Site management and emergency response plans are set out in: <ul style="list-style-type: none"> <li>Principal Hazard Management Plan Hazardous Substances MAC-257-PHM-007.</li> <li>Principal Control Plan Emergency Management MAC-253-PCP-000.</li> <li>Standard Operating Procedure - Hydrocarbon Spill Response MAC-209-PRO-014.</li> <li>Hydrocarbon Management Plan MAC-206-PLN-003.</li> </ul> |



## 6 Overpressure offset distances assessment

The HSW-HS regulations specify minimum offset distances around Class 1 explosive magazine locations such that, in the event of an unintended detonation, specified activities are not subject to stated blast overpressures. The blast overpressure is the sudden onset of a pressure wave after an explosion. The areas within these overpressure radii are referred to as 'controlled zones' and under regulation 9.27 of the HSW-HS ("Person Conducting Business or Undertaking to control adverse effects of unintended initiation"), certain activities must be excluded.

The regulations specify these minimum offset distances to "ensure that any potential adverse effects are managed and minimised. This includes making sure that people and structures are well protected and are located at a suitable distance from the explosives."<sup>16</sup>

The minimum offset distances that constitute the controlled zones for the Class 1 storage facility at GPUG are calculated using the WorkSafe NZ method<sup>16</sup> for each high explosives magazine and initiating explosives magazine combined: maximum 20,070 kg net explosive quantity ("NEQ"). The NEQ is the standardised way for expressing the mass of explosive material excluding any non-explosive casings.

The offset distances for each overpressure level calculated for the existing Golden Point Class 1 magazine are summarised in Table 6.1 below. All relevant activities are outside of the minimum offset distances, with the exception of the Golden Point Reserve, discussed further below.

**Table 6.1: Summary of minimum offset requirements for the Class 1 explosives storage facility at Golden Point Underground**

| Ref              | Exclusion from zone                                                                                                                                                                                                                                                                          | Blast overpressure level | Minimum offset distance | Comment                                                                                                      |
|------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------|--------------------------------------------------------------------------------------------------------------|
| r 9.27 (2)(a)(i) | Public traffic routes of low density and places where people may occasionally be present in numbers up to 200 persons on average in any 24-hour period.                                                                                                                                      | 13 kPa                   | 304 m                   | <b>Compliant:</b> There are no public traffic routes within this radius.                                     |
| r 9.27 (2)(b)(i) | Public traffic routes of medium density, places where people may occasionally be present in numbers up to 900 persons on average in any 24-hour period, and the interior of any proximate building within the boundary of the place where people not directly handling explosive substances. | 9 kPa                    | 402 m                   | <b>Compliant:</b> There are no public traffic routes or buildings within this radius.                        |
| r 9.27 (2)(c)(i) | Public traffic routes of high density, areas of high intensity land use, or any area where a person may be legally present inside the boundary of the place where the hazardous substance location is located.                                                                               | 5 kPa                    | 603 m                   | <b>Compliant:</b> There are no public traffic routes or areas of high intensity land use within this radius. |

<sup>16</sup> Explosives (including pyrotechnics) - Blast Overpressure. <https://www.worksafe.govt.nz/topic-and-industry/hazardous-substances/guidance/substances/explosives/> Retrieved 20 June 2025.

| Ref           | Exclusion from zone                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Blast overpressure level | Minimum offset distance | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|---------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------|-------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| r 9.27 (2)(d) | <p>Vulnerable facilities defined in the HSW-HS regulations as:</p> <ul style="list-style-type: none"> <li>a) Buildings of 4 storeys or more, of curtain wall construction with panels more than 1 500 mm square;</li> <li>b) Buildings of 4 storeys or more with more than 50 % of the wall area glazed;</li> <li>c) A hospital care institution, residential disability care institution, or rest home (as defined in section 58(4) of the Health and Disability Services (Safety) Act 2001), early childhood education and care centre (as defined in section 310 of the Education Act 1989), or school (as established under section 146 of the Education Act 1989);</li> <li>d) Public buildings or structures of historic value;</li> <li>e) Major transport and traffic terminals such as railway stations and airports handling more than 1 800 people in 24 hours;</li> <li>f) Major public utilities whose service could be disrupted by a blast of 5 kPa; and</li> <li>g) Any similar facilities.</li> </ul> | 2 kPa                    | 1,207 m                 | <p><b>Compliant:</b></p> <p>There are no 4-storey buildings, hospitals, schools, childcare centres, major transport terminals or major public utilities within this radius.</p> <p>There is a public structure of historic value within this radius: the Golden Point Reserve including the Golden Point Stamper Battery, Callery's House and Callery's Battery Building. The independent compliance certifier has provided comment to note that the minimum separation distance to the reserve is reduced in accordance with AS 2187.1-1998 due to the presence of a natural barrier (hill or mountain) between the magazine and off-site area.</p> |
| r 9.27 (4)(a) | A PCBU with management or control of a hazardous substance location that is used solely for securing and holding a class 1 substance must limit the quantities of any class 1 substance at the location to ensure that, in the event of an unintended initiation - the interior of any proximate building where a class 1 substance is manufactured would not be subject to a blast overpressure of more than 24 kPa.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | 24 kPa                   | NA                      | <b>Compliant.</b> No Class 1 manufacturing buildings proposed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

Figure 6.1 shows these overpressure levels and the locations of other site activities and off-site areas. While not linked to an offset distance requirement in the HSW-HS, the radius for the 3.5 kPa overpressure is also shown, for reference to injury criteria in Section 7.3.2 of this report. The 2 – 3.5 kPa overpressure radii overlaps off-site area at the Golden Point Reserve and hazardous substance storage associated with the Processing Plant and the Class 5 depot. These overpressure radii are used to quantify the consequence of an unplanned detonation on other hazardous substances storage locations and off-site areas in the partial quantitative risk analysis in Section 7.3.2 of this report. The overpressure radii calculations do not take the terrain into account. While areas of the Reserve are within the calculated 2 – 3.5 kPa radius, the intervening hillside is considered to provide a barrier in accordance with *AS 2187.1- 1998 Explosives - Storage, transport and use, Part 1: Storage*, such that the actual overpressure level in the reserve will be reduced.



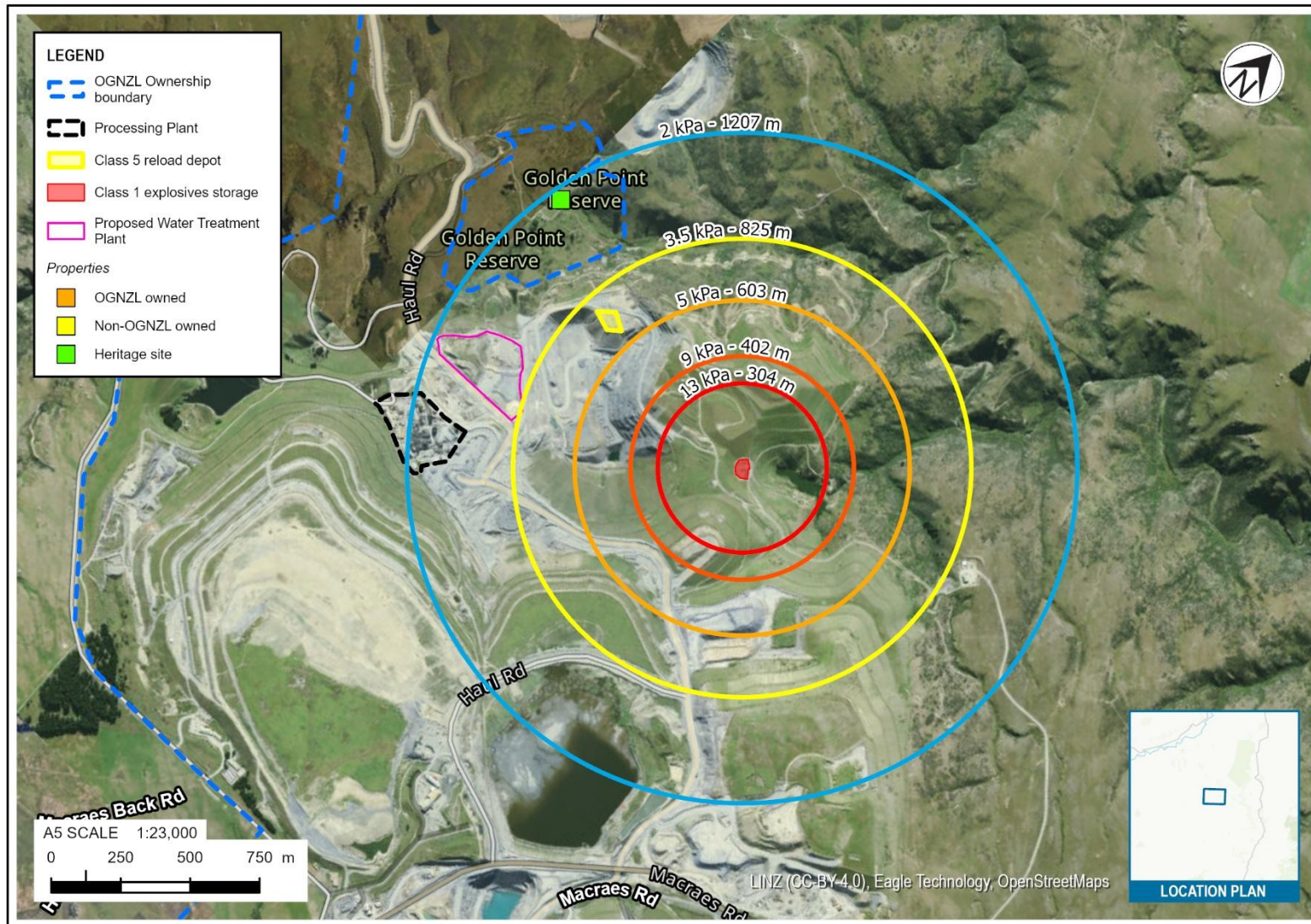


Figure 6.1: Overpressure radii for the Golden Point Class 1 explosives storage.

## 7 Risk assessment for hazardous substances

### 7.1 Introduction

The following sub-sections set out a risk assessment for the proposed storage and handling of hazardous substances at OGNZL's hazardous substances storage locations.

The risk assessment involves consideration of:

- Identification of potential hazards, failure modes and exposure pathways.
- The sensitivity of the surrounding environment.
- The separation distances from neighbouring activities and the number of people potentially at risk from the facility.
- Cumulative risks of hazardous facilities in the area.
- Transport of hazardous substances on and off the site to ensure safe access and appropriate routes for delivery vehicles around the site.

### 7.2 Assessment method

In the absence of New Zealand specific guidance, the New South Wales Department of Planning ("NSW DoPI") Multi-Level Risk Assessment<sup>17</sup> approach was considered in development of the methodology for this assessment.

The Multi-Level Risk Assessment approach is summarised in Figure 7.1. There are three levels of assessment, which are:

- Level 1 – Qualitative Analysis, primarily based on the hazard identification techniques and qualitative risk assessment of consequences.
- Level 2 – Partially Quantitative Analysis, using hazard identification and the focused quantification of key potential off-site risks.
- Level 3 – Quantitative Risk Analysis ("QRA") based on the full detailed quantification of risks, consistent with Hazardous Industry Planning Advisory paper No.6 – Guidelines for Hazard Analysis.

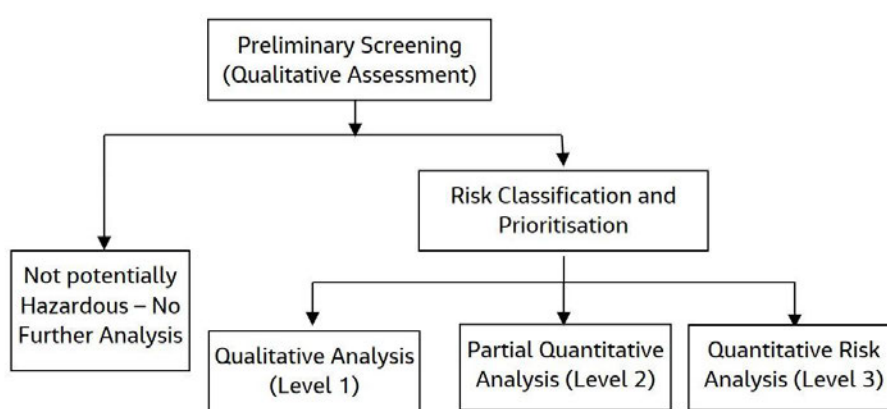


Figure 7.1: Multi-Level Risk Assessment flow diagram. Source: NSW-DoPI.

<sup>17</sup> Assessment Guideline Multi-Level Risk Assessment, New South Wales Department of Planning, 2011.



The risk assessment provides a screening level assessment, where all hazards in terms of their risk to people beyond the site boundary are assessed to identify any significant risks to off-site environments. Where these are limited to specific individual hazards, partial quantification is applied for potentially high consequence events with a low frequency of occurrence beyond the site boundary.

A detonation in the explosives store is identified in the HSW-HS as a potentially high consequence event that requires assessment using empirical calculations. This is expanded upon for the Golden Point Class 1 storage area in Section 7.3.2.

## **7.3 Risk assessment**

### **7.3.1 Hazard analysis**

The hazards associated with hazardous substances are generally classified by effect as follows:

- Fire/Explosion Effects: concerned with damage to property, the built environment and safety of people.
- Human Health Effects: concerned with the well-being, health and safety of people.
- Environmental Effects: concerned with damage to ecosystems and natural resources.

These hazards are based on the intrinsic characteristics of the substance, for example the flashpoint of a flammable substance. Table Appendix H.1 sets out the detailed hazard analysis for the Macraes Operation, identifying and rating potential hazards associated with each substance or storage activity, with reference to the hazard level assigned to each classification in the Land Use Planning Guide for Hazardous Facilities (Ministry for the Environment, 2000).

As noted in Section 3.4, New Zealand's hazardous substances classification system was originally developed under the HSNO Act but has now been aligned with the Globally Harmonized System of Classification and Labelling of Chemicals ("GHS"), specifically GHS 7 (introduced in 2021). Substances are classified based on their hazard properties, which align with the effects categories as follows:

- Physical hazards —flammable, explosive, oxidizing substances (Classes 1 – 5).
- Health hazards —toxic, corrosive, sensitizing, carcinogenic substances (Classes 6 and 8).
- Environmental hazards —aquatic toxicity, ecotoxicity to soil or air organisms (Class 9).

The purpose of the hazard analysis is to undertake a preliminary scaling and ranking of hazards and to identify risks that should be considered in greater detail.

Substances that, in the absence of controls, have hazards that could have off-site effects are evaluated in the qualitative risk assessment in Section 7.3.4. The hazard analysis findings are summarised as follows:

#### **7.3.1.1 Bulk diesel refuelling areas**

Bulk diesel has a low flammability hazard and does not produce a flammable vapour. The health hazard from diesel is also low, requiring chronic direct exposure to have effect. The key hazard associated with diesel is its chronic ecotoxicity, which presents a moderate risk to ecosystems in the event of a spill.

### 7.3.1.2 Workshops

The majority of substances stored and used at the Open Pit Workshop or workshop associated with the Processing Plant have low hazards to off-site areas:

- Hazards associated with diesel storage and use are described above.
- The storage and use of flammable or oxidising gases and flammable aerosols, and packages of flammable fuels or cleaning/maintenance products at the workshops pose a low hazard to off-site people and property due to the large separation of storage to off-site buildings.
- Human health hazards associated with the bulk packaged liquids used at the workshop (e.g. coolants, lubricants) are low and in many cases, negligible. Human health hazards of the smaller packaged liquids such as brake cleaner, paints, herbicides or cleaning products range from low to high, but are generally in small packages with limited potential to impact off-site locations.
- Many of the packaged liquids used at the Macraes Operation have low to moderate ecotoxicity hazards to ecosystems in the event of a spill. Substances with Class 9.1A classifications for high acute ecotoxicity include the herbicides (kept in small containers in banded areas).
- Fire extinguishant products have low hazards to human health via chronic skin contact, and moderate aquatic ecotoxicity in the event of a spill. This hazard is limited by the small package size (<20 L).

### 7.3.1.3 Processing Plant – laboratory:

Quantities of substances stored and used in the laboratory are generally very low in the context of the Processing Plant. Key hazards identified include;

- The storage and use of flammable or oxidising gases poses a low hazard to off-site people and property due to the large separation of storage to off-site buildings.
- Small packages of low to moderately flammable solvents, liquid frothing agents, acids and reagents that are low to moderately hazardous to human health and may have low to high ecotoxicity hazards, which are in practice limited by the small quantities used in an area well separated from sensitive activities.
- Solid fluxing agents have low hazards to human health via ingestion or inhalation and have a high ecotoxicity classification. In practice the hazard to off-site people or ecosystems is low due to the low mobility of the solid fluxing agents.
- Solid cyanide used in the laboratory has a high hazard to human health if ingested or inhaled as a dust or mist and has a moderate hazard to human health via direct skin contact. It is also acutely toxic to aquatic and terrestrial ecosystems. The hazard to off-site people or ecosystems is limited by the solid form of the product (which limits the mobility of the material in a spill, enabling easy containment and clean up) and the small quantity stored and used in the lab by certified individuals.

### 7.3.1.4 Processing Plant – bulk storage and ore processing:

Hazards identified for the Processing Plant include:

- The bulk gas storage of LPG and oxygen have high flammability hazards, noting that oxygen will accelerate a fire but is not itself flammable and that these are each well separated from other facilities on site.
- Nitric acid and potassium nitrate used in the Processing Plant have a moderate fire hazard as oxidising substances.

- Bulk cyanide is stored as a solid and as a liquid solution in process tanks in the plant area. It has a high hazard to human health if ingested or inhaled as a dust or mist and has a moderate hazard to human health via direct skin contact. It is also highly acutely toxic to aquatic and terrestrial ecosystems.
- SIBX is stored as a solid and in solution in process tanks. It has a low fire hazard as a self-heating substance and is therefore segregated from other flammable or oxidising substances. It has low toxicity to human health via ingestion and is a skin and eye irritant.
- Other solids used in the processing plant include copper sulphate pentahydrate, sodium metabisulphite, soda ash, sulphamic acid and activated carbon. The human health hazards associated with these substances arise from either ingestion, or chronic direct skin exposure or inhalation, and are considered low due to their limited mobility as solids and high separation to sensitive activities. The sulphamic acid has a moderate aquatic ecotoxicity classification, but its pathway to sensitive environments is limited by its solid state and as such its hazard to ecosystems is overall considered low.
- Other than the cyanide products, there are no bulk liquids or solids at the Processing Plant that have an acute toxicity hazard level higher than low (Class 6.1D). Many of the substances used across the Macraes Operation such as fuels, treatment chemicals or workshop substances have chronic health hazards such as carcinogenicity, skin or eye irritancy, target organ toxicity, which require direct contact via inhalation, ingestion or skin contact and are principally hazards to workers on site. These hazards do not have a pathway to impact off-site people.
- Corrosive substances are used in the Processing Plant (lime solution, nitric acid, caustic soda). The hazard from these substances to off-site people and property are low to moderate, as they require direct skin contact and have limited pathways to impact people due to the isolation of the activities. They may have impacts on the sensitive aquatic ecosystems if large quantities of concentrated corrosive liquids are released to downstream ecosystems in a spill event.
- Mercury is a waste product collected at the Gold Room. It has a moderate acute toxicity via ingestion or inhalation and has chronic exposure health hazards. It has a high hazard to ecosystems, limited by the small quantities and specialist training of certified handlers.

#### **7.3.1.5 Proposed Water Treatment Plant**

- Corrosive substances with low acute or chronic toxicity are proposed to be used in the WTP (quicklime, caustic soda, sulphuric acid, ferric chloride, sodium hypochlorite, sodium metabisulphite) along with low hazard coagulant and flocculants. The hazards from these substances to off-site people and property are low to moderate, as they require direct skin contact and have limited pathways to impact people due to the isolation of the activities from offsite areas. They may have impacts on the sensitive aquatic ecosystems if large quantities of concentrated corrosive liquids are released to downstream ecosystems in a spill event.

#### **7.3.1.6 Class 1 explosives and Class 5 storage:**

- The Class 1 explosives (boosters, packaged explosives and detonators) at the GPUG storage compound have a high hazard to people, property and ecosystems in the event of an unplanned detonation at the storage magazines. The residual risk may be significant, so a partial quantitative review of the consequence using the blast overpressure levels is undertaken in Section 7.3.2.
- The bulk storage of Class 5 oxidisers (ANE, sodium nitrite) in a dedicated area near the GPUG Mine has a high fire/explosion hazard, noting that this requires combustible materials to be present in order for a fire to be accelerated.

- The Class 1 explosives and Class 5 oxidisers have high ecotoxicity hazard classifications that are considered low in practice, limited by the solid (or pelletised) form of the substance enabling easy containment and clean up in a spill.

### 7.3.1.7 Ecological enhancement areas

- Agrichemicals (herbicides, pesticides, fungicides) may be stored and used in the ecological enhancement areas for management of pest species. The hazards to off-site people are low, and some of the products may have a low flammability hazard. Most agrichemicals pose a high hazard to ecosystems in the event of a spill of concentrate.
- Fuel (principally petrol) stored in these areas for supply to maintenance equipment is highly flammable, has a low hazard to human health and is highly ecotoxic in a spill. These hazards are limited by low storage quantities, and significant separation to off-site people or property.

### 7.3.2 Partial quantitative analysis of Class 1 explosion

Partial quantitative analysis has been undertaken for the consequence of a detonation at the Class 1 explosives stores by considering the level of damage expected at specific overpressure values provided by the Hazardous Industry Planning Advisory Paper No.4 ("HIPAP-4"<sup>18</sup>) Risk Criteria for Land Use Safety Planning, published by the State of New South Wales through the Department of Planning in 2011.

The maximum overpressure levels anticipated in the event of a detonation at the existing Class 1 explosives store has been calculated for the maximum quantity of explosives in storage in accordance with WorkSafe's blast overpressure calculations as shown on Figure 6.1 and in Table 6.1.

The predicted overpressure levels at off-site locations are considered in terms of the expected effect provided in Table 7 Appendix 1 of HIPAP-4. This table is reproduced as Figure 7.2 below.

| Explosion Overpressure | Effect                                                                                                                                                                                                                                                                        |
|------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 3.5 kPa (0.5 psi)      | <ul style="list-style-type: none"> <li>• 90% glass breakage</li> <li>• No fatality and very low probability of injury</li> </ul>                                                                                                                                              |
| 7 kPa (1 psi)          | <ul style="list-style-type: none"> <li>• Damage to internal partitions and joinery but can be repaired</li> <li>• Probability of injury is 10%. No fatality</li> </ul>                                                                                                        |
| 14 kPa (2 psi)         | <ul style="list-style-type: none"> <li>• House uninhabitable and badly cracked</li> </ul>                                                                                                                                                                                     |
| 21 kPa (3 psi)         | <ul style="list-style-type: none"> <li>• Reinforced structures distort</li> <li>• Storage tanks fail</li> <li>• 20% chance of fatality to a person in a building</li> </ul>                                                                                                   |
| 35 kPa (5 psi)         | <ul style="list-style-type: none"> <li>• House uninhabitable</li> <li>• Wagons and plants items overturned</li> <li>• Threshold of eardrum damage</li> <li>• 50% chance of fatality for a person in a building and 15% chance of fatality for a person in the open</li> </ul> |
| 70 kPa (10 psi)        | <ul style="list-style-type: none"> <li>• Threshold of lung damage</li> <li>• 100% chance of fatality for a person in a building or in the open</li> <li>• Complete demolition of houses</li> </ul>                                                                            |

Figure 7.2: Effects of explosion overpressure.

Source: HIPAP-4

<sup>18</sup> Hazardous Industry Planning Advisory Paper No.4 (HIPAP-4), Risk Criteria for Land Use Safety Planning. State of New South Wales through the Department of Planning, 2011.



Overpressure levels below 3.5 kPa are not discussed in HIPAP-4 and are presumed to have a negligible impact on people and property. At 3.5 kPa, brittle material like glass is expected to crack or break, but the potential for injury to individuals is described as 'very low'. For the Macraes Operation, all areas exposed to overpressure levels of more than 3.5 kPa are restricted to employee access within the operational areas of the existing site. Some off-site areas in the Golden Point Reserve, are within the 2 – 3.5 kPa radius. In an unplanned complete detonation of the Class 1 explosives in storage, buildings in the 2 – 3.5 kPa area could be expected to have some repairable damage in the form of cracked glass or damaged partitions. These overpressure estimates are expected to be conservatively high due to the mitigating effect of the intervening terrain, which is considered to act as a barrier.

A person in the 2 kPa – 3.5 kPa radius, such as a tourist, would be expected to hear a brief audible noise in the range of 160 – 165 dB from the blast overpressure. At this level, the sound would be likely to cause the person short term pain and ringing in the ears, similar to the effects of standing close range to a firework or shotgun fire.

*AS 2187.1:1998 Explosives - Storage, transport and use, Part 1: Storage* specifies minimum separation distances to 'Class B' protected works, which include flammable or dangerous goods depots. For a 20,000 kg NEQ store, the minimum separation to Class B protected works is 610 m. The Class 5 reload depot and Processing Plant are both outside of this separation distance (as are the proposed WTP, all diesel tanks and the proposed Open Pit Workshop), and therefore cumulative impacts are not anticipated. With consideration of the level of impact at the maximum overpressure level, the consequence of a detonation in the Class 1 explosives storage facility to human health and property is minor.

### 7.3.3 Consideration of known industry events

A detonation in an explosives store managed in accordance with the HSW-HS is considered unlikely. Detonations in Class 1 explosives stores are not common in the mining industry. T+T is aware of only one known occurrence associated with mining in the Oceania region, which was a detonation underground in the Telfer Mine in Western Australia in 2005.

The Mines Safety Bulletin detailing the causes and consequence of this detonation is attached as Appendix I and summarised as follows:

- The detonation occurred in a store that was not designed for high volumes of explosives. It occurred in a 'working party magazine', a term for a small temporary store of explosives and detonators (typically <200 kg NEQ) for use by a group working in a particular area in an underground mine. In this case the temporary store was established with more than 6,000 kg NEQ of high explosives and up to 3,000 detonators all in the one chamber. Additionally, the store contained waste packaging debris from the spent explosives and had been the site of a spill of ANFO in an environment with reactive sulphide-containing minerals.
- When a fire started in the store, it burned for two hours before the detonation occurred. Efforts to put out the fire were hampered by the lack of a water deluge system within the underground mine and fire hoses for firefighting, the unsuitable class of fire extinguisher available, and inappropriate forced ventilation.
- The consequence of this 6,000 kg class 1 explosive detonation to human life was limited due to timely worker evacuation, however it did cause significant damage to mine underground services, ventilation doors and machinery.

The contributing factors in this event would not lead to a detonation at the proposed operation. The store at Golden Point is designed to meet the standard AS 2187.1. for Explosives Storage Transport and Use, including systems for waste management, fire extinguishers and segregation of incompatible substances.

OGNZL has not had any such incidents in any of its existing explosive stores and has a number of controls to prevent such an incident. A likelihood rating of 'unlikely' is considered appropriate for the event.

Additionally, the long delay (two hours) between ignition of the fire in the Telfer mine working magazine and the detonation of the explosives illustrates how explosives in storage are less volatile than explosives that have been properly prepared and densely packed into a blast hole for firing. This example illustrates that instantaneous and complete detonation of the contents of a magazine is an unlikely scenario.

### 7.3.4 Risk analysis

A qualitative risk assessment of the identified hazards and failure modes has been undertaken in Appendix J for all of the scenarios identified in Section 7.3.1 where there is potential for off-site effects.

The qualitative risk assessment has been carried out in accordance with the method described in the MfE Guidance for Hazardous Facilities (2000) by applying a qualitative rating to the frequency (likelihood) of the failure occurring and the consequence (severity) of impacts if the event were to occur. The likelihood and consequence ratings take into account the controls (mitigation and management measures) that will be in place.

The qualitative risk analysis serves as a screening assessment to identify events where the residual risk may be significant and require further quantitative assessment. Where risks are identified that can be managed and are acceptable in terms of a qualitative assessment, no further evaluation is considered necessary. The assessment has been based on information from OGNZL from Macraes and similar mining operations elsewhere, and professional judgement.

There is one residual risk associated with the proposed activities as identified in Appendix J Table 4 that is assessed as moderate as follows:

- Moderate residual risk to the ecosystems from a spill of diesel during in-situ equipment refuelling, which is managed through physical controls including automatic shutoffs on fuel nozzles, and management provisions including refuelling procedures, emergency response planning, spill kits and staff training. Back up containment is provided by diversion drains, sediment collection ponds and other tertiary containment measures in the Mine Water Management System for additional failsafe protection for off-site waterways in the event of a spill of hazardous liquid.

All other risks were assessed as low including:

- Low residual risk to ecosystems from a spill of diesel from a tank leak or rupture, managed by use of double-skinned tanks which have monitoring systems to identify leaks from the internal tank.
- Low residual risk to ecosystems from a spill of corrosive or toxic liquid from a tank leak or rupture at the Processing Plant or Water Treatment Plant. The risk of tank failure is managed by locating the tanks in bunded areas and ensuring that the area around the tank drains to the network of sumps for reuse in the processing activities or treatment. In all cases, each tank is monitored to raise alarm in the event of an abnormal fill level change and staff supervising these operations are trained in the emergency response procedures.
- Low residual risk to ecosystems from a spill of packaged hazardous substances such as laboratory reagents, coolant, maintenance oils and greases during unloading to site or during storage. This is managed through physical controls including secondary containment in storage to prevent discharges to the off-site environment.

Small spills are primarily managed through the use of packaged goods within covered workshops, staff training and emergency response planning including spill kits at the unloading and storage areas and in the workshops.

- Low residual risk of fire at the diesel, LPG, acetylene, oxygen, ANE and sodium nitrite storage areas impacting off-site locations. The likelihood of a fire at these storage areas is minimised through prevention measures such as access restrictions, exclusion of ignition sources and segregation of incompatible or reactive substances. The consequence of a fire is minimised by the separation distances to buildings and the site boundary, as well as emergency management measures including fire-fighting facilities and staff emergency response training.
- Low residual risk to occupants of off-site properties or recreational users of the Golden Point Reserve from an unplanned detonation in the existing Class 1 explosives storage areas. The likelihood of this event is minimised through restricted access to externally certified handlers only, storage in certified magazine units with lightning strike protection, availability of firefighting equipment and emergency response management measures. The consequence of this event was evaluated quantitatively using the calculated overpressure level at off-site locations in Section 6 and was determined to be minor. The consequence to the public is limited through provision of a large separation distance to incompatible substances and the boundary. The overall risk given the low likelihood of an unplanned detonation is assessed as low.

## 8 Assessment of effects on the environment

### 8.1 Introduction

The following assessment identifies and assesses the actual and potential effects of the hazardous substances storage and use as part of MP4. This assessment also outlines the measures that OGNZL proposes to avoid, remedy or mitigate any potential adverse effects on the environment.

### 8.2 Hazardous substances

The assessment has particular regard to the following aspects:

- Avoiding or mitigating adverse effects associated with the production, storage, use, transport and disposal of hazardous substances.
- Requiring hazardous substances to be stored and used in a way that ensures residual risks of adverse effects on the health and safety of people are managed to acceptable levels.
- Ensuring that hazardous substances are used, handled and transported in such a way to avoid adverse effects on ecosystem and public health.
- Avoiding unsafe discharge or disposal of hazardous waste to the environment.

#### 8.2.1 Effects on people and property

The areas in which hazardous substances are principally stored and used are within the wider Macraes Operation landholding, zoned for Macraes Mining under the WDP. Some of the diesel storage and use activities are proposed to be undertaken within the Rural (2GDP) zone.

The surrounding areas are zoned for low density rural use under the WDP. The closest residence is over 750 m from the nearest hazardous substances activity at the Macraes Operation and over 2 km from the Processing Plant, Class 5 Depot or Class 1 explosives storage.

The key risks to people and property from the activities evaluated in this assessment are fire and blast overpressure risk and spill of toxic hazardous substances, these risks are discussed below.

##### 8.2.1.1 Fire risk to people and property

The risk to people from a fire at the flammable or oxidiser storage locations associated with the Processing Plant (specifically from LPG, solvents, liquid oxygen, potassium nitrate, nitric acid, SIBX, packaged flammable liquids and welding gases), Class 5 reload depot (ANE and sodium nitrite), workshops (packaged flammable liquids, oils, welding gases), ecological enhancement areas (petrol), and diesel tanks has been assessed as low. The risk is managed through controls including certification, preventative maintenance at the storage facilities, provision of fire extinguishers or fire-fighting water pump systems, segregation of reactive substances and separation of flammable or oxidising substances from buildings. OGNZL has emergency response procedures under their emergency response plan which includes a dedicated trained firefighting team and firefighting appliances to respond in the event of a fire and/or accidental release of hazardous substances.

Based on the emergency response plan, controls in place at the Macraes Operation, and the separation distances to the closest dwellings, the level of potential effect on people and property from a fire at the flammable or oxidising substance locations has been assessed as less than minor.

##### 8.2.1.2 Explosion risk to people and property

Overpressure zones have been presented for the Class 1 explosives storage to demonstrate compliance with the offset distances required in the HSW-HS regulations for the protection of the public.



These overpressure zones enable consequence analysis for the impact of an unintended initiation. The nearest publicly accessible area is over 900 m northwest of the Class 1 explosives storage facility at the closest point in the DOC-owned Golden Point Reserve, and the closest building within the reserve is approximately 1.1 km northwest of the Class 1 storage area. Therefore, the storage of explosives has been identified to have potential risks to off-site persons or public.

As discussed in the partial quantitative analysis in Section 7.3.2, there are areas of the Reserve, including the closest building, that fall within the 2 kPa – 3.5 kPa blast overpressure radius. The Golden Point Historic Reserve and the buildings within it are of historical interest but are not permitted to be used for overnight stays. Under the HSW-HS regulations, restrictions are placed on areas that may experience adverse effects at the identified overpressure levels. There are no restrictions on buildings with fewer than 4 storeys being located in the 2 kPa – 5 kPa radius area unless they are being used for hospitals, early childcare centres or vulnerable facilities of similar scale. While there are restrictions on *public buildings or structures of historic value* being located within the 2 kPa overpressure zone, the risks to the historic structures at this location is considered by the compliance certifier to be mitigated by the intervening terrain features.

The HIPAP-4 provides the expected effect of various levels of explosion overpressure as reproduced in Figure 7.2 in Section 7.3.2. The injury probability below 3.5 kPa boundary is described as ‘very low’. Minor and repairable damage to glass or partitions could be expected on a building near the OGNZL boundary. The off-site risk to people or property within the 2 – 3.5 kPa radius from an accidental detonation associated with the storage of explosives has been assessed as low.

The controls in place to mitigate the risk include the design, testing, regular certification auditing and maintenance of the explosives magazine location in accordance with the HSW-HS requirements (including for security, lightning strike protection), access restricted to trained Certified Handlers, segregated storage areas and loading zones away from other flammable or explosive substances storage, and an Emergency Management Principal Control Plan. Workers on-site are trained in emergency response per the Emergency Management Principal Control Plan and substance-specific emergency response procedures.

Taking into consideration the proposed controls to manage the hazards, the isolation of the activity and the separation distance to the closest dwelling, the effect on people or property from an accidental detonation at the explosives storage facility have been assessed as less than minor.

### 8.2.1.3 Spill risk to people and property

The risk to people and property from a spill of toxic or corrosive liquids (bulk reagents used at the Processing Plant, Water Treatment Plant or small packaged substances used at the workshops, ecological enhancement areas and laboratory) has been assessed as low. The hazardous substances mentioned are stored in secondary containment within the Processing Plant or workshops, segregated from incompatible substances. Where handling bulk substances that have potential for serious injury to humans e.g. corrosive to dermal or ocular tissue, the handling systems are automated to reduce human interaction and prevent overfilling. Emergency response plans for spill events have been prepared for the site and are regularly drilled by trained staff.

Mercury storage poses a risk to both people and environment in the event of an accidental release. Mercury is produced as a by-product of the processing of ore. However, as mercury is stored in small amounts (maximum 13 kg) within secure containment in the Gold Room, it is considered a low risk of impacts off-site. Standard operating procedures and controls are in place during handling and disposal of mercury, and these controls include establishing a secure collection system for mercury collection, tracking of mercury quantities, designation of trained and certified handlers, and disposal to an authorised facility.

A key risk that has been identified which could result in an off-site human effect is a spill of the cyanide due to its high degree of hazard to human health, especially if the cyanide enters waterbodies. OGNZL provides secondary containment facilities, as described in Section 4.3, to capture and retain liquid hazardous substances. In the unlikely event of a spill escaping these containment controls, tertiary containment is also available the form of engineered sumps and ponds.

Taking into account the controls in place, secondary containment, the large separation distances from storage areas to the OGNZL landholding boundary and the ponds to contain site run-off and spills, the effects on people from a spill of hazardous liquid associated with the activities has been assessed as less than minor.

### **8.2.2 Effects on ecosystems**

The existing and proposed areas within the Macraes Operation where hazardous substances will be stored and used are highly modified and are not considered sensitive to the ecotoxicity effects of hazardous substances. Off-site waterways (including Deepdell Creek, Murphys Creek, Highlay Creek, Waikouaiti River (North Branch) and Tipperary Creek) have been evaluated as having a high sensitivity to the effects of an uncontrolled spill of ecotoxic substances.

As outlined when considering the spill risk to people, the liquid hazardous substances are stored within secondary containment. Solid substances including quicklime, SIBX, soda ash, copper sulphate pentahydrate, cyanide, potassium nitrate, sodium nitrite, ANFO, booster and packaged explosive do not require secondary containment. ANE is in a highly viscous state and is considered a solid in the storage conditions within its designated shed.

Management and controls of substances are in place through the PHMP-HS which outlines the standards and procedures for hazardous substances. These include provision of secondary containment, equipment maintenance, interlocks or shut-off valves to prevent overfilling and potential spills, staff training to ensure competency when working with substances, safe transport procedures, emergency response plans and dedicated response teams in the event of accidental release.

Of the substances stored on-site, a spill of highly environmentally hazardous substances, cyanide or diesel could have adverse effects on the environment. As stated above, OGNZL has provided structural controls for this higher risk through provision of secondary containment and tertiary containment sumps to retain the cyanide or any other product in the event of a spill and failure of secondary containment. The diesel containers also are provided with structural controls including double skinned containment, bunded pumping equipment and overfilling protections.

Taking into account the controls and storage management in place, secondary containment and the tertiary containment provided by the collection sumps, the level of potential effect on the environment from a spill has been assessed as less than minor.

### **8.2.3 Cumulative effects**

The OGNZL activities are the only large-scale industrial activity within the immediate area.

With regards to cumulative effects of explosives, the greatest risk posed by the Class 1 storage associated with the Golden Point Underground Mine is an accidental detonation. Storage of explosives precursors (the ANE and sodium nitrite) at the Class 5 reload depot, approximately 650 m northwest of the Class 1 store is the nearest comparable activity and is suitably separated in compliance with AS 2187.1. Other explosives storage includes surface storage at the Redbull Facilities west of the Frasers West Pit located over 3.2 km from the existing Class 1 store at Golden Point. At this distance there is no increased risk of explosion propagation between the stores.

Each site will be managed in accordance with the relevant controls described in Appendix C including strict site security, exclusion of ignition sources and incompatible materials, and specialist training of all staff responsible for handling explosives. The risk of cumulative effects from explosives storage is negligible.

#### **8.2.4 Transport**

The main transport routes to the Macraes Operation facilities for delivery of hazardous substances are via the State Highway Network and Macraes Road and will be unchanged from the existing transport routes used for the current activities. No transport through built-up or dense residential areas outside the Main State Highway network is proposed.

Transport of all hazardous substances will be in accordance with the Land Transport Rule: Dangerous Goods 2005, which specifies requirements for placarding, separation of incompatible substances, emergency response equipment and staff training. Additionally, when on-site all transport of explosives and acutely toxic substances (cyanide products and mercury) is carried out under the supervision of a Certified Handler. These measures are considered sufficient to ensure that the environmental effects arising from the transport of hazardous substances will be less than minor.

## 9 Conclusions

The key risks related to the proposed storage and use of hazardous substances associated with the Project include:

- Risk of ecotoxic and human health effects from a spill of corrosives, oxidisers, diesel, oils or other packaged maintenance or cleaning substances at the Open Pit Workshop, Water Treatment Plant, Processing Plant or refuelling areas during delivery, storage or use.
- Fire risk at the flammable or oxidising substance storage areas at the Open Pit Workshop, Processing Plant, or refuelling areas.
- Risk of an unintended detonation at the existing Class 1 explosives storage facility that services GPUG mining activities.
- Fire risk in the existing Class 5 reload depot at the GPUG surface facilities.

The risks to people and property from an unintended detonation at the proposed or existing Class 1 explosives storage locations is assessed as low and the effect less than minor. This is managed through site and equipment design (e.g. separation distances to off-site locations and other explosives stores, provision of fire-fighting equipment and certification of the explosives storage magazines) and management controls (personnel access restrictions, security monitoring, staff training and handler certification, and emergency response planning).

The risk to people and property from a fire at the flammable or oxidising substance locations at the Macraes Operation has been assessed as low and the effect less than minor. Hydrocarbons and oxidising substances stored and used in workshops, Processing Plant or refuelling areas are managed through operational controls (security monitoring, training and handler certifications, emergency response plans, mine emergency response team) and equipment design (e.g. separation distances to the site boundary, separation from ignition sources, certification of storage areas to comply with safety regulations, provision of firefighting infrastructure at storage compounds). The storage locations are isolated from public access and are within the Macraes Operation boundaries.

The environment is considered sensitive to the effects of a spill of diesel, corrosive liquids or packaged ecotoxic liquids. The risk to the environment from ecotoxic spills is assessed as low to moderate and will be managed through site design (e.g. proposed spill containment measures including double-skinned tanks, bunded package storage areas and collection sumps for runoff arising from around the bulk hazardous substances storage areas) and operational procedures (e.g. procedures for spill response, unloading and safe handling and for managing contaminated soils).

Taking into account these controls, the overall effects on the environment from the use and storage of hazardous substances have been assessed as less than minor.

## 10 Applicability

This report has been prepared for the exclusive use of our client Oceana Gold (New Zealand) Limited, with respect to the particular brief given to us and it may not be relied upon in other contexts or for any other purpose, or by any person other than our client, without our prior written agreement.

We understand and agree that our client will submit this report as part of an application under the Fast-track Approvals Act 2024 and that an Expert Panel as the consenting authority will use this report for the purpose of assessing that application. We understand and agree that this report will be used by the Expert Panel in undertaking its regulatory functions in connection with the MP4 Project.

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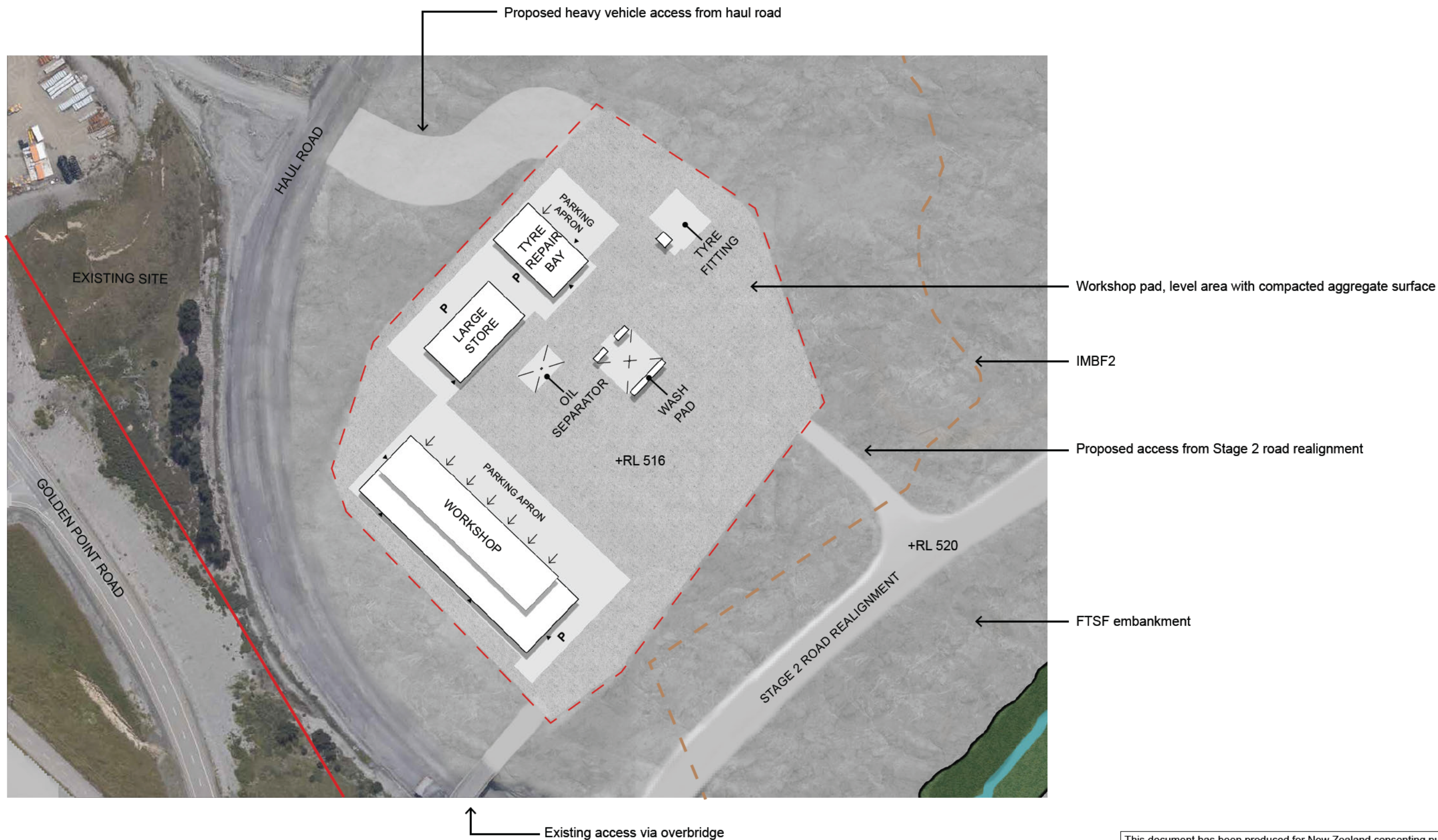
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## **Appendix A      Open pit workshop concept plan**

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This document has been produced for New Zealand consenting purposes only.  
Information contained herein must not be relied on for investment purposes.



LEGEND

|  |                     |
|--|---------------------|
|  | CONCRETE PAD        |
|  | COMPACTED GRAVEL    |
|  | GENERAL DISTURBANCE |

|  |                                |
|--|--------------------------------|
|  | INDICATIVE WORKSHOP PAD EXTENT |
|  | OPEN PIT DISTURBANCE AREA      |
|  | BACKFILL                       |

MP4  
Workshop Concept Plan

Date: 04 Sept 2026 | Revision: 0  
Plan prepared for Oceana Gold Ltd by Boffa Miskell Limited  
Drawn: MWa | Checked: RGi

## **Appendix B      Hazardous substances inventory**

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**Table Appendix B.1: Hazardous substance inventory – Open pit workshop**

| Substance                                     | State  | Classification (HSNO and GHS7)       |                                                                                                                                                                                         | Maximum quantity | Location                                               |
|-----------------------------------------------|--------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------------------------------|
| Bulk tanks                                    |        |                                      |                                                                                                                                                                                         |                  |                                                        |
| Diesel<br>(UN 3082)                           | Liquid | 3.1D<br>6.7B<br>6.1E<br>9.1B         | Flammable liquids Category 4<br>Carcinogenicity Category 2<br>Aspiration hazard Category 1<br>Chronic aquatic toxicity Category 2                                                       | 43,500 L         | Diesel tank FT5                                        |
| Grease                                        | Solid  | NH                                   | Not classified as hazardous                                                                                                                                                             | 5,760 kg         | Mobile tanks                                           |
| Oils                                          | Liquid | NH                                   | Not classified as hazardous                                                                                                                                                             | 60,500 L         | Bulk tanks :<br>4 x 10,000 L<br>1 x 20,500 L           |
| Waste oil                                     | Liquid | NH                                   | Not classified as hazardous                                                                                                                                                             | 55,000 L         | Bulk tank                                              |
| Packaged goods                                |        |                                      |                                                                                                                                                                                         |                  |                                                        |
| Maintenance oils<br>and lubricants            | Liquid | 6.5B                                 | Skin sensitisation Category 1                                                                                                                                                           | 1,000 L          | Yard                                                   |
| Coolants                                      | Liquid | 6.1D<br>6.8B<br>6.9B                 | Acute toxicity (Oral) Category 4<br>Reproductive toxicity Category 1B<br>Specific target organ toxicity (repeated exposure) Category 2                                                  | 10,000 L         | IBCs in the bulk tank bund and<br>next to grease tank. |
|                                               |        |                                      |                                                                                                                                                                                         | 24,000 L         | Bulk storage container                                 |
| Flammable paints<br>and solvents <sup>A</sup> | Liquid | 3.1C<br>6.1E<br>6.3A<br>9.1C         | Flammable liquids Category 3<br>Aspiration Hazard Category 1<br>Skin irritation Category 2<br>Chronic aquatic toxicity Category 3                                                       | 200 L            | Flammable storage cabinet<br>within the workshop       |
|                                               | Liquid | 3.1B<br>6.1D<br>6.3A<br>6.5B<br>6.4A | Flammable liquids Category 2<br>Acute toxicity (oral) Category 4<br>Skin irritation Category 2<br>Respiratory sensitisation Category 1B<br>Serious eye damage/eye irritation Category 2 | 40 L             | Flammable storage cabinet<br>within the workshop       |

| Substance                                                                | State   | Classification (HSNO and GHS7)        |                                                                                                                                                                                            | Maximum quantity                     | Location                                                      |
|--------------------------------------------------------------------------|---------|---------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|---------------------------------------------------------------|
|                                                                          |         | 6.7B<br>6.8B<br>6.9B<br>9.1B          | Carcinogenicity Category 2<br>Reproductive toxicity Category 2<br>Specific target organ toxicity (repeated exposure) Category 2<br>Hazardous to the aquatic environment (acute) Category 2 |                                      |                                                               |
| Flammable brake cleaner                                                  | Liquid  | 3.1B<br>6.1E<br>6.3A                  | Flammable liquids Category 2<br>Aspiration Hazard Category 1<br>Skin irritation Category 2                                                                                                 | 20 L                                 | Flammable cabinet within the workshop                         |
| Combustible solvents/degreaser                                           | Liquid  | 3.1D<br>6.1E<br>9.1B                  | Flammable liquids Category 4<br>Aspiration Hazard Category 1<br>Chronic aquatic toxicity Category 2                                                                                        | 500 L                                | Within the workshop                                           |
| Cleaning products (detergent, handwash, windscreen cleaner) <sup>A</sup> | Liquid  | 6.3A<br>6.5B<br>6.7A<br>6.4A/<br>8.3A | Skin irritation Category 2<br>Respiratory sensitisation Category 1B<br>Carcinogenicity Category 1<br>Eye irritation Category 2 / Serious eye damage Category 1                             | 275 L                                | Within the workshop                                           |
| Adhesives                                                                | Solid   | 6.3A<br>6.5B<br>8.3A                  | Skin irritation Category 2<br>Respiratory sensitisation Category 1B<br>Serious eye damage Category 1                                                                                       | 20 kg                                | Within the workshop                                           |
| Flammable aerosols                                                       | Aerosol | 2.1.2A                                | Flammable aerosol Category 1                                                                                                                                                               | 120 L (sighted in walkover)          | Aerosol cabinets (60 L max capacity each) within the workshop |
| Extinguishant /fire fighting foam                                        | 6.4A    | 6.5B                                  | Eye irritation Category 2                                                                                                                                                                  | 48 L<br>(8 x 6 L packs)              | Workshop                                                      |
|                                                                          |         |                                       |                                                                                                                                                                                            | 140 L<br>(33 packs in various sizes) | Dedicated container in yard                                   |
| Herbicides                                                               | Liquid  | 6.3A<br>6.4A<br>9.1B                  | Skin irritation Category 2<br>Eye irritation Category 2<br>Aquatic toxicity (Chronic) Category 2                                                                                           | 250 L maximum                        | Agrichemicals cabinet                                         |



| Substance                        | State | Classification (HSNO and GHS7) |                                                  | Maximum quantity      | Location                  |
|----------------------------------|-------|--------------------------------|--------------------------------------------------|-----------------------|---------------------------|
| Gas storage                      |       |                                |                                                  |                       |                           |
| LPG<br>(UN 1075)                 | Gas   | 2.1.1A                         | Flammable gas Category 1A                        | 225 kg– 5 cylinders   | Outdoor gas storage cages |
|                                  |       |                                |                                                  | 135.9 kg– 3 cylinders |                           |
| Acetylene<br>(UN 1001)           | Gas   | 2.1.1A                         | Flammable gas Category 1A                        | 23.4 m³ – 4 cylinders |                           |
| Oxygen<br>(UN 1072)              | Gas   | 5.1.2A                         | Oxidising gases Category 1                       | 93 m³– 10 cylinders   |                           |
| Nitrogen<br>(UN 1066)            | Gas   | NH                             | Gas under pressure (not classified as hazardous) | 52.2 m³– 6 cylinders  |                           |
| Argon or argoshield<br>(UN 1006) | Gas   | NH                             | Gas under pressure (not classified as hazardous) | 35.5 m³ – 5 cylinders |                           |
| Carbon dioxide<br>(UN 1013)      | Gas   | NH                             | Gas under pressure (not classified as hazardous) | 72 m³ – 10 cylinders  |                           |

Notes:

A. Not all products in this group have all the classifications listed, however, for conservatism these hazards are assessed as applying to all items in the group.

**Table Appendix B.2: Hazardous substance inventory – Processing plant**

| Substance                      | State                               | Classification (HSNO and GHS7) |                                                             | Maximum quantity | Location                     |
|--------------------------------|-------------------------------------|--------------------------------|-------------------------------------------------------------|------------------|------------------------------|
| Diesel<br>(UN 3082)            | Liquid                              | 3.1D                           | Flammable liquids Category 4                                | 500 L            | Mobile trailer tanker TK-100 |
|                                |                                     | 6.7B                           | Carcinogenicity Category 2                                  | 2,500 L          | Generator set                |
|                                |                                     | 6.1E                           | Aspiration hazard Category 1                                |                  |                              |
|                                |                                     | 9.1B                           | Chronic aquatic toxicity Category 2                         |                  |                              |
| BOC Gas Oxygen Plant           |                                     |                                |                                                             |                  |                              |
| Liquid oxygen<br>(UN 1073)     | Comp gas                            | 5.1.2A                         | Oxidising gases Category 1                                  | 100,000 kg       | Bulk tank L80A               |
|                                |                                     |                                |                                                             | 50,000 kg        | Bulk tank L80B               |
|                                |                                     |                                |                                                             | 12,000 kg        | Bulk tank T803               |
|                                |                                     |                                |                                                             | 87 m³            | 10 cylinders – portable      |
| Nitrogen<br>(UN 1977)          | Comp gas                            | NH                             | Non-hazardous gas under pressure                            | 5,000 kg         | Bulk tank                    |
|                                |                                     |                                |                                                             | 52.2 m³          | 6 cylinders                  |
| Trichloroethylene<br>(UN 1710) | Liquid                              | 6.3A                           | Skin irritation Category 2                                  | 600 L            | Bunded plant area            |
|                                |                                     | 6.4A                           | Eye irritation Category 2                                   |                  |                              |
|                                |                                     | 6.1D                           | Acute toxicity (inhaled) Category 4                         |                  |                              |
|                                |                                     | 6.6B                           | Germ cell mutagenicity Category 2                           |                  |                              |
|                                |                                     | 6.7A                           | Carcinogenicity Category 1B                                 |                  |                              |
|                                |                                     | 6.9B                           | Specific target organ toxicity repeated exposure Category 2 |                  |                              |
| 9.1B                           | Chronic aquatic toxicity Category 2 |                                |                                                             |                  |                              |
| Water treatment chemical       | Liquid                              | 8.1A                           | Corrosive to metals Category 1                              | 400 L            | Bunded plant area            |
|                                |                                     | 8.2B                           | Skin corrosion Category 1B                                  |                  |                              |
|                                |                                     | 8.3A                           | Serious eye damage Category 1                               |                  |                              |
|                                |                                     | 9.1C                           | Chronic aquatic toxicity Category 3                         |                  |                              |
| Used oil                       | Liquid                              | 6.7A                           | Carcinogenicity Category 1                                  | 1,000 L          | Plant store                  |

| Substance                                          | State  | Classification (HSNO and GHS7)               |                                                                                                                                                                                                                                                                         | Maximum quantity | Location           |
|----------------------------------------------------|--------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------|
| Biocides                                           | Liquid | 6.1D<br>8.2A/C<br>6.5A<br>6.5B<br>9.1A-D     | Acute toxicity (oral) Category 4<br>Skin corrosion Category 1A / Category 1C<br>Respiratory sensitisation Category 1<br>Skin sensitisation Category 1<br>Aquatic toxicity acute/chronic Category 1-4                                                                    | 400 L            | Bunded plant area  |
| LPG<br>(UN 1075)                                   | Gas    | 2.1.1A                                       | Flammable gas Category 1A                                                                                                                                                                                                                                               | 45 kg            | 5 x 9 kg cylinders |
| Bulk tanks                                         |        |                                              |                                                                                                                                                                                                                                                                         |                  |                    |
| Cyanide solution (30 %)<br>(UN 3414)               | Liquid | 6.1A                                         | Acute toxicity (oral, inhalation) Category 1                                                                                                                                                                                                                            | 60,000 L         | TK-11              |
|                                                    |        | 6.1C                                         | Acute toxicity (dermal) Category 3                                                                                                                                                                                                                                      | 32,000 L         | Storage TK-12      |
|                                                    |        | 6.5B                                         | Skin sensitisation Category 1                                                                                                                                                                                                                                           | 60,000 L         | Mixing TK-34       |
|                                                    |        | 6.8B                                         | Reproductive toxicity Category 2                                                                                                                                                                                                                                        |                  |                    |
|                                                    | Liquid | 6.9A                                         | Specific target organ toxicity (single or repeat exposure) Category 1                                                                                                                                                                                                   |                  |                    |
|                                                    |        | 8.1A                                         | Corrosive to metals Category 1                                                                                                                                                                                                                                          | 15,000 L         | Storage TK-17      |
|                                                    |        | 8.2A                                         | Skin corrosion Category 1A                                                                                                                                                                                                                                              |                  |                    |
|                                                    |        | 8.3A                                         | Serious eye damage Category 1                                                                                                                                                                                                                                           |                  |                    |
|                                                    |        | 9.1A                                         | Hazardous to the aquatic environment acute or chronic Category 1                                                                                                                                                                                                        |                  |                    |
|                                                    |        | 9.2A                                         | Hazardous to soil organisms                                                                                                                                                                                                                                             |                  |                    |
|                                                    |        | 9.3A                                         | Hazardous to terrestrial vertebrates                                                                                                                                                                                                                                    |                  |                    |
|                                                    |        | 9.4A.                                        | Hazardous to terrestrial invertebrates                                                                                                                                                                                                                                  |                  |                    |
| Copper sulphate pentahydrate solution<br>(UN 3082) | Liquid | 6.1D<br>6.3A<br>6.5B<br>6.4A<br>6.9B<br>9.1A | Acute toxicity (oral) Category 4<br>Skin irritation Category 2<br>Skin sensitisation Category 1<br>Eye irritation Category 2<br>Specific target organ toxicity (repeated exposure) Category 2<br>Hazardous to the aquatic environment Category 1 (acute and/or chronic) | 15,000 L         | Storage TK-17      |

| Substance                                            | State  | Classification (HSNO and GHS7) |                                                                                            | Maximum quantity | Location      |
|------------------------------------------------------|--------|--------------------------------|--------------------------------------------------------------------------------------------|------------------|---------------|
| Sodium metabisulphite solution<br>(UN 2693)          | Liquid | 6.3A                           | Skin irritation Category 2                                                                 | 20,000 L         | Mixing TK-42  |
|                                                      |        | 8.3A                           | Serious eye damage Category 1                                                              | 65,000 L         | Storage TK-43 |
|                                                      |        | 6.5A                           | Respiratory sensitisation Category 1                                                       |                  |               |
|                                                      |        | 6.5B                           | Skin sensitisation Category 1                                                              |                  |               |
| Soda ash (sodium carbonate)                          | Liquid | 8.3A                           | Serious eye damage Category 1                                                              | 10,000 L         | Mixing TK-500 |
|                                                      |        | 6.1E (resp)                    | Specific target organ toxicity (single exposure) Category 3 (respiratory tract irritation) |                  |               |
| Caustic soda (46-50 %)<br>(UN 1824)                  | Liquid | 6.1D                           | Acute toxicity (oral) Category 4                                                           | 20,000 L         | Storage TK-13 |
|                                                      |        | 8.1A                           | Corrosive to metals Category 1                                                             |                  |               |
|                                                      |        | 8.2B                           | Skin corrosion Category 1B                                                                 |                  |               |
|                                                      |        | 8.3A                           | Serious eye damage Category 1                                                              |                  |               |
|                                                      |        | 6.1E (resp)                    | Specific target organ toxicity (single exposure) Category 3 (respiratory tract irritation) |                  |               |
| Nitric acid (65-70 %)<br>(UN 2031)                   | Liquid | 5.1.1C                         | Oxidising liquids Category 3                                                               | 32,000 L         | Storage TK-14 |
|                                                      |        | 8.1A                           | Corrosive to metals Category 1                                                             |                  |               |
|                                                      |        | 8.2A                           | Skin corrosion Category 1A                                                                 |                  |               |
|                                                      |        | 8.3A                           | Serious eye damage Category 1                                                              |                  |               |
|                                                      |        | 6.1C                           | Acute toxicity (inhalation) Category 3                                                     |                  |               |
| Lime solution (high calcium quicklime)<br>(UN 1910)  | Liquid | 8.2C                           | Skin corrosion Category 1C                                                                 | 37,000 L         | Mixing TK-22  |
|                                                      |        | 8.3A                           | Serious eye damage Category 1                                                              |                  |               |
| Sodium isobutyl xanthate (SIBX) solution<br>(UN2922) | Liquid | 4.2C                           | Self-heating substances and mixtures Category 2                                            | 15,000 L         | Storage TK-18 |
|                                                      |        | 6.1D                           | Acute toxicity (oral) Category 4                                                           | 2,000 L          | Header TK-21  |
|                                                      |        | 6.3A                           | Skin irritation Category 2                                                                 | 1,000 L          | Header TK-41  |
|                                                      |        | 6.4A                           | Eye irritation Category 2                                                                  |                  |               |
| LPG<br>(UN 1075)                                     | Gas    | 2.1.1A                         | Flammable gas Category 1A                                                                  | 100,000 L        | Storage PV-21 |

| Substance                           | State  | Classification (HSNO and GHS7)                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Maximum quantity | Location                       |
|-------------------------------------|--------|---------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|--------------------------------|
| Solvent (Exxsol D40)<br>(UN 1268)   | Liquid | 3.1C<br>6.3A<br>6.9B<br>(narc)                                                        | Flammable liquids Category 3<br>Skin irritation Category 2<br>Specific target organ toxicity (single exposure) Category 3 (narcotic effects)                                                                                                                                                                                                                                                                                                                                         | 20,000 L         | Storage TK-59                  |
| Bulk solid storage and reagents     |        |                                                                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |                  |                                |
| High calcium quicklime<br>(UN 1910) | Solid  | 8.2C<br>8.3A                                                                          | Skin corrosion Category 1C<br>Serious eye damage Category 1                                                                                                                                                                                                                                                                                                                                                                                                                          | 150,000 kg       | Lime Storage Silo (BN-02)      |
| Sodium carbonate                    | Solid  | 6.1D<br>6.3A<br>6.4A                                                                  | Acute toxicity (dermal, inhalation) Category 4<br>Skin irritation Category 2<br>Eye irritation Category 2                                                                                                                                                                                                                                                                                                                                                                            | 100,000 kg       | Soda Ash Storage Silo (BN-501) |
| Activated carbon<br>(UN 1362)       | Solid  | 6.1E                                                                                  | Specific target organ toxicity (single exposure) Category 3 (respiratory tract irritation)                                                                                                                                                                                                                                                                                                                                                                                           | 11,000 kg        | Carbon Storage                 |
| Sodium cyanide (solid)<br>(UN 1689) | Solid  | 6.1A<br>6.1C<br>6.4A<br>6.5B<br>6.8B<br>6.9A<br>8.1A<br>9.1A<br>9.2A<br>9.3A<br>9.4A. | Acute oral, inhalation toxicity Category 1<br>Acute dermal toxicity Category 3<br>Eye irritation Category 2<br>Skin sensitisation Category 1<br>Reproductive toxicity Category 2<br>Specific target organ toxicity – repeated or chronic exposure Category 1<br>Corrosive to metals Category 1<br>Hazardous to the aquatic environment acute and chronic Category 1<br>Hazardous to soil organisms<br>Hazardous to terrestrial vertebrates<br>Hazardous to terrestrial invertebrates | 120,000 kg       | Cyanide Storage Yard           |



| Substance                                 | State | Classification (HSNO and GHS7)               |                                                                                                                                                                                                                                                                         | Maximum quantity | Location          |
|-------------------------------------------|-------|----------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-------------------|
| Copper sulphate pentahydrate (UN 3077)    | Solid | 6.1D<br>6.3A<br>6.4A<br>6.5B<br>6.9B<br>9.1A | Acute toxicity (oral) Category 4<br>Skin irritation Category 2<br>Eye irritation Category 2<br>Skin sensitisation Category 1<br>Specific target organ toxicity (repeated exposure) Category 2<br>Hazardous to the aquatic environment Category 1 (acute and/or chronic) | 77,000 kg        | Meta Storage Shed |
| Sodium metabisulphite                     | Solid | 6.1D<br>6.3A<br>8.3A<br>6.5A<br>6.5B         | Acute toxicity (oral) Category 4<br>Skin irritation Category 2<br>Serious eye damage Category 1<br>Respiratory sensitisation Category 1<br>Skin sensitisation Category 1                                                                                                | 40,800 kg        | Meta Storage Shed |
| Sodium isobutyl xanthate (SIBX) (UN 3342) | Solid | 4.2C<br>6.1D<br>6.3A<br>6.4A                 | Self-heating substances and mixtures Category 2<br>Acute toxicity (oral, dermal) Category 4<br>Skin irritation Category 2<br>Eye irritation Category 2                                                                                                                  | 102,000 kg       | SIBX Storage Shed |
| Sulphamic acid (UN 2967)                  | Solid | 6.3A<br>6.4A<br>9.1C                         | Skin irritation Category 2<br>Eye irritation Category 2<br>Hazardous to the aquatic environment (acute) Category 3                                                                                                                                                      | 1,000 kg         | Store yard        |
| Potassium nitrate (UN 1486)               | Solid | 5.1.1C<br>6.1D<br>6.4A                       | Oxidising liquids Category 3<br>Acute toxicity (oral) Category 4<br>Eye irritation Category 2                                                                                                                                                                           | 600 kg           | Store yard        |
| Borax                                     | Solid | 6.4A<br>6.8B                                 | Eye irritation Category 2<br>Reproductive toxicity Category 2                                                                                                                                                                                                           | 600 kg           | Store yard        |

| Substance                                              | State  | Classification (HSNO and GHS7) |                                                                                            | Maximum quantity | Location                                   |
|--------------------------------------------------------|--------|--------------------------------|--------------------------------------------------------------------------------------------|------------------|--------------------------------------------|
| Packaged liquids                                       |        |                                |                                                                                            |                  |                                            |
| Methyl isobutyl carbinol (UN 2053)                     | Liquid | 3.1C                           | Flammable liquids Category 3                                                               | 1,000 L          | Rougher cells                              |
|                                                        |        | 6.1D                           | Acute toxicity (inhalation) Category 4                                                     | 7,200 L          | Bulk storage outside Cyanide Yard          |
|                                                        |        | 6.3A                           | Skin irritation Category 2                                                                 |                  |                                            |
|                                                        |        | 6.4A                           | Eye irritation Category 2                                                                  |                  |                                            |
|                                                        |        | 6.1E (resp)                    | Specific target organ toxicity – single exposure Category 3 (respiratory tract irritation) |                  |                                            |
| Water-soluble carbon blanking reagent (DEHSCOFIX DG30) | Liquid | 6.1D                           | Acute toxicity (oral, dermal) Category 4                                                   | 2,000 L          | Dedicated heated container in yard         |
|                                                        |        | 6.3A                           | Skin irritation Category 2                                                                 |                  |                                            |
|                                                        |        | 8.3A                           | Serious eye damage Category 1                                                              |                  |                                            |
| Frothing agent Interfroth 60                           | Liquid | 3.1D                           | Flammable liquids Category 4                                                               | 6,920 L          | Bulk storage outside Cyanide Yard          |
|                                                        |        | 6.1D                           | Acute toxicity (oral, dermal) Category 4                                                   | 1,000 L          | Frother Dosing Station / Flotation Section |
|                                                        |        | 6.4A                           | Eye irritation Category 2                                                                  |                  |                                            |
| Frothing agent Interfroth 635                          | Liquid | 3.1D                           | Flammable liquids Category 4                                                               | 8,000 L          | Bulk storage outside Cyanide Yard          |
|                                                        |        | 6.1D                           | Skin irritation Category 2                                                                 | 1,000 L          | Frother Dosing Station                     |
|                                                        |        | 6.3A                           | Acute toxicity (oral, dermal) Category 4                                                   |                  |                                            |
|                                                        |        | 8.3A                           | Serious eye damage Category 1                                                              |                  |                                            |
| Frothing agent Hostaflot 10093                         | Liquid | 8.2B                           | Skin corrosion Category 1B                                                                 | 3,000 L          | Bulk storage outside Cyanide Yard          |
|                                                        |        | 8.3A                           | Serious eye damage Category 1                                                              | 1,000 L          | Frother Dosing Station                     |
| Boiler water treatment (Maxitreat 22045)               | Liquid | 6.1D                           | Acute toxicity (oral) Category 4                                                           | 410 L            | POX Boiler Room                            |
|                                                        |        | 8.1A                           | Corrosive to metals Category 1                                                             |                  |                                            |
|                                                        |        | 8.2B                           | Skin corrosion Category 1B                                                                 |                  |                                            |
|                                                        |        | 8.3A                           | Serious eye damage Category 1                                                              |                  |                                            |
| Corrosion inhibitor (Millsperse 806P)                  | Liquid | 6.4A                           | Eye irritation Category 2                                                                  | 3,000 L          | Process Pumps                              |
|                                                        |        |                                |                                                                                            | 2,000 L          | Yard storage                               |

| Substance                        | State  | Classification (HSNO and GHS7)                      |                                                                                                                                                                                                                                                                                         | Maximum quantity     | Location                                                                                            |
|----------------------------------|--------|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------|-----------------------------------------------------------------------------------------------------|
| Degreaser<br>(Trichloroethylene) | Liquid | 6.3A<br>6.4A<br>6.9B (narc)<br>6.6B<br>6.7A<br>9.1C | Skin irritation Category 2<br>Eye irritation Category 2<br>Specific target organ toxicity – single exposure (STOT SE) Category 3 (narcotic effects)<br>Germ cell mutagenicity Category 2<br>Carcinogenicity Category 1B<br>Hazardous to the aquatic environment (acute) Category 3      | 205 L                | Lubricant container                                                                                 |
| Lubricants                       | Liquid | 6.3A                                                | Skin irritation Category 2                                                                                                                                                                                                                                                              | 450 L                | Lubricant container                                                                                 |
|                                  |        |                                                     |                                                                                                                                                                                                                                                                                         | 10,000 L             | Yard storage                                                                                        |
| Waste oil                        | Liquid | NH                                                  | Not classified as hazardous                                                                                                                                                                                                                                                             | 17,000 L             | Drum storage in yard                                                                                |
| Grease                           | Solid  | 6.4A                                                | Eye irritation Category 2                                                                                                                                                                                                                                                               | 1,440 kg             | Workshop                                                                                            |
|                                  |        | 6.3A                                                | Skin irritation Category 2                                                                                                                                                                                                                                                              | 12.5 kg              | Workshop                                                                                            |
|                                  |        | 8.3A                                                | Serious eye damage Category 1                                                                                                                                                                                                                                                           |                      |                                                                                                     |
|                                  |        | 6.1E (resp)<br>6.9B                                 | Respiratory tract irritation Category 3<br>Narcotic effects Category 3                                                                                                                                                                                                                  |                      |                                                                                                     |
| Mercury                          | Liquid | 6.1B<br>6.5B<br>6.8A<br>6.9A<br>8.1A<br>9.1A        | Acute oral, inhalation toxicity Category 2<br>Skin sensitisation Category 1<br>Reproductive toxicity Category 1<br>Specific target organ toxicity – repeated exposure Category 1<br>Corrosive to metals Category 1<br>Hazardous to the aquatic environment acute and chronic Category 1 | 13 kg                | Recovered at the condenser in the Gold Room (Electrowinning Building) through the retort processes. |
| Gas cylinders                    |        |                                                     |                                                                                                                                                                                                                                                                                         |                      |                                                                                                     |
| LPG<br>(UN 1075)                 | Gas    | 2.1.1A                                              | Flammable gas Category 1A                                                                                                                                                                                                                                                               | 45.3 kg (1 cylinder) | Gas storage area                                                                                    |

| Substance                          | State | Classification (HSNO and GHS7)                                                                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Maximum quantity                         | Location                           |
|------------------------------------|-------|-----------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------|------------------------------------|
| Acetylene<br>(UN 1001)             | Gas   | 2.1.1A                                                                                        | Flammable gas Category 1A                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | 53.6 m <sup>3</sup> (8 cylinders)        | Gas storage area                   |
| Oxygen<br>(UN 1072)                | Gas   | 5.1.2A                                                                                        | Oxidising gases Category 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | 98 m <sup>3</sup> (pack of 10 cylinders) | Gas storage area                   |
| Nitrogen<br>(UN 1066)              | Gas   | NH                                                                                            | Gas under pressure (not classified as hazardous)                                                                                                                                                                                                                                                                                                                                                                                                                                             | 87 m <sup>3</sup> (10 cylinders)         | Gas storage area                   |
| Argon or argoshield<br>(UN 1006)   | Gas   | NH                                                                                            | Gas under pressure (not classified as hazardous)                                                                                                                                                                                                                                                                                                                                                                                                                                             | 48 m <sup>3</sup> (5 cylinders)          | Gas storage area                   |
| Nitrous oxide<br>(UN 1070)         | Gas   | 5.1.2A<br>6.8B<br>6.9B                                                                        | Oxidising gases Category 1<br>Reproductive toxicity Category 2<br>Specific target organ toxicity – single exposure Category 2                                                                                                                                                                                                                                                                                                                                                                | 30.8 m <sup>3</sup> (2 cylinders)        | SGS laboratory                     |
| Laboratory                         |       |                                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                          |                                    |
| Sodium Cyanide (Solid)<br>(UN1689) | Solid | 6.1A<br>6.1C<br>6.4A<br>6.5B<br>6.8B<br>6.9A<br><br>8.1A<br>9.1A<br><br>9.2A<br>9.3A<br>9.4A. | Acute oral, inhalation toxicity Category 1<br>Acute dermal toxicity Category 3<br>Eye irritation Category 2<br>Skin sensitisation Category 1<br>Reproductive toxicity Category 2<br>Specific target organ toxicity – repeated or chronic exposure Category 1<br><br>Corrosive to metals Category 1<br>Hazardous to the aquatic environment acute and chronic Category 1<br><br>Hazardous to soil organisms<br>Hazardous to terrestrial vertebrates<br>Hazardous to terrestrial invertebrates | 50 kg                                    | Cyanide cupboard in the laboratory |

| Substance                                           | State  | Classification (HSNO and GHS7)                                                  |                                                                                                                                                                                                                                                                                                       | Maximum quantity | Location                         |
|-----------------------------------------------------|--------|---------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------------------------------|
| Fluxing agent                                       | Solid  | 6.1D<br>6.8A<br>6.9B<br>9.1A                                                    | Acute oral, inhalation toxicity Category 4<br>reproductive toxicity Category 1<br>Specific target organ toxicity, repeated exposure Category 2<br>Hazardous to the aquatic environment acute Category 1                                                                                               | 2,000 kg         | Laboratory store                 |
| Hydrochloric acid solution (10 %)<br>(UN 1789)      |        | 8.1A<br>8.2C<br>8.3A                                                            | Corrosive to metals Category 1<br>Skin corrosion Category 1C<br>Serious eye damage Category 1                                                                                                                                                                                                         | 75 L             | Laboratory store                 |
| Flammable solvents and frothing agents <sup>A</sup> | Liquid | 3.1C<br>6.1E (resp)                                                             | Flammable liquids Category 3<br>Respiratory tract irritation Category 3                                                                                                                                                                                                                               | 140 L            | Laboratory store (heptanone)     |
|                                                     |        | 3.1C – 3.1D<br>6.1D<br>6.3A<br>8.3A – 6.4A<br>9.1A – 9.1D                       | Flammable liquids Category 3 – 4<br>Acute toxicity Category 4<br>Skin irritation Category 2<br>Serious eye damage Category 1 – Eye irritation Category 2<br>Hazardous to the aquatic environment (acute or chronic) Category 1 – 4                                                                    | 60 L             | Flotation cupboard in laboratory |
| Laboratory reagents <sup>A</sup>                    | Liquid | 3.1C – 3.1D<br>6.1C – 6.1D<br>8.2B – 6.3A<br>8.3A – 6.4A<br>8.1A<br>9.1A – 9.1D | Flammable liquids Category 3 – 4<br>Acute toxicity Category 3 – 4<br>Skin corrosion Category 1B – Skin irritation Category 2<br>Serious eye damage Category 1 – Eye irritation Category 2<br>Corrosive to metals Category 1<br>Hazardous to the aquatic environment (acute or chronic) Category 1 – 4 | 60 L             | Reagent cupboard in laboratory   |



| Substance                        | State  | Classification (HSNO and GHS7)                     |                                                                                                                                                               | Maximum quantity | Location |
|----------------------------------|--------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------|
| Laboratory reagents <sup>A</sup> | Solids | 6.1C –<br>6.1D<br>8.2B –<br>6.3A<br>8.3A –<br>6.4A | Acute toxicity Category 3 – 4<br><br>Skin corrosion Category 1B – Skin irritation Category 2<br><br>Serious eye damage Category 1 – Eye irritation Category 2 | 100 kg           |          |

Table note

A. Not all products in this group have all the classifications listed, however, for conservatism these hazards are assessed as applying to all items in the group.

**Table Appendix B.3: Hazardous substance inventory – bulk explosives storage**

| Substance                                         | State                                | Classification (HSNO and GHS7)                               |                                                                                                                                                                                                                                                                                                                                                                    | Maximum quantity | Location                                                              |
|---------------------------------------------------|--------------------------------------|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|-----------------------------------------------------------------------|
| ANFO<br>(UN 0082)                                 | Solid                                | 1.1D,<br>6.1D,<br>6.3B,<br>6.4A,<br>6.7B,<br>9.1D            | 1.1D – Substances and articles that have a mass explosion hazard<br>Acute toxicity Category 4 (oral route)<br>(See Note 1)<br>Eye irritation Category 2<br>Carcinogenicity Category 2<br>Hazardous to the aquatic environment chronic Category 4                                                                                                                   | 20,000 kg        | Golden Point Underground Mine<br>Explosive Reserve<br>Two magazines   |
| Booster<br>(UN 0042)                              | Solid in plastic or cardboard casing | 1.1D<br>6.1C<br>6.9B<br>9.1B                                 | 1.1D – Substances and articles that have a mass explosion hazard<br>Acute toxicity Category 3 (oral, dermal and inhalation route)<br>Specific target organ toxicity – single exposure Category 2<br>Hazardous to the aquatic environment chronic Category 2                                                                                                        |                  |                                                                       |
| Packaged explosive<br>(UN 0241)                   | Plastic encapsulated emulsion        | 1.1D<br>6.1D<br>6.3A<br>6.4A<br>6.8C<br>6.9A<br>9.1A<br>9.3C | 1.1D – Substances and articles that have a mass explosion hazard<br>Acute toxicity Category 4 (oral route)<br>Skin irritant Category 1<br>Eye irritation Category 2<br>Reproductive toxicant Category 3<br>Specific target organ toxicity – repeated exposure Category 1<br>Hazardous to the aquatic environment Category 1.<br>Harmful to terrestrial vertebrates |                  |                                                                       |
| Detonators<br>(UN 0030 /<br>UN 0456 /<br>UN 0360) | Solid                                | 1.1B                                                         | 1.1B - Substances and articles that have a mass explosion hazard                                                                                                                                                                                                                                                                                                   | 70 kg            | Golden Point Underground Mine<br>Explosive Reserve<br>Three magazines |

| Substance                                    | State | Classification (HSNO and GHS7)                         |                                                                                                                                                                                                                                                                                                                                      | Maximum quantity | Location                  |
|----------------------------------------------|-------|--------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|---------------------------|
| Ammonium nitrate emulsion (ANE)<br>(UN 3375) | Solid | 5.1.1B<br>6.1E<br>6.4A<br>9.1D                         | Oxidising solids Category 2<br>Aspiration hazard Category 1<br>Eye irritation Category 2<br>Hazardous to the aquatic environment chronic Category 4                                                                                                                                                                                  | 63,000 kg        | Golden Point Reload Depot |
| Sodium nitrite<br>(UN 1500)                  | Solid | 5.1.1C<br>6.1C<br>6.4A<br>6.6B<br>6.9B<br>9.1A<br>9.1B | Oxidising solids Category 3<br>Acute toxicity (oral or inhalation) Category 3<br>Eye irritation Category 2<br>Germ cell mutagenicity Category 2<br>Specific target organ toxicity – repeated exposure Category 2<br>Hazardous to the aquatic environment acute Category 1<br>Hazardous to the aquatic environment chronic Category 1 | 2,500 kg         |                           |

**Table Appendix B.4: Hazardous substance inventory – Ecological enhancement areas**

| Substance                                                               | State  | Classification (HSNO and GHS7) |                                                              | Maximum quantity | Location                      |
|-------------------------------------------------------------------------|--------|--------------------------------|--------------------------------------------------------------|------------------|-------------------------------|
| Agrichemical products (herbicides, pesticides, fungicides) <sup>A</sup> | Liquid | 6.1D                           | Acute oral toxicity Category 4                               | 800 L            | Dedicated bunded storage shed |
|                                                                         |        | 6.3A                           | Skin irritant Category 1                                     |                  |                               |
|                                                                         |        | 6.4A / 8.3A                    | Eye irritation Category 2A / Serious eye damage Category 1   |                  |                               |
|                                                                         |        | 6.5B                           | Skin sensitization Category 1                                |                  |                               |
|                                                                         | Solid  | 6.7B                           | Carcinogenicity Category 2                                   | 100 kg           |                               |
|                                                                         |        | 6.9B                           | Specific target organ toxicity, repeated exposure Category 2 |                  |                               |
|                                                                         |        | 9.1A                           | Acute aquatic toxicity Category 1                            |                  |                               |
|                                                                         |        | 9.1B/C                         | Chronic aquatic toxicity Category 2 or 3                     |                  |                               |
|                                                                         |        | 9.2A/B/C                       | Hazardous to soil organisms Category 1 – 3                   |                  |                               |
|                                                                         |        | 9.3A/B/C                       | Hazardous to terrestrial vertebrates Category 1 – 3          |                  |                               |
|                                                                         |        | 9.4A/B/C                       | Hazardous to terrestrial invertebrates Category 1 – 3        |                  |                               |
| Petrol                                                                  | Liquid | 3.1A                           | Flammable liquid Category 1                                  | 100 L            | Dedicated flammables storage  |
|                                                                         |        | 6.7B                           | Carcinogenicity Category 2                                   |                  |                               |
|                                                                         |        | 6.1E                           | Aspiration hazard Category 1                                 |                  |                               |
|                                                                         |        | 9.1B                           | Aquatic ecotoxicity Category 2                               |                  |                               |

Notes:

A. Not all products in this group have all the classifications listed, however, for conservatism these hazards are assessed as applying to all items in the group.

**Table Appendix B.5: Hazardous substance inventory – Water Treatment Plant**

| Substance                            | State  | Classification (HSNO and GHS7) |                                                             | Maximum quantity | Location |
|--------------------------------------|--------|--------------------------------|-------------------------------------------------------------|------------------|----------|
| Pretreatment                         |        |                                |                                                             |                  |          |
| Quicklime (CaO)                      | Solid  | 8.2C<br>8.3A                   | Skin corrosion Category 1C<br>Serious eye damage Category 1 | 90 m³            | WTP      |
| High calcium hydrated lime (Ca(OH)₂) | Slurry | 8.2C<br>8.3A                   | Skin corrosion Category 1C<br>Serious eye damage Category 1 | 10,000 L         | WTP      |

| Substance                              | State  | Classification (HSNO and GHS7)                       |                                                                                                                                                                                                                                                                                                       | Maximum quantity | Location |
|----------------------------------------|--------|------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------|----------|
| Sulphuric acid 60 – 98 %<br>(UN 1830)  | Liquid | 8.1A<br>6.1D<br>8.2B<br>8.3A<br>6.7A<br>6.9A<br>6.9B | Corrosive to metals Category 1<br>Acute toxicity (inhalation) Category 4<br>Skin corrosion Category 1B<br>Serious eye damage Category 1<br>Carcinogenicity Category 1<br>Specific target organ toxicity – repeated exposure Category 1<br>Specific target organ toxicity – single exposure Category 3 | 5,000 L          | WTP      |
| Polyaluminium chloride<br>(flocculant) | Liquid | 6.1D<br>6.3A<br>6.4A                                 | Acute toxicity (oral) Category 4<br>Eye irritation Category 2A<br>Skin irritation Category 2                                                                                                                                                                                                          | 5,000 L          | WTP      |
| Ferric chloride                        | Liquid | 6.1D<br>8.1A<br>8.2C<br>8.3A                         | Acute toxicity (oral) Category 4<br>Corrosive to metals Category 1<br>Skin corrosion Category 1C<br>Serious eye damage Category 1                                                                                                                                                                     | 5,000 L          | WTP      |
| Reverse osmosis plant                  |        |                                                      |                                                                                                                                                                                                                                                                                                       |                  |          |
| Caustic soda (sodium hydroxide 30 %)   | Liquid | 8.1A<br>8.2B<br>8.3A<br>6.1D                         | Corrosive to metals<br>Skin corrosion Category 1B<br>Serious eye damage Category 1<br>Acute toxicity (oral) Category 4                                                                                                                                                                                | 300 L            | WTP      |
| Antiscalant (Memguard AS 104)          | Liquid | 6.3A<br>6.4A<br>6.1E                                 | Skin irritation Category 2<br>Eye irritation Category 2<br>Specific target organ toxicity - single exposure Category 3                                                                                                                                                                                | 100 L            | WTP      |
| Sodium Hypochlorite                    | Liquid | 8.2C<br>8.3A<br>9.1A                                 | Skin corrosion Category 1C<br>Serious eye damage Category 1<br>Aquatic toxicity (acute and chronic) Category 1                                                                                                                                                                                        | 100 L            | WTP      |



| Substance             | State  | Classification (HSNO and GHS7) |                                  | Maximum quantity | Location |
|-----------------------|--------|--------------------------------|----------------------------------|------------------|----------|
| Sodium Metabisulphite | Liquid | 8.1A                           | Corrosive to metals Category 1   | 100 L            | WTP      |
|                       |        | 6.1D                           | Acute toxicity (oral) Category 4 |                  |          |
|                       |        | 6.3A                           | Skin irritation Category 2       |                  |          |
|                       |        | 6.4A                           | Eye irritation Category 2        |                  |          |
|                       |        | 6.5B                           | Skin sensitisation Category 1    |                  |          |

Notes:

A. Not all products in this group have all the classifications listed, however, for conservatism these hazards are assessed as applying to all items in the group.

## **Appendix C      Health and Safety at Work (Hazardous Substances) regulatory controls**

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## C1 Health and Safety at Work (Hazardous Substances) regulations (HSW-HS)

The site must comply with the following general hazardous substances management requirements (“controls”) for all hazardous substances in accordance with the Health and Safety at Work (Hazardous Substances) regulations (HSW-HS):

- Safety data sheets for each substance must be readily accessible to all workers.
- A hazardous substance register must be prepared and maintained.
- Training and instruction must be provided and recorded for all workers who manufacture, handle or store hazardous substance.
- Appropriate personal protective equipment must be provided for workers handling hazardous substances.

Further control measures that are triggered by the volumes and types of hazardous substances proposed to be stored on-site are summarised in Table Appendix C.1 below. The site is required to comply with all the listed provisions. Further detail on the application of these are provided in Appendix C.

These HSW-HS controls are specific to the types of hazards presented by the substances and are implemented to protect people on-site from harm. The measures to reduce the likelihood or consequence of an incident to on-site workers will also reduce the risks to off-site people. The controls specified for Class 9 ecotoxic substances in the HSW-HS duplicate those specified under the EPA Notice which are intended to protect ecosystems when using and storing ecotoxic substances.

**Table Appendix C.1: Summary and purpose of HSW-HS requirements**

| Control measure                       | Facility and substances                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Purpose of control                                                                                                                                                                    |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Signage<br>(Section C2)               | Processing Plant: <ul style="list-style-type: none"><li>• Flammable, oxidising, corrosive, toxic and ecotoxic substances.</li></ul> Explosives stores <ul style="list-style-type: none"><li>• Explosive or oxidising substances.</li></ul> Workshop <ul style="list-style-type: none"><li>• Flammable, toxic and ecotoxic substances.</li></ul> Diesel tanks <ul style="list-style-type: none"><li>• Flammable, toxic and ecotoxic substances.</li></ul> Water Treatment Plant <ul style="list-style-type: none"><li>• Corrosive, toxic and ecotoxic substances.</li></ul> | Ensures off-site persons and emergency response personnel are able to identify the hazards at the site and take appropriate precautions.                                              |
| Secondary containment<br>(Section C5) | Processing Plant: <ul style="list-style-type: none"><li>• Liquid reagent tanks, frothing agents, solvents and maintenance oils.</li></ul> Explosives stores <ul style="list-style-type: none"><li>• Not applicable to solids.</li></ul> Workshop <ul style="list-style-type: none"><li>• Oils, coolants and other packaged substances.</li></ul>                                                                                                                                                                                                                           | Prevents release of a hazardous liquid to the environment in the event of a failure of primary containment (tank or package) and enables recovery of the substance for safe disposal. |

| Control measure                                            | Facility and substances                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Purpose of control                                                                                                                                      |
|------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                            | Diesel tanks <ul style="list-style-type: none"> <li>• All diesel tanks.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• Bulk reagent tanks .</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |                                                                                                                                                         |
| Fire extinguishers<br>(Section 4.4)                        | Processing Plant: <ul style="list-style-type: none"> <li>• Bulk oxygen, bulk LPG, solvents, flammable solids (SIBX), oxidisers (potassium nitrate) outdoor storage of flammable and oxidising gases.</li> </ul> Explosives stores <ul style="list-style-type: none"> <li>• Class 1 explosives magazine and Class 5 reload depot.</li> </ul> Workshop <ul style="list-style-type: none"> <li>• Flammable or combustible paints or solvents, flammable and oxidising gases.</li> </ul> Diesel tanks <ul style="list-style-type: none"> <li>• All diesel tanks.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• Not applicable.</li> </ul> | Enables swift emergency response to small fires in areas near hazardous substances to prevent ignition of flammable, explosive or oxidising substances. |
| Segregation of incompatible substances<br>(Section C4)     | Processing Plant: <ul style="list-style-type: none"> <li>• Flammable, oxidising, corrosive, toxic and ecotoxic substances.</li> </ul> Explosives stores <ul style="list-style-type: none"> <li>• Class 1 explosives magazine and Class 5 reload depot.</li> </ul> Workshop <ul style="list-style-type: none"> <li>• Flammable or combustible paints or solvents, flammable and oxidising gases.</li> </ul> Diesel tanks <ul style="list-style-type: none"> <li>• All diesel tanks.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• Corrosive, toxic and ecotoxic substances.</li> </ul>                                                 | Minimises additional adverse consequences from a spill or fire by preventing reactive substances from mixing in the storage area.                       |
| Substance secured from unauthorised access<br>(Section C3) | Processing Plant: <ul style="list-style-type: none"> <li>• Bulk reagents, LPG, bulk oxygen.</li> </ul> Explosives stores <ul style="list-style-type: none"> <li>• Class 1 explosives magazine and Class 5 reload depot.</li> </ul> Workshop <ul style="list-style-type: none"> <li>• Flammable or combustible paints or solvents, flammable and oxidising gases.</li> </ul> Diesel tanks <ul style="list-style-type: none"> <li>• All diesel tanks.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• Bulk reagent tanks (sulphuric acid).</li> </ul>                                                                                     | Limits access to trained personnel and minimises the potential for operator error or tampering.                                                         |

| Control measure                                             | Facility and substances                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Purpose of control                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Emergency response planning<br>(Section 4.3.5)              | <p>Processing Plant:</p> <ul style="list-style-type: none"> <li>Bulk reagents, LPG, oxygen, mercury.</li> </ul> <p>Explosives stores</p> <ul style="list-style-type: none"> <li>Class 1 explosives magazine and Class 5 reload depot.</li> </ul> <p>Workshop</p> <ul style="list-style-type: none"> <li>Flammable or combustible paints or solvents, flammable and oxidising gases.</li> </ul> <p>Diesel tanks</p> <ul style="list-style-type: none"> <li>All diesel tanks.</li> </ul> <p>Water Treatment Plant</p> <ul style="list-style-type: none"> <li>Bulk reagent tanks .</li> </ul> | <p>Describes the emergency procedures for a site and takes into account any foreseeable emergency such as a fire, spill or injury. Emergency Response Plans must be regularly tested by the site.</p> <p>These plans help to minimise the consequence of an emergency event, such as through preventing a small spill reaching a drain, extinguishing a small fire or enabling safe evacuation of an affected area.</p>                                                                                                                                                                                                                                       |
| Separation from public and protected spaces<br>(Section C6) | <p>Processing Plant:</p> <ul style="list-style-type: none"> <li>Bulk reagents, LPG, oxygen, mercury.</li> </ul> <p>Explosives stores</p> <ul style="list-style-type: none"> <li>Class 1 explosives magazine and Class 5 reload depot.</li> </ul> <p>Workshop</p> <ul style="list-style-type: none"> <li>Flammable or combustible paints or solvents, flammable and oxidising gases.</li> </ul> <p>Diesel tanks</p> <ul style="list-style-type: none"> <li>All diesel tanks.</li> </ul> <p>Water Treatment Plant</p> <ul style="list-style-type: none"> <li>Bulk reagent tanks.</li> </ul>  | <p>Minimises any adverse event in the store impacting on public places or protected places, and correspondingly any off-site event from impacting the storage area.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Tracking and record-keeping<br>(Section C9)                 | <p>Processing Plant:</p> <ul style="list-style-type: none"> <li>Sodium cyanide (solid), cyanide solution and mercury.</li> </ul> <p>Explosives stores</p> <ul style="list-style-type: none"> <li>Class 1 explosives.</li> </ul> <p>Workshop</p> <ul style="list-style-type: none"> <li>None required.</li> </ul> <p>Diesel tanks</p> <ul style="list-style-type: none"> <li>None required.</li> </ul> <p>Water Treatment Plant</p> <ul style="list-style-type: none"> <li>None required.</li> </ul>                                                                                        | <p>A record is required to be kept for explosive or highly toxic substances, which details the identity of the person in control of the substance (see certified handler), the location and quantity of the substance, any transfer of the substance to other locations, and details regarding any disposal of the substance including the date, manner, quantity and location of the substance disposed.</p> <p>This ensures that highly toxic or explosives substances are at all times either under the control of an appropriately trained worker or secured, and that the location of the substance is known throughout its lifespan in New Zealand.</p> |
| Certified handler<br>(Section C9)                           | <p>Processing Plant:</p> <ul style="list-style-type: none"> <li>Cyanide (solid), cyanide solution, mercury.</li> </ul> <p>Explosives stores</p> <ul style="list-style-type: none"> <li>Class 1 explosives.</li> </ul> <p>Workshop</p> <ul style="list-style-type: none"> <li>None required.</li> </ul>                                                                                                                                                                                                                                                                                     | <p>A certified handler is a person who is trained and qualified (holds a Certified Handler Compliance Certificate issued by a compliance certifier authorised by WorkSafe) to handle acutely toxic or explosive substances. This control restricts activities involving these highly hazardous</p>                                                                                                                                                                                                                                                                                                                                                            |

| Control measure                                                                                               | Facility and substances                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Purpose of control                                                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                                                                               | Diesel tanks <ul style="list-style-type: none"> <li>• None required.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• None required.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                             | substances to people with demonstrated competency.<br><br>For explosive substances or certain vertebrate toxic agents and fumigants, the person must also hold a controlled substance licence to possess and work with the material. This control is in place to protect the health and safety of workers and the public by limiting access to controlled substances. |
| Hazardous Substances Location Compliance certification required (Section C9)                                  | Processing Plant: <ul style="list-style-type: none"> <li>• Oxygen, LPG, cyanide (solution and solid), caustic soda, nitric acid, SIBX, solvent, potassium nitrate, boiler treatment.</li> </ul> Explosives stores <ul style="list-style-type: none"> <li>• Class 1 explosives.</li> <li>• ANE and sodium nitrate storage at the reload depot.</li> </ul> Workshop: <ul style="list-style-type: none"> <li>• LPG cylinder storage.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• Bulk reagents (caustic soda, sulphuric acid).</li> </ul> | Independently certifies that the hazardous substance location where explosive, flammable, oxidising, toxic or corrosive substances are stored or used, has in place all applicable controls and notifications to manage the hazards (such as segregation of incompatibles, secondary containment, access restrictions).                                               |
| Stationary Container System Compliance certification required (Section C9)                                    | Processing Plant: <ul style="list-style-type: none"> <li>• All process and storage tanks &gt;5,000 L.</li> </ul> Explosives stores <ul style="list-style-type: none"> <li>• Not applicable to packaged solids.</li> </ul> Workshop: <ul style="list-style-type: none"> <li>• Diesel tank.</li> </ul> Diesel tanks <ul style="list-style-type: none"> <li>• All diesel tanks.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• Bulk reagent tanks.</li> </ul>                                                                                | Independently certifies that the tank or process container and associated equipment is safe and complies with the standards for tank design, such as providing secondary containment, pressure relief and overfill protections.<br><br>Generally required for tanks containing hazardous liquids with more than 5,000 L capacity.                                     |
| Separation from land use activities according to potential overpressure levels (controlled zones) (Section 6) | Processing Plant: <ul style="list-style-type: none"> <li>• Not applicable.</li> </ul> Explosives stores <ul style="list-style-type: none"> <li>• Class 1 explosives.</li> </ul> Workshop: <ul style="list-style-type: none"> <li>• Not applicable.</li> </ul> Diesel tanks <ul style="list-style-type: none"> <li>• Not applicable.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>• Not applicable.</li> </ul>                                                                                                                             | Minimum separation distances for blast overpressure levels are specified to ensure that people and structures are located at a suitable distance from the explosive hazard for protection from adverse effects in the event of an unplanned initiation in the storage area.                                                                                           |
| Hazardous areas (ignition source restrictions) (Section C7)                                                   | Processing Plant: <ul style="list-style-type: none"> <li>• LPG, acetylene, solvents.</li> </ul> Explosives stores                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Prohibits ignition sources from areas where substances with flammable vapour or gas are stored to minimise the risk of a fire.                                                                                                                                                                                                                                        |



| Control measure | Facility and substances                                                                                                                                                                                                                                                                                                                                                                                                           | Purpose of control |
|-----------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------|
|                 | <ul style="list-style-type: none"> <li>Not applicable to explosive and oxidising solids</li> </ul> Workshop: <ul style="list-style-type: none"> <li>LPG, acetylene, solvents, paints, aerosols.</li> </ul> Diesel tanks <ul style="list-style-type: none"> <li>Not applicable to liquids that do not produce flammable vapour.</li> </ul> Water Treatment Plant <ul style="list-style-type: none"> <li>Not applicable.</li> </ul> |                    |

## C2 Signage

Signage is required for the hazardous substances identified in Table Appendix C.1, triggered by the substance's classification and quantity stored on-site under Schedule 3 of the HSW-HS. Signage must be located at the entrance to a site and at the specific building or tank in which the substances is located. Signage enables emergency responders to identify the hazards at each location.

An example of the signage for the SIBX bulk store is shown in Figure Appendix C.1 below.



Figure Appendix C.1: Example of signage at the SIBX store in the Processing Plant.

## **C3 Security**

Storage of highly hazardous substances require security to ensure that access is restricted to authorised personnel. The Macraes Operation is set up so that access is restricted by boom gates and turnstiles that are activated by swipe card identification.

This includes the sodium cyanide, SIBX, sodium metabisulphite, copper sulphate stores and explosive magazines. Only authorised personnel shall have access to the hazardous substances areas and vehicles.

## **C4 Segregation of incompatible materials**

Under the HSW-HS regulations, substances with physical hazard classifications (Classes 1 – 5) are incompatible and must not be stored together, i.e., Class 3.1 (flammable liquid) must not be stored with Class 1 (explosive), Class 2 (flammable gas or aerosol), Class 3.2 (desensitised explosive), Class 4 (flammable solids) or Class 5 (oxidising) substances.

Class 5 oxidising substances have additional incompatibilities that require exclusion of all combustible material from Class 5 storage areas.

Class 8 substances include corrosive acids and alkalis that are incompatible with each other and must not be stored in the same bunded area. Class 8 substances are also incompatible with Class 1 (explosive) and Class 5 (oxidising) substances.

Hazard classifications and segregation requirements are identified in the ChemAlert System used by OGNZL to maintain its inventory records. More detail is provided on this system in Section 4.3.

Dedicated storage areas, containers and cabinets segregated by hazard class are provided at all OGNZL facilities in accordance with OGNZL procedures for safe storage of hazardous substances<sup>19</sup>, to prevent adverse reactions in the event of a spill or fire. Stored hazardous substances are segregated based on quantity of materials stored, physical state, degree of compatibility, manufacturer's instructions and known material behaviour.

Specific separation distances that apply to hazardous substances storage areas are detailed in Section C6.

## **C5 Secondary containment**

Secondary containment and separation of activities from protected and public places are requirements of the HSW-HS identified in Table Appendix C.1 for the corrosive substances, oxidising substances, cyanide and hydrocarbons.

The Principal Hazard Management Plan – Hazardous Substances (see Section 4.3.1 of this report) sets out the requirements for the bunded compounds for hazardous substances. In summary, all tanks are provided with secondary containment, either integral (double skinned) or a bund with capacity for 110 % of the largest tank volume. The bunds must be chemically resistant to the substance stored, equipment is adequately protected, and incompatible substances are segregated and do not come into contact within the bunded areas.

The relocated Open Pit Workshop will provide bunded storage areas for the bulk oils, lubricants and coolants. Likewise, the new Water Treatment Plant facilities will need to provide secondary

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<sup>19</sup> Section 5.1.2 Segregated and Secure Storage Facilities of the Principal Hazard Management Plan – Hazardous Substances MAC-257-PHM-007. August 2022.

containment for the bulk reagent liquids (lime solution, sulphuric acid, caustic soda, flocculants and coagulants).

An overview of the separation and segregation requirements for the proposed volumes is set out in Table Appendix C.2 below.

## C6 Separation distances

The HSW-HS regulations require separation distances between substances with hazards to human health or property from potentially sensitive locations within the boundary, such as worker lunchrooms or offices, and from any areas off-site where members of the public may be present. The minimum separation distances to protected and public places (including the site boundary) specified in the HSW-HS regulations are designed to mitigate<sup>20</sup> the risk of:

- Any adverse event in the store impacting on public places or protected places.
- Any adverse event at public places or protected places impacting on the store.

The separation distances provided to off-site locations are detailed in Table Appendix C.2 below.

**Table Appendix C.2: Separation requirements under the HSW-HS for hazardous substances**

| Substance name                                                            | Identified separation requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Comments                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
|---------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Bulk corrosives</b><br>Caustic soda,<br>nitric acid,<br>sulphuric acid | <p>Segregated from all Class 1 substances, Class 4, Class 5, Class 6.1A, Class 6.1B and Class 6.1C toxic cyanides, and Class 8.2A and 8.2B corrosive alkalis/acids.</p> <p>The minimum separation distances specified for the 32,000 L tank of nitric acid at the Processing Plant as a Class 8.2A liquid:</p> <ul style="list-style-type: none"> <li>• 10 m to protected places.</li> <li>• 5 m to public places.</li> </ul> <p>The minimum separation distances specified for 20,000 L of caustic soda as a Class 8.2B substance:</p> <ul style="list-style-type: none"> <li>• 5 m to protected places.</li> <li>• 3 m to public places.</li> </ul> <p>At the proposed Water Treatment Plant, tanks containing 5,000 L of class 8.2B liquids (sulphuric acid and ferric chloride) must be separated by:</p> <ul style="list-style-type: none"> <li>• 5 m to protected places.</li> <li>• 3 m to public places.</li> </ul> <p>Separation between the tanks must be at least 1 m.</p> | <p>In the Processing Plant, the sodium hydroxide and nitric acid tanks are in separate but adjacent bunded areas. The nearest incompatible substance includes the cyanide solution tanks and lime silo over 15 m south of the corrosive tanks.</p> <p>In the proposed WTP, the tanks containing incompatible substances must be in separate bunded areas. The WTP is well separated from the boundary (150 m) or on-site protected places (over 250 m to the Processing Plant office).</p> |
| <b>Cyanide (30 % solution)</b>                                            | <p>Segregated from all Class 1 substances, Class 4, Class 5, and Class 8.2A and 8.2B corrosive alkalis/acids.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <p>The cyanide solution tanks are 60 m to the nearest building.</p>                                                                                                                                                                                                                                                                                                                                                                                                                        |

<sup>20</sup> Policy Clarification, Storing class 6 and 8 hazardous substances, WorkSafe NZ, November 2019.

| Substance name                                 | Identified separation requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Comments                                                                                                                                                                                                            |
|------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Cyanide (solid)</b>                         | <p>The minimum separation distances specified for the largest liquid tank</p> <ul style="list-style-type: none"> <li>• 15 m to protected places.</li> <li>• 7.5 m to public places</li> </ul> <p>For the 120,000 kg bulk solids store:</p> <ul style="list-style-type: none"> <li>• 20 m to protected places.</li> <li>• 10 m to public places</li> </ul>                                                                                                                                                                                                                                                                                                                                | <p>The cyanide solids store is 25 m from the nearest bulk tanks and over 90 m from the closest on-site building.</p>                                                                                                |
| <b>Oxygen gas</b>                              | <p>Oxygen gas should be separated from incompatible substances, specifically Class 1, 2, 3, 4, 5.2, 6.1A-C, or 8, zinc, magnesium, any metal in powdered form, and combustible materials.</p> <p>The minimum separation distances specified for 162,000 L of Class 5.1.2A oxidising gas are as follows:</p> <ul style="list-style-type: none"> <li>• 5 m away from public areas.</li> <li>• 5 m from ignition sources.</li> </ul> <p>The smaller oxygen cylinders and nitrous oxide cylinders at the Processing Plant or workshops require minimum separation:</p> <ul style="list-style-type: none"> <li>• 3 m away from public areas.</li> <li>• 3 m from ignition sources.</li> </ul> | <p>Bulk oxygen tanks are at least 5 m from any other activities in the Processing Plant.</p> <p>The dedicated oxygen gas cylinder storage and use areas are at least 3 m from incompatible gases or substances.</p> |
| <b>Oxidising solids</b><br>ANE, sodium nitrite | <p>Oxidising solids should be separated from incompatible substances, specifically Class 1, 2, 3, 4, 5.2, 6.1A-C, or 8, zinc, magnesium, any metal in powdered form, and combustible materials.</p> <p>The minimum separation distances for the 63,000 kg ANE and 2,500 kg sodium nitrite depot:</p> <ul style="list-style-type: none"> <li>• 8 m away from incompatible substances.</li> <li>• 8 m from ignition sources.</li> </ul>                                                                                                                                                                                                                                                    | <p>The Class 5 reload depot is over 300 m from the nearest other hazardous substances storage activity and approximately 180 m to the nearest site boundary to the north.</p>                                       |
| <b>LPG</b>                                     | <p>Segregation from all Class 1, Class 2.1.2, Class 3, Class 4 and Class 5 substances.</p> <p>The minimum separation distances specified for the 100,000 kg bulk tank:</p> <ul style="list-style-type: none"> <li>• 20 m to protected places.</li> <li>• 11 m to public places.</li> </ul> <p>For 360 kg of LPG at the Open Pit workshops</p> <ul style="list-style-type: none"> <li>• 0.6 m away from public areas.</li> <li>• 2 m to protected places.</li> </ul>                                                                                                                                                                                                                      | <p>The bulk LPG vessel is over 20 m to any other hazardous substances storage locations and over 90 m from the nearest building.</p>                                                                                |
| <b>Acetylene</b>                               | <p>Segregation from all Class 1, Class 2.1.2, Class 3, Class 4 and Class 5 substances.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | <p>Acetylene gas storage locations are in open outdoor areas at least 3 m from other gases or hazardous substances.</p>                                                                                             |



| Substance name                               | Identified separation requirements                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Comments                                                                                                                                              |
|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>SIBX</b>                                  | Segregation from all Class 1, Class 2, Class 3, Class 4.1, Class 4.3 and Class 5 substances.<br>Minimum separation distances for the 15,000 L tank are: <ul style="list-style-type: none"> <li>• 8 m to protected places.</li> <li>• 3 m to public places.</li> </ul>                                                                                                                                                                                                                                                                                        | The SIBX solids store is over 20 m to the offices.<br>The SIBX solution tank is approximately 15 m to the stores.                                     |
| <b>Diesel tanks and solvent (Exxsol D40)</b> | Segregation from all Class 1, Class 2, Class 3.2, Class 4 and Class 5 substances.<br>A minimum separation of 1 m between tanks is required.<br>Separation requirements for the tanks to protected places or the boundary:<br>For the 40,000 – 60,000 L diesel tanks: <ul style="list-style-type: none"> <li>• 5 - 6 m to protected places.</li> <li>• No requirement for separation to public places.</li> </ul> For the 20,000 L Exxsol tank: <ul style="list-style-type: none"> <li>• 5 m to protected places.</li> <li>• 3 m to public places.</li> </ul> | The Exxsol tank is over 20 m to the nearest hazardous substances location.<br>All diesel tanks are over 6 m to the boundary or any on site buildings. |

## C7 Hazardous areas

A hazardous area is an area where an ignitable or explosive gas atmosphere could be present. Hazardous areas must exclude ignition sources including electrical equipment, naked flames, and hot sources to help minimise the risk of ignition or explosion. Hazardous areas are relevant to the storage of LPG and acetylene gas, flammable aerosols, paints and solvents at the workshop and Processing Plant.

The extent of hazardous areas must be determined in accordance with AS/NZ 60079.10.1:2009 Explosive atmospheres: Classification of areas – Explosive gas atmospheres.

There is no requirement for establishment of hazardous areas around diesel tanks, as diesel has a high flashpoint and does not readily form a flammable vapour at ambient conditions.

Likewise, the oxygen storage area does not require establishment of a hazardous area, however it must be separated from incompatible substances, including acetylene, diesel and other combustible materials.

## C8 Certified handlers

A certified handler is required for person(s) handling very hazardous substances as specified in Schedule 26 of the HSW-HS. In order to obtain a certified handler compliance certificate, the person(s) must demonstrate the knowledge, experience and competency to safely handle the hazardous substances. A certified handler compliance certificate is required for highly flammable substances (3.1A, 3.2A, 4.1.2A, 4.1.3A, 4.2A and 4.3A), highly oxidising substances (5.1.1.A, 5.2A, 5.2B), acutely toxic substances (6.1A and 6.1B) substances, and substances that require controlled substance licence (Class 1 substances) which includes most explosives, fumigants and vertebrate toxic agents.

This requirement applies to the Class 6.1A solid cyanide and cyanide solution used as part of the processing of gold ore, the Class 6.1B mercury recovered in the gold room and to the Class 1 ANFO, packaged explosive, boosters and initiating devices stored at the GPUG magazine.

This requirement reduces the likelihood of an incident by limiting access to specialist workers with demonstrated competency to handle the substance safely.

The OGNZL must maintain a list of certified handlers and the relevant substances each handler has a compliance certificate for handling.

## C9 Tracking and certified handlers

Tracking is required for highly hazardous properties as identified in Table Appendix C.3 below. Tracking requirements mean that OGNZL must record:

- The name, position within the company, and physical address of the competent person who is in charge of the product and details of their Certified Handler certificate;
- The name of the product (its trade name or common name);
- How much is held and where it is held;
- Usage of the product, including where it was used, and how much was used;
- Whether the product was transferred to another place (e.g. an orchard) or person (you must ensure the person taking control of the product is a "competent person", i.e. has a Certified Handler certificate); and
- If the product was disposed of, the quantity, how, when and where it was disposed of.

**Table Appendix C.3: Classifications that must be tracked**

| Class                   |                                                                                       | Comment                                                                                                                                 |
|-------------------------|---------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 1.1                     | Substances and articles with mass explosion hazard                                    | Applicable to Class 1 explosives storage at the Golden Point explosives storage facility.                                               |
| 3.1A                    | Flammable liquid Category 1                                                           | Not anticipated at the Macraes Operation, other than petrol (3.1A) which is exempt from tracking requirements.                          |
| 3.2A                    | desensitised explosive (liquid) Category 1                                            |                                                                                                                                         |
| 4.1.2A, 4.1.2B          | Self-reactive substances and mixtures Type A or B                                     |                                                                                                                                         |
| 4.1.3A                  | Desensitised explosive (solid) Category 1                                             |                                                                                                                                         |
| 4.2A                    | Pyrophoric liquids or solids Category 1                                               |                                                                                                                                         |
| 4.3A                    | Substances and mixtures which, in contact with water, emit flammable gases Category 1 | Not anticipated at the Macraes Operation.                                                                                               |
| 5.1.1A                  | Oxidizing liquid or solid Category 1                                                  |                                                                                                                                         |
| 5.2A, 5.2B              | Organic peroxide Type A or B                                                          |                                                                                                                                         |
| 6.1A, 6.1B <sup>A</sup> | Acute toxicity (oral, inhalation or skin) Category 1 or 2                             | Applicable to sodium cyanide and cyanide solution used in the Processing Plant, and mercury collected in the electrowinning processing. |



## **C10 Tank and location certification**

Bulk hazardous substances storage tanks must hold stationary container compliance certification under Part 17 of the HSW-HS. This verifies that the design and installation meet requirements for foundation stability, secondary containment, pressure management, liquid fill level management and monitoring of the interstitial space (for double skinned tanks) to detect any leaks.

All storage tanks containing hazardous liquids larger than 5,000 L are required to have stationary container compliance certificates.

Locations where hazardous substances storage exceeds the quantity threshold in the HSW-HS (package stores or tanks) are required to hold a location compliance certificate that independently verifies that operational controls such as signage, security, hazardous areas, segregation of incompatibles, emergency response planning, separation distances and staff training requirements are met.

OGNZL are responsible for the recertification of process tank certificates and location compliance certificates. All bulk diesel tanks used at the Macraes Operation hold a stationary container compliance certificate.

## **C11 Substance specific controls at the Processing Plant**

### **C11.1 Sodium Cyanide delivery, storage and use**

Cyanide is delivered to site in bulk as pellets within an isotainer, which is pumped full of water and mixed into an adjacent holding tank to form a cyanide solution (liquid cyanide) for leaching gold from the ore. Solid sodium cyanide (cyanide) is stored in bags within a bunded shed as backup supply.

The following specific controls apply:

- The liquid cyanide is stored in a bunded tank that must be certified under the HSW-HS by an external compliance certifier, within a bunded shed to prevent spill or uncontrolled release to the workplace or environment. The shed is located in a secure fenced area with unauthorised access prohibited.
- Fixed gas monitors are located at four locations around the Carbon-in-Leach (CIL circuit to trigger detection alarms and initiate investigation of any unplanned gas generation and release.
- The cyanide management plan<sup>21</sup> outlines the cyanide processes within the Processing Plant, transport of cyanide to the mine, handling and storage requirements, monitoring sensors and testing undertaken, site water management and protection measures for workers, equipment and the environment.
- Where cyanide is used in the Processing Plant, the control systems are automated where possible, to enable automatic dosing and mixing and minimise worker contact. Interlocked control systems are in place to prevent tank overflows and avoid uncontrolled releases.
- As an additional layer of protection, if there was a bund failure, any release would be contained within engineered sumps at the Processing Plant.
- A site-specific cyanide emergency procedure is provided in the Cyanide Management Plan which outlines the hazards, symptoms of poisoning, PPE required, medical and first aid requirements, and instructions for response to small and large spill instructions, fires and contact (poisoning).

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<sup>21</sup> OGNZL, *Cyanide Management Plan MAC-257-PRO-010*. V4, June 2026.

## **C11.2 Mercury collection and disposal**

Mercury collected as a by-product of ore processing in the Gold Room is subject to specific procedures for safe handling and disposal:

- Standard Operating Procedure – Safe Work Instruction, Mercury, Collection, Packing and Shipping (MAC-456-PRO-015), OGNZL, October 2024; and
- Standard Operating Procedure – Safe Work Instruction, Mercury, Spill Clean Up (MAC-456-PRO-014), OGNZL, November 2024.

Up to 1 L (13 kg) of mercury is removed from the system at a time in a bottle that is sealed, submerged in a bucket of sand and crated for transport. It is collected and disposed of by a dedicated recycling service (Prime Environmental at the time of application). Mercury decontamination powder is kept on site for response to spills and specific PPE including respirators are provided for immediate response.

## **C11.3 Liquid oxygen production and storage**

Oxygen is termed a ‘permanent gas’ in the HSW-HS regulations because it liquefies only under extreme temperature and pressure conditions. The oxygen used at the Processing Plant is stored in a cryogenic tank segregated from other hazardous substances and the site boundary.

BOC New Zealand Limited has designed, installed and maintains the cryogenic tank. The cryogenic tank is routinely inspected and certified under the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 (HSE-PECPR).

Transfers of oxygen are carried out by trained staff or contractors to minimise the risk of releases or incidents during tank filling.

## **C11.4 Non-bulk hazardous substances**

Smaller quantities of hazardous substances are used in the workshops and labs. Where appropriate, these substances are to be stored in dangerous goods cabinets with internal secondary containment and applicable segregation from incompatible substances in place to meet the HSW-HS requirements.

## **C12 Specific controls for explosives**

### **C12.1 Magazine certification**

The total aggregate quantity of stored high explosives (H.E) product including ANFO, boosters and packaged explosive (20,000 kg NEQ) is divided across three separate H.E magazine units at the Golden Point Class 1 compound. An additional 70 kg (NEQ) of initiating explosives (I.E or detonators) is stored in up to two entirely separate magazine units (I.E magazines).

The HSW-HS regulations require any storage of Class 1.1D explosives in excess of 2.5 kg to be secured in a magazine designed and certified to meet requirements for the material of construction, the design of the locking arrangement and arrangements for prevention of removal.

The magazine is also required to have an earthing system between the atmosphere above the hazardous substance location and earth to dissipate any build-up of electrostatic charge. The magazines must also have a lightning interceptor designed in accordance with section 4 in AS/NZS 1768: 2007—Lightning protection. These features are required to minimise the risk of an inadvertent ignition of the explosives.

The magazines used by OGNZL are designed to standard AS 2187.1 1998 for relocatable magazines and hold design compliance certificates to demonstrate that the requirements set in the HSW-HS regulations are met.

## **C12.2 Security**

The Class 1 Explosives compound is securely fenced, and only certified personnel are authorised to access the keys to the storage site. This measure reduces the likelihood of operator error or of tampering with the explosives and reduce the likelihood of an event causing a detonation.

## **C13 Hazardous substance location for the Class 5 reload depot**

Packages of Class 5 ANE and sodium nitrite are stored within a dedicated compound (“reload depot”) for oxidising substances located 630 m northwest of the Processing Plant.

The Class 5 substances are not flammable but will accelerate a fire and will generate an explosion when mixed with combustible material and ignited within a confined space. As a result, the key control for management of fire and explosion risk at the site is to eliminate combustible materials from the Class 5 bulk storage locations. The HSW-HS sets a minimum separation distance of 8 m between combustible materials and the Class 5 oxidising substances (ANE or sodium nitrite). There are no combustible substances stored in this location.

The closest boundary to an area not owned by OGNZL is approximately 200 m west of this storage area at the Golden Point Reserve. A DOC building within the reserve is approximately 400 m west of the storage area.

The storage area is secured from access by unauthorised personnel. The ANE is a highly viscous emulsion that is stored in a solid state, and therefore secondary containment is not required. However, the store and any movement of the ANE is subject to site-wide spill response protocols. The location is certified to meet the relevant controls specified in the HSW-HS regulations as set out in Table Appendix C.1.

## **Appendix D      Principal Hazard Management Plan – Hazardous Substances**

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# Principal Hazard Management Plan

Hazardous Substances

Approved date: June 2025

Document ID: MAC-257-PHM-007-10

This is no longer a controlled document once printed.  
This document must not be released outside of the company without permission of the Departmental Manager.

|               |                   |
|---------------|-------------------|
| Department    | Health and Safety |
| Location/Site | Macraes           |



## Approval table

|                    | Position title                            | Name            | Date     |
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| <b>Approved by</b> | Asset President and Site Senior Executive | James Isles     | Jun 2025 |

## Document issuance and revision history

**Document name:** Hazardous Substances

**Document id:** MAC-257-PHM-007-10

| Revision number | Revision date | Section | Page | Description                                                                                                                      | Effective Date |
|-----------------|---------------|---------|------|----------------------------------------------------------------------------------------------------------------------------------|----------------|
| 4               | 2016          | All     | All  | Critical Control Check Sheet (CCCS) audit identified changes required                                                            | Nov 2016       |
| 5               | 2017          | All     | All  | External Audit carried out, CCCS check sheet carried out, Legislation changes updated and externally reviewed                    | Dec 2017       |
| 6 - 7           | 2019          | All     | All  | Review and edits to align with all PHMP's                                                                                        | Jan 2020       |
| 8               | Sep 2020      | All     | All  | Update to standard information<br>Addition of Nature of Principal hazard and Critical Control definition<br>Update to new format | Sep 2020       |
| 9               | Jul 2022      | All     | All  | Review and sign off by SSE                                                                                                       | Aug 2022       |

Approver: James Isles

Approved date: Jun 2025

Next Review: Jun 2027

|    |                                  |       |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|----|----------------------------------|-------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 10 | Dec 2024<br>Mar 2025<br>Apr 2025 | 5.1.4 | 8    | <ul style="list-style-type: none"> <li>- Team review and quality check</li> <li>- Rearranged sequence of Section 5 "Management Plan"</li> <li>- Added requirement for self-closing HAZCHEM cupboard(s)</li> <li>- Include specific reference to the OceanaGold Environmental Performance Standard 6.14 and its requirements for piping and flow lines shall be colour-coded and marked</li> <li>- Include specific reference to spill response kits as required by the OGC Safety Performance Standard for Hazardous Substances at section 6.18 and 6.19</li> <li>- Included context and reference to the Hydrocarbon Management Plan</li> <li>- Included context and reference to the Cyanide Management Plan</li> <li>- Added more context to ChemAlert software</li> <li>- Added appendix to track compliance towards the Environmental Performance Standard</li> <li>- Removed hyperlinks</li> <li>- Added revision number to doc ID</li> </ul> | Jun 2025 |
|    |                                  | 5.1.7 | 9    |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|    |                                  | 5.2.1 | 10   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|    |                                  | 5.2.6 | 11   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|    |                                  | 5.3.2 | 14   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|    |                                  | 7     | 7-12 |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|    |                                  | 5     | 17   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |
|    |                                  | 10    |      |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     |          |

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## 1 PURPOSE

The purpose of the Principal Hazard Management Plan (PHMP) is to provide the framework for the management of the identified principal hazard of hazardous substances to the immediate environment through a risk-based approach.

This PHMP will reference the documents and processes to be followed to ensure tasks or activities associated with the principal hazard, are conducted in a safe manner.

## 2 SCOPE

This PHMP is applicable to all activities undertaken at the Macraes Operation with the identified principal hazard environmental impact but excludes impact on workers, which is included in the Worker Health PCP.

## 3 REFERENCE AND COMPLIANCE

| Level                     | Source                                                                                                                                       |
|---------------------------|----------------------------------------------------------------------------------------------------------------------------------------------|
| Legislation or Guidelines | <ul style="list-style-type: none"> <li>Health and Safety at Work Act 2015</li> </ul>                                                         |
|                           | <ul style="list-style-type: none"> <li>Hazardous Substance and New Organism Act 1996</li> </ul>                                              |
|                           | <ul style="list-style-type: none"> <li>Resource Management Act 1991</li> </ul>                                                               |
|                           | <ul style="list-style-type: none"> <li>Environmental Protection Authority Act 2011</li> </ul>                                                |
|                           | <ul style="list-style-type: none"> <li>Radiation Safety Act 2016</li> </ul>                                                                  |
|                           | <ul style="list-style-type: none"> <li>Radiation Safety Regulations 2016</li> </ul>                                                          |
|                           | <ul style="list-style-type: none"> <li>Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> </ul>    |
|                           | <ul style="list-style-type: none"> <li>WorkSafe NZ - HSNO Codes of Practice for Hazardous Substances</li> </ul>                              |
|                           | <ul style="list-style-type: none"> <li>Safe Work Australia - Managing Risks of Hazardous Chemicals in the Workplace</li> </ul>               |
|                           | <ul style="list-style-type: none"> <li>International Cyanide Management Code</li> </ul>                                                      |
| Corporate                 | <ul style="list-style-type: none"> <li>OGC-450-CHK-018 Critical Control Check Sheet - Hazardous Materials and Chemical Substances</li> </ul> |
|                           | <ul style="list-style-type: none"> <li>OGC-450-BWT-013 Hazardous Materials and Chemical Substances</li> </ul>                                |
|                           | <ul style="list-style-type: none"> <li>OGC-450-BWT-002 Fire and Explosion</li> </ul>                                                         |
| Site                      | <ul style="list-style-type: none"> <li>MAC-253-PLN-003 Hazardous Substances Map - Layout of Processing Plant</li> </ul>                      |
|                           | <ul style="list-style-type: none"> <li>MAC-257-PRO-009 Personal Protective Equipment</li> </ul>                                              |

|  |                                                                                                                       |
|--|-----------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"><li>• MAC-257-PHM-005 Fire and Explosion Principal Hazard Management Plan</li></ul> |
|  | <ul style="list-style-type: none"><li>• MAC-458-MAN-051 Reagents Spill Response Manual</li></ul>                      |
|  | <ul style="list-style-type: none"><li>• MAC-458-ASM-053 Reagents Spill Response Manual Written Assessment</li></ul>   |
|  | <ul style="list-style-type: none"><li>• MAC-350-PRO-006 Open Pit Explosives Management Plan</li></ul>                 |
|  | <ul style="list-style-type: none"><li>• MAC-458-PRO-006 Na CN Sample, Draw in Solution and Deliver to SGS</li></ul>   |

## 4 RISK ASSESSMENT

Hazardous Substances has not been directly identified as a principal hazard in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016, however, OceanaGold (OGL) Macraes has identified it as a principal hazard in accordance with, Part 4, Section 65 (b).

The site risk register is to be reviewed after all significant incidents. Formal risk assessments are to be undertaken where changes to this document affect safety of personnel. Risk assessments are to be conducted according to OGC-450-GUI-005 Risk Management Guidelines.

Reference:

- MAC-250-RSK-005 Macraes Risk Register
- MAC-250-RSK-011 Hazardous Substances
- MAC-250-RSK-017 Fire & Explosion

### 4.1 Nature of Principal Hazard

Hazardous substances are those that are or have the potential to be explosive, flammable, oxidising, toxic to people or the environment (ecotoxic) or corrosive. The Macraes Operations uses several hazardous substances to extract and process ore in the processes of gold recovery.



## **5 MANAGEMENT PLAN**

### **5.1 Procedures and Rules**

#### **5.1.1 Legal Requirement**

All departments are responsible to comply to requirements of the Health and Safety at Work (Hazardous Substance) Regulation 2017.

##### **5.1.1.1 Location Compliance Certificate(s)**

Departments who hold explosive, flammable, oxidising, toxic or corrosive substances with quantities exceeding the thresholds specified in the Health and Safety at Work (Hazardous Substances) Regulations 2017 shall obtain a Location Compliance Certificate.

Reference:

- Health and Safety at Work (Hazardous Substances) Regulation 2017

#### **5.1.2 New or Changing a Hazardous Substance**

No hazardous substances may be brought onto an Macraes Operations site without approval. Hazardous substances required for a one-off use must also go through the approval process.

The Principal's Representative, appointed to manage contractors, must ensure that all hazardous substances to be used by contractors are subject to the Macraes Operations hazardous substances approval process.

Reference:

- MAC-200-FOR-003 Chemical Substance Approval for Use Form
- MAC-252-PRO-009 Contractor Management Plan

#### **5.1.3 Hazardous Registers and Locations**

Each department shall maintain a Hazardous Substances Register (ChemAlert may be used for this function) and Layout Map. The register must provide details such as:

- The product name
- The United Nations identification code
- Storage locations, requirements, and precautions
- Summary of maximum inventories
- Estimation of current inventories
- Approved disposal methods
- Hazardous substance identification as identified by statutory approval requirement

Hazardous Substances storage areas shall be maintained in line with Health and Safety at Work (Hazardous Substances) Regulations 2017 and best practice guidelines.

#### **5.1.4 Signage**

Signage shall be placed on all chemical storage vessels, containers and tanks and comply to the Health and Safety at Work (Hazardous Substance) Regulation 2017 and/or SDS requirements.

### **5.2 Transportation, Disposal and Tracking of Hazardous Substances**

#### **5.2.1 Transportation of Hazardous Substances**

The Macraes Operations and their contractors shall handle and transport dangerous goods in accordance with the Land Transport Rule - Dangerous Goods 2005 (when transported by road), and those substances shall be handled in accordance with the label and Safety Data Sheet (SDS) directions applicable to that substance.

Reference:

- NZTA - Transporting Dangerous or Hazardous Goods

#### **5.2.2 Disposal of Hazardous Substances**

All departments are responsible to ensure that the disposal of hazardous substances shall be in accordance with regulations and directions given on the SDS for the substance. The methods shall also be consistent with Territorial Local Authority waste disposal practices and the EPA Hazardous Substances Disposal Notice 2017.

Where required, approved contractor handling, transporting, and disposing hazardous substances and chemicals must operate in accordance with relevant legislation permits and licensing requirements.

Reference:

- EPA - Hazardous Substances (Disposal) Notice 2017
- MAC-455-PRO-056 Hazardous Waste, Destruction and Removal from Site
- MAC-451-PRO-041 Lead Containment Materials Disposal
- MAC-458-PRO-001 Cyanide, Disposal of Contaminated Boxes

#### **5.2.3 Tracking Substances**

Tracking is required for hazardous substances, e.g. highly flammable and oxidising substances, and all poisons. Macraes mine site has a number of these substances e.g. Cyanide by means of Pronto and disposal certificates supplied by the service provider.

### **5.3 Equipment Design and Standards**

#### **5.3.1 Processing Plant Control System**

All equipment within the processing plant that is associated with hazardous substances is controlled by the processing plant Yokogawa DCS (Distributed Control System). This has sensors and an automated control philosophy that monitors and controls this equipment to reduce the likelihood of exposure.

#### **5.3.2 Segregated and Secure Storage Facilities**

Hazardous substances shall be stored appropriately in secure storage facilities and Hazchem storage cupboards shall be equipped with self-closing doors.

The Macraes Operation is set up to secure the operational areas from unauthorised access using boom gates and turnstiles requiring identification card access. All other areas are fenced and signed "No Unauthorised Entry".

Storage of hazardous substances and its waste are secured through fencing and locked gates/doors. This includes but it's not limited to sodium cyanide, SIBX, sodium metabisulphite and copper sulphate stores. Only authorised personnel shall have access to the hazardous substance's areas and vehicles.

Departments/areas containing hazardous substances must have a hazardous map identifying all the segregation and secure storage facilities.

### **5.3.3 Vessel and Pipeline Labelling**

Identified hazardous substance piping and flow lines in workplaces shall be colour-coded to identify the contents and direction of flow.

Storage vessels for large volumes of hazardous substances always requires storage vessels to be certified and inspected annually and/or 3 yearly (dependent on hazardous substance type) by an external provider and have labels identifying the hazardous substance visible.

Storage tanks and piping must be certified and approved for the conditions of use and be made of a suitable material to be impervious to the chemicals stored in them. They are to be routinely inspected by means of the preventative maintenance schedule and situated above ground by preference.

Storage areas, rooms, tanks are constructed in accordance with the regulations and applicable Australian Standards and New Zealand guidelines.

Reference:

- AS 1940 – Storage and Handling of Flammable Substances and Dangerous Goods
- OGC-450-STD-019 Environmental Performance Standard - Section 6 & 8
- NZ WorkSafe Guideline

### **5.3.4 Bunding**

All hazardous substances shall be stored in banded compounds in compliance with AS/NZ standards. Bunding is required to provide recovery of liquids, spill containment and prevention of seepage to waterways.

**All banded compounds shall be maintained to provide:**

- Capability to allow recovery of liquid
- Chemical resistant to the substance being banded
- Valves, pumps, and metres associated with the transfer are designed and operated as required
- Any potential jetting from any storage vessel or fitting is captured within the banded area
- Incompatible chemicals are physically segregated and do not meet each other
- Capable of holding 110% of the largest vessel in that area. Where this requirement is unable to meet additional controls are detailed in the business unit management plans

Reference:

- Secondary Containment Systems - HSNOCOP 47 - WorkSafe

## **5.4 Radiation**

The Radiation Management Plan details the requirements for where the sources of radiation are used, the testing of radiation presence, and management of storage of radiation sources.

Reference:

- MAC-250-PLN-008 Radiation Safety Management Plan

## **5.5 Cyanide**

Cyanide is one of the most widely used chemicals in the gold mining industry. It is also one of the most toxic, but with knowledge of safe handling techniques can be used without harm to operating staff and the environment.

The Cyanide Management Plan applies to the safe use, handling, storing and disposing of cyanide at Oceana Gold Macraes.

Reference:

- MAC-257-PRO-010 Cyanide Management Plan

## **5.6 Hydrocarbon Management**

Hydrocarbons must be stored and handled in accordance with the Hydrocarbon Management Plan to ensure the storage, use, disposal, and reuse of hydrocarbons are conducted in a sustainable manner that meets relevant legislation, standards, permits and licence conditions.

### **5.6.1 Spill Response**

Spill response kits should be positioned or placed where hydrocarbon and other substances may require spill recovery and clean-up. Spill response kit audits should be undertaken during monthly workplace inspections.

Workers are advised and coached on spill kit use during the mandatory Macraes General Site Inductions.

All spill recovery and clean-up must be recorded via INX InControl.

Reference:

- MAC-206-PLN-003 Hydrocarbon Management Plan

## **5.7 Supervision, Monitoring and Review**

Supervisors are critical in ensuring workers remain safe while undertaking work. They ensure that the systems, processes, and procedures associated with the tasks are followed by reviewing and inspecting all work activities under their control, ensuring workers have the appropriate training and competencies to undertake the work task and undertaking behavioural based observations.



Contractor management is essential in the implementation of this PHMP and is achieved through the allocation of a Macraes Principal Representative who is responsible for ensuring all site requirements are met and communicated to the contractor.

Reference:

- MAC-250-SMP-000 Macraes Integrated Management System
- MAC-252-PRO-009 Contractor Management Plan

## 5.8 Training and Competency

All Macraes Operations personnel shall receive required site-specific training during general and refresher inductions, consisting of the following:

- Environmental Management System
- Legislative requirements
- Environmental incidents
- Chemicals and spills
- Spill kits identification and locations
- Hydrocarbons (fuels and oils)
- Waste management

Relevant workers to undertake work under this procedure shall understand this plan, their roles and responsibilities and the appropriate qualifications for their position.

| Trainee                                                                               | Training Requirement                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|---------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>All relevant Workers (includes contractors)</b>                                    | <ul style="list-style-type: none"><li>• All mine workers shall receive required site-specific training during mandatory induction</li><li>• Familiarisation with this PHMP</li><li>• All mine workers affected by the requirements of this plan shall understand the plan and their roles and responsibilities</li></ul>                                                                                                                                                                                                                                         |
| <b>Workers, Certified Handlers, and Supervisors working with hazardous substances</b> | <ul style="list-style-type: none"><li>• All the above</li><li>• External Provider – 2 Yearly Hazardous Substances Awareness</li><li>• Competency training and assessment for transport, handling and storage of hazardous substances including:<ul style="list-style-type: none"><li>○ Reading and interpretation of SDS contents</li><li>○ PPE</li><li>○ Hazard/Risk control</li><li>○ Waste disposal</li><li>○ Emergency arrangements and response</li><li>○ Disposal of hazardous substances</li><li>○ Accounting of hazardous substances</li></ul></li></ul> |

Reference:

- MAC-252-PRO-001 Training Management Procedure

## 5.9 Fitness for Work

OceanaGold has a strong commitment to ensuring that all workers present fit for work. This includes not being adversely affected by the effects of medication, illegal drugs, alcohol, stress, injury or illness and dehydration. Fitness for Work testing programs are in place at the Macraes Operations.

Reference:

- OGN-450-PRO-001 Drugs and Alcohol
- MAC-252-PRO-003 Fatigue Management Procedure

## 5.10 Emergency Management

In the event of an emergency, the site Emergency Response Team (ERT) shall be activated according to site procedures. ERT shall manage the initial emergency in accordance with the Emergency Management Control Plan and specific Trigger Action Response Plan (TARP).

SDSs for hazardous substances should be displayed or readily available in close proximity to the storage / use of the chemical.

Reference:

- MAC-253-PCP-000 Emergency Management Control Plan
- MAC-253-TRP-003 Emergency Trigger Action Response Plans

## 6 RESPONSIBILITIES AND ACCOUNTABILITIES

| Role                                                   | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  |
|--------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Asset President and Site Senior Executive (SSE)</b> | <ul style="list-style-type: none"> <li>• Ensure the requirements of this plan are met</li> <li>• Approve the management plan and all reviews</li> <li>• Appoint all safety critical roles under the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• Develop, implement, and maintain a health and safety management system to comply with regulations, including identifying principal hazards and establishing Principal Hazard Management Plans and Principal Control Plans (PCP)</li> <li>• Oversight of legislative compliance</li> <li>• Ensure budgets are sufficient to provide adequate training and resources to conduct work safely</li> <li>• Manage the mining operations</li> <li>• Supervise the health and safety aspects of the mining operation on every day on which any mine worker is at work</li> </ul> |
| <b>Department Manager</b>                              | <ul style="list-style-type: none"> <li>• Ensure to hold a register and layout map for all hazardous substances and chemicals across the department</li> <li>• Ensure relevant/required Location Compliance Certificate(s) are in place and valid</li> <li>• Manage the mining operation</li> <li>• Supervise the health and safety aspects of the mining operation on every day on which any mine worker is at work</li> <li>• Ensure that the Hazardous Substances PHMP is understood by all personnel and is understood to manage risks/hazards associated with hazardous substances</li> <li>• Conduct task observations within the mining operations areas</li> </ul>                                                                                                                                                                                                       |
| <b>Supervisors</b>                                     | <ul style="list-style-type: none"> <li>• Must hold the relevant competency requirements as outlined in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



|                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                               | <ul style="list-style-type: none"> <li>• Examination of the work areas as defined in Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• Ensure that the systems, processes, and procedures associated with all work are followed by reviewing and inspecting all work activities under their control</li> <li>• Ensure that all hazardous substances SOPs are reviewed and comply with the Hazardous Substances PHMP</li> <li>• Ensure workers have the appropriate competencies to undertake the work task</li> <li>• Conduct task observations within the mining operations areas</li> </ul> |
| <b>Health, Safety and Training Department</b> | <ul style="list-style-type: none"> <li>• Ensure audits and reviews are carried out as outlined in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• PHMP and PCPs are document controlled and available to all mine workers</li> <li>• Ensure there is a training plan to achieve competency in hazardous substances SOPs for all OceanaGold mine workers and contractors</li> <li>• Monitor and review incidents involving hazardous substances</li> <li>• Conduct task observations within the mining operations areas</li> </ul>                                                       |
| <b>Approved/ Certified Handlers</b>           | <ul style="list-style-type: none"> <li>• Adhere to relevant SOPs for the handling of cyanide</li> <li>• Wear task specific PPE when handling cyanide</li> <li>• Report all hazards or potential hazards to a supervisor immediately</li> <li>• Complete theory assessment for Sodium cyanide Certified Handler - CLASS 6</li> </ul>                                                                                                                                                                                                                                                                                                            |
| <b>Specialised Handler (Cyanide)</b>          | <ul style="list-style-type: none"> <li>• Adhere to relevant SOPs for the handling chemical onsite</li> <li>• Wear task specific PPE when handling chemicals</li> <li>• Report all hazards or potential hazards to a supervisor immediately</li> <li>• Hold Unit Standards 31290 and 31293</li> </ul>                                                                                                                                                                                                                                                                                                                                           |
| <b>Emergency Coordinator</b>                  | <ul style="list-style-type: none"> <li>• Ensure the Emergency Management Control Plan addresses the requirements as set out in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016, Subpart 4 – Emergency management</li> </ul>                                                                                                                                                                                                                                                                                                                                                                        |
| <b>Mine workers</b>                           | <ul style="list-style-type: none"> <li>• Present to work unimpaired and able to undertake their job safely</li> <li>• Adhere to instructions provided in this PHMP</li> <li>• Adhere to relevant SOPs / JHA for the specific task being carried out</li> <li>• Wear additional task specific PPE when required</li> <li>• Report all hazards or potential hazards to a supervisor immediately</li> </ul>                                                                                                                                                                                                                                       |

## 7 RECORDS AND DOCUMENTATION

OceanaGold uses the on-line safety management system and software INX to record and store safety, health and hygiene and training requirements. Records are stored securely and indefinitely within this facility. The following software are specific to the type of data stored and managed:

- InControl – Stationary Container System Certificates, event and incident reporting, action tracking, audits, inspections, task observations, Mine Record Entries and Management of Change
- InTuition – Worker's training and competency requirements
- Cority – Worker health monitoring and occupational hygiene monitoring programs
- Pronto
  - Inventories of substances
  - Tracking records of Cyanide
  - Inspection and maintenance management
- ChemAlert
  - To store and record all chemicals and hazardous substances used on site
  - All products in the ChemAlert system are classified **RED**, **AMBER**, or **GREEN** according to the associated hazards and the potential risk of exposure

All inspection and maintenance reports are to be held by the relevant department or through corporate maintenance databases i.e. Pronto.

This document is a controlled document secured within the OceanaGold document control system TeamBinder and published to the site through SharePoint.

Any changes made to this document must be documented in the revision reference.

Reference:

- ChemAlert
- SharePoint - H&S System Support & Coaching - ChemAlert Use

## 8 AUDIT AND REVIEW

This Hazardous Substances PHMP and referenced site procedures, shall be reviewed at least every 2 years as a minimum or:

- The occurrence of an incident at the operation involving a principal hazard that it was intended to manage
- A material change in the management structure at the operation that may affect the principal hazard management plan
- A material change in plant used or installed at the operation that may affect the principal hazard management plan
- A change to the development or extraction method used at the operation

An external PHMP audit using independent specialised consultants shall be conducted every 3 years as per legislative requirements.

Details of any external audits shall be retained for twelve months from the date at which the mining operation is abandoned.

Internal or site PHMP audits are conducted using Critical Control Checklist Sheets (CCCS), developed to monitor the effectiveness and implementation of the PHMP and shall be conducted in accordance with the corporate annual schedule.

Changes to this PHMP shall only be authorised by the Site Senior Executive.

## 9 DEFINITIONS

| Term                          | Definition                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ALARP</b>                  | As Low as Reasonably Practicable                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
| <b>Certified Handler</b>      | A person who is competent and certified to handle hazardous substances and who has met the requirements of the HSNO (Personnel Qualifications) Regulations 2001 or Health and Safety at Work (Hazardous Substances) Regulations 2017.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| <b>Compliance Certificate</b> | Document provided by a Regulator certifying that the compliance has been met in accordance with a relevant regulation, standard or guidance                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>ChemAlert</b>              | OceanaGold's Chemical Data Base administered by the Health and Safety Officer. It can be used to look up the SDS of a chemical and to track approved chemicals and storage locations at site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| <b>Dangerous Good</b>         | Means substances or articles having the properties described in the Land Transport Rule, dangerous goods 2005 Rule 45001/1 - <i>Table A: Properties and classification of dangerous goods for land transport</i> , and substances or articles declared by the relevant authority to be dangerous goods for transport on land; and includes any packaging and empty containers that have been cleaned after containing dangerous goods.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>EPA</b>                    | Environmental Protection Authority                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
| <b>Hazardous Substance</b>    | <p>Is the legal term for substances regulated by New Zealand's Hazardous Substances and New Organisms Act 1996 (HSNO Act).</p> <p>Means, unless expressly provided otherwise by Regulations, any substance with one or more of the following intrinsic properties:</p> <ul style="list-style-type: none"> <li>• Explosiveness</li> <li>• Flammability</li> <li>• A capacity to oxidise</li> <li>• Toxicity (including chronic toxicity)</li> <li>• Corrosiveness</li> <li>• Ecotoxicity, with or without bioaccumulation, or</li> </ul> <p>Which on contact with air or water (other than air or water where the temperature or pressure has been artificially increased or decreased) generates a substance with any one or more of the properties specified in paragraph (a).</p> <p>Such substances can readily explode, burn, oxidise (accelerate the combustion of other material), or corrode (metals or biological tissue), and/or be toxic to people and ecosystems (for more information, see hazardous properties). The Act and Regulations control the import, manufacture, or use (including disposal) of hazardous substances (i.e. substances that have hazardous properties).</p> |



|                                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
|-------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Hazardous Substance Location</b> | Means an area where a quantity of the substance exceeds the relevant quantity specified in table 4 in Schedule 9, table 1 or 2 in Schedule 10, table 1 in Schedule 11, or regulation 13.38 is located for more than 24 hours, in the case of a substance that is not subject to the tracking provisions of Part 19, or 2 hours, in the case of a substance subject to the tracking provisions.                                                                                               |
| <b>HSNO</b>                         | Hazardous Substances and New Organisms Act 1996                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>HSNO Classes</b>                 | Means one of the classes referred to in the EPA Hazardous Substances (Classification) Notice 2017<br>Class 1 – explosives<br>Class 2 – flammable gases<br>Class 3 – flammable liquids<br>Class 4 – flammable solids<br>Class 5 – oxidising substances<br>Class 6 – substances toxic to people<br>Class 8 – corrosive substances<br>Class 9 – substances that are toxic to the environment                                                                                                    |
| <b>Hazardous Waste</b>              | Means waste that is—<br>(a) generated by a manufacturing or other industrial process; and<br>(b) reasonably likely to be or contain a substance that meets 1 or more of the classification criteria for substances with explosive, flammable, oxidising, toxic, or corrosive properties under the Hazardous Substances (Classification) Notice 2017                                                                                                                                          |
| <b>Principal Representative</b>     | A OceanaGold employee designated to be the Contractor's day to day contact person prior to and during execution of the contract                                                                                                                                                                                                                                                                                                                                                              |
| <b>Principal Hazard</b>             | Any hazard arising at any mining operation that could create a risk of multiple fatalities in a single accident or a series of recurring accidents at the mining operation                                                                                                                                                                                                                                                                                                                   |
| <b>SDS<br/>(Safety Data Sheet)</b>  | A document providing information to help users develop correct occupational hygiene and safety procedures and exercise the required degree of care.<br>An SDS:<br>a) identifies the substance and its use<br>b) describes the chemical and physical properties of the substance<br>c) provides health hazard information and precautions for use and safe handling; and<br>d) incorporates all the legislative requirements as well as additional safety information (refer to Section 5.17) |
| <b>Tracked Substance</b>            | Means a hazardous substance described in table 1 or 2 in Schedule 26. A very hazardous substance which must be tracked recording what happens to them from when they were imported into New Zealand or manufactured, through their distribution and transport, to their final use or disposal for example cyanide.                                                                                                                                                                           |
| <b>WES</b>                          | Workplace Exposure Standards                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

## 10 APPENDIX

### 10.1 Company Standards

| Environmental Performance Standard OGC-450-STD-019-0 – Section 6                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Document Reference                                                                                                                                                        |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Purpose:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                           |
| To ensure the effective selection, purchase, transportation, handling, and storage of hazardous substances, compliant with all legislative and licence requirements and to minimise their potential adverse impacts of hazardous materials and chemical substances on workers and the environment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                           |
| 6.1 Comply with host countries legislative requirements regarding the safe transport, storage, use, handling and disposal of hazardous materials.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <ul style="list-style-type: none"> <li>• Section 5.1 Procedures and Rules</li> <li>• Section 5.2 Transportation, Disposal and Tracking of Hazardous Substances</li> </ul> |
| 6.2 A risk assessment shall be conducted to identify the risks associated with the security, transportation, storage, compliance and handling of hazardous materials generated and used by the Business Unit.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>• Section 4 – Risk Assessment</li> </ul>                                                                                           |
| 6.3 A plan describing all systems, processes, procedures, controls and safeguards undertaken to manage risks identified in the risk assessment shall be developed, implemented, communicated and maintained.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>• MAC-257-PHM-007 Hazardous Substances</li> </ul>                                                                                  |
| 6.4 Where cyanide is used at the Business Unit, a Cyanide Management Plan shall be developed, implemented and communicated in accordance with the OceanaGold Statement of Position on Cyanide use. This plan shall describe how; <ul style="list-style-type: none"> <li>• Cyanide use is minimised</li> <li>• Monitoring, validation and reporting of compliance with all regulatory requirements relating to cyanide is undertaken</li> <li>• Transparent communication and collaboration with stakeholders in relation to cyanide management is achieved</li> <li>• Host country regulatory requirements and the principles of the International Cyanide Management Institute (ICMI) are achieved</li> <li>• Conformance against the Cyanide Management Plan is reviewed annually with corrective actions developed for issues and opportunities identified during the audit process</li> <li>• Independent third-party audits of compliance against the Cyanide Management Plan are undertaken every three years and ensure corrective actions for issues and opportunities identified during the audit process are developed.</li> </ul> | <ul style="list-style-type: none"> <li>• Section 5.5 Cyanide</li> <li>• MAC-257-PRO-010 Cyanide Management Plan</li> </ul>                                                |
| 6.5 The General Manager of the relevant Business Unit shall review and authorise any plan's and shall be accountable for their implementation and ongoing effectiveness.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>• Section 6 – Responsibilities and Accountabilities</li> </ul>                                                                     |
| 6.6 A process shall be implemented to assess and approve all substances prior to being allowed on-site.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | <ul style="list-style-type: none"> <li>• Section 5.1.2 - New or Changing a Hazardous Substance</li> <li>• Section 7 – Records and Documentation</li> </ul>                |

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                    |
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| 6.7 All substances shall have a current Safety Data Sheet (SDS) readily available                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | <ul style="list-style-type: none"> <li>Section 5.10 – Emergency Management</li> </ul>                                                              |
| 6.8 Each Business Unit shall maintain a Hazardous Substances Register providing details of the following: <ul style="list-style-type: none"> <li>Quality and certification requirements for tyre, rim, and wheel assemblies</li> <li>The product name</li> <li>The United Nations identification code</li> <li>Storage locations, requirements and precautions</li> <li>Summary of maximum inventories</li> <li>Estimation of current inventories</li> <li>Approved disposal methods</li> <li>Hazardous substance identification as identified by any statutory approval requirement.</li> </ul>        | <ul style="list-style-type: none"> <li>Section 5.1.3 - Hazardous Registers and Locations</li> <li>Section 7 – Records and Documentation</li> </ul> |
| 6.9 All personnel handling hazardous substances as part of their work activities shall be trained and competent in the safe use, handling and storage of these substances.                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Section 5.8 – Training and Competency</li> </ul>                                                            |
| 6.10 Signage shall be placed on all storage vessels, containers and tanks that complies with host country legislation or SDS requirements.                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Section 5.1.4 - Signage</li> </ul>                                                                          |
| 6.11 Where the type or volume of chemicals used or stored changes materially, the Business Unit shall determine the need for any required licence and permit changes. Processes shall be in place to ensure this occurs prior to any modifications being made.                                                                                                                                                                                                                                                                                                                                          | <ul style="list-style-type: none"> <li>Section 5.1 – Procedures and Rules</li> <li>Section 5.1.1 Location Compliance Certificate(s)</li> </ul>     |
| 6.12 Storage tanks and piping shall be certified, regularly inspected and approved for the conditions of use, and be made of a suitable material to be impervious to the chemicals stored in them. They are to be routinely inspected and maintained and situated above ground.                                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>Section 7 – Records and Documentation</li> <li>Pronto software maintenance schedules</li> </ul>             |
| 6.13 Piping and flow lines shall be colour-coded and marked to indicate the contents and direction of flow.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>Section 5.3.3 Vessel and Pipeline Labelling</li> </ul>                                                      |
| 6.14 Plant control systems shall be in place wherever practicable to eliminate the need for operator intervention. Such controls shall incorporate fail safe systems in the event of emergencies. Where automatic control is not practicable, risk assessments shall be used to identify and implement operational processes, that reduce the risk to As Low as Reasonably Practicable (ALARP) and include; <ul style="list-style-type: none"> <li>Training and competency</li> <li>Storage and handling</li> <li>Signage, demarcation and restricted access</li> <li>Monitoring and alarms.</li> </ul> | <ul style="list-style-type: none"> <li>Section 5.3.1 - Processing Plant Control System</li> </ul>                                                  |
| 6.15 Adequately segregated stored hazardous substances, based on: <ul style="list-style-type: none"> <li>Quantity of materials stored</li> <li>Physical state of the chemicals (solid, liquid or gas)</li> <li>Degree of incompatibility</li> <li>Manufacturer's instructions</li> <li>Known behaviour of the materials.</li> </ul>                                                                                                                                                                                                                                                                     | <ul style="list-style-type: none"> <li>Section 5.3.2 - Segregated and Secure Storage Facilities</li> </ul>                                         |
| 6.16 Store all new installations and environmentally hazardous chemicals within low permeability bunded compounds designed in compliance with AS 1940 –2017 The Storage and Handling of Flammable and Combustible Liquids.                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>Section 5.3.3 Vessel and Pipeline Labelling</li> </ul>                                                      |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                 |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------|
| <p>6.17 All bunded compounds shall be maintained to provide:</p> <ul style="list-style-type: none"> <li>• Capability to allow recovery of liquid</li> <li>• Chemical resistant to the substances stored</li> <li>• Valves, pumps and metres associated with the transfer are operable as required</li> <li>• Adequately protected and contained equipment</li> <li>• Any potential jetting from any storage vessel or fitting is captured within the bunded area</li> <li>• Incompatible chemicals are physically segregated and do not come into contact with each other</li> <li>• Capable of holding 110% of the largest vessel in that area. Where this requirement is not able to be met the Business Unit shall detail additional controls in their plan to provide appropriate protection for workers and the environment.</li> </ul> | <ul style="list-style-type: none"> <li>• Section 5.3.2 - Segregated and Secure Storage Facilities</li> <li>• Section 5.3.4 - Bunding</li> </ul> |
| <p>6.18 Make available spill response kits and place them in work areas where hydrocarbons and other substances may require containment and clean-up.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Section 5.6.1 – Spill Response</li> </ul>                                                              |
| <p>6.19 Conduct spill recovery and clean-up.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• Section 5.6.1 – Spill Response</li> </ul>                                                              |
| <p>6.20 Document emergency response to chemical events in the Business Units Emergency Management Plan.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• MAC-253-PRO-003 Emergency Trigger Action Response Plans – Section 15</li> </ul>                        |
| <b>Radiation:</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                 |
| <p>6.21 Where radiation sources are used by a Business Unit, a Radiation Safety Officer shall be appointed.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• Section 5.5 - Radiation</li> <li>• MAC-257-PRO-010 Radiation Management Plan</li> </ul>                |
| <p>6.22 A register of all radiation sources shall be maintained and reviewed annually.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• Section 5.5 - Radiation</li> <li>• MAC-257-PRO-010 Radiation Management Plan</li> </ul>                |
| <p>6.23 Sign post all radiation sources, and all unused and expired sources shall be securely held in a locked storage facility that meets the host country legislation. These disused radiation gauges shall be removed off-site by an approved contractor, at intervals not exceeding 10 years.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>• Section 5.5 - Radiation</li> <li>• MAC-257-PRO-010 Radiation Management Plan</li> </ul>                |
| <p>6.24 Test all radiation sources for the presence of leaks on a regular basis using an approved and regularly maintained radiation leak detection device or method.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>• Section 5.5 - Radiation</li> <li>• MAC-257-PRO-010 Radiation Management Plan</li> </ul>                |

## **Appendix E      Principal Hazard Management Plan – Explosives**

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# Principal Hazard Management Plan

## Explosives

Approved date: July 2025

Document ID: MAC-257-PHM-006-15

This is no longer a controlled document once printed.  
This document must not be released outside of the company without permission of the Departmental Manager.

|               |                   |
|---------------|-------------------|
| Department    | Health and Safety |
| Location/Site | Macraes           |



## Approval table

|             | Position title                             | Name           | Date     |
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## Document issuance and revision history

Document name: Explosives

Document id: MAC-257-PHM-006-15

| Revision number | Revision date | Section | Page | Description                                                                                                                                                                           | Effective Date |
|-----------------|---------------|---------|------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 8               | 2020          | All     | All  | Added detail on storage of Explosives while working on a shot.<br>Addition of Nature of Principal Hazard and Critical Control definition<br>Update document with standard information | Sep 2020       |
| 9               | Nov 2020      | 3       |      | Addition of reference to RedBull Powder Mining Company Transport and Risk Management Plans                                                                                            | Nov 2020       |
| 10              | Aug 2021      | All     | All  | As per external audit 461360 Action # 11<br>Update reference to risk assessments in Section 4<br>Update links throughout document<br>Update document into new format                  | Aug 2021       |
| 11              | Jul 2022      | All     | All  | Internal review – sawyers bay removed for storage, inclusion of underground                                                                                                           | Jul 2022       |



|    |          |       |     |                                                                                                                                                                               |          |
|----|----------|-------|-----|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 12 | Mar 2023 | All   | All | Quality check, reformat & team review                                                                                                                                         | May 2023 |
| 13 | May 2024 | 5.6   | 11  | Addition of section 5.6 disposal of explosive waste and by-products. References to resource consents and noise, air-blast and vibration management plan added where relevant. | Jun 2024 |
| 14 | Jun 2025 | 1     | 5   | Added reference to consent requirements at Purpose, Management Plan and Records and Documentation                                                                             | Jun 2025 |
|    |          | 5     | 7   | Added sections on Disposal of Explosive waste by-products                                                                                                                     |          |
|    |          | 7     | 15  | Updated HSW(MOQO) Regulations 122 Explosives                                                                                                                                  |          |
|    |          | 5.6   | 10  |                                                                                                                                                                               |          |
|    |          | 10    | 19  | Added reference to MAC-213-PLN-000 Noise, Air blast and Vibration Management Plan                                                                                             |          |
| 15 | Jun 2025 |       |     | Updated References and Compliance table                                                                                                                                       | Jul 2025 |
|    |          |       |     | Updated Section 5.1 to include Orica                                                                                                                                          |          |
|    |          | 3     | 5   | Updated Section 5.3.2 to add Explosive Precursors                                                                                                                             |          |
|    |          | 5.1   | 7   |                                                                                                                                                                               |          |
|    |          | 5.3.2 | 8   | Updated Section 5.4.2 to replace "Foreman" with "Superintendent"                                                                                                              |          |
|    |          | 5.4.2 | 9   | Updated Section 5.7 header to "Contractors" from "Redbull"                                                                                                                    |          |
|    |          | 5.7   | 11  | Updated Section 6 to replace "General Manager" with "Asset President and Site Senior Executive" / updated context                                                             |          |
|    |          | 6     | 13  |                                                                                                                                                                               |          |
|    |          | 7     | 15  | Updated Section 8 to include requirements of the HSW(MOQO) Regulation 69(a) Review and revision of principal hazard management plans                                          |          |
|    |          | 8     | 16  |                                                                                                                                                                               |          |
|    |          | 10.1  | 18  | Updated Section 10.1 Legislative and Compliance Check sheet Regulation 86(m) and (n) to include the Regulatory amendments that came into force on 18 July 2022                |          |





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## 1 PURPOSE

The purpose of the Principal Hazard Management Plan (PHMP) is to provide the framework for the management of the identified Principal Hazard of Explosives through a risk-based approach.

This PHMP will reference the documents, processes and resource consents to be followed to ensure tasks or activities associated with the principal hazard, are conducted in a safe and compliant manner.

## 2 SCOPE

This PHMP applies to all persons in any capacity accessing the Macraes Operation and undertaking work associated with the identified principal hazard. The scope also includes the community surrounding the mining operations and road users in and around the Macraes Operation.

## 3 REFERENCE AND COMPLIANCE

| Level                     | Source                                                                                                                                    |
|---------------------------|-------------------------------------------------------------------------------------------------------------------------------------------|
| Legislation or Guidelines | <ul style="list-style-type: none"> <li>Health and Safety at Work Act 2015</li> </ul>                                                      |
|                           | <ul style="list-style-type: none"> <li>Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> </ul> |
|                           | <ul style="list-style-type: none"> <li>Health and Safety at Work (Hazardous Substances) Regulations 2017</li> </ul>                       |
|                           | <ul style="list-style-type: none"> <li>Hazardous Substance and New Organism Act 1996</li> </ul>                                           |
|                           | <ul style="list-style-type: none"> <li>Electricity (Safety) Regulations 2010</li> </ul>                                                   |
|                           | <ul style="list-style-type: none"> <li>AS 2187.1 - 1998 - Explosives - Storage, Transport and Use - Part 1 - Storage</li> </ul>           |
|                           | <ul style="list-style-type: none"> <li>AS 2187.2 -1998 - Explosives - Storage, Transport and Use - Part 2 - Use of Explosives</li> </ul>  |
| Corporate                 | <ul style="list-style-type: none"> <li>OGC-450-STD-005 Integrated Management System</li> </ul>                                            |
|                           | <ul style="list-style-type: none"> <li>OGC-450-STD-020 Safety Performance Standards Manual</li> </ul>                                     |
|                           | <ul style="list-style-type: none"> <li>OGN-450-PRO-001 Drugs and Alcohol Procedure</li> </ul>                                             |
|                           | <ul style="list-style-type: none"> <li>OGC-450-CHK-016 Critical Control Check Sheet - Explosives</li> </ul>                               |
| Site                      | <ul style="list-style-type: none"> <li>MAC-440-PRO-042 Underground Misfire Procedure</li> </ul>                                           |
|                           | <ul style="list-style-type: none"> <li>MAC-352-PRO-005 Drill &amp; Blast - Misfires (Open Pit)</li> </ul>                                 |
|                           | <ul style="list-style-type: none"> <li>MAC-257-PHM-005 Fire and Explosion Principal Hazard Management Plan</li> </ul>                     |
|                           | <ul style="list-style-type: none"> <li>MAC-206-PLN-002 Waste Management Plan</li> </ul>                                                   |
|                           | <ul style="list-style-type: none"> <li>RPC-HS-PL-01-14 Macraes Frasers West Explosives Reserve ERP</li> </ul>                             |



## **4 RISK ASSESSMENT**

The unsafe or uncontrolled use of explosives may result in fatalities, injuries and incidents.

The site risk register is to be reviewed after all significant incidents. Formal risk assessments are to be undertaken where changes to this document affect safety of personnel. Risk assessments are to be conducted according to OGC-450-GUI-005 Risk Management Guidelines.

The site risk register and associated risk assessment for Explosives can be accessed on the SharePoint Macraes Health and Safety Page and department pages.

Reference:

- OGC-450-BWT-011 Explosives Bowtie
- MAC-250-RSK-008 Explosives
- MAC-250-RSK-005 Macraes Risk Register

### **4.1 Nature of Principal Hazard**

Explosives are used in surface and underground mining activities at the Macraes Operation and are a critical part of the mining process. The main risk of Explosive are the security of the product and unplanned initiation through handling, storage or transport.

### **4.2 Critical Controls**

A single control or control type (group, category) that significantly reduces the likelihood or consequence of a Principal Hazard and/or addresses multiple causes or mitigates multiple consequences of the Principal Hazard.

## **5 MANAGEMENT PLAN**

This section summarises how Explosives are managed at the Macraes Operation, including contractors (Certified Handlers), transport, storage, manufacture, personnel training, fitness for work, emergency response, and environmental or social effects in relation to waste, noise, air-blast vibration and dust management to meet resource consent requirements.

Reference:

- MAC-350-PRO-006 Open Pit Explosives Management Plan
- MAC-440-PRO-010 Underground Transport, Storage & Handling of Explosives
- MAC-213-PLN-000 Noise, Air-blast and Vibration Management Plan

### **5.1 Explosives Contractor**

RedBull Powder Company and Orica are responsible for the transport, storage, and manufacture of Explosives at the Macraes Operations. Their services contracts are managed by OGNZL principal representatives.

Reference:

- OGN-026-PLN-001 Contractor Management Plan
- RPC-HS-PL-01-24 RedBull Principal Risk Management Plan Explosives



## **5.2 Explosive Activities**

Explosives are used daily throughout the Open Pit and Underground Mines at the Macraes Operation, primarily for the purpose of rock fragmentation. Explosives are also occasionally used at the Processing Plant for clearing crusher jaws or chute blockages.

Activities related to Explosive use include the transport to, from and within site, the manufacture of Explosives and Explosive Precursors within the on-site explosive's contractors' compound, surface and underground mining operations, and disposal of explosive waste by-products.

## **5.3 Transport of Explosives**

This PHMP covers transport of Explosives within the Macraes site only.

### **5.3.1 Transport to Site**

Explosives and Explosive Precursors are transported to the Macraes Operations under the control of an approved dangerous goods transport provider. All Explosive transport operators shall have a Certified Handler's Certification and Dangerous Goods Licence.

Explosive Precursors and accessories are stored at the Macraes on-site storage facility in such a way as to safeguard public health and safety and prevent impacts on the environment. The transfer will be arranged such that:

- Delays between the points of transfer are minimised
- Explosives are not left at any location other than designated locations
- Explosives are not left unattended during transportation

The Macraes site induction and the explosives contractor's site induction must be completed by the transport company operators before accessing the mine site and renewed every two years. If the transport operator does not meet this requirement, they must be accompanied by a site escort at all times.

### **5.3.2 Delivery and Receipting of Explosives and Explosive Precursors**

When Explosives and Explosive Precursors are delivered to site, they must be checked off against the delivery docket as they are unloaded into the appropriate magazines and/or bulk stores.

### **5.3.3 Transport within Site**

It is necessary to transport prepared Ammonium Nitrate and Fuel Oil (ANFO)/emulsion and blasting materials from the explosive's magazines and explosives contractor's facility to the mine locations. Any unused Explosives are also transported back again. The bulk ANFO/emulsion blend is mixed at the location it is to be used by the Mobile Mixing Unit (MMU). Blasting accessories are transported around site onboard a designated explosives vehicle.

Explosives are transported to the underground magazine by a designated store truck and then by an approved explosives vehicle throughout the underground operation as required.

Regulatory requirements for transportation of Explosives by road are documented in the Explosives Management Plan(s).





Reference:

- MAC-350-PRO-006 Open Pit Explosives Management Plan
- MAC-440-PRO-010 Underground Transport, Storage & Handling of Explosives
- RPC-HS-PL-01-11 RedBull Transport Emergency Response Plan
- RPC-HS-PL-01-24 RedBull Principal Risk Management Plan Explosives

## 5.4 Explosives Storage

Bulk storage facilities for emulsion and ammonium nitrate products have been constructed at the Macraes operation. The ANFO/emulsion non-detonator sensitive blend is only considered an Explosive agent when loaded into the hole. The explosive contractor is responsible for maintaining the on-site manufacturing facility.

Detonators, primers, packaged Explosives and miscellaneous blasting products that are transported to site are stored in on-site magazines. All magazines have been constructed to comply with AS 2187.1 - 1998 - Explosives - Storage, Transport and Use - Part 1 - Storage and have design and construction compliance certificates (renewed every 5-years), which requires a high standard of security, ventilation, and lightning protection.

Magazines are located in an approved area where their inadvertent detonation will not adversely impact upon electrical sub-stations, equipment, or other important installations. The access road leading to this area is located within the Macraes site with controlled access. The magazine locations, including separation distances, are also in accordance with AS 2187.1 - 1998 - Part 1. The location compliance certificate for magazines is renewed annually.

Reference:

- MAC-350-PRO-006 Open Pit Explosives Management Plan
- MAC-440-PRO-010 Underground Transport, Storage & Handling of Explosives

### 5.4.1 Surface and Underground Storage

#### 5.4.1.1 Surface Storage

All Explosives that leave the surface magazine to various mining areas are to be recorded in the magazine logbook so an accurate inventory is maintained, as required by the "tracking" requirements of the Health and Safety at Work (Hazardous Substances) Regulation 2017.

The explosives contractor is required to conduct inspections of all surface explosive's facilities and the safe operation of all surface Explosives equipment. Monthly reports to the drill and blast supervisors detailing total Explosives consumption, inventory of ammonium nitrate and other Explosives on-site, and safety concerns or incidents are required.

Explosive accessories are to be stored in appropriate lock boxes in the designated explosives vehicle when being used on a shot. If the vehicle is unavailable for any reason, an approved day box can be used. Explosive products and accessories must not be left unaccompanied in any other circumstance.

#### 5.4.1.2 Underground Storage

The underground operation has a surface explosives magazine that stores bulk bagged ANFO and bulk boxed packaged Explosives, and a separate magazine for electric and non-electric detonators.



#### **5.4.2 Working Party Magazines**

Working party magazines are used for the temporary storage of small amounts of Explosives. Any working party magazine must be authorised by the Underground Mine Manager to ensure they meet all regulatory requirements for:

- Design, Quantity
- Segregation
- Security
- Stock control
- Relocation
- Fire
- Fire prevention
- Maintenance

Underground Supervisors and Superintendents are responsible for ensuring that Explosives storage, charged headings and firing are carried out as per underground Safe Operating Procedures (SOPs). Underground Supervisors and Superintendents are also responsible for ensuring that all Explosives used underground are recorded and logbooks are up to date and accurate.

#### **5.4.3 Stock Rotation and Expiry of Explosives**

Stock inventory and rotation is managed by the explosive's contractors and OGNZL personnel. Explosives must not be used beyond their set used by date. Disposal of Explosives if expired or damaged are managed through completion of a Job Hazard Analysis (JHA), typically by detonating with a bulk production waste blast.

Reference:

- RPC-HS-PL-01-24 RedBull Principal Risk Management Plan Explosives

### **5.5 Manufacturing of Explosives**

Explosives are manufactured on site at the Macraes Operation under the control of the explosive's contractors.

#### **5.5.1 Ammonium Nitrate and Fuel Oil**

The ANFO plant has been designed, built and commissioned to produce ANFO (ANFO – red dyed) and low density ANFO (ANFO 50/50 – blue dyed) for direct use by the Macraes operation.

The ammonium nitrate (class 5.1.1C) along with all handling equipment requires an annual location compliance certificate, which is the responsibility of the explosives contracting company.

#### **5.5.2 Emulsion**

The explosives contractors Emulsion Plant has been designed to produce bulk emulsions. Packaged emulsion is imported pre-packaged.



Reference:

- RPC-HS-PL-01-24 RedBull Principal Risk Management Plan Explosives

### **5.5.3 Chemical Hazards**

Information is available from the relevant Safety Data Sheets (SDS), which can be found in the contractor's office and at the location of storage and must be replaced five-yearly. All chemicals and capacities are recorded in the hazardous substances register ChemAlert.

Reference:

- RPC-HS-PL-01-24 RedBull Principal Risk Management Plan Explosives
- MAC-257-PHM-007 Hazardous Substances Principal Hazard Management Plan

## **5.6 Disposal of Explosive waste by-products**

The use and manufacture of explosives onsite results in a number of waste streams which are managed independently by department and type. Details of the sites waste management practises can be found in the Macraes Waste Management Plan (MAC-206-PLN-002). The Macraes Waste Management Plan includes where waste materials are to be disposed.

OceanaGold holds no resource consents for the disposal or burial of explosive waste or explosive waste by-products on site, or any OceanaGold Land.

The burnable dump is operated as a permitted activity under the Otago Regional Councils Air Plan.

## **5.7 Explosives Contractors**

The Explosive Contractors manage an almost zero waste facility in the manufacture of Explosives on site. All Ammonium Nitrate, emulsifiers and diesel are fully used in the production of bulk emulsion/ANFO and low density ANFO with no residual or byproducts created in the process.

All old emulsion is added to planned detonations for managed destruction. Removal off site is coordinated with OGNZL's Environmental Department via a third party disposal company, in line with the classification of the waste product.

All AN packaging is to be disposed of by the respective OGNZL departments off site.

### **5.7.1 Open Pit**

The use of explosives in the open pit produces waste in the form of ammonium nitrate bags. Ammonium nitrate is a class 5.1 product and is classified as a dangerous good and hazardous chemical. As such the packaging the product comes in is to be destroyed in line with the product itself or are to be treated to remove any residual content of ammonium nitrate.

The detonators are classified as 1.4 or 1.1 of the explosives division, depending on type. They come to site in cardboard boxes and foil packaging. The cardboard boxes can be burned at the burnable dump providing all contents have been removed, boxes are to be placed into one of the burnable bins for transport to the dump by Whitestone Contracting Ltd. The foil packaging and contents are to be disposed of as a hazardous or special waste, the foil packages and any remaining dunnage products are disposed of via Prime Environmental. Prior to collection by Prime Environmental the detonator waste is packed into labelled boxes for storage at Redbull.





These waste streams are currently managed by Redbull who contracts Plasback for the treatment and reuse of the bags. Responsibility for this waste stream is to come back to the open pit.

### **5.7.2 Underground**

The use of explosives in the underground produces waste in the forms of ANFO bags and detonators.

ANFO is a class 1.1D product and is classified as a hazardous waste stream, and as such any excess product and the container/ packaging is to be disposed of via an authorised hazardous or special waste collection point in accordance with any local regulation. Prime Environmental is contracted to facilitate the disposal of ANFO packaging. Prior to collection by Prime Environmental the bags are packed into labelled boxes for storage at the Golden Point Underground (GPUG) laydown yard.

The detonators are classified as 1.4 or 1.1 of the explosives division, depending on type. They come to site in cardboard boxes and foil packaging. The cardboard boxes can be burned at the burnable dump providing all contents have been removed, boxes are to be placed into one of the burnable bins for transport to the dump by Whitestone Contracting Ltd. The foil packaging and contents are to be disposed of as a hazardous or special waste, the foil packages and any remaining dunnage products are disposed of via Prime Environmental. Prior to collection by Prime Environmental the detonator waste is packed into labelled boxes for storage at GPUG's laydown.

## **5.8 Compliance Certificates Registers**

### **5.8.1 Location Compliance Certificates**

All Explosives and Explosive Precursors storage areas are required to be annually certified by a Compliance Certifier. These compliance certificates are to be kept at the magazine or chemical storage locations, as well as in registers in INX InControl.

The emulsion storage tank and pipework require a stationary container compliance certificate, which is the responsibility of the explosive's contractor.

## **5.9 Training Competencies**

All Macraes Operations personnel shall receive required site-specific skill and knowledge during mandatory induction training, refresher training, and ongoing job safety training as per the Macraes site training procedure.

All workers required to undertake work as detailed in this procedure shall understand this plan, their roles and responsibilities and the appropriate qualifications for their position.

#### **References:**

- MAC-252-PRO-001 Training Procedure
- MAC-350-PRO-006 Open Pit Explosives Management Plan
- MAC-440-PRO-010 Underground Transport, Storage & Handling of Explosives

### **5.10 Fitness for Work**

OceanaGold has a strong commitment to ensuring that all workers present fit for work. This includes not being adversely affected by the effects of fatigue, medication, illegal drugs, alcohol, stress, injury or illness and dehydration. Fitness for work at Macraes monitors drugs and alcohol, fatigue and hydration.



Reference:

- MAC-256-PRO-003 Fatigue Management Procedure
- MAC-256-PRO-000 Drugs and Alcohol Procedure
- MAC-256-PCP-000 Worker Health Principal Control Plan

## 5.11 Emergency Response

In the event of an emergency, the site Emergency Response Team (ERT) shall be activated according to site procedures. ERT shall manage the initial emergency in accordance with the Emergency Management Control Plan and specific Trigger Action Response Plan (TARP).

Reference:

- MAC-253-PCP-000 Emergency Management Control Plan
- MAC-253-PRO-003 Emergency Trigger Action Response Plans
- MAC-250-PRO-004 Extreme Weather
- RPC-HS-PL-01-11 RedBull Transport Emergency Response Plan

## 6 RESPONSIBILITIES AND ACCOUNTABILITIES

| Role                                             | Responsibility                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Asset President and Site Senior Executive</b> | <ul style="list-style-type: none"> <li>• Must hold the relevant competency requirements as outlined in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• Ensure the requirements of this plan are met</li> <li>• Approve the management plan and all reviews</li> <li>• Appoint all safety critical roles under the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• Develop, implement, and maintain a health and safety management system to comply with regulations, including identifying principal hazards and establishing Principal Hazard Management Plans and Principal Control Plans (PCP)</li> <li>• Oversight of legislative compliance</li> <li>• Ensure budgets are sufficient to provide adequate training and resources to conduct work safely</li> <li>• Manage the mining operations</li> <li>• Supervise the health and safety aspects of the mining operation on every day on which any mine worker is at work</li> </ul> |
| <b>Open Pit and Underground Mine Managers</b>    | <ul style="list-style-type: none"> <li>• Must hold the relevant competency requirements as outlined in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• Supervise the health and safety aspects of the mining operation on every day on which any mine worker is at work</li> <li>• Notifiable events are investigated, recorded and reported</li> <li>• Conduct task observations within the mining operations areas</li> <li>• Manage the mining operation</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |





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| <b>Engineers<br/>(Production / Drill<br/>and Blast)</b> | <ul style="list-style-type: none"> <li>• Drill &amp; blast design and issue of approved plans</li> <li>• Ensure drilling, charging and firing operations are conducted in accordance with approved plans</li> <li>• Manage magazine location and design certification</li> <li>• Annual blasting notification to WorkSafe (Open Pit)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
| <b>All Supervisors</b>                                  | <ul style="list-style-type: none"> <li>• Must hold the relevant competency requirements as outlined in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• Examination of the work areas as defined in Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• Ensure that the systems, processes and procedures associated with all work are followed by reviewing and inspecting all work activities under their control</li> <li>• Ensure workers have the appropriate competencies to undertake the work task</li> <li>• Conduct task observations within the mining operations areas</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| <b>Underground<br/>Superintendent /<br/>Supervisors</b> | <ul style="list-style-type: none"> <li>• Supervising handling, transport, charging, firing and re-entry operations and ensuring compliance with procedures and approved charging plans</li> <li>• Conduct regular task observations on work involving Explosives processes</li> <li>• Blasting Operations documentation is completed</li> <li>• Blast clearance and re-entry processes undertaken prior to re-entering the mine</li> <li>• Giving clearance to the designated Shotfirer for blasting</li> <li>• Manage the firing of misfires during normal blasting hours</li> <li>• Giving re-entry clearance for headings after re-entry procedures have been completed by competent persons</li> <li>• Ensure all persons who handle, transport, charge or fire are certified and holds valid Certified Handlers and Controlled Substance Licence</li> <li>• Ensure completion of misfire notification as required</li> <li>• Communicate all charging and firing information to the oncoming Shift Supervisor</li> <li>• Accounting of explosives documentation is carried out and correct</li> <li>• Inspections of explosives areas and the use of Explosives</li> <li>• Section 220 Record of mine workers underground</li> <li>• Section 222 Examination of operations</li> <li>• Section 223 Barometer, hygrometer and thermometer</li> </ul> |
| <b>Open Pit Drill and<br/>Blast Supervisors</b>         | <ul style="list-style-type: none"> <li>• Correct SOPs for Explosives are followed</li> <li>• Relevant emergency procedures are known and followed</li> <li>• Ensure all Explosives activities are in accordance with the PHMP and any other relevant standard operating procedures that may exist for the work being undertaken</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |



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|                                               | <ul style="list-style-type: none"> <li>• Conduct regular task observations on work involving Explosives processes</li> <li>• Authorising Blasting Operations</li> <li>• Supervise explosives contractors</li> <li>• Blasting notifications</li> <li>• Ensure all persons who handle, transport, charge or fire are certified and holds valid Certified Handlers and Controlled Substance Licence</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| <b>Open Pit Designated Shotfirer</b>          | <ul style="list-style-type: none"> <li>• Following the firing procedure and communicating all firing information to their Drill and Blast Supervisor</li> <li>• Ensuring the locking of the magazines and explosive boxes on the explosive Light Vehicles (LV's) always when they are unattended and safekeeping of the keys</li> <li>• Conduct handling, transport, and charging operations in compliance with procedures and approved plans</li> <li>• Holds valid Certified Handlers and Controlled Substance Licence</li> <li>• Ensure safe disposal of defective Explosives</li> <li>• Maintaining the stock rotation system</li> <li>• Ensuring housekeeping of the magazines is to an acceptable standard</li> <li>• Rubbish disposal as per SDS and consent requirements</li> <li>• Keeping records of blasting e.g. blast reports</li> </ul> |
| <b>UG Designated Shotfirer</b>                | <ul style="list-style-type: none"> <li>• Following the firing procedure and communicating all firing information to their underground shift</li> <li>• Ensuring the locking of the magazines and explosive boxes on the explosive LV's and safekeeping of the keys</li> <li>• Conduct handling, transport, and charging operations in compliance with procedures and approved charging plans</li> <li>• Ensure safe disposal of defective Explosives</li> <li>• Complete all required documentation including the Misfire Book</li> <li>• Ensuring housekeeping of the magazines is to standard</li> <li>• Rubbish disposal as per SDS and consent requirements</li> <li>• Holds valid Certified Handlers and Controlled Substance Licence</li> </ul>                                                                                                 |
| <b>Health, Safety and Training Department</b> | <ul style="list-style-type: none"> <li>• Ensure audits and reviews are carried out as outlined in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>• PHMP's and PCP's are document controlled and available to all mine workers</li> <li>• A training plan is developed and operational to achieve competency for all mine workers</li> <li>• Conduct task observations within the mining operations areas</li> </ul>                                                                                                                                                                                                                                                                                                                                                                             |



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| <b>Emergency Coordinator</b> | <ul style="list-style-type: none"> <li>Ensure the Emergency Management Control Plan addresses the requirements as set out in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016, Part 5, Subpart 4 - Emergency Management</li> </ul>                                                                                        |
| <b>Contractor(s)</b>         | <ul style="list-style-type: none"> <li>Delivering Explosives</li> <li>Ensure that the Explosives are within specification</li> <li>Ensuring compliant storage</li> <li>Inventory management</li> <li>Ensure all persons who handle, transport or charge are certified and holds valid Certified Handlers and Controlled Substance Licence</li> </ul>                 |
| <b>Mine workers</b>          | <ul style="list-style-type: none"> <li>Must hold the relevant competency requirements for their position as outlined in the Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> <li>Follow all OceanaGold Health, Safety and Environment policies and procedures</li> <li>Adhere to fitness to work requirements</li> </ul> |

## 7 RECORDS AND DOCUMENTATION

OceanaGold uses the on-line safety management system and software INX to record and store safety, health and hygiene, training and resource consent requirements. Records are stored securely and indefinitely within this facility. The following suites are specific to the type of data stored and managed:

- InControl – Event and incident reporting, action tracking, audits, inspections, task observations, Mine Record Entries and Management of Change
- InTuition – Worker's training and competency requirements
- InHealth – Worker health monitoring and occupational hygiene monitoring programs
- InForm – Resource consent documents and conditions
- MagMan – Record and manage explosive inventory

All inspection and maintenance reports are to be held by the relevant department or through Corporate maintenance databases i.e. Pronto.

This document is a controlled document secured within the OceanaGold document control system TeamBinder and published to the site through SharePoint.

Any changes made to this document must be documented in the revision reference.

## 8 AUDIT AND REVIEW

This Explosives PHMP and referenced site procedures, shall be reviewed at least every 2 years as a minimum or:

- The occurrence of an incident at the operation involving a principal hazard that it was intended to manage
- A material change in the management structure at the operation that may affect the principal hazard management plan



- A material change in plant used or installed at the operation that may affect the principal hazard management plan
- A change to the development or extraction method used at the operation

An external PHMP audit using independent specialised consultants shall be conducted every 3 years as per legislative requirements.

Details of any external audits shall be retained for twelve months from the date at which the mining operation is abandoned.

Internal or site PHMP audits are conducted using Critical Control Checklist Sheets (CCCS), developed to monitor the effectiveness and implementation of the PHMP and shall be conducted in accordance with the corporate annual schedule.

Changes to this PHMP shall only be authorised by the Site Senior Executive.





## 9 DEFINITIONS

| Term                                 | Definition                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>ANFO</b>                          | An approved mixture of ammonium nitrate and fuel oil (diesel)                                                                                                                                                                                                                                                                                                                              |
| <b>Blasting Operations</b>           | <p>Include:</p> <ul style="list-style-type: none"> <li>• Priming a cartridge</li> <li>• Charging and stemming a hole</li> <li>• Connecting the detonator into a round of shots</li> <li>• Coupling a shot firing cable or lead-in line into a detonator circuit, circuit tester or exploder</li> <li>• Testing a shot firing circuit</li> <li>• Firing a shot or round of shots</li> </ul> |
| <b>Burden</b>                        | The distance between a blast hole and a free face, or the distance between rows of holes in a blast pattern                                                                                                                                                                                                                                                                                |
| <b>Certified (Explosive) Handler</b> | A person who has met the competency requirements of the Health and Safety at Work (Hazardous Substances) Regulations 2017 and has been certified by a Compliance Certifier for Explosives (previously termed “approved handler” under the HSNO Act)                                                                                                                                        |
| <b>Controlled Substance License</b>  | You will require a controlled substance license (CSL) to possess certain Explosives                                                                                                                                                                                                                                                                                                        |
| <b>Compliance Certifier</b>          | A compliance certifier is an individual or non-individual (a body corporate) authorised by WorkSafe to issue compliance certificates                                                                                                                                                                                                                                                       |
| <b>Critical Controls</b>             | A critical control is a control that will have the greatest impact on preventing the risk(s) relating to the principal hazard from occurring, or if the risk was to occur the critical control would provide the greatest mitigation of the potential consequences                                                                                                                         |
| <b>Danger Zone</b>                   | An area in which a person may be injured, or machinery may sustain damage as a result of blasting operations                                                                                                                                                                                                                                                                               |
| <b>Detonator</b>                     | A detonator is a device used to trigger an Explosive device. Detonators can be chemically, mechanically, or electrically initiated, the latter two being the most common                                                                                                                                                                                                                   |
| <b>Exploder</b>                      | Any electrical apparatus approved for the purpose of initiating detonators in a mine                                                                                                                                                                                                                                                                                                       |
| <b>Explosives</b>                    | <p>Includes detonation cord, detonators, boosters, relays, signal tubes, signal tube starters, primed cartridge or similar devices</p> <p>Packaged products &amp; ANFO</p> <p>Note: That when explosive precursors are mixed in the truck and pumped down the hole, they are then considered as explosives</p>                                                                             |





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| <b>Explosive Precursors</b>                | Bulk Emulsion, Sodium Nitrate, Ammonium Nitrate                                                                                                                                                              |
| <b>Magazine</b>                            | An approved store, which is exclusively used for the storage of Explosives                                                                                                                                   |
| <b>Misfire</b>                             | An occurrence where:<br>a) Testing before firing a shot reveals broken continuity which cannot be rectified<br>b) Any shot, or whole or part of a round, fails to explode when an attempt is made to fire it |
| <b>OGNZL</b>                               | OceanaGold New Zealand                                                                                                                                                                                       |
| <b>Principal Hazard</b>                    | Any hazard arising at any mining operation that could create a risk of multiple fatalities in a single accident or a series of recurring accidents at the mining operation                                   |
| <b>Risk</b>                                | The chance of something happening that will have an impact upon objectives. Risk is measured in terms of a combination of the consequences of an event and their likelihood                                  |
| <b>Risk Management</b>                     | The processes and structures that are directed towards identifying and managing risk                                                                                                                         |
| <b>Shot</b>                                | A charge of Explosive placed in a blast hole in rock for the purpose of breaking the rock                                                                                                                    |
| <b>Shotfirer</b>                           | A person appointed by Mine Management to conduct shot firing who holds a Controlled Substance License for “use” of Explosives with no limitations                                                            |
| <b>Site Senior Executive</b>               | The person responsible to develop, implement and maintain a health and safety management system to comply with regulations                                                                                   |
| <b>Stemming Material</b>                   | Inert coarse material, such as crushed gravel about 1/10th hole diameter, loaded into the blast hole to confine the gaseous energy and prevent it from venting into the atmosphere                           |
| <b>TARP - Trigger Action Response Plan</b> | A TARP defines the minimum set of actions required by workers in response to a deviation from normal working conditions                                                                                      |



## 10 APPENDIX

### 10.1 Legislative Compliance Check Sheet

| Legislative Compliance                                                                                                                                      | Document Reference                                                                                                                                                                                                                                                                                                     |
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| <b>Regulation 86: Principal hazard management plan for Explosives</b>                                                                                       |                                                                                                                                                                                                                                                                                                                        |
| The PHMP for Explosives must, at a minimum, address the following matters:                                                                                  |                                                                                                                                                                                                                                                                                                                        |
| a) transportation of explosives at the mining operation;                                                                                                    | <ul style="list-style-type: none"> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> <li>Section 5.3 Transport of Explosives</li> </ul>                                                                                |
| b) explosive precursors;                                                                                                                                    | <ul style="list-style-type: none"> <li>Section 5 Management Plan</li> </ul>                                                                                                                                                                                                                                            |
| c) inspection of and reporting on the safety of equipment used at the mining operation for manufacturing, storing, transporting, and delivering explosives; | <ul style="list-style-type: none"> <li>Section 5.8 Compliance Certificates Register</li> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                       |
| d) the appropriate action to be taken to make safe the equipment mentioned in paragraph (c);                                                                | <ul style="list-style-type: none"> <li>Section 5.8 Compliance Certificates Register</li> </ul>                                                                                                                                                                                                                         |
| e) how explosives brought into the mining operation and used at the mining operation will be accounted for;                                                 | <ul style="list-style-type: none"> <li>Section 5.3.2 Delivery and Receipting of Explosives</li> <li>Section 5.4.3 Stock Rotation and Expiry of Explosives</li> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul> |
| f) how explosives will be checked for any deterioration in the explosives and isolated if they have deteriorated;                                           | <ul style="list-style-type: none"> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                                                                             |
| g) the establishment of secure storage for explosives at the mining operation, including a system for signing Explosives in and out of storage;             | <ul style="list-style-type: none"> <li>Section 5.4 Explosives Storage</li> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                                     |



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| h) for underground mining operations and tunnelling operations, a process to remove explosives from underground at the operation unless there is an approved facility to store the explosives underground;                                                                                                                        | <ul style="list-style-type: none"> <li>Section 5.4.1.2 Underground Storage</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                                                                                         |
| i) the identification and control of hazards that may arise; <ul style="list-style-type: none"> <li>I. during the charging and firing of Explosives; and</li> <li>II. in particular places, including, for example, in a storage bin feeder in which an Explosive is to be used to clear a blockage;</li> </ul>                   | <ul style="list-style-type: none"> <li>Section 4 Risk Assessment</li> <li>SOP's relevant to surface and underground held within each department (see SharePoint)</li> </ul>                                                                                                                                        |
| j) the establishment of declared danger zones that no person may enter while blasting operations are taking place;                                                                                                                                                                                                                | <ul style="list-style-type: none"> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                                                                         |
| k) the procedure to find, recover, and detonate misfired Explosives;                                                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-352-PRO-005 Drill &amp; Blast – Misfires (Open Pit)</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> <li>MAC-440-PRO-042 Underground Misfire Procedure</li> </ul> |
| l) a record to be kept of misfired explosives;                                                                                                                                                                                                                                                                                    | <ul style="list-style-type: none"> <li>MAC-440-PRO-042 Underground Misfire Procedure</li> <li>MAC-352-PRO-005 Drill &amp; Blast – Misfires (Open Pit)</li> </ul>                                                                                                                                                   |
| m) a register of people at or providing a service to the operation who— <ul style="list-style-type: none"> <li>(i) are certified handlers under the <a href="#">Health and Safety at Work (Hazardous Substances) Regulations 2017</a>; and</li> <li>(ii) hold a controlled substance licence under those regulations;;</li> </ul> | <ul style="list-style-type: none"> <li>InTuition – Training database, has all records of certified handlers, the Explosives contractor has records of their employees with certified handlers</li> <li>Section 5.9 Training Competencies</li> </ul>                                                                |



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| <p>n) the co-operation required between the operation and any person authorised under the <a href="#">Health and Safety at Work (Hazardous Substances) Regulations 2017</a> regarding the safety of the storage, handling, transportation, and use of explosives at the operation, including compliance with any conditions attached to the authorisation under the Act or the Health and Safety at Work (Hazardous Substances) Regulations 2017 of the person handling the explosive.</p> | <ul style="list-style-type: none"> <li>• OGN-026-PLN-001 NZ Contractor Management Plan</li> </ul>                                                                                                                                                                                                                                                             |
| <p><b>122 Explosives</b></p>                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                                                                                                               |
| <p>1. A relevant operator must ensure that:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                                                                                                                                                                                                                                                                               |
| <p>a) no person uses, handles, or issues explosives at the operation unless the person;</p> <p>I. Is a certified handler for the purposes of the Health and Safety at Work (Hazardous Substances) Regulations 2017; and</p> <p>II. Holds a controlled substance license under those regulations; and</p>                                                                                                                                                                                   | <ul style="list-style-type: none"> <li>• MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>• MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> <li>• Section 5.9 Training Competencies</li> </ul>                                                                                                                   |
| <p>b) Explosives used at the mining operation are</p> <p>I. authorised by the relevant mine operator</p> <p>II. stable</p> <p>III. appropriate for their intended use</p> <p>IV. insensitive to shock, sparks, friction, and the environment in which they will be stored, transported, and used</p> <p>V. simple to store, use, transport, and control; and</p>                                                                                                                           | <ul style="list-style-type: none"> <li>• Section 5.1 Explosives Contractor</li> <li>• Section 5.3 Transport of Explosives</li> <li>• Section 5.4 Explosives Storage</li> <li>• Section 5.4.3 Stock Rotation and Expiry of explosives</li> <li>• Section 5.5 Manufacturing of explosives</li> <li>• Section 6 Responsibilities and Accountabilities</li> </ul> |
| <p>c) every person who designs or initiates a shot does so in a manner that ensures that the shot and any material expelled outside the <b>declared danger zone</b> do not cause injury to any person in, or in the vicinity of, the operation</p>                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• MAC-350-PRO-006 Open Pit Explosives Management Plan</li> </ul>                                                                                                                                                                                                                                                       |
| <p>2. In subclause (1)(c), <b>declared danger zone</b> means the area that no person may enter while blasting operations are to take place, established in accordance with:</p> <p>a. the operations health and safety management system, in the case of;</p>                                                                                                                                                                                                                              | <ul style="list-style-type: none"> <li>• MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>• MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> <li>• MAC-352-PRO-015 Drill &amp; Blast – Blast Area Delineation</li> <li>• MAC-440-PRO-059 Underground Firing and Re-entry</li> </ul>                               |



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| <ul style="list-style-type: none"><li>i. a quarrying operation at which no more than 4 quarry workers ordinarily work at any one time; or</li><li>ii. an alluvial mining operation at which no more than 4 alluvial mine workers ordinarily work at any one time; or</li></ul> <p>b) in all other mining operations, quarrying operations, and alluvial mining operations, the operation's principal hazard management plan for explosives.</p> |  |
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## 10.2 OceanaGold Safety Performance Standards Manual

| Standard                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Reference                                                                                                                                                                                                                                                          |
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| 7.1 Each Business Unit shall undertake risk assessments to identify risks associated with the transport, storage, handling and use of Explosives in the workplace.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | <ul style="list-style-type: none"> <li>MAC-250-RSK-005 Macraes Risk Register</li> <li>MAC-250-RSK-008 Explosives</li> <li>OGC-450-BWT-011 Explosives Bowtie</li> </ul>                                                                                             |
| 7.2 The identified risks and associated controls shall be recorded in the Site Risk Register to eliminate or minimise the risks                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | <ul style="list-style-type: none"> <li>MAC-250-RSK-005 Macraes Risk Register</li> </ul>                                                                                                                                                                            |
| 7.3 A plan shall be developed at each Business Unit to describe all systems, processes, procedures, operational controls and safeguards undertaken to manage the risks identified by the risk assessment process. The plan shall include:                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | <ul style="list-style-type: none"> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                         |
| <p><b>7.3.1 Modelling and design</b></p> <p>Specific aspects of design and modelling for the storage, transport and use of Explosives, including:</p> <ul style="list-style-type: none"> <li>Drill and blast design - blast hole design, timing, layout, method of initiation, and product usage and quantity;</li> <li>Magazine design - layout (distance from other infrastructure such as electrical substations, workshops and crib rooms, etc.), adequate segregation of initiating agents and Explosives, and statutory design requirements (e.g. lightning rod overhead, provision for stock control processes, and heat/ventilation management); and</li> </ul> <p>Mobile equipment design (mobile manufacturing unit, and shotfirers vehicle) - regulatory requirements, engineering standards and adequate segregation of Explosives and initiating agents.</p> | <ul style="list-style-type: none"> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                         |
| <p><b>7.3.2 Standards and compliance requirements</b></p> <p>Each Business Unit shall develop operating standards to ensure drill and blast activities, Explosives storage facilities, Explosive transportation and delivery processes are undertaken in a manner that minimises the risk of fatalities, injuries and incidents. The standards shall consider:</p> <ul style="list-style-type: none"> <li>Compliance with statutory requirements for transport, storage, handling and use of initiating agents, and Explosives and their constituents;</li> </ul>                                                                                                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> <li>MAC-213-PLN-000 Noise, Air blast and Vibration Management Plan</li> </ul> |



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|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Maintenance of equipment used for the transport and charging of Explosives;</li> <li>• Contractor management and personnel records;</li> <li>• Procurement and security; and</li> <li>• Environmental noise, vibration and dust.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                    |
| <p><b>7.3.3 Procedures and rules</b></p> <p>Procedures and rules for the safe transport, handling and use of explosives, including:</p> <ul style="list-style-type: none"> <li>• Charging procedures;</li> <li>• Establishing exclusion zones;</li> <li>• Security and access rules;</li> <li>• Blast re-entry;</li> <li>• Demarcation and signage requirements;</li> <li>• Smoking and hot work restrictions; and</li> <li>• Vehicle use.</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | <ul style="list-style-type: none"> <li>• MAC-352-PRO-000 Drill &amp; Blast – Blasting</li> <li>• MAC-352-PRO-011 Drill &amp; Blast – Blast Guards</li> <li>• MAC-352-PRO-015 Drill &amp; Blast – Blast Area Delineation</li> <li>• MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                          |
| <p><b>7.3.4 Supervision, inspection, and review</b></p> <p>Each Business Unit shall develop routine schedules to ensure supervision, monitoring and review of drill and blast designs, product storage, procurement, transport and use of Explosives. The supervision, monitoring and review schedule shall consider:</p> <ul style="list-style-type: none"> <li>• People - fit for work, competent, authorised, performance monitoring, contractor management;</li> <li>• Equipment - pre-start, defect reporting, condition, housekeeping, isolation, fit for purpose storage, signage;</li> <li>• Environment - noise, atmosphere, vibration, light, and rainfall and weather (slippery surfaces and lightning potential); and</li> <li>• Procedures and processes - hazard identification and control, task methodology and product storage, receipting and stocktake of inventory, blast notification and demarcation and contractor audits secure access to magazines and drill and blast areas.</li> </ul> | <ul style="list-style-type: none"> <li>• MAC-256-PRO-003 Fatigue Management Plan</li> <li>• MAC-256-PRO-000 Drugs and Alcohol Procedure</li> <li>• MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>• MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> <li>• MAC-213-PLN-000 Noise, Air blast and Vibration Management Plan</li> </ul> |
| <p><b>7.3.5 Training and competency</b></p> <p>Each Business Unit shall detail competency for personnel working with Explosives. The training shall include:</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• MAC-252-PRO-001 Training Procedure</li> <li>• INX - InTuition</li> <li>• MAC-350-PRO-006 Open Pit Explosives Management Plan</li> <li>• MAC-440-PRO-010 Underground Transport, Storage &amp; Handling of Explosives</li> </ul>                                                                                                            |



|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |                                                                                                     |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> <li>• Hazard identification and awareness – ensuring all personnel are aware of the risks and hazards associated with their workplace and the tasks they are required to undertake; and</li> <li>• Assurance of skills and knowledge required to undertake specific roles, including: <ul style="list-style-type: none"> <li>○ Mandatory equipment and its use;</li> <li>○ Communication procedures and protocols;</li> <li>○ First aid skills appropriate to the task and location of work;</li> <li>○ Emergency contact details; and</li> <li>○ Relevant rules and procedures.</li> </ul> </li> </ul> |                                                                                                     |
| <p><b>7.3.6 Fitness for work</b></p> <p>Each Business Unit shall establish processes and procedures to support employees in being deemed 'fit for work'. The processes and procedures shall include:</p> <ul style="list-style-type: none"> <li>• Medical and fitness assessments;</li> <li>• Fatigue Management Awareness;</li> <li>• Drug &amp; Alcohol Testing; and</li> <li>• Hydration monitoring.</li> </ul>                                                                                                                                                                                                                         | <ul style="list-style-type: none"> <li>• MAC-256-PCP-000 Worker Health Control Plan</li> </ul>      |
| <p><b>7.4</b> The General Manager of the Business Unit shall review and authorise the plan and shall be accountable for its implementation and ongoing effectiveness.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <ul style="list-style-type: none"> <li>• Section 6 Responsibilities and Accountabilities</li> </ul> |

## **Appendix F      Principal Control Plan – Emergency Management**

---



# Principal Control Plan

Macraes Emergency Management PCP

Approved Date: June 2026

Document ID: MAC-253-PCP-000.20.1

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|               |                   |
|---------------|-------------------|
| Department    | Health and Safety |
| Location/Site | Macraes           |



## Approval table

| Reviewed by | Position title                 | Name            | Date                |
|-------------|--------------------------------|-----------------|---------------------|
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|             | Coordinator Emergency Response | Stephen Renton  |                     |
| Approved by | Acting Asset President         | Pieter Doelman  | June 2026           |

## Document issuance and revision history

**Document Name:** Macraes Emergency Management PCP

**Document ID:** MAC-253-PCP-000.20

| Revision number | Revision date       | Section | Page | Description                                                                                                                                         | Effective Date |
|-----------------|---------------------|---------|------|-----------------------------------------------------------------------------------------------------------------------------------------------------|----------------|
| 16              | Mar 2018            | All     | All  | WorkSafe recommendations                                                                                                                            | Mar 2018       |
| 17              | Oct 2019            | All     | All  | Rewrite and format, sign off by SSE                                                                                                                 | Oct 2019       |
| 18              | Jul 2022            | All     | All  | Reformat to new template, Review – added section 5.4.2.1.9 as per regs; section updates as required; section 5.3.3.2 added to include reg 124 & 125 | Aug 2022       |
| 19              | Jul 2023            | All     | All  | Team review & quality check                                                                                                                         | Aug 2023       |
| 20 & 20.1       | Sep 2025 – Jun 2026 | All     | All  | - Quality check, reformat & team review, added revision number to document ID<br>- Removal of hyperlinks throughout document                        | Jun 2026       |

|  |  |         |         |                                                                                                                                                                                                                                    |  |
|--|--|---------|---------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
|  |  |         |         | - Reference to EMT updated to IMT throughout document                                                                                                                                                                              |  |
|  |  | 1       | 4       | - Section 1 Purpose – Wording expanded to identify potential emergencies, and ensure plans/process are available                                                                                                                   |  |
|  |  | 3       | 4       | - Section 3 References and Compliance<br>- Revised and edited                                                                                                                                                                      |  |
|  |  | 5.1.1   | 6       | - Section 5.1.1 Helipads – Staffing levels updated                                                                                                                                                                                 |  |
|  |  | 5.3.1.2 | 7       | - Section 5.3.1.2 Inspections and Audits of Emergency Equipment - Reworked into a table for clarity                                                                                                                                |  |
|  |  | 5.3.3.2 | 8       | - Section 5.3.3.2 Emergency Response Vehicles - Reworked into location based table for clarity                                                                                                                                     |  |
|  |  | 5.3.3.3 | 8       | - Section 5.3.3.3 First Aid Rooms - Expanded to include Top Office                                                                                                                                                                 |  |
|  |  | 5.3.3.5 | 9       | - Section 5.3.3.5 Defibrillation Devices - Ownership and location table updated                                                                                                                                                    |  |
|  |  | 5.3.3.7 | 12      | - Section 5.3.3.7 Mine Control Rooms – Expanded process detail                                                                                                                                                                     |  |
|  |  | 5.4.1.1 | 12      | - Section 5.4.1.1 Emergency Action Plans – Section moved and expanded                                                                                                                                                              |  |
|  |  | 5.4.2   | 12      | - Section 5.4.2 De-escalation – New section                                                                                                                                                                                        |  |
|  |  | 5.4.3.1 | 12      | - Section 5.4.3.1 Notification Process expanded to include a significant addition of Section 5.4.3.1.1 Open Pit and Processing Plant Radio Transceiver (RT) System and Section 5.4.3.1.2 Underground Radio Transceiver (RT) System |  |
|  |  | 7 & 8   | 23 & 24 | - Section 7 Records and Documentation & Section 8 Audit and Review mining working changes                                                                                                                                          |  |
|  |  | 10      | 27      | - Section 10 – Appendix – Contact numbers updated                                                                                                                                                                                  |  |
|  |  | 10.3    | 29      | - Appendix 10.3 Legal Compliance – Updated compliance mapping                                                                                                                                                                      |  |

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## 1 PURPOSE

The purpose of this Emergency Management Principal Control Plan (PCP) is to assist Macraes Management team to identify potential emergencies, assess the risks associated with emergency scenarios and ensure effective plans, response processes and resources are available to minimise injury, property damage, harm to the environment or company reputation.

## 2 SCOPE

This PCP applies to all persons in any capacity accessing Macraes Operation. The PCP describes the progression of emergency response from the site-based Emergency Management Team (EMT) to the Corporate Crisis Management Team (CMT) using the Coordinated Incident Management System (CIMS).

## 3 REFERENCE AND COMPLIANCE

| Level                             | Source                                                                                                                                              |
|-----------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Legislation and Guidelines</b> | <ul style="list-style-type: none"> <li>Health and Safety at Work Act 2015</li> </ul>                                                                |
|                                   | <ul style="list-style-type: none"> <li>Health and Safety at Work (Mining Operations and Quarrying Operations) Regulations 2016</li> </ul>           |
|                                   | <ul style="list-style-type: none"> <li>Hazardous Substances and New Organisms Act 1996</li> </ul>                                                   |
|                                   | <ul style="list-style-type: none"> <li>WorkSafe Emergency Response Protocol: Underground Mines and Tunnels</li> </ul>                               |
|                                   | <ul style="list-style-type: none"> <li>WorkSafe Code of Practice - Emergency Preparedness in Mining and Tunnelling Operations (Aug 2016)</li> </ul> |
|                                   | <ul style="list-style-type: none"> <li>Mines Rescue Act 2013</li> </ul>                                                                             |
|                                   | <ul style="list-style-type: none"> <li>The New Zealand Coordinator Incident Management System (CIMS) 3<sup>rd</sup> Ed. 2019</li> </ul>             |
|                                   | <ul style="list-style-type: none"> <li>WorkSafe - Workplace Emergency Plans</li> </ul>                                                              |
| <b>Corporate</b>                  | <ul style="list-style-type: none"> <li>OGC-450-STD-005 Integrated Management System Standards</li> </ul>                                            |
|                                   | <ul style="list-style-type: none"> <li>OGC-450-PRO-002 Incident Communication, Investigation and Review Flow Path</li> </ul>                        |
|                                   | <ul style="list-style-type: none"> <li>OGC-450-CHK-019 Critical Control Check Sheet - Emergency Preparedness and Response</li> </ul>                |
|                                   | <ul style="list-style-type: none"> <li>OGN-450-PRO-001 Drugs and Alcohol Procedure</li> </ul>                                                       |
| <b>Site</b>                       | <ul style="list-style-type: none"> <li>MAC-250-SMP-000 Macraes Integrated Management System</li> </ul>                                              |
|                                   | <ul style="list-style-type: none"> <li>MAC-380-PRO-068 Open Pit Evacuation Procedure</li> </ul>                                                     |
|                                   | <ul style="list-style-type: none"> <li>MAC-455-PRO-081 Macraes Processing Plant Evacuation Plan</li> </ul>                                          |

|  |                                                                                                                        |
|--|------------------------------------------------------------------------------------------------------------------------|
|  | <ul style="list-style-type: none"> <li>• MAC-400-PRO-002 Underground Office / Workshop Evacuation Procedure</li> </ul> |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PCP-002 Ventilation Control Plan</li> </ul>                           |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-000 Ground Control PHMP</li> </ul>                                |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-002 Inundation and Inrush PHMP</li> </ul>                         |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-004 Tips, Ponds and Voids PHMP</li> </ul>                         |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-005 Fire and Explosion PHMP</li> </ul>                            |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-006 Explosives PHMP</li> </ul>                                    |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-007 Hazardous Substances PHMP</li> </ul>                          |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-008 Lifting Operations PHMP</li> </ul>                            |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-009 Working at Height PHMP</li> </ul>                             |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-010 Confined Space PHMP</li> </ul>                                |
|  | <ul style="list-style-type: none"> <li>• MAC-257-PHM-011 Tyre and Rim Management PHMP</li> </ul>                       |
|  | <ul style="list-style-type: none"> <li>• MAC-253-PLN-003 Hazardous Substances Map - Layout of Process</li> </ul>       |
|  | <ul style="list-style-type: none"> <li>• MAC-440-PLN-003 GPUG Underground Refuge Chamber Escapeway</li> </ul>          |
|  | <ul style="list-style-type: none"> <li>• MAC-252-PRO-009 Contractor Management Plan</li> </ul>                         |
|  | <ul style="list-style-type: none"> <li>• MAC-250-PLN-009 Macraes Emergency Action Tactical Plan</li> </ul>             |
|  | <ul style="list-style-type: none"> <li>• MAC-256-PRO-003 Fatigue Management Plan</li> </ul>                            |

## 4 RISK ASSESSMENT

The site risk register is to be reviewed after all significant incidents. Formal risk assessments are to be undertaken where changes to this document affect safety of personnel. Risk assessments are to be conducted according to OGC-450-GUI-005 Risk Management Guidelines.

The site risk register can be accessed on the SharePoint Macraes Health and Safety Page.

Reference:

- MAC-250-RSK-005 Macraes Risk Register
- OGC-450-BWT-015 Emergency Preparedness and Response Bowtie
- MAC-250-RSK-023 Emergency Management Risk Assessment



## 5 MANAGEMENT PLAN

### 5.1 General Demographics

#### 5.1.1 Helipads

Location: Macraes Operation is situated 87km NW of Dunedin, Otago, New Zealand.

| Top Office                                          | River Pumps                          | Coronation                           |
|-----------------------------------------------------|--------------------------------------|--------------------------------------|
| Lat/ long: East 170 ° 25min<br>54sec                | Lat/ long: East 170 ° 15min<br>49sec | Lat/ long: East 170 ° 23min<br>50sec |
| New Zealand Transverse<br>Mercator (NZTM): E1398884 | NZTM: E1385627                       | NZTM: E1395261                       |
| Lat/ long: South 45 ° 22min<br>14sec                | Lat/ long: South 45 ° 20min<br>32sec | Lat/ long: South 45 ° 19min<br>28sec |
| NZTM: S4972663                                      | NZTM: S4975374                       | NZTM: S4977369                       |

Or any suitable remote location dictated by competent person(s) in charge.

- **Mine Type:** The mine is an active open pit and underground gold mine with process plant, vehicle maintenance facilities, tails dams and support departments
- **Operating Hours:** The mine operates 24 hours a day, seven days a week
- **Staffing Levels:** There are approximately 770 OGNZL workers including contractors

The number of personnel on site at any given time can vary greatly. The numbers below are indicative of normal numbers expected to be on site at these times.

| Daytime Monday – Friday | Nights and Weekends | Plant Shutdown Days |
|-------------------------|---------------------|---------------------|
| 200                     | 100                 | 450                 |

### 5.2 Prevention

Prevention strategies are centred on removing risk identified through risk assessments and documented in all site PHMPs and PCPs.

### 5.3 Preparedness

#### 5.3.1 Emergency Response Capabilities

##### 5.3.1.1 Incident Management Team

The Incident Management Team (IMT) comprises between 40 and 50 volunteer personnel with manning for a minimum of 6 (as far as reasonably practical) emergency responders on shift at any one time, spread across all Departments. IMT are trained and capable of responding to emergency situations and undertake regular training for the following disciplines:

- BG4 and CABA breathing apparatus
- Gas and confined space training
- Rope rescue
- Advanced medical training
- Airlifting bag operations
- Vehicle extraction
- Underground search and rescue
- Fire-fighting – underground, surface operations and confined spaces
- HAZMAT response
- Underground communication systems

#### 5.3.1.2 Inspections and Audits of Emergency Equipment

Inspections of the following emergency equipment in accordance with manufacturers specifications:

| Equipment                                                       | Responsibility |
|-----------------------------------------------------------------|----------------|
| Underground refuge chambers (includes underground trauma packs) | UG HST         |
| Underground first response capabilities BG4 and CABA units      | ERT / NZMRS    |
| First aid rooms                                                 | ERT            |
| Processing CABA & firefighting gear storage area (plant)        | ERT / NZMRS    |
| Trauma packs                                                    | ERT            |
| Emergency response container                                    |                |
| Emergency response trailers                                     |                |
| Emergency response training room                                |                |

#### 5.3.1.3 Registered Nurse

OGNZL employs NZ Registered Nurse / Occupational Health Nurse(s) to assist in emergency care.

#### 5.3.1.4 First Aid Trained Personnel

OGNZL encourages all workers to hold basic first aid qualifications and provide training to this qualification on an ongoing basis.

### 5.3.2 Training

| Trainee                          | Training Requirement                                                                                                                                                                                                                                                                                                                  |
|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>All Workers</b>               | <ul style="list-style-type: none"> <li>• Basic first aid training (not mandatory)</li> <li>• Site-specific emergency management information during general and refresher inductions and specific task requirements ie. electrical workers</li> <li>• Participate in department emergency scenario and evacuation exercises</li> </ul> |
| <b>Underground Workers</b>       | <ul style="list-style-type: none"> <li>• As per 'all workers'</li> <li>• Three monthly self-rescuer training / refresher</li> </ul>                                                                                                                                                                                                   |
| <b>Incident Management Team</b>  | <ul style="list-style-type: none"> <li>• Emergency management training</li> <li>• CIMS level 2 minimum (level 4 preferred)</li> <li>• 1 x desk top emergency scenario annually</li> <li>• 1 x level 3 emergency scenario annually – involving external agencies</li> </ul>                                                            |
| <b>Mine Incident Controllers</b> | <ul style="list-style-type: none"> <li>• Incident Management Team training as listed above</li> <li>• Level 4 CIMS</li> </ul>                                                                                                                                                                                                         |
| <b>Emergency Response</b>        | <ul style="list-style-type: none"> <li>• Follow an annual training plan covering all emergency response disciplines</li> </ul>                                                                                                                                                                                                        |

### 5.3.3 On Site Emergency Resources

#### 5.3.3.1 Incident Control Points

Incident Control Points (ICPs) are rooms allocated for use during an emergency and set up with the same equipment / tools to manage the emergency. There are three main ICPs located at:

- Underground Administration Office
- Processing Plant Training Room / Plant Muster Point 4
- Surface Operations – Top Office Boardroom
- The Emergency Response trailer is resourced to be set up as a mobile ICP, if required

The ICP location can be established in alternative locations when deemed required.

#### 5.3.3.2 Emergency Response Vehicles

The Macraes operation has the following response vehicles available for all injuries and trapped or injured persons, this includes treatment and transport:

| Location                              | Emergency Response Vehicle                             |
|---------------------------------------|--------------------------------------------------------|
| Processing Plant                      | 1 x Pump Truck<br>2 x Rescue Trailers<br>4WD Ambulance |
| Underground<br>Underground ER Station | First response vehicle<br>Fire Truck                   |
| IMT Co-ordinator vehicle              | First responder light vehicle                          |

### 5.3.3.3 First Aid Rooms

There are four first aid rooms located on site which are set up with trauma packs, medical oxygen and basic first aid supplies:

- Underground Office - First Aid Room
- Processing Plant Office - First Aid Room
- Golden Point Underground (GPUG) – Tagboard area
- Top Office - First Aid Room

### 5.3.3.4 First Aid Kits and Trauma Packs

First aid kits are in each building and light vehicle. Kits are the responsibility of the department. Trauma packs are available for Pre-hospital Emergency Care (PHEC) trained personnel to use across site and are located as follows:

- Ambulance
- Process Plant First Aid Room
- Open Pit – Finger 19 Office Building
- Open Pit – Coronation
- Open Pit Maintenance Admin Office
- Top Office First Aid Room
- Underground Office Block First Aid Room
- GPUG First Aid Room
- Refuge Chambers
- First Responder Light Vehicle (IMT Coordinator)

### 5.3.3.5 Defibrillation Devices

Defibrillators are maintained by IMT. Automatic defibrillators are in the following locations:

| Location                                                                                              | Type                 |
|-------------------------------------------------------------------------------------------------------|----------------------|
| <b>Top Office</b><br>Top Office Foyer<br>Top Office First Aid Room                                    | Zoll<br>Zoll         |
| <b>Mobile</b><br>Site Ambulance<br>ER Coordinator Truck                                               | Zoll<br>Zoll         |
| <b>Underground</b><br>UG Surface First-Aid Room (office buildings)<br>GPUG First-Aid Facility         | Medtronic<br>Zoll    |
| <b>Open Pit</b><br>Finger 19 Office Building<br>Open Pit Maintenance Workshop<br>Coronation Crib Room | Zoll<br>Zoll<br>Zoll |
| <b>Processing Plant</b><br>Process Plant First Aid Room                                               | Medtronic            |
| N/A – Spare                                                                                           | Zoll                 |

#### **5.3.3.6 Family Liaison Facilities (Coronation Hall)**

The Macraes Coronation Hall, situated on the road through the township is suitable for all emergency welfare activities.

#### **5.3.3.7 Mine Control Rooms**

Open Pit Mine Control is the first receiver of emergency phone calls and Mill Control is the backup.

If unanswered, the call will loop between the two control rooms three times, then forward to the ER Co-ordinator's cell phone.

Mine Control and Mill Control are manned 24 hours seven days a week. Both follow specific Duty Cards to assist in the initial emergency notification and response process.

##### **5.3.3.7.1 Underground Mine Control**

Underground have a control room that monitors underground personnel locations and receives emergency notifications by radio.

In the event of an emergency call, Underground control will contact Open Pit Mine Control and inform of the location of the emergency. The operators adhere to specific Duty Cards.

#### **5.3.3.8 Underground Self Rescuers**

Any person entering the underground shall carry a self-rescuer on their person. Self-rescuers are maintained and monitored by the Health, Safety and Training (HST) department and undergo external pressure testing annually. All workers shall undergo three monthly training on their use as per legislative requirements. Long duration self-rescuers are located on specific equipment that operate in areas of potential entrapment.

### **5.4 Response**

#### **5.4.1 Emergency Response Levels**

General guideline – refer to the appropriate TARP for detailed response.



| Level 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | Level 2                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Level 3                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Localised response by operational area with own resources</b><br><br><b>Incident Management Team NOT required</b>                                                                                                                                                                                                                                                                                                                                                                                                                              | <b>Activation of IMT</b><br><b>External support on stand-by or mobilised</b><br><br><b>Incident Management Team MAY be required</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | <b>Activation of IMT</b><br><b>External assistance mobilised – CIMS activated</b><br><br><b>Incident Management Team /S activated</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| <ul style="list-style-type: none"> <li>• Injury or illness requiring first aid treatment</li> <li>• No further threat or danger of escalation</li> <li>• Damage affecting but not halting mine operations</li> <li>• Injury or incident requiring personnel to exit mine</li> <li>• IMT notified and / or on standby</li> <li>• A vehicle incident with no or minor injuries</li> <li>• A minor machinery fire that has been extinguished</li> <li>• Movement alarm activation</li> <li>• Possibility of flooding in the next 24 hours</li> </ul> | <ul style="list-style-type: none"> <li>• Notify Site Senior Executive (SSE)</li> <li>• People seriously injured</li> <li>• Personnel are trapped or missing under hazardous conditions</li> <li>• Further threat or danger of escalation</li> <li>• Damage to mine safety systems</li> <li>• IMT may be activated</li> <li>• May require assistance of external emergency service providers</li> <li>• A vehicle incident with moderate injuries requiring external medical intervention</li> <li>• A fire that can be controlled by an onsite response</li> <li>• An unplanned detonation of explosives with no injuries</li> <li>• A large movement which has blocked egress for personnel</li> <li>• A movement which has the potential to affect the underground operations</li> <li>• A sudden flooding event with potential to trap personnel</li> </ul> | <ul style="list-style-type: none"> <li>• Notify SSE</li> <li>• A major level incident that may result in multiple fatalities and / or trigger significant public interest</li> <li>• Personnel trapped or seriously injured with high level of risk</li> <li>• Increasing complexity, duration and consequences (out of control)</li> <li>• Of national concern/ media interest</li> <li>• Serious damage to safety systems</li> <li>• Emergency Management Plan initiated and may escalate to Corporate Crisis Management Plan</li> <li>• External emergency service providers assistance required</li> <li>• NZ Mines Rescue mobilised</li> <li>• Need for strategic advice and potential for additional resources beyond the capacity of the Mine Operator</li> <li>• Initiate Underground Mines Rescue Protocol for underground level 3 emergencies</li> <li>• A fire involving explosives</li> <li>• Missing explosives</li> <li>• A large failure with personnel missing/ trapped</li> <li>• A large failure that has blocked access/ egress from the underground operations</li> <li>• Significant pit flooding that has real potential to affect the underground workings</li> </ul> |

#### 5.4.1.1 Emergency Action Plans

Emergency Action Plans have been developed for specific potential major emergencies relating to explosives, tailings storage and the Process oxygen plant. Emergency Action Plans provide an organised, planned and coordinate approach to managing an emergency on site or with assistance from external emergency services.

Reference:

- MAC-205-PLN-001 Emergency Action Plan – Macraes Tailings Storage Facilities
- MAC-253-PRO-006 BOC Oxygen Plant - Emergency Action Plan
- MAC-352-PLN-001 Redbull Principal Hazard Management Plan – Explosives
- MAC-352-PLN-000 Redbull Transport Emergency Response Plan
- MAC-440-PLN-006 Orica Macraes Plant Emergency Plan

#### 5.4.2 De-escalation

- In the event of an emergency call it is expected from the departments / workers who receives this call to stop all work until an all clear or further instructions has been given by the responsible Incident Controller
- The attending emergency responders will assess the situation and determine the amount of resources required to manage the event
- The Emergency Responders will provide updated information to the incident controller
- The Incident Controller will communicate to mine control and other relevant stakeholders to continue operations or information on a stand down period

#### 5.4.3 Site Emergencies / Evacuation

##### 5.4.3.1 Notification Process

Area or site wide evacuations will be communicated via radio (surface and underground) and/or by the evacuation siren (Processing Plant, Redbull Powder & Open Pit Workshop).

Underground shall release 'stench gas' to alert personnel of the need to evacuate to refuge chambers.

On notification, all personnel are required to immediately move to the nearest Muster Point as per the Muster Point / Evacuation Map.

##### 5.4.3.1.1 Open Pit and Processing Plant Radio Transceiver (RT) System

The Open Pit and Processing Plant operation is provided with ten channels each specifically tailored for a particular audience, these are as follows:

| Channel                                                                  | Coverage  | Priority                                                  | Use                                                                                                              |
|--------------------------------------------------------------------------|-----------|-----------------------------------------------------------|------------------------------------------------------------------------------------------------------------------|
| <b>Channel 1</b> – Oceana – Open Pit Primary Channel ( <i>Recorded</i> ) | Site wide | Should be used at all times when within Open Pit Boundary | General and emergency communications across Open Pit such as requesting access, calling ore or raising alarm etc |

|                                                                                     |                                                                                                   |                                                                                                                                                                   |                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Channel 2 – MILL SX – Processing Plant Conversation</b>                          | Point to point (all within range of radio)                                                        | Should be used where required, after which radio should be returned to Channel 3 when at Processing Plant or Channel 1 when operating within Open Pit boundary    | Specific in-depth Processing Plant related communication that do not need to be heard over the primary Channel 3 such as directing crane or discussing job etc                                              |
| <b>Channel 3 – MILL RP – Processing Plant Primary Channel</b>                       | Primarily the Processing Plant area and fringes such as Pump Station 2, Lone Pine & Deep Dell etc | Should be used at all times when operating at the Processing Plant                                                                                                | General communication across Processing Plant such as gaining entry or speaking with Mill control etc                                                                                                       |
| <b>Channel 4 – MT OBI RP – Bus Channel)</b>                                         | From Mt Obi to elevated areas of site and through Pigroot Valley to Palmerston                    | Should be used when required, after which radio should be returned to Channel 1 when operating within Open Pit boundary or Channel 3 when at the Processing Plant | Used by emergency services & busses                                                                                                                                                                         |
| <b>Channel 5 – MINE SX – Open Pit Operational Conversations</b>                     | Point to point (all within range of radio)                                                        | Should be used where required, after which radio should be returned to Channel 1                                                                                  | Specific in-depth Open Pit related communication that does not need to be heard over the primary Channel 1 or across the whole site, such as discussing pit pump projects or ore spotter chat to digger etc |
| <b>Channel 6 – NON OPS SX – Open Pit Non-Operational Conversations/Tailings Dam</b> | Point to point (all within range of radio)                                                        | Should be used where required and returned to Channel 1 when operating within the Open Pit boundary, Channel 3 when at the Processing Plant                       | The channel is to be used at designated areas such as tailings dam project and for non-operational related conversations between contractors or company staff which do not relate directly to operations    |
| <b>Channel 7 – EMS1 SX – Emergency Rescue Team</b>                                  | Point to point (all within range of radio)                                                        | Should only be used by the Emergency Rescue Team. Emergency Co-ordinator nominates users                                                                          | Emergency Responders uninterrupted communication channel                                                                                                                                                    |

|                                                                             |                                                                 |                                                                                                                                                                                         |                                                                                                                                                                                                                                   |
|-----------------------------------------------------------------------------|-----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Channel 8 – EMS2 SX – Emergency Rescue Team</b>                          | Point to point (all within range of radio)                      | Should only be used by the Emergency Rescue Team. Emergency Co-ordinator nominates users                                                                                                | Emergency Responders uninterrupted communication channel                                                                                                                                                                          |
| <b>Channel 9 – MTCE SX – Maintenance / Shovel Conversations</b>             | Point to point (all within range of radio)                      | Should be used where required and returned to Channel 1 when operating within the Open Pit boundary, Channel 3 when at the Processing Plant and Channel 6 when within a designated area | This channel is to be used for maintenance related conversations, such as directing cranes or shovel crew when moving cable etc                                                                                                   |
| <b>Channel 10 – MINE RP – Open Pit Operational Conversations (Recorded)</b> | Site wide – Exception CN4 & CS5 beyond limit for portable radio | Should be used where required and returned to Channel 1 when operating within the Open Pit boundary, Channel 3 when at the Processing Plant and Channel 6 when within a designated area | Specific in-depth Open Pit related communication that does not need to be heard over the primary Channel 1, but requires communicating across site, e.g., Mine Control communication to supervisor or ore spotter to Geo base etc |

#### 5.4.3.1.2 Underground Radio Transceiver (RT) System

Both Golden Point and Frasers Underground operations are currently provided with six UHF channels. Each specifically tailored for a particular audience, these are as follows:

| Channel                                                  | Coverage                                                       | Priority                                                                                                   | Use                                                                                                                                   |
|----------------------------------------------------------|----------------------------------------------------------------|------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Channel 1 – Oceana (Open Pit Primary Channel)</b>     | Site wide                                                      | Should be used at all times when within Open Pit Boundary, excluding Underground specific areas            | General and emergency communications across Open Pit such as communicating with Mine Control and interactions with Open Pit machinery |
| <b>Channel 2 – Underground Op's (UG Primary Channel)</b> | Underground corridor between FRUG / GPUG & Underground Offices | Should be used for initial communications between underground personnel, within the underground operations | Primary channel for underground communications. Not for extended conversations                                                        |



|                                                  |                                                                                   |                                                                                                                                                       |                                                                                                                                                               |
|--------------------------------------------------|-----------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Channel 3 –<br/>Underground<br/>Chat</b>      | Underground,<br>corridor<br>between<br>FRUG / GPUG<br>&<br>Underground<br>Offices | Should be used when extended<br>conversations are required,<br>then return to Channel Two<br>when underground, or Channel<br>One when in the Open Pit | General communication for<br>extended conversations<br>between individuals and small<br>groups                                                                |
| <b>Channel 4 –<br/>Underground<br/>General</b>   | Underground,<br>corridor<br>between<br>FRUG / GPUG<br>&<br>Underground<br>Offices | Should be used when extended<br>conversations are required, then<br>return to Channel Two when<br>underground, or Channel One when<br>in the Open pit | General communication for<br>extended conversations<br>between individuals and small<br>groups                                                                |
| <b>Channel 5 –<br/>Underground<br/>Emergency</b> | Underground,<br>corridor<br>between<br>FRUG / GPUG<br>&<br>Underground<br>Offices | Used by Underground<br>personnel to call an emergency<br>to Mine Control. Not for general<br>use                                                      | To initiate an Emergency call<br>with Mine Control. Constantly<br>monitored                                                                                   |
| <b>Channel 6 –<br/>Underground<br/>Simplex</b>   | All Site - point<br>to point (all<br>within range<br>of radio)                    | Can be used where required<br>between underground<br>personnel within line of site                                                                    | This channel can be used for<br>general, close-range<br>communications between<br>individuals and small groups, for<br>example, between truck and a<br>loader |

Reference:

- MAC-253-PLN-000 Site Emergency Muster-Evacuation Map

#### 5.4.3.2 Muster Points

Dedicated muster points are identified for surface operations on the Site Emergency Muster / Evacuation Map. Personnel shall remain at the muster point until advised to return to work, relocate to an alternative Evacuation Point or leave site.

Reference:

- MAC-253-PLN-000 Site Emergency Muster-Evacuation Map

#### 5.4.3.3 Underground Evacuations

Underground operations shall evacuate to either the nearest refuge chamber or to the surface via multiple means of egress, as directed and using all available light vehicles to transport workers. On arrival at the surface all personnel shall immediately remove their tag from the tag board and move to the assigned muster point as advised by Supervisors.



#### **5.4.3.4 Accounting for Personnel**

Macraes utilises several processes to account for personnel during an emergency. Dependent on the situation a combination of the below accounting methods may need to be implemented:

- Gallagher system - an electronic worker identification and work area access system
- Shift attendance sheets
- Underground tag board
- Deployment sheets with locations and activities for the current shift
- Department visitor's books
- Contractor's sign-in boards / sheets

#### **5.4.3.5 Lone Worker**

Supervisors need to ensure where workers are isolated that there are controls and procedures in place to account for them.

Reference:

- MAC-250-RSK-032 Working Alone, Remotely or in Isolation

#### **5.4.3.6 Transport During an Emergency**

All OGNZL vehicles may be utilised to transport personnel during an emergency. Surface traffic procedures and rules shall apply during the emergency. Dependent on duration of the emergency, contract buses may be activated outside normal hours if required.

Reference:

- MAC-257-PHM-003 Roads and Other Operating Areas Principal Management Plan
- MAC-350-PRO-003 Traffic Procedures and Rules - Surface
- MAC-380-PLN-002 Main Workshop Traffic Management Plan
- MAC-400-PRO-001 Traffic Procedures and Rules - Underground

#### **5.4.3.7 Explosives Facility Exclusion Zones**

There are two exclusion zones for incidents involving the explosives facility and storage areas. The minimum exclusion distance is 1000 meters from the centre. All personnel are to move to the nearest muster area without entering the exclusion zone. Roadblocks shall be established to ensure traffic does not enter the exclusion zone as per the Emergency Muster / Evacuation Map

Reference:

- MAC-253-PLN-000 Site Emergency Muster - Evacuation Map

#### **5.4.3.8 Personnel Emergency Contact Records**

Worker's emergency contact details are held within Success Factors. Contractors shall provide emergency contact details of their workers to their Principal Representative or delegate as requested or through completing induction paperwork.

Information can be accessed through the People and Culture Department.

#### 5.4.3.9 Underground Evacuation Notification Systems

Underground operations shall be advised of the requirements to evacuate the mine through radio communications and the release of stench gas into the ventilation system.

#### 5.4.3.10 Scene Isolation

As and when required measures will be taken to isolate the areas of the mine that are affected by the emergency through the use of reflective white cones to comply with legislative requirements to securing the scene or a need to preserve information.

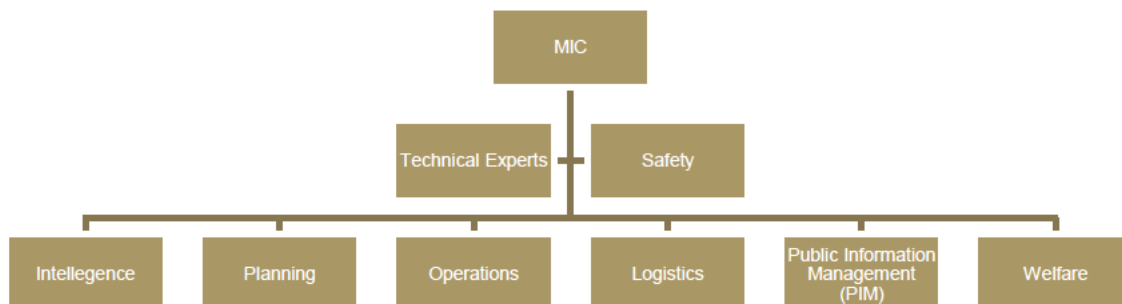
Reference:

- MAC-351-PRO-012 Operations Safety Cones and Signs

### 5.4.4 Incident Management Team

The IMT may not be required for all emergencies and the decision to activate the team shall be based on complexity, duration, and capability of the response by the Mine Incident Controller (MIC). The MIC is to be appointed by the SSE or Asset President and has overall responsibility for the management of the incident.

Any of the Site Leadership Team (SLT) may be called on to fulfill a position within the IMT. Once advised of the incident and activation of IMT, members shall immediately proceed to the allocated Incident Control Point (ICP) and await allocation of roles from the MIC. Below is the basic structure of the IMT.



#### 5.4.4.1 Emergency Management Documents

##### 5.4.4.1.1 Duty Cards

Duty cards are provided as prompts to persons in designated roles involved in responding to emergency calls.

- MAC-253-PRO-000 Mine - Mill Control Emergency Duty Cards
- MAC-253-PRO-002 Incident Management Team Duty Cards
- MAC-440-PRO-088 Underground Mine Control Emergency Duty Cards

##### 5.4.4.1.2 Emergency Trigger Action Response Plans

Trigger Action Response Plan (TARPs) outline what processes should be followed for specific incidents and what changes as the level of emergency increases. These documents are designed to assist those involved

in the emergency to react quickly and decisively at certain points of the emergency. TARPs are available on SharePoint and in the following locations:

- Mine Control and Mill Control Room
- Incident Control Points

Reference:

- MAC-253-TRP-003 Emergency Trigger Action Response Plans (TARPs)

#### 5.4.4.1.3 Maps

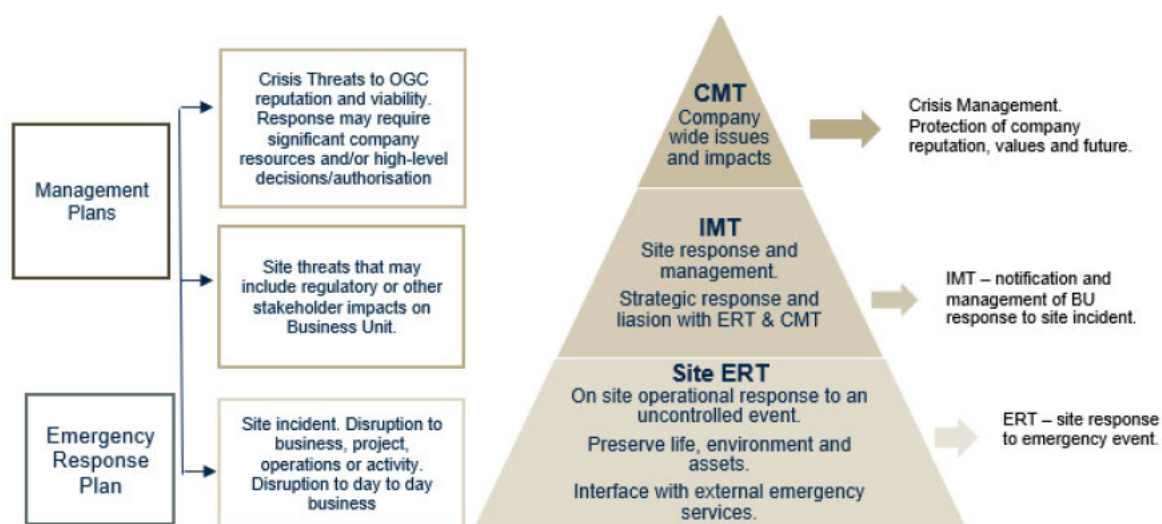
The main maps required to assist in the management of emergency events to assist personnel in identifying and planning activities. All maps must be updated when changes that effect a mining operation and are available from SharePoint and hard copy in the ICPs.

Reference:

- MAC-253-PLN-000 Site Emergency Muster / Evacuation Map
- MAC-253-PLN-003 Hazardous Substances Map - Layout of Process

#### 5.4.5 OGNZL Crisis Management Interface

The MIC shall notify Corporate of all incidents when the IMT is activated. Corporate shall determine their course of action dependent on the information provided in relation to the potential consequence, complexity, duration, or scale of the emergency.



#### 5.4.6 Coordinated Incident Management System

OGNZL New Zealand has incorporated the CIMs model into the IMT framework to achieve effective coordinated incident management across responding agencies by establishing common structures, functions and terminology used by agencies in incident management.

CIMS may be activated in any of the following circumstances as an example:

- Environmental incidents
- Fire
- Hazardous substances incidents
- Multiple or mass casualties
- Natural hazard incidents
- Search and rescue

#### **5.4.7 Underground Emergency Response Protocol**

The purpose of the protocol is to provide high level guidance on managing a Level three underground mines or tunnel emergency in New Zealand. This includes establishing the roles and responsibilities of stakeholders under the protocol and the lines of authority for decision making and communication.

The protocol is initiated when the MIC declares a Level three underground emergency and concludes when the MIC has downgraded the incident to a level two incident. To activate the Protocol, the following statements shall be used when notifying the Police Emergency Communication Centre:

**“We have a major underground mining emergency at Macraes Underground mine.**

**Please activate the Underground Mine and Tunnelling Operations emergencies standard operating procedure.”**

#### **5.4.8 External Resources**

##### **5.4.8.1 New Zealand Police**

The local police may be called to assist for any emergency on site as required. This will be at the discretion of the MIC. The Police shall also undertake the following roles in a Level 3 incident:

- Local controller to assist the communication process between the mine and external agencies
- Police media relations
- Public information management (PIM), who will inform the public about the incident and the response, media and community liaison

##### **5.4.8.2 New Zealand Mine Rescue Service**

New Zealand Mine Rescue Service (NZMRS) are available to aid with long duration underground rescue operations. The closest station is on the west coast at Rapahoe. NZMRS can provide the following services:

- Additional mine rescue personnel to assist in the emergency
- Additional resources and equipment
- Recommission BG4 breathing apparatus sets, enough stores are maintained to replenish operational supplies as required

##### **5.4.8.3 Fire & Emergency New Zealand**

Fire and Emergency New Zealand (FENZ) is New Zealand's main firefighting and emergency services body. The closest fire station is in Palmerston which is located 35km from the mine. Response time is approximately 30 minutes. Fire service response for chemical incidents will come from Dunedin.



#### **5.4.8.4 Urban Search and Rescue**

Urban Search and Rescue (USAR) involves finding and rescuing people trapped when a structure collapses, for example if a single building collapses or as a result of a major landslide or earthquake. In New Zealand Urban Search and Rescue comes under the umbrella of the Fire & Emergency New Zealand. Taskforces include firefighters, search and rescue dog handlers, communications experts, engineers, other technical experts, including doctors and paramedics.

#### **5.4.8.5 Rural Fire**

Rural fire is part of FENZ and are contactable by calling 111 and asking for rural fire response. Most bush and scrub fires can get out of hand very quickly, so its vital rural fire is contacted and put on standby to assist.

#### **5.4.8.6 St John Ambulance**

Land response is from Dunedin located 95km away with backup response coming from Palmerston 35km, Ranfurly 60km or Oamaru 92km.

Air ambulance response is through the rescue helicopter located at Taieri Airfield in Mosgiel. The helicopter flight time is 20 minutes. Should the helicopter be required, identification of landing sites and pre-inspection / clearance of area will be undertaken by ERT personnel.

#### **5.4.8.7 Waihi Operations Emergency Response**

Waihi is situated on the North Island and has fully trained emergency response members and may assist in long duration underground rescue operations.

### **5.5 Recovery**

#### **5.5.1 Post Emergency Start Up**

Once an incident has escalated to a level two or three emergency, then a formal process is required to down grade the emergency and return the mine to operation. The following are guides of what to consider for post emergency start up:

- What resources are still required to deal with the situation
- What personnel are required
- Timeframes / timelines
- Clear responsibilities to be put in place
- Incident Action Plan (IAP) may be required to finalise the down grade and restore operations back to normal working order – this needs to be authorised by the MIC
- Is regulator permission required to restore operations
- Ongoing or after the event issues e.g. are staff going to need on going counselling or assistance
- Full debrief needs to be scheduled as soon as possible with relative and key personnel
- An action plan may be required to ensure improvements and learnings are followed through
- Business continuity plan will come into effect (how / who / where)
- Site security



## 6 ACCOUNTABILITIES

### 6.1 Incident Management Team Roles

| ROLE                     | RESPONSIBILITY                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |
|--------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Site Senior Executive    | <ul style="list-style-type: none"> <li>• If an approved MIC is in place, the SSE becomes a support role</li> <li>• Liaise with Oceana Gold Limited (OGL) corporate personnel</li> <li>• Activate OGL delegate to be represented in the NZ Police Emergency Command Centre (ECC)</li> <li>• Delegate resources as required</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Mine Incident Controller | <ul style="list-style-type: none"> <li>• Manage emergency event and team through incident until normal operations resume, utilising duty cards</li> <li>• Delegates Senior Leadership Team to an IMT position</li> <li>• Briefs IMT and external services on type and magnitude of event, progression and consequence of event to date and actions attended</li> <li>• Arrange allocated areas for external emergency services and agencies</li> <li>• Responsible for setting objective of the emergency</li> <li>• Leads IMT in decision making ensuring all decisions are consultative and collaborative</li> <li>• Calls SitReps as required to maintain situational awareness</li> <li>• Signs off Incident Action Plan and Risk Assessment (legislative requirement)</li> <li>• Higher level resourcing requests to support IAP and / or IMT function</li> <li>• Anticipates relief manning and staggered change over with appropriate briefings</li> <li>• Ensure consultative process in IAP build</li> <li>• Downgrades to level 2 when appropriate</li> <li>• Details of qualified MICs are to be kept in a register on INX and listed at designated ICPs</li> </ul> |
| Planning Coordinator     | <ul style="list-style-type: none"> <li>• Coordinates planning activities, incident status, contingency plans and resource needs</li> <li>• Appoint, brief and task planning team</li> <li>• Prepare Incident Action Plan</li> <li>• Maintain maps and display boards</li> <li>• Track incident and resources status</li> <li>• Liaise with the technical experts</li> <li>• Record decisions, actions, and other activities from planning meetings</li> <li>• Develop long-term plans and/ or contingency plans</li> <li>• Assisting with planning the transition to recovery</li> <li>• Forecasting medium-to-long-term resourcing requirements</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
| Operations Coordinator   | <ul style="list-style-type: none"> <li>• Provides detailed direction, coordination and supervision to Operations team</li> <li>• Implement and follow Incident Action Plan</li> <li>• Establish staging areas</li> <li>• Review, assemble and deploy resources</li> <li>• Provide regular situation status reports</li> <li>• Record decisions, actions, and other activities</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |

|                                       |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                       | <ul style="list-style-type: none"> <li>• Coordinating day-to-day response activities on behalf of the Controller</li> <li>• Contribute and implement the Action Plan – adjust as required</li> <li>• Planning response tasks in detail</li> <li>• Forecasting resource use or needs to Logistics</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
| <b>Logistics Coordinator</b>          | <ul style="list-style-type: none"> <li>• Organise resources including personnel, equipment, supplies, facilities, catering and service to support response activities</li> <li>• Appoint brief and task Logistics team</li> <li>• Help prepare the Incident Action Plan</li> <li>• Prepare the communications plan</li> <li>• Ensure incident control room is sufficiently stocked</li> <li>• Organise resources – RT's, telephones, binoculars, first aid equipment, vehicles, and catering needs</li> <li>• Process requests for additional resources</li> <li>• Advise Operations of resource availability</li> <li>• Record decisions, actions, and other activities</li> </ul>                                                                                                                                  |
| <b>Intelligence Coordinator</b>       | <ul style="list-style-type: none"> <li>• Gathers and analysis incident information and coordinates all communications</li> <li>• Receiving authorised resource requests, and procuring the resources</li> <li>• Requesting, receiving, storing, maintaining, and issuing procured resources</li> <li>• Participating in the development of the action plan</li> <li>• Tracking resource use and financial expenditure</li> <li>• Activating and operating any required assembly areas</li> <li>• Providing transport</li> <li>• Establishing and maintaining information technology networks</li> <li>• Providing record-keeping and administration support</li> <li>• Collating and matching offers of assistance</li> <li>• Advising the controller and the IMT of logistics issues and resource levels</li> </ul> |
| <b>Emergency Response Coordinator</b> | <ul style="list-style-type: none"> <li>• Confirm requirement (or not) for external emergency services</li> <li>• Confirm requirement (or not) for full ERT activation</li> <li>• Coordinate with MIC and organise an ERT response to the situation</li> <li>• Assess further requirements as more information is received</li> <li>• Liaise with Supervisor and formulate response plans to the emergency</li> <li>• Communicate these plans to the ERT Captain</li> </ul>                                                                                                                                                                                                                                                                                                                                           |
| <b>Public Information Management</b>  | <ul style="list-style-type: none"> <li>• Preparing and sharing information directly to the public (via social media, public meetings, pamphlets etc.), or via the media. Note that the content of official information such as warnings is generated by official processes, and approved by the Controller</li> <li>• Monitoring the public and media reactions and passing information to the relevant CIMS functions</li> <li>• Coordinating with other response agencies' PIM activities</li> <li>• Preparing spokespeople for interviews and media conferences</li> <li>• Liaising with the community</li> <li>• Working with the media, including arrangements for media visits and media conferences</li> <li>• Liaising with VIPs and their personnel about site visits</li> </ul>                            |

|                |                                                                                                                                                                                                                                                                         |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                | <ul style="list-style-type: none"> <li>Ensuring call centres, helplines and reception personnel have current public information and key messages</li> <li>Participating in the development of the action plan</li> <li>Advising the Controller on PIM issues</li> </ul> |
| <b>Welfare</b> | <ul style="list-style-type: none"> <li>Welfare is responsible for managing the consequences of an incident on individuals, families/ whanau, and communities</li> <li>Advises on the welfare resources, organisational structure, and facilities</li> </ul>             |

## 6.2 Incident Management Team Support Roles

| ROLES                                                                                             | ACCOUNTABILITY                                                                                                                                                                                                                                                                                                                    |
|---------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Safety Manager</b>                                                                             | <ul style="list-style-type: none"> <li>Monitor safety conditions and hazards</li> <li>Report directly to MIC</li> <li>Establish communications with required personnel</li> <li>Notify Mine Incident Controller of potential issues</li> <li>Record decisions, actions, and other activities</li> </ul>                           |
| <b>People and Culture Manager</b>                                                                 | <ul style="list-style-type: none"> <li>Liaise with incident controller on employee and family updates</li> <li>Liaise with contact within the Local Controller and pass information as required</li> <li>Ensure all employee records and details are available</li> </ul>                                                         |
| <b>Environmental Manager</b>                                                                      | <ul style="list-style-type: none"> <li>Monitor environmental conditions and hazards</li> <li>Report directly to MIC</li> <li>Establish communications with required personnel</li> <li>Notify MIC of potential issues</li> <li>Record decisions, actions, and other activities</li> </ul>                                         |
| <b>Recorder</b>                                                                                   | <ul style="list-style-type: none"> <li>Person designated to keep situation boards and timeline up-to-date</li> </ul>                                                                                                                                                                                                              |
| <b>Mine Control / Mill Control Operator</b>                                                       | <ul style="list-style-type: none"> <li>Select the appropriate Emergency Procedure Duty Card guide and follow the prompts</li> </ul>                                                                                                                                                                                               |
| <b>Supervisor (Incident controller – initial most senior person on the scene of the incident)</b> | <ul style="list-style-type: none"> <li>Evaluate available information and organise a response protecting Life, Environment, Property and Production, in that order</li> <li>Liaise with the Emergency Response Coordinator regarding response</li> <li>Site/ scene security</li> <li>Notification to senior management</li> </ul> |
| <b>Emergency Response Team Captain</b>                                                            | <ul style="list-style-type: none"> <li>Follow directions given by the Emergency Response Coordinator</li> <li>Direct the Emergency Response Team</li> <li>Pass relevant information back to the Emergency Response Coordinator</li> <li>Emergency Response Structure</li> </ul>                                                   |
| <b>All Workers</b>                                                                                | <ul style="list-style-type: none"> <li>Ensure their own safety and other in immediate area</li> <li>Report all emergencies immediately</li> <li>Assist if safe to do so</li> <li>Maintain radio silence</li> </ul>                                                                                                                |

## 7 RECORDS AND DOCUMENTATION

OGNZL uses the on-line safety management system and software INX to record and store safety, health and hygiene and training requirements. Records are stored securely and indefinitely within this facility. The following suites are specific to the type of data stored and managed:



- InControl – Event and incident reporting, action tracking, audits, inspections, task observations, emergency exercises, Mine Record Entries and Management of Change
- InTuition – Worker's training and competency requirements
- Cority – Worker health monitoring and occupational hygiene monitoring programs

Specific software databases are held for specific tasks and include:

- Gallagher System – electronic cards used for identification and access permissions and is maintained by the HST Department
- Success Factors – stores workers individual information such as address, next of kin and emergency contact numbers

Visitor's inductions / books are managed and held within individual Departments.

All inspection and maintenance reports are to be held by the relevant department or through corporate maintenance databases i.e. Pronto.

This PCP document is a controlled document secured within the OGNZL document control system TeamBinder and published to the site through SharePoint.

Any changes made to this document must be documented in the revision reference.

Electronic copies of this PCP shall be held with the following external authorities:

- Oamaru Police
- Dunedin Police
- Civil Defence Emergency Management - Oamaru
- Dunedin Fire Brigade
- NZ Mines Rescue Service
- OGL Waihi via SharePoint

## **8 AUDIT AND REVIEW**

This Emergency Management PCP and referenced site procedures, shall be reviewed at least every 2 years as a minimum or:

- The occurrence of an accident at the operation involving any hazard that the principal control plan was intended to manage
- A material change in the management structure at the operation that may affect the principal control plan
- A material change in plant used or installed at the operation that may affect the principal control plan
- The occurrence of any other event identified in a principal control plan as requiring a review of the plan

Any review of a PCP under HSW (MOQO) - Reg 69 must include a review of the risk assessment in relation to the relevant principal hazard and a review of all other aspects of the PCP.

An external PCP review using specialised consultants shall be conducted every 3 years, as per legislative requirements. Details of any external audits shall be retained for twelve months from the date at which the mining operation is abandoned.

Internal or site PCP audits are conducted using Critical Control Checklist Sheets (CCCS) developed to monitor the effectiveness and implementation of the PCP and shall be conducted in accordance with the corporate annual schedule.

Changes to this PCP shall only be authorised by the Site Senior Executive.

## 9 DEFINITIONS

| TERM                                  | DEFINITION                                                                                                                                                                                                                                                                |
|---------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Incident Action Plan (IAP)</b>     | A document that describes how the response will be managed and how response agencies will integrate their activities to achieve the response objectives. It is owned by the MIC and developed by planning with participation of all the functions and agencies activated. |
| <b>Incident Control Point (ICP)</b>   | Single location where an Incident Controller and members of their IMT coordinate and manage response operations at an incident level response.                                                                                                                            |
| <b>Incident Management Team (IMT)</b> | The group of management personnel that supports the MIC. Includes the Controller, the managers of Planning, Intelligence, Operations, Logistics, PIM and Welfare; it also may include a Response Manager, risk advisors, and technical experts.                           |
| <b>Logistics</b>                      | The functions that support a response through the provision of resources which help maintain the response plan and the affected communities.                                                                                                                              |
| <b>Mine Operator</b>                  | In respect of a mining operation carried out under a permit granted under the Crown Minerals Act 1991, the person appointed by the permit operator to manage and control the mining operation.                                                                            |
| <b>Mine Worker</b>                    | A person who works in a mining operation, either as an employee or as a self-employed person or contractor.                                                                                                                                                               |
| <b>Operations</b>                     | The function responsible for the co-ordination of the response, detailed task planning, and the implementation of the Action Plan. It is also responsible for coordinating volunteers and liaising with other agencies.                                                   |
| <b>Planning</b>                       | The function that prepares and updates Action Plans, and other plans such as long-term or contingency plans.                                                                                                                                                              |
| <b>Principal Hazard</b>               | Any hazard that may have the potential to cause multiple fatalities.                                                                                                                                                                                                      |



|                                               |                                                                                                                                                                                  |
|-----------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Public Information Management (PIM)</b>    | The function that, during an incident, prepares, distributes, and monitors information to and from the media and the public.                                                     |
| <b>Situation Report (SitRep)</b>              | A brief description of an incident, usually given at regular intervals. Also called SitRep.                                                                                      |
| <b>New Zealand Transverse Mercator (NZTM)</b> | In 2001 Land Information New Zealand (LINZ) adopted New Zealand Transverse Mercator (NZTM or NZTM2000) as the new standard coordinate system for general mapping in New Zealand. |
| <b>Muster Point</b>                           | In the event of an emergency a muster point is a designated place where all personnel can assemble and be accounted for before moving to the evacuation point.                   |
| <b>Evacuation Point</b>                       | A safe area for personnel while waiting for emergency response.                                                                                                                  |

## 10 APPENDIX

### 10.1 Site Emergency Phone Numbers

| TITLE                                                                           | DIRECT DIAL   | MOBILE |
|---------------------------------------------------------------------------------|---------------|--------|
| <b>IN THE EVENT OF AN EMERGENCY CALL MINE CONTROL 4666 OR CHANNEL 1</b>         |               |        |
| <b>IN THE EVENT OF INJURY OR ILLNESS CONTACT MINE CONTROL 4633 OR CHANNEL 1</b> |               |        |
| Emergency Calls                                                                 | (03) 479 4666 |        |
| Emergency Response Coordinator                                                  | (03) 479 4631 |        |
| <b>OPEN PIT</b>                                                                 |               |        |
| Open Pit Mine Control Room                                                      | (03) 479 4633 |        |
| Occupational Health Nurse – Open Pit                                            | Seth          |        |
| <b>TOP OFFICE</b>                                                               |               |        |
| Boardroom ICP                                                                   | (03) 479 4758 |        |
| Boardroom Kitchen                                                               | (03) 479 4759 |        |
| <b>PROCESS PLANT</b>                                                            |               |        |
| Processing Plant Top Control Room                                               | (03) 471 5726 |        |
| Processing Plant Training Room                                                  | (03) 479 4798 |        |
| Macraes Ambulance                                                               |               |        |
| Processing Plant First Aid Room                                                 | (03) 479 4760 |        |
| Mill Control Room                                                               | (03) 471 5748 |        |
| Occupational Health Nurse – Process Plant/Top Office                            | Sue           |        |
| <b>UNDERGROUND</b>                                                              |               |        |
| Underground First Aid Room = GPUG                                               | (03) 479 4741 |        |
| Underground Surface First Aid Room                                              | (03) 471 5751 |        |
| Underground ICP                                                                 | (03) 479 4607 |        |
| Underground Mine Control                                                        | (03) 479 4765 |        |
| Underground Portal Tag Board                                                    | (03) 479 4863 |        |
| Occupational Health Nurse - Underground                                         | Laura         |        |

#### 10.1.1 Management Team

| TITLE                                     | DIRECT DIAL | MOBILE |
|-------------------------------------------|-------------|--------|
| Site Senior Executive and Asset President | 03 479 4629 |        |
| Open Pit Mining Manager                   | 03 471 5737 |        |
| Process Plant Manager                     | 03 471 5768 |        |
| Underground Mine Manager                  | 03 479 4628 |        |
| Environment & Social Performance Manager  | 03 479 4725 |        |
| Geology and Resource Development Manager  | 03 479 4612 |        |
| People and Culture Manager                | 03 479 4773 |        |

|                                       |             |  |
|---------------------------------------|-------------|--|
| Health, Safety & Training Manager     | 03 479 4613 |  |
| Commercial and Finance Manager        | 03 479 4723 |  |
| Technical Services & Projects Manager | 03 479 4794 |  |

Reference:

- SharePoint Departmental Phone List

### 10.1.2 External

| DEPARTMENT                          |                                                     | LANDLINE     | MOBILE |
|-------------------------------------|-----------------------------------------------------|--------------|--------|
| Emergency Services                  |                                                     |              | 111    |
| District Command Centre (DCC)       |                                                     | 03 471 5002  |        |
| Medical Centres                     | Palmerston Health Centre                            | 03 465 1445  |        |
|                                     | Mornington Health Centre                            | 03 466 5011  |        |
|                                     | Palmerston Emergency Doctors                        | 03 465 1444  |        |
|                                     | Urgent Doctors - Dunedin                            | 03 479 2900  |        |
|                                     | Waikouaiti Medical Centre                           | 03 465 7599  |        |
| Hospitals                           | Dunedin Public Hospital                             | 03 474 0999  |        |
|                                     | Oamaru Public Hospital                              | 03 433 0290  |        |
| National Poisons Information Centre | Poisons and Hazardous Chemicals (urgent only)       | 03 474 7000  |        |
|                                     | Poisons and Hazardous Chemicals (non – urgent)      | 03 479 1200  |        |
| WorkSafe NZ                         | WorkSafe NZ 24 hour                                 | 0800 030 040 |        |
|                                     | 24 Hour Pollution Hotline                           | 0800 800 033 |        |
| Civil Defence & Rural Fire          | Dunedin                                             | 03 474 3879  |        |
|                                     | Oamaru Emergency Only                               | 03 434 6400  |        |
|                                     | Macraes Civil Defence Coordinator (Rebecca Tisdall) | 03 465 2493  |        |
| Trust Power                         | Head Office (Tauranga)                              | 03 418 1600  |        |
|                                     | Lines Company (Balclutha)                           | 03 418 4950  |        |
|                                     | Faults                                              | 0800 878 787 |        |
| Genesis Power                       |                                                     | 0800 600 900 |        |
| New Zealand Mines Rescue            | Rapahoe Station – 24hr                              | 03 762 7828  |        |
|                                     | General Manager                                     |              |        |
| Air Support                         | Central South Island Helicopters                    | 03 439 5656  |        |
| Helicopters Otago                   |                                                     | 03 489 7322  |        |

## 10.2 Radio Channels

### 10.2.1 Surface

| Channel    | Purpose                                                                      |
|------------|------------------------------------------------------------------------------|
| Channel 1  | Open pit working channel Emergency calls                                     |
| Channel 2  | Processing Plant Mill Control simplex                                        |
| Channel 3  | Mill control channel (repeater) Mill / loader operator communications on ROM |
| Channel 4  | Public repeater channel – used by anyone in the area                         |
| Channel 5  | Open Pit Job specific communication – longer calls (Simplex)                 |
| Channel 6  | Non-Ops (Simplex line of site)                                               |
| Channel 7  | ERTS1                                                                        |
| Channel 8  | ERT S2                                                                       |
| Channel 9  | HV Maintenance simplex                                                       |
| Channel 10 | Open Pit Job Specific communication - longer calls site wide                 |

### 10.2.2 Underground

| Channel   | Comments                    | Area Covered                                       |
|-----------|-----------------------------|----------------------------------------------------|
| Channel 1 | Underground/ Open Pit link  | Open Pit                                           |
| Channel 2 | Underground operations      | Underground and surface                            |
| Channel 3 | Chat Channel                | Underground and surface                            |
| Channel 4 | General                     | Underground and surface                            |
| Channel 5 | Dedicated emergency channel | Underground and surface. Monitored by Mine Control |
| Channel 6 | Simplex                     | Line of sight                                      |

## 10.3 Legal Compliance

| Legislation Reference                                                                                                                                                                       | Document reference                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------|
| <b>Regulation 104: Consultation with Emergency Services</b>                                                                                                                                 |                                            |
| (1) When developing an Emergency Management Control Plan, the Site Senior Executive must consult:                                                                                           |                                            |
| a) fire, police, and ambulance emergency services that have responsibility for the area in which the mining operation is located; and                                                       | Section 5.4 Response                       |
| <b>Regulation 105: Emergency Management Control Plan</b>                                                                                                                                    |                                            |
| (1) The Emergency Management Control Plan must, at a minimum, address the following matters:                                                                                                |                                            |
| a) the co-ordination and control of emergencies at the mining operation:                                                                                                                    | Section 6.1 Incident Management Team Roles |
| b) the people (or positions) at the mining operation who, or that, will have responsibilities in relation to emergencies at the mining operation, and the detail of those responsibilities: | Section 6.1 Incident Management Team Roles |

|                                                                                                                                                                                                                                             |                                                                                                                                                         |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------|
| c) the events that trigger the activation of the plan:                                                                                                                                                                                      | Section 5.4.1 Emergency Response Levels                                                                                                                 |
| d) the use of communication systems in emergencies at the mining operation:                                                                                                                                                                 | Section 5.4.3.1.1 Open Pit and Processing Plant Radio Transceiver (RT) System<br><br>Appendix 10.1 Site Emergency Phone Numbers and 10.2 Radio Channels |
| e) the giving of timely notice, information, and warnings about emergencies to anyone potentially affected by an emergency at the mining operation, including to the persons nominated as next of kin by mine workers:                      | Section 5.4.3.6 Family Liaison Facilities (Coronation Hall)<br><br>Section 5.4.3.8 Personnel Emergency Contact Records                                  |
| f) measures to be taken to isolate an area of the mining operation affected by an emergency:                                                                                                                                                | Section 5.4.3.10 Scene Isolation                                                                                                                        |
| g) the availability of the Mines Rescue Trust and other emergency services to respond to an emergency at the mining operation:                                                                                                              | Section 5.4.8 External Resources                                                                                                                        |
| h) the means to locate and account for people at the mining operation in the event of an emergency at the mining operation:                                                                                                                 | Section 5.4.3.4 Accounting for Personnel                                                                                                                |
| i) the maintenance of an accurate record of all people underground at a mining operation at all times and their likely location, and the availability of that record for the purposes of responding to emergencies at the mining operation: | Section 5.4.3.3 Underground Evacuations<br><br>Section 5.4.3.4 Accounting for Personnel<br><br>Section 5.4.7 Underground Emergency Response Protocol    |
| j) the evacuation of the mining operation in an emergency, including the conditions that will prompt withdrawal of mine workers from the mining operation where there is an imminent risk of harm to mine workers:                          | Section 5.4.3.9 Underground Evacuation Notification Systems                                                                                             |
| k) appropriate transportation from the mining operation:                                                                                                                                                                                    | Section 5.3.3.2 Emergency Response Vehicles                                                                                                             |
| l) first aid arrangements at the mining operation, including first aid equipment, facilities, and services and the mine workers who are qualified to provide first aid:                                                                     | Section 5.3.3.3 First Aid Rooms<br><br>Section 5.3.3.4 First Aid Kits and Trauma Packs<br><br>Section 5.3.3.5 Defibrillation Devices                    |
| m) provision for all aspects of firefighting, including adequate and compatible firefighting equipment, procedures for firefighting, and training mine workers in firefighting:                                                             | Section 5.3.1 Emergency Response Capabilities                                                                                                           |



|                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                            |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------|
| n) a procedure to ensure prompt notification of all relevant emergency services and the Mines Rescue Trust.                                                                                                                                                                                                                                                                                                                                   | Appendix 10.2 Radio Channels                                                               |
| (2) In the case of an underground mining operation or tunnelling operation, the EMCP must, in addition to the matters in sub clause (1), include provision for ensuring:                                                                                                                                                                                                                                                                      |                                                                                            |
| a) there is an effective means of communicating between the surface of the mining operation and any part of the mining operation where people may be located underground; and                                                                                                                                                                                                                                                                 | Appendix 10.2 Radio Channels                                                               |
| b) the availability of a suitable number of people trained in mines rescue who will be able to respond to an emergency at a mining operation; and                                                                                                                                                                                                                                                                                             | Section 5.3.2 Training                                                                     |
| c) there is adequately maintained equipment at the mining operation that will: <ul style="list-style-type: none"> <li>i. allow for rapid and continuous rescue operations to take place at the mining operation in conditions of reduced visibility and irrespirable and irritant atmospheres; and</li> <li>ii. assist the escape or safe recovery of any mine worker or other person from a mining operation where necessary; and</li> </ul> | Section 5.3.3 On Site Emergency Resources                                                  |
| d) the safe escape of people from underground in the mining operation through conditions of reduced visibility and irrespirable and irritant atmospheres (including adequately maintained self-rescuers and other facilities to aid escape where appropriate); and                                                                                                                                                                            | Section 5.3.3 On Site Emergency Resources<br><br>Section 5.3.3.8 Underground Self Rescuers |
| e) there is an appropriate means of escape to the surface part of the mining operation; and                                                                                                                                                                                                                                                                                                                                                   | Section 5.4.3.3 Underground Excavations                                                    |
| f) the maintenance of an up-to-date plan of:                                                                                                                                                                                                                                                                                                                                                                                                  | MAC-253-PLN-000 Site Emergency Muster-Evacuation Map                                       |
| <ul style="list-style-type: none"> <li>i. the exits from the underground parts of the mining operation; and</li> <li>ii. the changeover stations and refuges in the underground parts of the mining operation</li> </ul>                                                                                                                                                                                                                      | MAC-440-PLN-003 GPUG Underground Refuge Chamber Escapeway Plan                             |

| Legislation Reference                                                                                                                                                                                                                                                                                                                     |  | Document Reference                 |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|------------------------------------|
| <b>Regulation 106: Testing of Emergency Management Control Plan</b>                                                                                                                                                                                                                                                                       |  |                                    |
| (1) In addition to the requirements of regulation sixty-nine, the site senior executive must ensure that:                                                                                                                                                                                                                                 |  |                                    |
| a) the Emergency Management Control Plan is regularly tested                                                                                                                                                                                                                                                                              |  |                                    |
| i. using practice drills; and                                                                                                                                                                                                                                                                                                             |  |                                    |
| ii. involving the services referred to in regulation 104; and                                                                                                                                                                                                                                                                             |  |                                    |
| b) mine workers are provided with training in the EMCP and that the provision of this training is recorded.                                                                                                                                                                                                                               |  | Section 5.3.2                      |
| (2) The mine operator must ensure that the mining operation is provided with adequate resources to:                                                                                                                                                                                                                                       |  |                                    |
| a) effectively implement the Emergency Management Control Plan; and                                                                                                                                                                                                                                                                       |  |                                    |
| b) keep facilities and equipment regularly inspected and maintained in a fully operational condition.                                                                                                                                                                                                                                     |  | Section 5.3.1.2                    |
| (3) In addition to the requirements of regulation sixty-two, the site senior executive must ensure that a copy of the current Emergency Management Control Plan is given to the Mines Rescue Trust, where relevant, and other emergency services referred to in regulation 104                                                            |  | Section 7                          |
| <b>Regulation 124: Crush Injuries and Rescue Trapped or Injured Persons</b>                                                                                                                                                                                                                                                               |  |                                    |
| The mine operator must ensure that there are adequate and appropriate means available at the mining operation to deal with any crush injuries that may occur and to rescue a trapped or injured person.                                                                                                                                   |  | Section 5.3.3.2                    |
| <b>Regulation 125: Treatment and Transport of Sick and Injured Mine Workers</b>                                                                                                                                                                                                                                                           |  |                                    |
| (1) The mine operator must ensure that suitable and sufficient facilities, including first aid equipment, and mine workers trained in first aid are available at the mining operation to provide first aid to sick or injured mine workers, including in the underground parts of an underground mining operation or tunnelling operation |  | Section 5.3.3                      |
| (2) The mine operator must ensure that arrangements are in place, or an appropriate vehicle is available at the mining operation, to transport sick or injured workers from the mining operation to a place where they can receive further medical attention if required                                                                  |  | Section 5.3.3                      |
| (3) In the case of an underground mining operation or tunnelling operation, the arrangements or vehicle required under sub-clause (2) must enable transportation of sick or injured mine workers from the underground part of the operation to the surface                                                                                |  | Section 5.3.3                      |
| <b>Regulation 126: Resuscitation Equipment</b>                                                                                                                                                                                                                                                                                            |  |                                    |
| a) Suitable resuscitation equipment is available for all parts of the mining operation; and                                                                                                                                                                                                                                               |  | Section 5.3.3.4<br>Section 5.3.3.5 |
| b) People trained to use the equipment are available at the mining operation; and                                                                                                                                                                                                                                                         |  | Section 5.3.1                      |
| c) There is a procedure for any mine worker to raise the alarm when resuscitation equipment is required                                                                                                                                                                                                                                   |  | Section 5.4.2.1.1                  |

## Appendix G      WDP hazard classification correlations

The correlation between the hazard classifications as set in Schedule 1 of the WDP and the systems of classification commonly used in New Zealand under the Hazardous Substances and New Organisms Act (HSNO) and the Globally Harmonised System (GHS) are included in Table Appendix G.1 below.

**Table Appendix G.1:      Correlations between the relevant WDP Schedule 1 Classification of Hazardous substances, HSNO classifications and the GHS classifications relevant to OGNZL's Macraes Operation**

| Operative Waitaki District Plan |                                                                      | Classifications             |                                                                                                                                                                                                                                                   |
|---------------------------------|----------------------------------------------------------------------|-----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Schedule 1 Class                | Characteristic                                                       | HSNO classification         | GHS classification                                                                                                                                                                                                                                |
| 1                               | 1a – Explosives                                                      | 1.1<br>1.2<br>1.3           | Explosives with a mass explosion hazard.<br>Explosives with a projection hazard but not a mass explosion hazard.<br>Explosives with a significant fire hazard and a minor blast or projection hazard, but do not present a mass explosion hazard. |
|                                 | 1b – Explosives (restricted use in small arms cartridges and flares) | 1.4                         | Typically, consumer fireworks, small arms ammunition, and safety cartridges.                                                                                                                                                                      |
| 2                               | 2.1a                                                                 | -                           | LPG.                                                                                                                                                                                                                                              |
|                                 | 2.1b – Flammable gases and aerosols                                  | 2.1.1A<br>2.1.2A            | Flammable gas Category 1A – 1B.<br>Flammable aerosol Category 1 – 3.                                                                                                                                                                              |
|                                 | 2.2 – Toxic gases                                                    | 6.1 A – 6.1D (gases)        | Acute inhalation toxicity Category 1 – 4.                                                                                                                                                                                                         |
|                                 | 2.2 – Non-flammable, nontoxic gases                                  | Not classified as hazardous | Compressed gas.                                                                                                                                                                                                                                   |
| 4                               | 4.1 – Flammable solids                                               | 4.1.1A – 4.1.1B             | Flammable solids Category 1 and 2.                                                                                                                                                                                                                |
|                                 | 4.2 – Substances or wastes liable to spontaneous combustion          | 4.2A – 4.2C                 | Pyrophoric liquids or solids Category 1.<br>Self-heating substances and mixtures Category 1 – 2.                                                                                                                                                  |
|                                 | 4.3 – Substances which in contact with water, emit flammable gases   | 4.3A – 4.3C                 | Substances and mixtures which, in contact with water, emit flammable gases Category 1 – 3.                                                                                                                                                        |
| 3                               | 3(a) – Flammable liquids, flash point <23°C                          | 3.1A – 3.1B                 | Flammable liquids Category 1 – 2.                                                                                                                                                                                                                 |
|                                 | 3(b) – Flammable liquids, flash point >23°C, <61 °C                  | 3.1C                        | Flammable liquids Category 3.                                                                                                                                                                                                                     |
|                                 | 3(c) – Flammable liquids, flash point >61 °C                         | 3.1D                        | Flammable liquids Category 4.                                                                                                                                                                                                                     |

| Operative Waitaki District Plan |                                                                                                                                                                                             | Classifications              |                                                                                                                              |
|---------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------|------------------------------------------------------------------------------------------------------------------------------|
| Schedule 1 Class                | Characteristic                                                                                                                                                                              | HSNO classification          | GHS classification                                                                                                           |
| 5                               | 5.1 – Oxidising substances                                                                                                                                                                  | 5.1.1B, 5.1.1C               | Oxidising liquids Category 2 or 3, or oxidising solids Category 2 or 3.                                                      |
| 6                               | Corrosives – Substances that will cause severe damage when in contact with living tissue or, in the case of leakage will damage or destroy other material and goods or cause other hazards. | 8.1A<br>8.2A<br>8.2B<br>8.2C | Corrosive to metals Category 1.<br>Skin corrosion Category 1A.<br>Skin corrosion Category 1B.<br>Skin corrosion Category 1C. |
| 7                               | Agrichemicals – Substances formulated specifically for agricultural and horticultural activities (including aquaculture) and including but not limited to herbicides and fungicides.        | NA                           | NA.                                                                                                                          |
| 8                               | Miscellaneous:<br>8.1 Timber preservatives<br>8.2 Chlorinated solvents                                                                                                                      | NA                           | NA.                                                                                                                          |

Notably, there is no Schedule 1 class that corresponds to an acute toxicity classification.

## **Appendix H      Hazard analysis**

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**Table Appendix H.1: Hazard analysis**

| Hazardous Substance and quantity stored                         | Identification of potential hazard properties (Hazard level <sup>A</sup> )                  | Failure Modes                                                                           | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                                  | Potential for off-site effects |                                                                                                                                                                                                                      |
|-----------------------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Diesel</b><br>(20,000 L – 60,000 L tanks, various locations) | Fire/Explosion effects (low).<br>Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (medium) | Valve leak, pipe failure, accidental release during refuelling.<br>Fire in storage area | People, property, ecosystems                       | Low fire hazard.<br>Low chronic hazard to human health by direct skin contact or aspiration of droplets.<br>Moderate hazard to ecosystems in the event of a spill, managed through secondary containment. | Yes                            | Effects on ecosystems and effects due to fire to be considered further in the risk analysis.                                                                                                                         |
| <b>Greases</b><br>(5,000 kg at the workshops)                   | Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (low <sup>C</sup> )                       | Package leak<br>Spill during delivery or movement                                       | People, ecosystems                                 | Greases are solids with limited mobility in a spill.                                                                                                                                                      | No                             | Effects not considered in further risk analysis.                                                                                                                                                                     |
| <b>Oils</b><br>(up to 50,000 L at the workshops)                | Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (low <sup>C</sup> )                       | Package leak<br>Spill during delivery or movement                                       | People, ecosystems.                                | Low hazard to human health by direct skin contact.<br>Low hazard to ecosystems in a spill.                                                                                                                | Yes                            | Due to the low hazard and large distances to sensitive receptors, the potential for off-site human health effects is not considered further in the risk analysis.<br>Effects on ecosystems to be considered further. |

| Hazardous Substance and quantity stored                                                     | Identification of potential hazard properties (Hazard level <sup>A</sup> )                            | Failure Modes                                     | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                          | Potential for off-site effects |                                                                                                                                                                                                                                          |
|---------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Flammable solvents, degreasers and paints</b><br>(200 – 500 L at the workshops and labs) | Fire/Explosion effects (medium to high)<br>Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (medium) | Package leak<br>Spill during delivery or movement | People, property, ecosystems.                      | Low fire hazard, limited by low volume and segregated storage.<br>Low hazard to human health by direct skin contact.<br>Moderate hazard to ecosystems in a spill. | Yes                            | Due to the low hazard and large distances to sensitive receptors, the potential for off-site human health effects is not considered further in the risk analysis.<br>Effects of fire and effects on ecosystems to be considered further. |
| <b>Combustible solvents/degreaser</b><br>(200 – 500 L at the workshops and labs)            | Fire/Explosion effects (low)<br>Human toxicity (low)<br>Ecotoxicity (medium)                          | Package leak<br>Spill during delivery or movement | People, property, ecosystems.                      | Low fire hazard.<br>Low hazard to human health by direct skin contact.<br>Moderate hazard to ecosystems in a spill.                                               | Yes                            | Due to the low hazard and large distances to sensitive receptors, the potential for off-site human health effects is not considered further in the risk analysis.<br>Effects on ecosystems to be considered further.                     |
| <b>Packaged maintenance oils, coolants, lubricants</b><br>(35,000 L)                        | Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (low <sup>C</sup> )                                 | Package leak<br>Spill during delivery or movement | People, ecosystems                                 | Low hazard to human health by direct skin contact.<br>Low hazard to ecosystems in a spill.                                                                        | Yes                            | Due to the low hazard and large distances to sensitive receptors, the potential for off-site human health effects is not considered further in the risk analysis.<br>Effects on ecosystems to be considered further.                     |

| Hazardous Substance and quantity stored           | Identification of potential hazard properties (Hazard level <sup>A</sup> ) | Failure Modes                                     | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                  | Potential for off-site effects |                                                                                                                                                                                                                      |
|---------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Adhesives</b><br>(20 kg in the workshops)      | Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (low <sup>C</sup> )      | Package leak<br>Spill during delivery or movement | People, ecosystems.                                | Low hazard to human health by direct skin contact.<br>Low hazard to ecosystems in a spill.                                                                                                | Yes                            | Due to the low hazard and large distances to sensitive receptors, the potential for off-site human health effects is not considered further in the risk analysis.<br>Effects on ecosystems to be considered further. |
| <b>Aerosols</b><br>(120 L per workshop)           | Fire/Explosion effects (high)                                              | Fire in storage area                              | People, property                                   | Moderate fire hazard, limited by small distributed aerosol storage segregated from incompatibles.                                                                                         | No                             | Due to small quantities and large distance to sensitive receptors, effects not considered in further risk analysis.                                                                                                  |
| <b>Fire extinguishant</b><br>(200 L per workshop) | Human toxicity (low <sup>B</sup> )                                         | Package leak<br>Spill during delivery or movement | Ecosystems                                         | Mild chronic health hazards to workers handling the substance (skin irritant). Negligible hazard to off-site people.<br>Low hazard to ecosystems in the event of a spill.                 | Yes                            | Due to small quantity, low hazard and large separation to sensitive receptors, human health effects are not considered further.                                                                                      |
| <b>Herbicides, pesticides</b><br>(up to 250 L)    | Human toxicity (high)<br>Ecotoxicity (high)                                | Package leak<br>Spill during delivery or movement | Ecosystems                                         | High hazard to human health (harmful if swallowed or chronic direct contact hazards). Health hazard limited to on-site staff.<br>High hazard to ecosystems in a spill to the environment. | Yes                            | Effects on human health and ecosystems due to a spill to be considered further in risk analysis.                                                                                                                     |

| Hazardous Substance and quantity stored                                 | Identification of potential hazard properties (Hazard level <sup>A</sup> ) | Failure Modes         | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                    | Potential for off-site effects |                                                                                                                                                                                             |
|-------------------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>LPG</b><br>(up to 360 kg)                                            | Fire/Explosion effects (high)                                              | Fire in storage area  | People, property                                   | Moderate fire hazard due to storage of cylinders in certified hazardous substances location separated from buildings and the boundary.                                                      | Yes                            | Effects of fire considered further in the risk analysis.                                                                                                                                    |
| <b>Acetylene cylinders</b><br>(23.4 – 53.6 m <sup>3</sup> )             | Fire/Explosion effects (high)                                              | Fire in storage area  | People, property                                   | Low fire hazard due to use of certified pressure cylinders in certified hazardous substances location.                                                                                      | Yes                            | Effects of fire considered further in the risk analysis.                                                                                                                                    |
| <b>Oxygen cylinders</b><br>(98 m <sup>3</sup> at the workshops)         | Fire/Explosion effects (high)                                              | Fire in storage area. | People, property                                   | Low fire hazard due to use of certified pressure cylinders and segregation from flammable gases.                                                                                            | Yes                            | Effects of fire considered further in the risk analysis.                                                                                                                                    |
| <b>Nitrous oxide</b><br>(30.8 m <sup>3</sup> )                          | Fire/Explosion effects (high)<br>Human toxicity (low <sup>B</sup> )        | Fire in storage are   | People, property                                   | Low fire hazard due to use of certified pressure cylinders and segregation from flammable gases.<br>Low human health hazard via chronic inhalation. Health hazard limited to on-site staff. | Yes                            | Due to small quantity, low hazard and large separation to sensitive receptors, human health effects are not considered further.<br>Effects of fire considered further in the risk analysis. |
| <b>Nitrogen cylinders</b><br>(52.2 m <sup>3</sup> , multiple locations) | Not classified as hazardous                                                | -                     | -                                                  | -                                                                                                                                                                                           | No                             | Effects not considered further in risk analysis.                                                                                                                                            |
| <b>Argon or argoshield cylinders</b><br>(35.5 –48 m <sup>3</sup> )      | Not classified as hazardous                                                | -                     | -                                                  | -                                                                                                                                                                                           | No                             | Effects not considered further in risk analysis.                                                                                                                                            |

| Hazardous Substance and quantity stored                         | Identification of potential hazard properties (Hazard level <sup>A</sup> ) | Failure Modes                                                                          | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                               | Potential for off-site effects |                                                                                                                                                                                                                    |
|-----------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Carbon dioxide cylinders</b><br>(72 m <sup>3</sup> )         | Not classified as hazardous                                                | -                                                                                      | -                                                  | -                                                                                                                                                                                      | No                             | Effects not considered further in risk analysis.                                                                                                                                                                   |
| <b>Liquid oxygen bulk tanks</b><br>(162,000 kg)                 | Fire/Explosion effects (high)                                              | Failure of the cryogenic storage tank system<br>Tanker completing silo refill          | People, property                                   | High fire hazard, noting this would require presence of combustible material and a source of ignition.                                                                                 | Yes                            | Effects due to fire to be considered further in the risk analysis.                                                                                                                                                 |
| <b>Nitrogen bulk tank</b><br>(5,000 kg)                         | Not classified as hazardous                                                | -                                                                                      | -                                                  | -                                                                                                                                                                                      | No                             | Effects not considered further in risk analysis.                                                                                                                                                                   |
| <b>LPG bulk tank</b><br>(100,000 kg)                            | Fire/Explosion effects (high)                                              | Valve leak, pipe failure, accidental release during refuelling<br>Fire in storage area | People, property                                   | High fire hazard.                                                                                                                                                                      | Yes                            | Effects due to fire to be considered further in the risk analysis.                                                                                                                                                 |
| <b>Trichloroethylene</b><br>(600 L)                             | Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (moderate)               | Package leak<br>Spill during delivery or movement                                      | Ecosystems                                         | Low hazard to human health (harmful if inhaled or chronic direct contact hazards). Health hazard limited to on-site staff.<br>High hazard to ecosystems in a spill to the environment. | Yes                            | Due to small quantity, low hazard and large separation to sensitive receptors, human health effects are not considered further.<br>Effects on ecosystems due to a spill to be considered further in risk analysis. |
| <b>Water treatment chemicals at BOC oxygen plant</b><br>(400 L) | Human toxicity (medium)<br>Ecotoxicity (medium)                            | Package leak<br>Spill during delivery or movement                                      | Ecosystems                                         | Moderate hazard to human health (direct skin contact hazards).<br>Moderate hazard to ecosystems in a spill to the environment.                                                         | Yes                            | Effects on human health and ecosystems due to a spill to be considered further in risk analysis.                                                                                                                   |



| Hazardous Substance and quantity stored                    | Identification of potential hazard properties (Hazard level <sup>A</sup> ) | Failure Modes                                                         | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                                   | Potential for off-site effects |                                                                                                                                               |
|------------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sodium Cyanide (Solid)</b><br>(120,000 L)               | Human toxicity (high)<br>Ecotoxicity (high)                                | Package leak<br>Spill during delivery or movement                     | People,<br>ecosystems                              | High hazard to human health.<br>High hazard to ecosystems in the event of a spill. Mobility of spilled material limited due to solid state.                                                                | Yes                            | Human health effects and effects on ecosystems to be considered further in the risk analysis.                                                 |
| <b>Cyanide solution (30%)</b><br>(152,000 L)               | Human toxicity (high)<br>Ecotoxicity (high)                                | Valve leak, pipe failure, accidental release during use and unloading | People,<br>ecosystems                              | High hazard to human health via ingestion or inhalation.<br>High hazard to ecosystems in a spill.                                                                                                          | Yes                            | Human health effects and effects on ecosystems to be considered further in the risk analysis.                                                 |
| <b>Copper Sulphate Pentahydrate</b><br>(77,000 kg)         | Human toxicity (low)<br>Ecotoxicity (high)                                 | Package leak<br>Spill during delivery or movement                     | People,<br>ecosystems                              | Low hazard to human health via ingestion or chronic skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in a spill. Mobility of spilled material limited due to solid state. | Yes                            | Effects on ecosystems due to a spill to be considered further in the risk analysis.                                                           |
| <b>Copper sulphate pentahydrate solution</b><br>(15,000 L) | Human toxicity (low)<br>Ecotoxicity (high)                                 | Valve leak, pipe failure, accidental release during use and unloading | People,<br>ecosystems                              | Low hazard to human health via ingestion or chronic skin contact. Health hazard limited to on-site staff.<br>High hazard to ecosystems in a spill.                                                         | Yes                            | Effects on human health and ecosystems due to a spill to be considered further in risk analysis.                                              |
| <b>Sodium metabisulphite</b><br>(40,800 kg)                | Human toxicity (low)                                                       | Package leak<br>Spill during delivery or movement                     | People                                             | Low hazard to human health via ingestion, eye contact or chronic skin contact. Health hazard limited to on-site staff.<br>Mobility of spilled material limited due to solid state.                         | No                             | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis. |

| Hazardous Substance and quantity stored                   | Identification of potential hazard properties (Hazard level <sup>A</sup> ) | Failure Modes                                                         | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                            | Potential for off-site effects |                                                                                                                                               |
|-----------------------------------------------------------|----------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sodium metabisulphite solution</b><br>(85,100 L)       | Human toxicity (low)<br>Ecotoxicity (low <sup>C</sup> )                    | Valve leak, pipe failure, accidental release during use and unloading | People, ecosystems                                 | Low hazard to human health via ingestion or skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in a spill.                                           | Yes                            | Effects on human health and ecosystems due to a spill to be considered further in risk analysis.                                              |
| <b>Soda Ash (sodium carbonate) silo</b><br>(100,000 kg)   | Human toxicity (low)                                                       | Silo failure, spill during delivery                                   | People                                             | Low hazard to human health via inhalation, eye contact or chronic skin contact. Health hazard limited to on-site staff.<br>Mobility of spilled material limited due to solid state. | No                             | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis. |
| <b>Soda Ash (sodium carbonate) solution</b><br>(10,000 L) | Human toxicity (low)                                                       | Package leak<br>Spill during delivery or movement                     | People                                             | Low hazard to human health via ingestion, eye contact or chronic skin contact. Health hazard limited to on-site staff.<br>Mobility of spilled material limited due to solid state.  | No                             | Effects not considered further in risk analysis.                                                                                              |
| <b>Caustic soda (46-50 %)</b><br>(20,300 L)               | Human toxicity (medium)<br>Ecotoxicity (low)                               | Valve leak, pipe failure, accidental release during use and unloading | People, ecosystems                                 | Moderate hazard to human health by direct skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in a spill.                                             | Yes                            | Human health effects and effects on ecosystems to be considered further in the risk analysis.                                                 |

| Hazardous Substance and quantity stored                 | Identification of potential hazard properties (Hazard level <sup>A</sup> )                              | Failure Modes                                                         | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                                                                                                                                                      | Potential for off-site effects |                                                                                                                                                                                                                                |
|---------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Potassium nitrate</b><br>(600 kg)                    | Fire/explosion hazard (medium)<br>Human toxicity (low <sup>A</sup> )<br>Ecotoxicity (low <sup>C</sup> ) | Package leak<br>Spill during delivery or movement                     | People, property, ecosystems                       | Moderate fire hazard, noting this would require presence of combustible material and a source of ignition.<br><br>Low hazard to human health by direct eye contact or ingestion. Health hazard limited to on-site staff.<br><br>Low hazard to ecosystems in a spill. Mobility of spilled material limited due to solid state. | Yes                            | Due to low hazard, solid state and large separation to sensitive activities, effects on human health and ecosystems not considered further in risk analysis.<br><br>Effects from fire considered further in the risk analysis. |
| <b>Nitric Acid (65-70 %)</b><br>(32,000 L)              | Fire/explosion hazard (medium)<br>Human toxicity (high)<br>Ecotoxicity (high)                           | Valve leak, pipe failure, accidental release during use and unloading | People, property, ecosystems                       | Moderate fire hazard, noting this would require presence of combustible material and a source of ignition.<br><br>Moderate hazard to human health by direct skin contact.<br><br>High hazard to ecosystems in a spill.                                                                                                        | Yes                            | Effects from fire, human health effects and effects on ecosystems to be considered further in the risk analysis.                                                                                                               |
| <b>High calcium quicklime silo</b><br>(150,000 kg each) | Human toxicity (low)<br>Ecotoxicity (high <sup>D</sup> )                                                | Silo failure, spill during delivery                                   | People, ecosystems                                 | Low hazard to human health via eye contact or skin contact. Health hazard limited to on-site staff.<br><br>High hazard to ecosystems in the event of a spill as a pH modifier. Mobility limited by solid state.                                                                                                               | Yes                            | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects on ecosystems to be considered further in the risk analysis.      |

| Hazardous Substance and quantity stored                              | Identification of potential hazard properties (Hazard level <sup>A</sup> )             | Failure Modes                                                         | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                   | Potential for off-site effects |                                                                                                                                                                                                                                               |
|----------------------------------------------------------------------|----------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Lime solution (hydrated high calcium quicklime)</b><br>(47,000 L) | Human toxicity (low)<br>Ecotoxicity (high <sup>D</sup> )                               | Valve leak, pipe failure, accidental release during use and unloading | People, ecosystems                                 | Low hazard to human health via eye contact or skin contact. Health hazard limited to on-site staff.<br>High hazard to ecosystems in a spill as a pH modifier.              | Yes                            | Effects on ecosystems to be considered further in the risk analysis.                                                                                                                                                                          |
| <b>Sodium isobutyl xanthate (SIBX)</b><br>(102,000 kg)               | Fire/explosion hazard (low)<br>Human toxicity (low)<br>Ecotoxicity (low <sup>E</sup> ) | Package leak<br>Spill during delivery or movement                     | People, property, ecosystems                       | Low fire hazard.<br>Low hazard to human health via ingestion or skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in the event of a spill. | Yes                            | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br>Effects from a fire and effects on ecosystems to be considered further in the risk analysis. |
| <b>Sodium Isobutyl Xanthate (SIBX) solution</b><br>(18,000 L)        | Fire/explosion hazard (low)<br>Human toxicity (low)<br>Ecotoxicity (low <sup>A</sup> ) | Valve leak, pipe failure, accidental release during use and unloading | People, property, ecosystems                       | Low fire hazard.<br>Low hazard to human health via ingestion or skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in the event of a spill. | Yes                            | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br>Effects from a fire and effects on ecosystems to be considered further in the risk analysis. |

| Hazardous Substance and quantity stored   | Identification of potential hazard properties (Hazard level <sup>A</sup> )                           | Failure Modes                                                         | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                             | Potential for off-site effects |                                                                                                                                                                                                                                      |
|-------------------------------------------|------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Solvent (Exxsol D40)</b><br>(20,000 L) | Fire/explosion hazard (low)<br>Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (low <sup>C</sup> ) | Valve leak, pipe failure, accidental release during use and unloading | People, property, ecosystems                       | Low fire hazard.<br>Low hazard to human health via direct skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in the event of a spill. | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects from a fire and effects on ecosystems to be considered further in the risk analysis. |
| <b>Activated carbon</b><br>(11,000 kg)    | Human toxicity (low <sup>B</sup> )                                                                   | Package leak<br>Spill during delivery or movement                     | People                                             | Negligible hazard to human health – requires inhalation of solid activated carbon.                                                                                   | No                             | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis.                                                                                        |
| <b>Sulphamic acid</b><br>(900 kg)         | Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (low)                                              | Package leak<br>Spill during delivery or movement                     | People, ecosystems                                 | Low human health hazard via direct skin or eye contact and low hazard to ecosystems in the event of a spill.                                                         | Yes                            | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects on ecosystems to be considered further in the risk analysis.            |



| Hazardous Substance and quantity stored      | Identification of potential hazard properties (Hazard level <sup>A</sup> )                 | Failure Modes                                                                 | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                         | Potential for off-site effects |                                                                                                                                                                                                                                      |
|----------------------------------------------|--------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------|----------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Borax</b><br>(600 kg)                     | Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (low <sup>C</sup> )                      | Package leak<br>Spill during delivery or movement                             | People, ecosystems                                 | Low human health hazard via direct skin or eye contact and low hazard to ecosystems in the event of a spill.                                                                     | Yes                            | Due to low hazard, solid state and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects on ecosystems to be considered further in the risk analysis.            |
| <b>Mercury</b><br>(13 kg)                    | Human toxicity (high)<br>Ecotoxicity (high)                                                | Container leak/rupture during recovery and storage for disposal               | People, ecosystems                                 | High human health hazard and high hazard to ecosystems in the event of a spill.                                                                                                  | Yes                            | Human health and effects on ecosystems to be considered further in the risk analysis.                                                                                                                                                |
| <b>Methyl isobutyl carbinol</b><br>(8,000 L) | Fire/Explosion effects (medium)<br>Human toxicity (low)<br>Ecotoxicity (low <sup>C</sup> ) | Fire in the storage area<br>Package leak<br>Spill during delivery or movement | People, property, ecosystems                       | Moderate fire hazard.<br>Low hazard to human health via inhalation or skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in the event of a spill. | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects from a fire and effects on ecosystems to be considered further in the risk analysis. |

| Hazardous Substance and quantity stored                    | Identification of potential hazard properties (Hazard level <sup>A</sup> )                           | Failure Modes                                     | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                        | Potential for off-site effects |                                                                                                                                                                                                                                  |
|------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Water-soluble carbon blanking reagent</b><br>(2,000 L)  | Human toxicity (low)<br>Ecotoxicity (low <sup>C</sup> )                                              | Package leak<br>Spill during delivery or movement | People, ecosystems                                 | Low hazard to human health via ingestion or skin contact. Health hazard limited to on-site staff.<br>Low hazard to ecosystems in the event of a spill.                          | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects on ecosystems to be considered further in the risk analysis.                     |
| <b>Frothing agent</b><br>(21,000 L)                        | Fire/Explosion effects (low)<br>Human toxicity (low to medium)<br>Ecotoxicity (medium <sup>D</sup> ) | Package leak<br>Spill during delivery or movement | People, property, ecosystems                       | Low fire hazard.<br>Low hazard to human health via ingestion or skin contact. Health hazard limited to on-site staff.<br>Moderate hazard to ecosystems in the event of a spill. | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects of fire and effects on ecosystems to be considered further in the risk analysis. |
| <b>Boiler water treatment (Maxitreat 22045)</b><br>(410 L) | Human toxicity (medium)<br>Ecotoxicity (medium <sup>B</sup> )                                        | Package leak<br>Spill during delivery or movement | People, ecosystems                                 | Low hazard to human health via ingestion or skin contact. Health hazard limited to on-site staff.<br>Moderate hazard to ecosystems in the event of a spill.                     | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects on ecosystems to be considered further in the risk analysis.                     |

| Hazardous Substance and quantity stored                   | Identification of potential hazard properties (Hazard level <sup>A</sup> ) | Failure Modes                                     | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                                           | Potential for off-site effects |                                                                                                                                                                                                                |
|-----------------------------------------------------------|----------------------------------------------------------------------------|---------------------------------------------------|----------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Corrosion inhibitor (Millspurse 806P)</b><br>(5,000 L) | Human toxicity (low)<br>Ecotoxicity (low <sup>C</sup> )                    | Package leak<br>Spill during delivery or movement | People, ecosystems                                 | Low hazard to human health via chronic skin contact. Health hazard limited to on-site staff.<br><br>Low hazard to ecosystems in the event of a spill.                                                              | Yes                            | Effects on ecosystems to be considered further in the risk analysis.                                                                                                                                           |
| <b>Hydrochloric acid solution (10 %)</b><br>(75L)         | Human toxicity (low)<br>Ecotoxicity (high)                                 | Package leak<br>Spill during delivery or movement | People, ecosystems                                 | Low hazard to human health via direct skin contact. Health hazard limited to on-site staff.<br><br>High hazard to ecosystems in the event of a spill limited by small volume.                                      | Yes                            | Due to small volume and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects on ecosystems to be considered further in the risk analysis. |
| <b>Fluxing agent</b><br>(2,000 kg)                        | Human toxicity (low)<br>Ecotoxicity (high)                                 | Package leak<br>Spill during delivery or movement | People, property, ecosystems                       | Low hazard to human health via ingestion or inhalation. Health hazard limited to on-site staff.<br>Substance is a solid with limited mobility in a spill.<br><br>Low hazard to ecosystems in the event of a spill. | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br><br>Effects on ecosystems to be considered further in the risk analysis.   |

| Hazardous Substance and quantity stored                  | Identification of potential hazard properties (Hazard level <sup>A</sup> )                            | Failure Modes                                                              | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                                              | Potential for off-site effects |                                                                                                                                                                                                                                |
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| <b>Flammable solvents and frothing agents</b><br>(200 L) | Fire/Explosion effects (low to medium)<br>Human toxicity (low)<br>Ecotoxicity (low to high)           | Package leak<br>Spill during delivery or movement                          | People, property, ecosystems                       | Low to moderate fire hazard.<br>Low hazard to human health via direct skin contact or ingestion. Hazard is limited to OGNZL staff.<br>Low to high risk to ecosystems in a spill, limited by small package quantities. | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br>Effect of a fire and effects on ecosystems to be considered further in the risk analysis.  |
| <b>Laboratory reagents</b><br>(160 L)                    | Fire/Explosion effects (low to medium)<br>Human toxicity (low to medium)<br>Ecotoxicity (low to high) | Package leak<br>Spill during delivery or movement                          | People, property, ecosystems                       | Low to moderate fire hazard.<br>Low hazard to human health via direct skin contact or ingestion. Hazard is limited to OGNZL staff.<br>Low to high risk to ecosystems in a spill, limited by small package quantities. | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis.<br>Effects of a fire and effects on ecosystems to be considered further in the risk analysis. |
| <b>ANE</b><br>(63,000 kg)                                | Fire/Explosion effects (high)<br>Ecotoxicity (moderate)                                               | Fire in storage area;<br>Package leak<br>Spill during delivery or movement | People, property, ecosystems                       | High fire hazard.<br>Low hazard to the environment as substance is a highly viscous emulsion, considered a solid for storage and transport purposes.                                                                  | Yes                            | Due to its solid state, effects on ecosystems in a spill not considered further.<br>Effects due to fire/explosion to be considered further in risk analysis.                                                                   |

| Hazardous Substance and quantity stored                                   | Identification of potential hazard properties (Hazard level <sup>A</sup> )          | Failure Modes                                                              | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                             | Potential for off-site effects |                                                                                                                                                                                                                        |
|---------------------------------------------------------------------------|-------------------------------------------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Sodium nitrite</b><br>(2,500 kg)                                       | Fire/Explosion effects (medium)<br>Human health (medium)<br>Ecotoxicity (high)      | Fire in storage area;<br>Package leak<br>Spill during delivery or movement | People, property, ecosystems                       | High fire hazard.<br>Low hazard to human health via inhalation or ingestion, or chronic direct exposure.<br>Medium hazard to ecosystems as substance is a bagged solid.                              | Yes                            | Due to its solid state, effects on ecosystems in a spill not considered further.<br>Effects due to fire/explosion to be considered further in the risk analysis.                                                       |
| <b>High explosives (ANFO, packaged explosive, booster)</b><br>(20,000 kg) | Fire/Explosion effects (high)<br>Human health (low to medium)<br>Ecotoxicity (high) | Fire in storage area;<br>Package leak<br>Spill during delivery or movement | People, property, ecosystems                       | Low hazard to ecosystems as substance is packed into small individual cardboard or plastic units. High explosion hazard.                                                                             | Yes                            | Due to its solid (or individually packaged) state, effects on ecosystems in a spill not considered further.<br>Effects due to fire/explosion to be considered further in risk analysis.                                |
| <b>Initiating explosive (Detonators)</b><br>(70 kg)                       | Fire/Explosion effects (high)                                                       | Fire in storage area                                                       | People, property                                   | High explosion hazard.                                                                                                                                                                               | Yes                            | Effects due to fire/explosion to be considered further in risk analysis.                                                                                                                                               |
| <b>Agrichemicals (herbicides and pesticides)</b><br>(800 L & 100 kg)      | Fire/Explosion effects (low)<br>Human health (low)<br>Ecotoxicity (high)            | Fire in storage area;<br>Package leak<br>Spill during delivery or movement | People, property, ecosystems                       | Low fire hazard and low chronic hazard to human health by direct skin contact, inhalation or ingestion.<br>High hazard to ecosystems in the event of a spill, managed through secondary containment. | Yes                            | Due to low hazard and large separation to sensitive activities, effects on human health and from fire not considered further in risk analysis.<br>Effects on ecosystems to be considered further in the risk analysis. |



| Hazardous Substance and quantity stored          | Identification of potential hazard properties (Hazard level <sup>A</sup> )                  | Failure Modes                                                                           | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                                  | Potential for off-site effects |                                                                                                                                                                                                                                      |
|--------------------------------------------------|---------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Petrol</b><br>(100 L)                         | Fire/Explosion effects (high)<br>Human toxicity (low <sup>B</sup> )<br>Ecotoxicity (medium) | Valve leak, pipe failure, accidental release during refuelling.<br>Fire in storage area | People, property, ecosystems                       | Low fire hazard.<br>Low chronic hazard to human health by direct skin contact or aspiration of droplets.<br>Moderate hazard to ecosystems in the event of a spill, managed through secondary containment. | Yes                            | Effects on ecosystems and effects due to fire to be considered further in the risk analysis.<br><br>Due to low hazard and large separation to sensitive activities, effects on human health not considered further in risk analysis. |
| <b>Polyaluminium Chloride</b><br>(5,000 L)       | Human health (low)                                                                          | Container leak or rupture,<br>Package damage during delivery to site                    | People, ecosystems                                 | Hazard to human health is by ingestion, which is not a hazard to off-site people.                                                                                                                         | No                             | Effects not considered further in risk analysis.                                                                                                                                                                                     |
| <b>Antiscalant (Memguard AS 104)</b><br>(100 L). | Human health (low <sup>B</sup> )<br>Ecotoxicity (low <sup>C</sup> )                         | Container leak or rupture,<br>Package damage during delivery to site.                   | People, ecosystems                                 | Hazard to human health by direct skin or eye contact, which presents a hazard to operators only.<br>Moderate hazard to ecosystems minimised by secondary containment, spill response procedures.          | Yes                            | Potential off-site ecotoxic effects from spill during package delivery to be considered further in risk analysis.                                                                                                                    |
| <b>Sodium hypochlorite</b><br>(100 L)            | Human health (low)<br>Ecotoxicity (high)                                                    | Container leak or rupture,<br>Package damage during delivery to site                    | People, ecosystems                                 | Hazard to human health by direct skin or eye contact, which presents a hazard to operators only.<br>High hazard to ecosystems minimised by secondary containment, spill response procedures.              | Yes                            | Potential off-site ecotoxic effects from spill during package delivery to be considered further in risk analysis.                                                                                                                    |

| Hazardous Substance and quantity stored        | Identification of potential hazard properties (Hazard level <sup>A</sup> ) | Failure Modes                                                        | Exposure pathways/<br>Affected part of environment | Indicative hazard rating                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Potential for off-site effects |                                                                                                                   |
|------------------------------------------------|----------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------|
| <b>Sulphuric acid (60 – 98 %)</b><br>(5,000 L) | Human health (moderate)<br>Ecotoxicity (moderate)                          | Spill during delivery<br>Rupture of tank                             | People, ecosystems                                 | <p>Moderate hazard to human health from corrosivity via direct skin contact, hazard limited to workers on site.</p> <p>The water treatment facilities are located central to the mining site with adequate separation to the nearest sensitive receptors.</p> <p>Low acute toxicity via inhalation, and confirmed carcinogenic hazard also via inhalation of mists, along with specific target organ toxicity via repeated exposure. These hazards concern workers that regularly handle the substance. In a spill, the remote location of the WTP facilities minimises the hazard to people that are not working at the sites.</p> <p>While not classified as ecotoxic, the low pH of this substance would be hazardous to ecosystems in a major release off-site.</p> | Yes                            | Effects due to a spill to be considered further in risk analysis.                                                 |
| <b>Ferric chloride</b><br>(5,000 L)            | Human health (low)<br>Ecotoxicity (low <sup>C</sup> )                      | Container leak or rupture,<br>Package damage during delivery to site | People, ecosystems                                 | <p>Hazard to human health by direct skin contact or ingestion, which presents a hazard to operators only.</p> <p>Moderate hazard to ecosystems minimised by secondary containment, spill response procedures.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Yes                            | Potential off-site ecotoxic effects from spill during package delivery to be considered further in risk analysis. |

Table notes:

A. The hazard level is specified according to the hazard classification in Table 1 of the Land Use Planning Guide for Hazardous Facilities, MfE 2000.

B. The MfE 2000 guide does not assign a hazard level to chronic health hazards (Class 6.3 – 6.9). Out of conservatism, we have considered these as low human toxicity hazards for the purpose of this screening assessment.

C. These substances are not classified as ecotoxic. For the purpose of this assessment, they have been considered as having low ecotoxicity.

D. Where a substance has a corrosive classification (Class 8.1A or 8.2A-8.2C) but is not classified as ecotoxic, these have been treated as having medium ecotoxicity due to the pH modifying properties.

## **Appendix I      Mine safety bulletin**

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Department of Consumer  
and Employment Protection  
Government of Western Australia

Resources Safety 

# Mines Safety Bulletin No. 75

Date: 10 January 2006

Subject: Fire and explosion in a working party magazine

This bulletin is issued following extensive investigation, technical review and test-work relating to a fire and subsequent explosion that occurred in a working party explosives magazine underground at a mine with sulphide mineralisation during 2005.

## Incident

At about 5.45 am, a fire behind the locked gates of a working party magazine was observed by underground personnel who were passing the area. Attempts were made to put out the fire using Dry Chemical Powder (DCP) fire extinguishers, but these attempts were unsuccessful.

It was estimated that in excess of six tonnes of explosives and between 1,500 and 3,000 detonators were stored in the working party magazine at the time of the fire.

Five people were able to escape from the mine through the decline portal entrance while a further 22 personnel, who were unable to use this means of egress, travelled to fresh-air bases and refuge chambers underground where they were all accounted for. Once accounted for, the personnel were moved to the shaft plat in preparation for evacuation from the mine.

Delays occurred in evacuating personnel through the shaft, as it was in transition from shaft sinking to equipping the production winding system. This necessitated the completion of a risk analysis so that the sinking kibble could be safely used for the evacuation of personnel.

About two hours after the fire was identified an explosion occurred which knocked out the underground communications. The explosion also stopped two surface fans for a brief period until they could be restarted.

## Injuries

Four people in the vicinity of the working party magazine, who attempted to fight the fire, suffered smoke inhalation. No personnel suffered any serious injuries during the emergency evacuation from underground. The potential for serious consequences is, however, obvious.

## Causes

The cause of the ignition in the magazine was not determined with certainty due to the damage sustained. However, the following contributory factors were evident as a result of investigation, technical review and testing:



- Reactive mineralisation, containing sulphide material including pyrite and chalcopyrite, was present in the rock in which the magazine was excavated. Marcasite was also identified — a material that could react with ammonium nitrate in the explosive stored in the magazine and cause self-ignition as a result of the chemical reaction.
- ANFO was known to have spilled in the magazine prior to the incident. ANFO is known to interact with sulphides to cause an exothermic reaction. The chemical reaction may have a long induction period with little observable temperature increase. However, once sufficient catalysing species have built up, the reaction rate increases rapidly, generating sufficient heat to cause self-ignition.
- Ammonium nitrate is also an oxidising agent, which evolves its own oxygen during chemical reaction. This made it impossible for the dry powder fire extinguishers to smother the fire. Water application is the primary suppression method recommended in explosives manufacturers' material safety data sheets.
- A number of empty 500 kg bulk ANFO bags were allowed to accumulate in the magazine, stacked in close proximity to full ANFO bags. This would have provided an additional fuel source and assisted in the propagation of the fire.
- A number of personnel authorised to enter the working party magazine were found to be smokers and routinely carried cigarettes and lighters into the magazine. However, there was no evidence from witness statements or previous inspections and audits that personnel had been smoking inside or in the vicinity of the magazine immediately prior to the incident.
- The working party magazine was being utilised to supply several jumbo development headings concurrently. Consequently, a quantity of explosives in excess of six tonnes was being stored in one area for this purpose.
- There was no regular shift supervisory inspection carried out in the working party magazine on the shift the incident took place or on the shifts immediately prior to the incident.
- The explosives management plan for the mine did not detail the storage requirements mandated by legislation and regulation.
- The explosive management plan required weekly contractor inspections and monthly principal employer audits of magazines. Records revealed that the inspections and audits were not being carried out at this frequency.
- Dry chemical powder fire extinguishers were provided both inside and outside of the locked gates of the magazine. Personnel were not able to use these extinguishers due to their proximity to the fire. Fire extinguishers were sourced from mobile equipment to fight the fire.
- There was no water hose provided outside the locked magazine. The water hose inside the magazine could not be utilised when fighting the fire as the smoke had become too intense by the time the gate was unlocked.
- The area was force ventilated using a compressed air fan. The direction of the ventilation hampered attempts to put out the fire.

## Consequences

- Personnel involved in fighting the fire suffered from smoke inhalation. They did not don their self rescuers but were able to quickly reach fresh air in the main decline after their attempts to extinguish the fire failed.
- The fire and subsequent explosion caused significant damage to services, ventilation doors and machinery up to a kilometre away. Communications were lost underground as a result of damage to the leaky feeder during the explosion. Communications were re-established after half an hour using hand held line-of-sight two way radios, which were brought down the shaft.
- The location of the working party magazine and the siting of force ventilation fans serving an adjacent, blind incline development heading were such that a jumbo operator wearing a self-rescuer had to

retreat about one kilometre through smoke towards the entrance to the heading, which was directly opposite the magazine where the fire and subsequent explosion took place. The person was retrieved by the brave action of a fitter who returned underground in a light vehicle and had to pass close by the magazine on two occasions to effect the rescue.

## Comment

- The working party magazine concept, historically, was created to provide for local storage of small quantities of explosives and detonators for the use of one airleg miner or a small group working in a particular area.
- With the advent of jumbo development, the quantities stored in working party magazines have generally increased from a nominal quantity of about 100–200 kg up to quantities in excess of one tonne. Where dedicated jumbo development crews and charge up crews are established, the quantities of explosives and detonators required to serve the multiple areas being developed, can lead (without appropriate controls) to even greater tonnages being stored in a so-called working party magazine. The regulatory provisions, as they were originally developed, did not envisage catering for the levels of usage occurring today.
- A working party magazine should only be utilised to provide small quantities of explosive for an individual or a small work group, and the concept should not be used for the large-scale storage and supply of explosives to service extensive jumbo development or multiple stope face blasting. Large quantities of explosives needed for such working methods should be supplied from a main magazine underground or directly from a surface magazine if this is feasible.

## Preventative action

- Mines with reactive sulphide orebodies or stringers should develop a comprehensive management plan to adequately deal with the hazards potentially associated with reactive ground:
  - The geology should be examined on a regular basis to determine the potential for the presence of reactive ground.
  - A geological plan should be maintained identifying areas where sulphides or reactive ground is present.
  - Explosives sensitive to reactive ground should not be used or stored in those areas identified as having reactive ground present. Comprehensive inspections and risk assessments should be completed to affirm that explosive storage areas are free from the presence of sulphide material or reactive ground.
  - Specialised inhibited explosives designed for use in reactive ground should be sourced and appropriately used where sulphide material or reactive ground may present a hazard.
  - Inspection, monitoring and suppression methods should be implemented to mitigate or remove the potential hazards associated with reactive ground, such as sulphide dust explosions or spontaneous combustion catalysed by extraneous materials such as explosives or fuels.
- A comprehensive procedure for the storage, transport and usage of explosives needs to be developed for each operation, in accordance with legislation, regulatory provisions and applicable standards.
- The statutorily appointed managers who have the daily control and supervision of the mine (Registered Manager and Underground Manager) need to ensure that a system is established to verify that shift inspections are being completed by supervisory staff in all working areas underground, including explosive magazines in accordance with regulations 3.18 and 3.21.
- The statutorily appointed managers who have the daily control and supervision of the mine (Registered Manager and Underground Manager) need to ensure that a system is in place to verify that inspections and audits laid down in company procedures are being completed at the prescribed frequency.

- A procedure to deal with the accumulation and removal of empty ANFO bags or spillage in an explosives magazine needs to be included as part of the storage requirements in any explosives management plan. Prior to removal from the mine once empty, the ANFO bags should be cleaned and stored outside the magazine and a safe distance from the explosives to reduce the fire risk hazard. All spillage should be cleaned up and removed immediately.
- Procedures should be developed to ensure that no personnel smoke or take contraband (e.g. lighters, matches, mobile phones, radio transmitters) inside the detonator or explosive magazines. This should be reinforced at periodic retraining sessions for personnel with access to explosives.
- A water deluge system and fire hoses should be provided at all storage areas where large quantities of explosives, in particular ANFO, are stored. The activation mechanism for the water deluge system should preferably be automatic or otherwise should be accessible from outside the locked magazine. Fire hoses and water should also be similarly installed outside the entrance to magazines.
- Fire extinguishers need to be placed a safe distance from the explosive storage area so they can be safely utilised in an emergency.
- Working party magazines need to be sited clear of entrances to currently working development headings and their air intakes so that, in the event of a fire, personnel can retreat to safety without being exposed to the hazards potentially arising from a fire or explosion associated with the magazine.
- Back up communications in the form of a direct telephone system underground should be considered in addition to any leaky feeder system. The installation of the back up communication should be such that it is connected via a separate route to avoid both sets of communications being damaged by a fire or explosion in any one area.
- Personnel need to be adequately trained, retrained and regularly reminded of the importance of donning self-rescuers where a fire is evident underground. Once donned, personnel should not attempt to fight the fire but should immediately evacuate the area and proceed to a fresh-air base or refuge.

## Further guidance

The Department has previously issued *Safety Bulletin No. 1: Sulphide Dust Explosion Hazard* and a *Guideline on the Safety Management of Underground Combustible Sulphide Dust*, which mine operators should review and implement where a similar hazard is evident. Both documents are available on the Department's website at [www.docep.wa.gov.au/ResourcesSafety](http://www.docep.wa.gov.au/ResourcesSafety) in the mining section, under guidance material and publications.

Mines should also conform to Australian Standard AS 2187.1:1998 — Explosives Storage Transport and Use — Part 1 in Appendix H, which recommends in part that magazines should be located clear of sources of sulphide dust.

**Martin Knee**  
**STATE MINING ENGINEER**

## **Appendix J      Qualitative risk analysis**

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The qualitative rating of likelihood and consequence are presented in Appendix J Table 1 and Appendix J Table 2 below.

**Appendix J Table 1: Qualitative rating of likelihood<sup>A</sup>**

| Frequency rating | Descriptor       | Explanation                                                                 |
|------------------|------------------|-----------------------------------------------------------------------------|
| <b>A</b>         | Very Likely      | Almost certain or expected to occur.                                        |
| <b>B</b>         | Likely           | Good chance that it might occur under normal operating conditions.          |
| <b>C</b>         | As likely as not | Might or might not occur depending on conditions.                           |
| <b>D</b>         | Unlikely         | Could occur but is not expected to occur under normal operating conditions. |
| <b>E</b>         | Improbable       | Theoretically possible, but extremely remote chance of occurrence.          |

A. Adapted from AS/NZS 4360:1999 and Table 3 "Likelihood qualitative descriptors", Risk Assessment Methodology for Hazardous Substances, EPA, December 2022

**Appendix J Table 2: Qualitative rating of consequence<sup>A</sup>**

| Effect rating | Descriptor    | Spill to environment                                 | Human health or property                                                             |
|---------------|---------------|------------------------------------------------------|--------------------------------------------------------------------------------------|
| <b>1</b>      | Insignificant | Negligible environmental damage.                     | No injuries.                                                                         |
| <b>2</b>      | Minor         | On-site release contained.                           | First aid treatment required, minor damage to property.                              |
| <b>3</b>      | Moderate      | Minor environmental damage.                          | Medical treatment required, damage to off-site property.                             |
| <b>4</b>      | Major         | Major environmental damage to immediate environment. | Extensive injuries, moderate damage to off-site property.                            |
| <b>5</b>      | Catastrophic  | Widespread environmental damage.                     | Fatalities both on and off-site, major exposure to toxic release by numerous people. |

A. From AS/NZS 4360:1999.

The likelihood and consequence ratings for each event are selected based on experience and judgement. These ratings are then combined to assess the overall level of risk associated with each hazard. The risk assessment matrix is shown in Appendix J Table 3.



**Appendix J Table 3: Risk matrix<sup>A</sup>**

| Consequence<br>Likelihood | Severity      |             |             |             |              |
|---------------------------|---------------|-------------|-------------|-------------|--------------|
|                           | Insignificant | Minor       | Moderate    | Major       | Catastrophic |
|                           | (1)           | (2)         | (3)         | (4)         | (5)          |
| <b>Almost certain (A)</b> | Significant   | Significant | High        | High        | High         |
| <b>Likely (B)</b>         | Moderate      | Significant | Significant | High        | High         |
| <b>Moderate (C)</b>       | Low           | Moderate    | Significant | High        | High         |
| <b>Unlikely (D)</b>       | Low           | Low         | Moderate    | Significant | High         |
| <b>Improbable (E)</b>     | Low           | Low         | Moderate    | Significant | Significant  |

A. From AS/NZS 4360:1999.

**Appendix J Table 4: Risk Assessment**

| Event                                                                                                                       | Controls (Mitigation/ Management Measures)                                                                                                                                                                                                                                                                                                                                                                                                   | Residual risk                                                                                                                                                               |                                                                                                                                                                                                                                                                        |          |
|-----------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
|                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                              | Likelihood                                                                                                                                                                  | Consequence                                                                                                                                                                                                                                                            | Risk     |
| Container leak or rupture during unloading to site – Moderate to highly ecotoxic container (e.g. herbicides, caustic soda). | Transport of hazardous substances via truck in accordance with the Land Transport Rule: Dangerous Goods 2005, meeting requirements for packaging, labelling, loading restrictions, segregation of incompatibles, unloading inspections and recurrent training.<br>Swift movement of goods into dedicated bunded storage.<br>Emergency Response Plan will be in place, including provision of spill kits and staff trained in spill response. | Unlikely – Package failures or damage during transit are not uncommon but requires failure of procedures and secondary containment to result in release to the environment. | Minor – any release cleaned up and removed from on-site systems.                                                                                                                                                                                                       | Low      |
| Container leak or rupture of packaged goods in storage (any liquid – oils, coolants).                                       | Storage locations for packages of hazardous liquids are provided with bunding to contain any leaked material.<br>Emergency Response Plan will be in place, including provision of spill kits and staff trained in spill response.                                                                                                                                                                                                            | Unlikely – Package failures or damage during transit are not uncommon but requires failure of procedures and secondary containment to result in release to the environment. | Minor – any release cleaned up and removed from on-site systems.                                                                                                                                                                                                       | Low      |
| Spill during refuelling of equipment.                                                                                       | Design, testing, certification and maintenance of the refuelling equipment in accordance with the HSW-HS regulations.<br>Vehicle and equipment refuelling undertaken by OGNZL staff in accordance with the procedures for transferring hydrocarbons.<br>Emergency Response Plan will be in place, including provision of spill kit adjacent to tank and staff trained in spill response.                                                     | As likely as not – small fuel spills during equipment refuelling are not uncommon but require failure of procedures to result in release to the environment.                | Minor – refuelling spills are expected to be small in volume, limited by overfill cut offs, ability to immediately stop pumping equipment and all refuelling being supervised by trained staff. Refuelling must be undertaken in areas that drain to collection sumps. | Moderate |

| Event                                             | Controls (Mitigation/ Management Measures)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Residual risk                                                                                           |                                                                                                                                                                                                                                                                         |      |
|---------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------|
|                                                   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Likelihood                                                                                              | Consequence                                                                                                                                                                                                                                                             | Risk |
| Spill during refuelling of diesel tanks.          | <p>Design, testing, certification and maintenance of the refuelling equipment in accordance with standards set out in the HSW-HS, including level indicators and pressure relief, and preventative maintenance will minimise the risk of failure during refilling.</p> <p>Tank refilling undertaken by specialist fuel delivery contractors in accordance with their procedures.</p> <p>Emergency response plan will be in place, including provision of spill kit adjacent to tank and staff trained in spill response.</p> <p>Refuelling area drains to on-site treatment network as a final containment control in the event of a spill.</p> <p>Dry break couplings used for tank refilling.</p> <p>Overfill prevention systems and interlocks to prevent spills.</p> | Unlikely – multiple failures of physical controls required to result in a spill during tank refilling.  | Minor – tank refilling spills are limited by overfill cut offs, dry-break couplings, ability to immediately stop pumping equipment and tank refilling being supervised by trained staff. The refuelling area drains to containment ponds for retention and remediation. | Low  |
| Diesel tank leak or rupture at storage locations. | <p>Design, testing, certification and maintenance of the storage systems in accordance with standards set out in the HSW-HS and preventative maintenance will minimise the risk of leakage of hazardous substances.</p> <p>Double-skinned secondary containment provided for all diesel tanks, with monitoring of the interstitial space.</p> <p>Emergency Response Plan will be in place, including provision of spill kits and staff trained in spill response.</p>                                                                                                                                                                                                                                                                                                    | Unlikely – multiple failures of structural controls required to result in discharge to the environment. | Minor – any release contained in secondary containment.                                                                                                                                                                                                                 | Low  |
| Fire in the diesel tank or LPG tank areas.        | <p>Design, testing, certification and maintenance of the tanks, pumps and systems in accordance with the HSW-HS regulations for flammable liquid tanks or gas pressure vessels.</p> <p>Prohibition of ignition sources and incompatible substances at the tank locations.</p> <p>Separation distances to other buildings, other hazardous substances, sensitive locations or the boundary.</p> <p>PCP-EM will be in place, including fire-fighting provisions, regular drills and evacuation plans.</p>                                                                                                                                                                                                                                                                  | Unlikely – multiple failures of structural controls required to result in fire at the tank location.    | Minor – damage to on-site property only.                                                                                                                                                                                                                                | Low  |

| Event                                                                       | Controls (Mitigation/ Management Measures)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Residual risk                                                                                                                   |                                                                       |      |
|-----------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------|
|                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Likelihood                                                                                                                      | Consequence                                                           | Risk |
| Fire/explosion in the bulk oxygen tank area.                                | <p>Design, testing, inspection, certification in accordance with standards set out in the Health and Safety in Employment (Pressure Equipment, Cranes, and Passenger Ropeways) Regulations 1999 and preventative maintenance will minimise the risk of leakage of oxygen.</p> <p>Exclusion of ignition sources, incompatible materials and combustible materials from the oxygen tank area.</p> <p>Separation distances to other buildings, hazardous substances or sensitive locations.</p> <p>Fire protection systems will be available.</p> <p>Emergency response plans prepared for the event of accidental release.</p> | Unlikely – oxygen system has restricted access and cannot accelerate fire without both an ignition source and combustible fuel. | Minor – area is well separated from any sensitive off-site receptors. | Low  |
| Fire in flammable goods storage (aerosol store, flammable liquids storage). | <p>Design, testing, certification and maintenance of the storage areas in accordance with standards set out in the HSW-HS for flammable liquids.</p> <p>Prohibition of ignition sources and incompatible substances at the flammable goods storage areas.</p> <p>Separation of flammable goods stores from other buildings and incompatible substances.</p> <p>Small inventory of highly flammable substances (aerosols,) maintained.</p> <p>Emergency response plans in place, including firefighting provisions (extinguishers, water carts and hydrant systems) and evacuation plans.</p>                                 | Unlikely – multiple failures of structural controls required to result in fire at the good storage sites.                       | Minor – minor damage to OGNZL property.                               | Low  |

| Event                                                                                      | Controls (Mitigation/ Management Measures)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Residual risk                                                                                                               |                                         |      |
|--------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|------|
|                                                                                            |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Likelihood                                                                                                                  | Consequence                             | Risk |
| Fire in flammable or oxidising cylinder storage areas.                                     | <p>Design, testing, certification and maintenance of the gas storage areas in accordance with standards set out in the HSW-HS for cylinder storage.</p> <p>Prohibition of ignition sources and incompatible substances at the cylinder storage areas.</p> <p>Separation of gas storage from other buildings and incompatible substances.</p> <p>Emergency response plans in place, including firefighting provisions (extinguishers, water carts and hydrant systems) and evacuation plans.</p>                                                                                                                                        | Unlikely – multiple failures of structural controls required to result in fire at the sites.                                | Minor – minor damage to OGNZL property. | Low  |
| Valve or connection failure for the liquid cyanide systems and release to the environment. | <p>Design, testing, inspection, certification of storage systems in accordance with standards set out in the HSW-HS and preventative maintenance will minimise the risk of leakage of hazardous substances.</p> <p>Process control systems are automated with interlock systems in place.</p> <p>Gas monitoring for hazardous fume</p> <p>Secondary and tertiary containment provided for the Processing Plant to contain any spills on-site.</p> <p>Emergency response plans prepared for the event of accidental release.</p> <p>Staff training in task specific procedures, regular task audits and cyanide awareness training.</p> | Unlikely – multiple failures of structural controls required to result in a release of cyanide solution to the environment. | Minor – minor damage to OGNZL property. | Low  |



| Event                                                                                                   | Controls (Mitigation/ Management Measures)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Residual risk                                                                                                                                        |                                                                                  |      |
|---------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------|
|                                                                                                         |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Likelihood                                                                                                                                           | Consequence                                                                      | Risk |
| Rupture of packaging in the solid cyanide store and release to the environment.                         | <p>Design, testing, inspection, certification of storage systems in accordance with standards set out in the HSW-HS and preventative maintenance will minimise the risk of leakage of hazardous substances.</p> <p>Storage in specialist packaging within the dedicated covered cyanide storage shed, with rainwater directed away from the enclosed areas.</p> <p>The storage area is segregated from other hazardous substances and secured to limit access to authorised personnel.</p> <p>Emergency response plans in place for the cyanide in the event of accidental release or incident on-site.</p> <p>Staff training in task specific procedures for cyanide management.</p> | Unlikely – multiple failures of structural controls required to result in discharge to the environment.                                              | Minor – any release contained in secondary containment or waste systems on-site. | Low  |
| Rupture or leak of the corrosive or oxidising liquid tanks on-site and release to the environment.      | <p>Design, testing, inspection, certification of storage systems in accordance with standards set out in the HSW-HS and preventative maintenance will minimise the risk of leakage of hazardous substances.</p> <p>Secondary containment provided for the tanks.</p> <p>Tank levels are monitored.</p> <p>Tanks are located in areas that drain to wastewater sumps, enabling containment of hazardous liquid spills in on-site systems.</p> <p>Emergency response plans prepared for the event of accidental release.</p>                                                                                                                                                            | Unlikely – multiple failures of structural controls including secondary and tertiary containment required to result in discharge to the environment. | Minor – any release contained in secondary containment or waste systems on-site. | Low  |
| Valve or connection failure for the corrosive or oxidising liquid tanks and release to the environment. | <p>Design, testing, certification and maintenance of the tank systems in accordance with the HSW-HS regulations.</p> <p>Tanks are located in areas that drain to wastewater sumps, enabling containment of hazardous liquid spills in on-site systems.</p> <p>Tank monitoring to detect abnormal conditions and raise alarm.</p> <p>Emergency Response Plan are in place, including provision of spill kits and staff trained in spill response.</p>                                                                                                                                                                                                                                  | Unlikely – multiple failures of physical controls required.                                                                                          | Minor – any release contained in secondary containment or waste systems on-site. | Low  |

| Event                                                                                  | Controls (Mitigation/ Management Measures)                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | Residual risk                                                                                                          |                                                                                  |      |
|----------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|------|
|                                                                                        |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Likelihood                                                                                                             | Consequence                                                                      | Risk |
| Mercury spill or loss of mercury containment released to the environment.              | Dedicated staff induction and training for the Gold Room<br>Mercury handling is restricted to certified handlers and subject to tracking requirements.<br>Standard operating procedures for mercury collection, packing and storage and specialist spill response procedure.                                                                                                                                                                                                                                                                                                                                                                            | Unlikely – multiple failures of procedural and structural controls required to result in discharge to the environment. | Minor – any release contained in secondary containment or waste systems on-site. | Low  |
| Fire in the solid Class 5 oxidiser facilities (ANE, sodium nitrite, potassium nitrate) | Design, testing, certification and maintenance of the compound in accordance with standards set out in the HSW-HS.<br>Prohibition of ignition sources and combustible materials in proximity to the oxidiser storage.<br>Strict security measures and restricted access to licenced staff.<br>Emergency Management Plan will be in place, including firefighting provisions and evacuation plans.<br>Incompatible substances are well segregated from the oxidising substances.<br>Store location selected for internal separation distance to off-site properties.                                                                                     | Unlikely – multiple failures of structural controls required to result in fire at the site                             | Minor –Damage to OGNZL facilities or buildings.                                  | Low  |
| Unplanned detonation in explosives store.                                              | Design, testing, inspection, certification and maintenance of the explosives storage magazine in accordance with standards set out in the HSW-HS, including provisions for lightning interception.<br>Adherence to WorkSafe requirements including the establishment of a certified Hazardous Substance Location prohibiting ignition sources and incompatible substances and ensuring the appropriate separation distances and fire protection systems are available.<br>Strict security, access restriction and inventory monitoring for storage area.<br>Emergency response plan is in place including firefighting provisions and evacuation plans. | Unlikely – storage site has strict security, multiple ignition prevention and firefighting equipment                   | Minor – see partial quantitative assessment in Section 7.3.2 of this report.     | Low  |

