ENERGET1°C5

# Hemi Gold Project - Emissions estimates, peer benchmarking and scope 3 review

## Summary Report

De Grey Mining | 11 July 2022 | 126819

# Executive summary

Energetics developed a carbon emissions calculation tool to assist De Grey Mining in estimating the emissions associated with their proposed Hemi Gold Project ("Hemi" or "Project"). The tool provides emissions estimates for following three scenarios:

**Scenario 1: Gold mining 'standard practice'**: This scenario is a model of a 'business as usual' approach which assumes all-diesel mining vehicles, no renewable power generated or procured and a conventional processing circuit.

**Scenario 2: Hemi base case:** This scenario is based on the current mine design and includes several emissions reducing initiatives including: the use of high-pressure grinding rolls in the comminution circuit and 30% of site demand provided by renewable energy.

**Scenario 3: Hemi low emissions:** This scenario is based on Hemi as it is anticipated to operate in 2030. This scenario includes additional emissions reducing initiatives including high penetration of electric vehicles and 70% of site demand provided by renewable energy.

The results of the emissions modelling are presented below in Table 1:

*Table 1: Summary of emissions results – all scenarios*

| Scenario | Scope 1 emissions ($tCO_2e$) | Scope 2 emissions ($tCO_2e$) | Total emissions ($tCO_2e$) | Emissions intensity ($tCO_2e/oz$) |
|---|---|---|---|---|
| Standard practice | 184,316 | 315,561 | 499,877 | 1.00 |
| Hemi base case | 176,231 | 171,408 | 347,639 | 0.70 |
| Hemi low emissions | 120,517 | 66,558 | 187,075 | 0.37 |

Emissions intensities ranged from 0.37 to 1.00 $tCO_2e/oz$. This shows good alignment with similar gold mining operations where emissions intensities range from 0.37 – 1.25 $tCO_2e/oz$ (refer to section 4.2). Furthermore, the emissions intensity for scenario 2 (Hemi base case) was estimated to be 0.70 $tCO_2e/oz$ which is below the WA average for the peer group (0.79 $tCO_2e/oz$) analysed in this report.

In interpreting the results, specific key themes were identified:

- Emissions across all scenarios are dominated by emissions from grid electricity, diesel and, to a much lesser degree, limestone.
- Emissions are attributed to a small proportion of end uses. Over 95% of all emissions can be attributed to grid electricity use, diesel for mining vehicles and on-site power generation.

A peer benchmarking exercise was undertaken to assist De Grey in gaining an understanding of the ambition and performance of their peers. Peer groups evaluated included Northern Star, Anglo Gold Ashanti, Gold Fields and Newmont. The following key findings of the peer benchmarking are noted:

- Scope 1 and 2 emissions reduction targets:
  - 30-32% reduction in emissions intensity by 2030 are common for the industry
  - Most peers have set a 2050 target of net-zero
- Scope 3 emissions reduction targets: only one of the peer group (Newmont) has set a scope 3 emissions target of net-zero by 2050. A number of peers have, however, begun reporting on scope 3 emissions

- Emissions intensities for the peer group:
  - Range: 0.37 – 1.25 $tCO_2e/oz$
  - WA average: 0.79 $tCO_2e/oz$

The final scope of work included in this project was a qualitative review of the Project's scope 3 emissions profile. This was completed by reviewing similar gold miners who have begun reporting scope 3 emissions in their annual reports. Key findings include:

- The reporting of scope 3 emissions is becoming more common within the mining sector with a high proportion of miners reporting, or committing to report, their scope 3 emissions.
- Scope 3 emissions for gold mining occur almost exclusively upstream of the operation.
- For the miners evaluated, nearly all indicated that 90% of emissions occur within the following categories:
  - purchased goods and services
  - capital goods
  - fuel and energy-related activities

Scope 3 emissions vary considerably from organisation to organisation, reflecting the influence of location and supply chain structure. As such, care should be exercised in extrapolating results.

# Contents

# 1.0 Introduction

## 1.1 Project objectives

De Grey Mining Limited engaged Energetics to develop a greenhouse gas 'emissions tool' to estimate the emissions associated with their proposed Hemi Gold Project ("Hemi" or "Project"). The tool is intended to assist De Grey in finalising the mine design by estimating the emissions associated with a series of scenarios, each with a different mix of technologies and processes under consideration. The tool estimates scope 1 and 2 emissions with results presented as follows:

- Scope 1 and 2 emissions in $tCO_2e$ (tonnes $CO_2$ equivalent)
- Emissions intensities in $tCO_2e$/oz gold and $tCO_2e$/t ore

The results of the emissions modelling are presented in section 3.

In addition to the emissions tool, Energetics undertook a comprehensive peer benchmarking exercise, focused on benchmarking Hemi against the emissions targets and intensities of several peers and their operations. The results of this are presented in section 4.

Finally, a qualitative review of Hemi's likely scope 3 emissions profile was undertaken. This was completed by reviewing the scope 3 emissions profiles of existing Australian gold miners to identify the likely composition of Hemi's scope 3 emissions, both upstream and downstream of the operation. The results of this are presented in section 5.

## 1.2 Overview of proposed mining operations

The Hemi Mineral Resource is an 8.5Moz gold resource located within De Grey Mining's 10.6Moz Mallina Gold Province. The proposed operations are located approximately 85km south of Port Headland in Western Australia's Pilbara region (refer Figure 1).

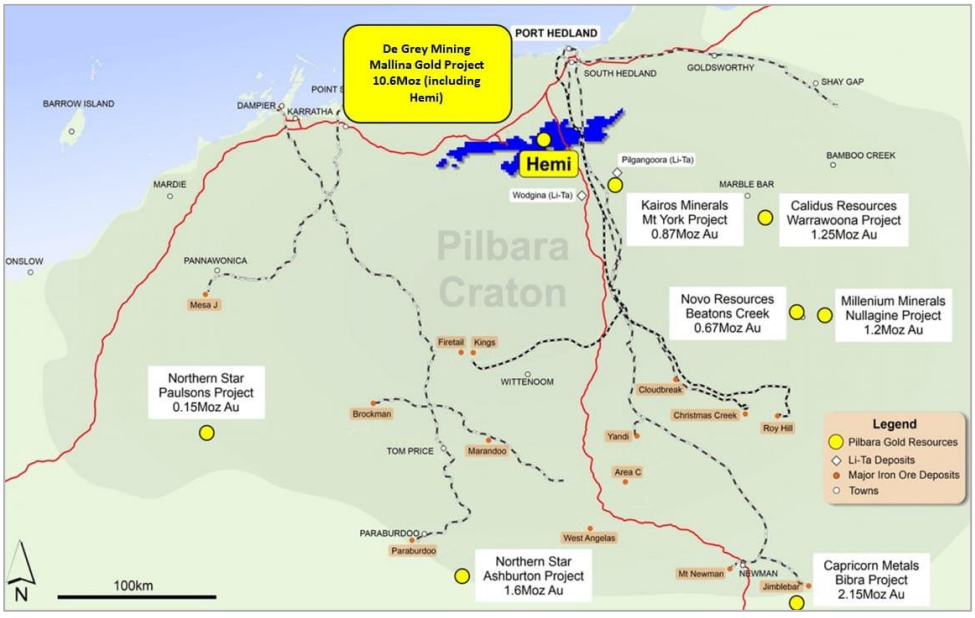



*Figure 1: Location of Hemi (source: De Grey Mining Limited)*

A range of power supply and generation options are being assessed, including:

- Grid connection
- Renewable power purchase agreements (PPA)
- On-site generation (diesel, natural gas and LPG)
- On-site renewable energy (wind and solar)

Processing of ore will be undertaken as follows:

- Free-milling ore: comminution – flotation - neutralisation – carbon-in-leach (CIL) - electrowinning - refining
- Refractory ore: comminution – flotation – pressure oxidation (POX) – neutralisation - carbon-in-leach (CIL) - electrowinning - refining

The proposed process flow is presented in Figure 2:

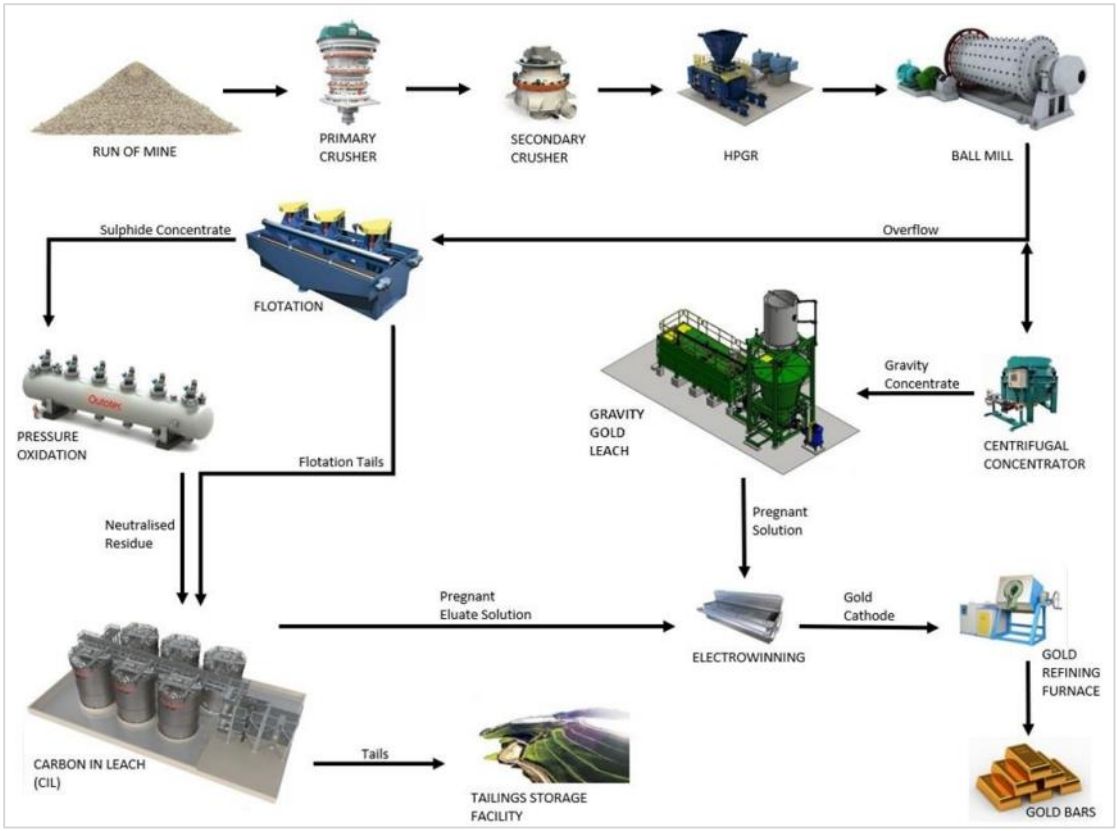



*Figure 2: Proposed process flow for Hemi (source: De Grey Mining Limited)*

Although the processing strategy has been largely confirmed, De Grey had considered a range of comminution and sulphide oxidation technologies. Specifically:

Comminution technologies:

- Primary crushing / SAG mill / ball mill / pebble crusher
- Three stage crushing circuit utilising high pressure grinding rolls plus ball milling
- Two-stage crushing circuit plus vertical roller mill

Sulphide oxidation technologies:

- Pressure oxidation (POX)

- Ultra-fine grinding (UFG) followed by atmospheric oxidation (Albion)
- Bacterial or Biological oxidation

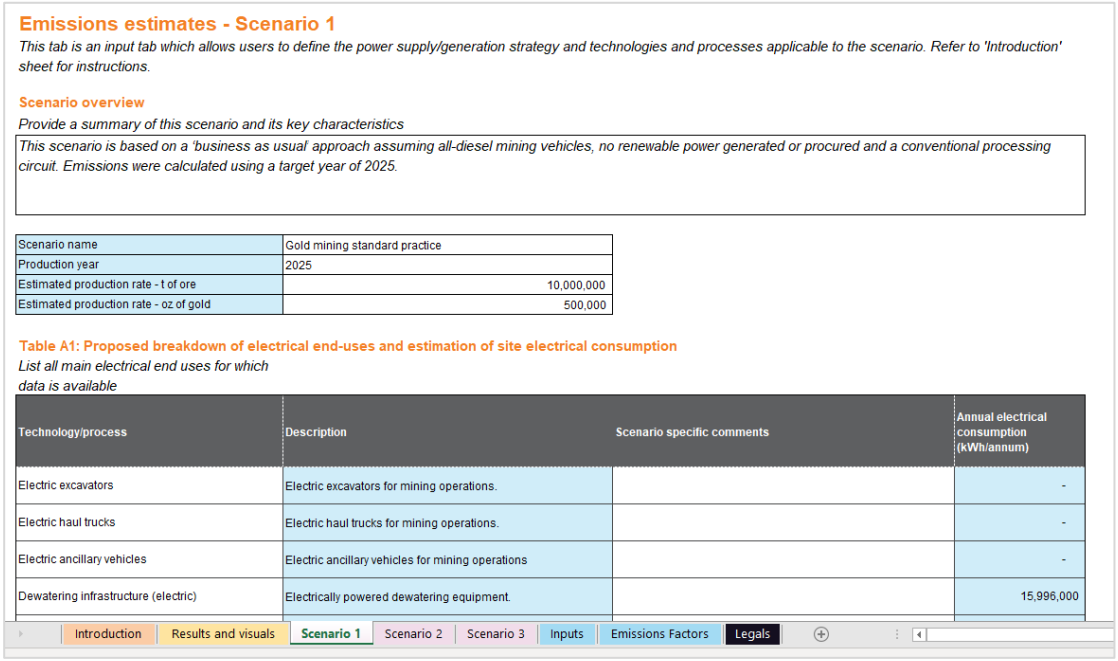
The various comminution and sulphide oxidation technologies have differing capital costs and energy consumption profiles. For this assessment, only the three comminution technologies were analysed during the emissions estimation phase of the project. However, the development and delivery of the emissions tool to De grey has allowed it to be applied separately to compare the sulphide oxidation options.

# 2.0 Overview of emissions tool

## 2.1 Description of the tool

The emissions tool is a spreadsheet-based tool designed to estimate scope 1 and 2 emissions for 3 unique emissions 'scenarios'. The scenarios represent distinct mine designs, each with a different mix of processes and technologies. The tool is a static emissions model with emissions estimates based on inputs for a given year only. The tool is comprised of the following main sheets (refer to Figure 3):

- Introduction: Tool overview, instructions, assumptions, document control
- Results and visuals: Summary of results including charts
- Scenario 1/2/3: The scenario sheets allow users to define the technologies and processes applicable to the scenario. Specifically, users define:
  - the breakdown of electrical end-uses
  - the power supply/generation mix
  - the emissions-producing technologies/processes proposed for the scenario
- Inputs: Input sheet where all technologies and processes are defined, including the input fuel/energy source used, the unit of measure and the annual consumption of fuel/energy source for the selected year
- Emissions factors: Input sheet where all carbonaceous (greenhouse gas producing) fuels and energy sources are defined, including key data required for calculating emissions (energy intensity factor and emissions factors)



**Emissions estimates - Scenario 1**

*This tab is an input tab which allows users to define the power supply/generation strategy and technologies and processes applicable to the scenario. Refer to 'Introduction' sheet for instructions.*

**Scenario overview**

*Provide a summary of this scenario and its key characteristics*

*This scenario is based on a 'business as usual' approach assuming all-diesel mining vehicles, no renewable power generated or procured and a conventional processing circuit. Emissions were calculated using a target year of 2025.*

| | |
|---|---|
| Scenario name | Gold mining standard practice |
| Production year | 2025 |
| Estimated production rate - t of ore | 10,000,000 |
| Estimated production rate - oz of gold | 500,000 |

**Table A1: Proposed breakdown of electrical end-uses and estimation of site electrical consumption**

*List all main electrical end uses for which data is available*

| Technology/process | Description | Scenario specific comments | Annual electrical consumption (kWh/annum) |
|---|---|---|---|
| Electric excavators | Electric excavators for mining operations. | | - |
| Electric haul trucks | Electric haul trucks for mining operations. | | - |
| Electric ancillary vehicles | Electric ancillary vehicles for mining operations | | - |
| Dewatering infrastructure (electric) | Electrically powered dewatering equipment. | | 15,996,000 |

Introduction | Results and visuals | Scenario 1 | Scenario 2 | Scenario 3 | Inputs | Emissions Factors | Legals

*Figure 3: Screen capture of tool showing sheets*

## 2.2 Overview of tool inputs

Prior to tool development, a 'tool inputs workshop' was undertaken to identify an exhaustive list of all fuels, energy sources and consumables anticipated to be required for the Project. These were then analysed to determine whether they were 'material' from an emissions perspective (i.e. would result in the release of greenhouse gases). The list of material inputs, energy sources and consumables are summarised in Table 2 with a summary of immaterial consumables presented in Appendix A.

*Table 2: Summary of material inputs, energy sources and consumables*

| Fuel / input name | Description | Where used | Emissions scope |
|---|---|---|---|
| Grid electricity | Conventional grid-connected electricity | All electrical equipment | 2 |
| Renewable electricity - PPA | Renewable power supplied under a power purchase agreement | All electrical equipment | - |
| Renewable energy | Wind, solar or similar renewable energy source for power generation | Power generation | - |
| Diesel oil | Conventional diesel for power generation and mining vehicles | Power generation, mining vehicles | 1 |
| Natural gas | Piped natural gas for power generation | Power generation | 1 |
| Green hydrogen | Green hydrogen[1] (trucked to site) for use in hydrogen mining vehicles | Mining vehicles | - |
| Limestone | CaCO3, 10mm crushed | Neutralisation circuit | 1 |
| LPG | Liquified petroleum gas | Elution circuit | 1 |
| Petroleum based oils | Oils combusted within internal combustion engines | Mining vehicles | 1 |
| Petroleum based greases | Greases combusted within internal combustion engines | Mining vehicles | 1 |
| Gasoline | Fuel for road-registered vehicles | Throughout operation | 1 |
| Diesel oil - transport post 2004 | Fuel for road-registered vehicles | Throughout operation | 1 |
| ANFO | Explosives (ammonium nitrate and fuel oil) | Mining operations | 1 |
| SF6 | Incidental losses from switchgear and circuit breakers | Power generation, processing | 1 |

Note: certain non-carbonaceous fuels have been included in Table 2 to allow users to model the impact of replacing a material fuel source (such as grid electricity) with a zero-emissions fuel source (such as renewable power).

[1] Green hydrogen refers to hydrogen produced entirely using renewable power

## 2.3 Overview of technologies and processes

As outlined in section 2.1, scenarios are developed within the tool by selecting the combination of processes and technologies applicable to that scenario. Note, however, that only emissions producing technologies and processes are considered. Examples of emissions-producing technologies and processes include diesel-powered mining vehicles, on-site diesel generators and the neutralisation process step.

Scope 2 emissions associated with the consumption of grid electricity are calculated within the tool using the annual electrical demand of the entire operation, rather than the demand of individual electrical end-uses. This is consistent with the approach taken in developing emissions inventories for National Greenhouse gas and Energy Reporting (NGER)[2].

The complete list of emissions-producing technologies and processes included in the tool is presented in Table 3.

*Table 3: Summary of emissions-producing processes and technologies*

| Technology/process name | Description | Input/energy source |
|---|---|---|
| Excavators (diesel) | Diesel powered excavators for mining operations | Diesel oil |
| Haul trucks (diesel) | Diesel powered haul trucks for mining operations | Diesel oil |
| Ancillary vehicles (diesel) | Diesel powered ancillary vehicles for mining operations | Diesel oil |
| Mining vehicles (hydrogen) | Hydrogen powered load, haul and ancillary vehicles for mining operations | Green hydrogen |
| Blasting (ANFO) | Blasting using ammonium nitrate and fuel oil (ANFO), 94:6 by weight | Diesel oil |
| Dewatering infrastructure (diesel) | Diesel powered dewatering equipment | Diesel oil |
| Neutralisation | Addition of limestone to neutralise acidic product of POX process prior to leaching | Limestone |
| Elution circuit | Desorption of soluble gold from activated carbon particles using heat | LPG |
| Fleet vehicles (diesel) | Road registered diesel fleet vehicles | Diesel oil - transport post 2004 |
| Fleet vehicles (gasoline) | Road registered gasoline fleet vehicles | Gasoline - transport post 2004 |
| Electrical switchgear (total SF6) | SF6 emissions associated with electrical switchgear and circuit breakers | SF6 |
| Other emissions (greases combusted) | General entry for a range of small emissions sources (petroleum-based greases) | Petroleum based greases |
| Other emissions (oils combusted) | General entry for a range of small emissions sources (petroleum-based oils) | Petroleum based oils |

[2] To assist users in estimating total site demand, the tool includes an electrical end-use table within each scenario. The complete list of electrical end-uses allowed is presented in Appendix A.

## 2.4 Assumptions and qualifications

The following list of assumptions were made in preparing the model and undertaking the scenario analysis:

1. Fugitive emissions associated with mine methane have not been considered.
2. Emissions associated with neutralisation of carbonates within ore during processing have not been considered.
3. Emissions factors and energy content factors have been taken from the National Greenhouse gas and Energy Reporting (NGER) (Determination), 2021.
4. All kWh of power generated on site are consumed on site.
5. Limestone purity assumed to be 97% by weight, per NGER 2021.
6. Fuel oil used in ANFO assumed to be diesel, mixed to a ratio of 94:6 by weight.
7. Emissions associated with HFCs assumed negligible as operations will be open cast with air conditioning limited to offices and mining village only (limited refrigerant charge). Furthermore, existing refrigerants (such as R22 and R134a) are in the process of being phased out. New air conditioning equipment installed beyond 2024 is likely to contain refrigerants with very low global warming potentials.
8. Consumption rates for petroleum-based oils and greases, SF6 and petrol/diesel used in road registered vehicles have been estimated by Energetics based on similar operations.
9. Hydrogen has been included under the assumption that it is green hydrogen (i.e. produced using entirely renewable energy) and is trucked to site (i.e. no scope 1 or 2 emissions).
10. Electric vehicle uptake is based on an assumed rate of technology commercialisation. The actual level of electric vehicle penetration may differ from the rate assumed in the scenarios.

# 3.0 Summary of emissions results

## 3.1 Scenario descriptions

Three scenarios were developed to compare emissions for a range of technologies/processes:

**Scenario 1: Gold mining 'standard practice':** This scenario is based on a 'business as usual' approach assuming all-diesel mining vehicles, no renewable power generated or procured and a conventional processing circuit. Emissions were calculated using a target year of 2025*.

**Scenario 2: Hemi base case:** This scenario is based on the current mine design philosophy and includes several low-emissions initiatives including: high-pressure grinding rolls in the comminution circuit and the procurement of up to 30% renewable power. Emissions were calculated using a target year of 2025.

**Scenario 3: Hemi low emissions:** This scenario is based on Hemi as it is anticipated to operate in 2030. This scenario includes additional low-emissions initiatives, including a high penetration of electric vehicles, 70% of site demand being delivered by renewable power. Emissions were calculated using a target year of 2030.

* The target year of 2025 was selected for scenario 1 and 2 as this represents the first year of full production operation at Hemi. Usage rates for inputs/energy sources are correspondingly based on estimated usage in 2025. Emissions factors for inputs/energy sources, however, are representative of present-day conditions. While emissions factors for fossil fuels and chemical consumables remain relatively constant over time, emissions factors for electricity vary considerably, reflecting the changing mix of power generation within the grid. As such, the emissions factors for electricity are likely to be different in 2025 (anticipated to be lower, reflecting an increase in grid connected renewables) than the factor used in the tool.

The following table summarises all elements used to model the scenarios:

*Table 4: Summary of emissions-producing processes and technologies used for scenarios*

| Process / technology | Description | Scenario |
|---|---|---|
| Power supply | Conventional grid connection: 90%<br>On-site diesel generation: 10% | 1 |
| | Conventional grid connection: 60%<br>Renewable PPA: 30%<br>On-site diesel generation: 10% | 2 |
| | Conventional grid connection: 20%<br>Renewable PPA: 70%<br>On-site diesel generation: 10% | 3 |
| Mining vehicles | Excavators: 3 diesel<br>Haul trucks: 24 diesel<br>Other: 100% diesel | 1 |

| Process / technology | Description | Scenario |
|---|---|---|
| | Excavators: 3 diesel<br>Haul trucks: 24 diesel<br>Other: 100% diesel | 2 |
| | Excavators: 3 diesel, 2 electric<br>Haul trucks: 12 diesel, 12 electric<br>Other: 70% diesel, 30% electric | 3 |
| Comminution | Primary crushing / SAG mill / ball mill / pebble crusher | 1 |
| | Three stage crushing circuit utilising high pressure grinding rolls plus ball milling | 2 |
| | Two-stage crushing circuit plus vertical roller mill | 3 |
| Dewatering infrastructure | Diesel powered dewatering equipment | 1, 2 |
| | Electric dewatering equipment | 3 |
| Neutralisation | Addition of limestone to neutralise acidic product of POX process prior to leaching | All |
| Elution circuit | Separation of gold/cyanide ions from activated carbon through acid washing and application of heat. Input fuel: LPG | All |
| Fleet vehicles (diesel) | Road registered diesel vehicles | All |
| Fleet vehicles (gasoline) | Road registered gasoline vehicles | All |
| Electrical switchgear | SF6 emissions associated with electrical switchgear | All |
| Air conditioning systems | HFC emissions associated with air-conditioning systems | All |
| Other emissions (greases) | General entry for a range of small emissions sources (petroleum-based greases) | All |
| Other emissions (oils) | General entry for a range of small emissions sources (petroleum-based oils) | All |

## 3.2 Summary of Results

The scope 1 and 2 emissions calculated for scenarios 1 to 3, as well as the resultant emissions intensities, are summarised below in Table 5:

*Table 5: Summary of emission results - all scenarios*

| Scenario | Target year | Scope 1 emissions ($tCO_2e$) | Scope 2 emissions ($tCO_2e$) | Total emissions ($tCO_2e$) | Emissions intensity ($tCO_2e$/oz) |
|---|---|---|---|---|---|
| Standard practice | 2025 | 184,316 | 315,561 | 499,877 | 1.00 |
| Hemi base case | 2025 | 176,231 | 171,408 | 347,639 | 0.70 |
| Hemi low emissions | 2030 | 120,517 | 66,558 | 187,075 | 0.37 |

These results have been presented graphically in Figure 4 and Figure 5.

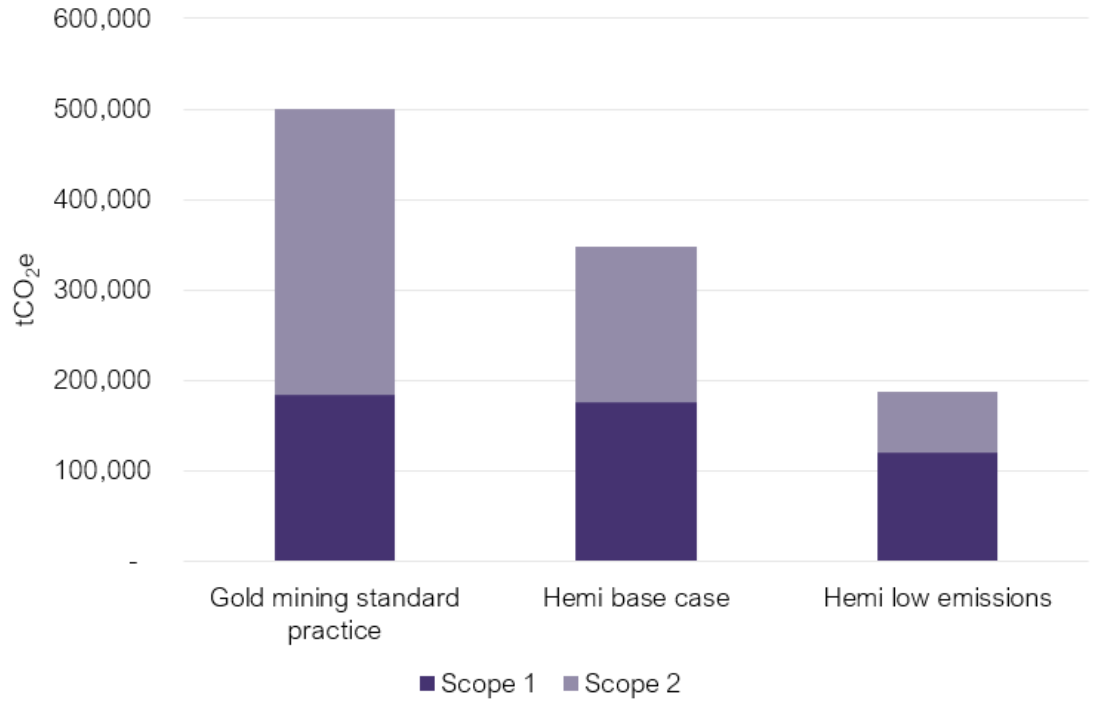



*Figure 4: Annual scope 1 and 2 emissions (total) - all scenarios*

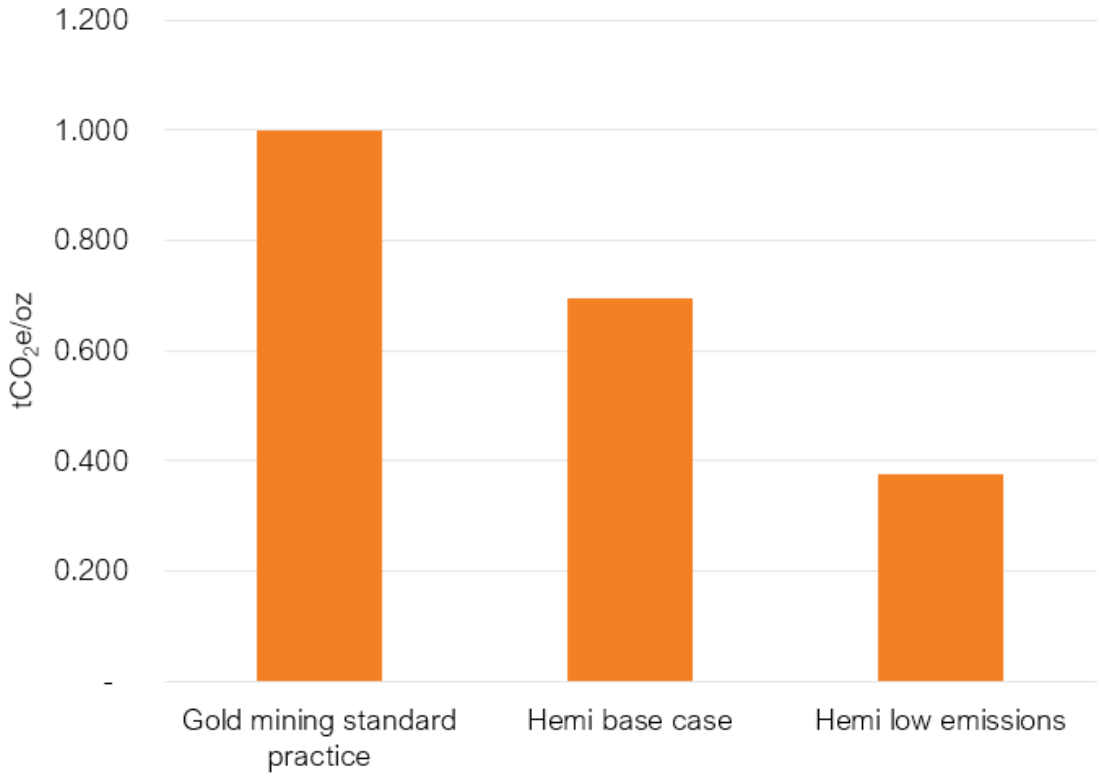



*Figure 5: Emissions intensities - all scenarios*

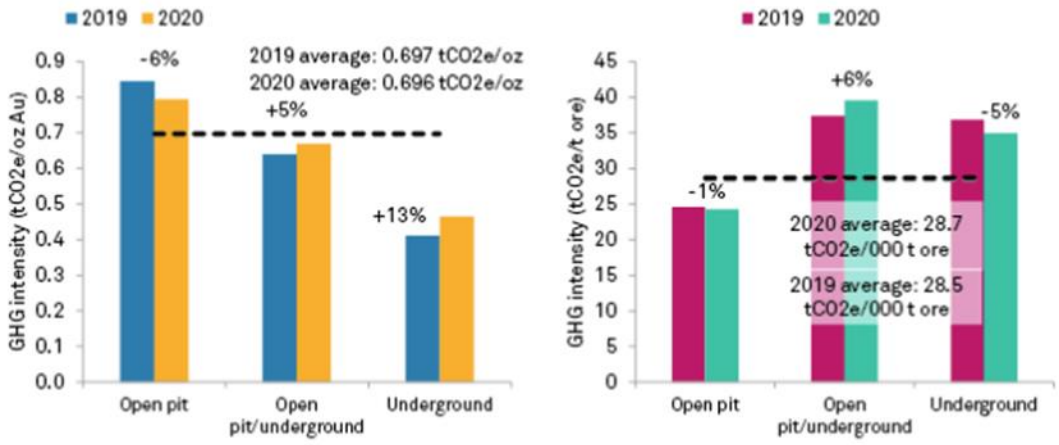
## 3.3 Key findings

### Emissions intensities

Absolute emissions, while valuable for understanding future reporting obligations (related to National Greenhouse gas and Energy Reporting), are dependent on the size of the operation and the proposed rate of production. For comparison purposes, a more useful metric is emissions intensity, calculated as the annual emissions divided by annual gold production.

The calculated emissions intensities ranged from 0.37 to 1.00 $tCO_2e$/oz (based on an estimated gold production rate of 500 koz/annum for all scenarios). This shows good alignment with similar gold mining operations where emissions intensities, based on the peers selected for this project, ranged from 0.37 – 1.25 $tCO_2e$/oz (refer section 4.2).

The emissions intensity for the Hemi base case scenario was calculated to be 0.695 $tCO_2e$/oz which is below the WA average for the peer review group (0.79 $tCO_2e$/oz – refer section 4.2). It also compares favourably when compared with studies undertaken for international operations. According to an S&P Global review of sustainability reports from over 90 "leading gold mines", the average emissions intensity for open cut gold mines is approximately 0.8 $tCO_2e$/oz[3] (refer Figure 6).




Data as of Aug. 11, 2021.
tCO2e = tonnes of CO2 equivalent; GHG = greenhouse gas
Sources: S&P Global Market Intelligence; company sustainability reports

*Figure 6: Average emissions intensity from a study of over 90 international gold mines (S&P Global)*

There are two important conclusions to draw from the observations above. Firstly, it suggests that the model architecture and the input data used to estimate the emissions appear accurate and realistic. Secondly, the design proposed for the Project is expected to result in a lower emissions intensity than the industry average for similar mining operations in WA. An important caveat to note in this regard, however, is that the Hemi base case is based on 2025 data. It is conceivable that emissions intensities of the peer operations will decrease as they pursue their own decarbonisation targets and the emissions intensity of grid electricity decreases.

[3] S&P Global Market Intelligence, Greenhouse gas and gold mines - Emissions intensities unaffected by lockdowns, https://www.spglobal.com/marketintelligence/en/news-insights/blog/greenhouse-gas-and-gold-mines-emissions-intensities-unaffected-by-lockdowns

## Emissions breakdown by fuel type

A significant theme of the results was that total emissions across all scenarios were dominated by emissions from grid electricity, diesel and, to a much lesser degree, limestone. This is illustrated below for scenario 2 in Figure 7, although this trend was observed for all scenarios.

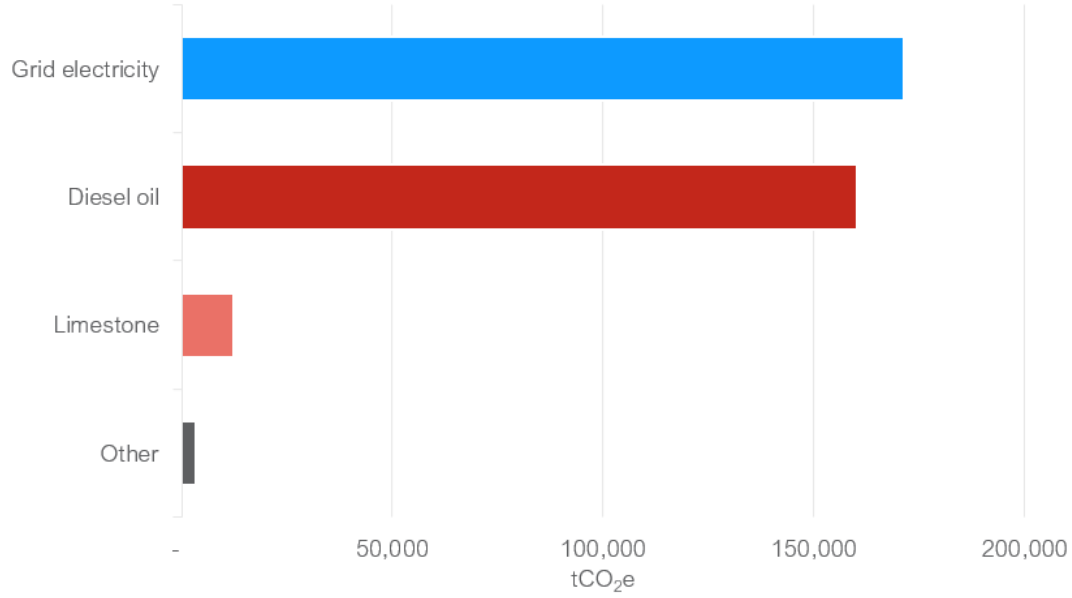



*Figure 7: Emissions breakdown by fuel type for scenario 2: Hemi base case*

Another important theme (which is directly related to the observations above) is that emissions are the result of a small proportion of end uses. Over 90% of all emissions are the result of grid electricity use, diesel for mining vehicles and on-site power generation (refer Figure 8).

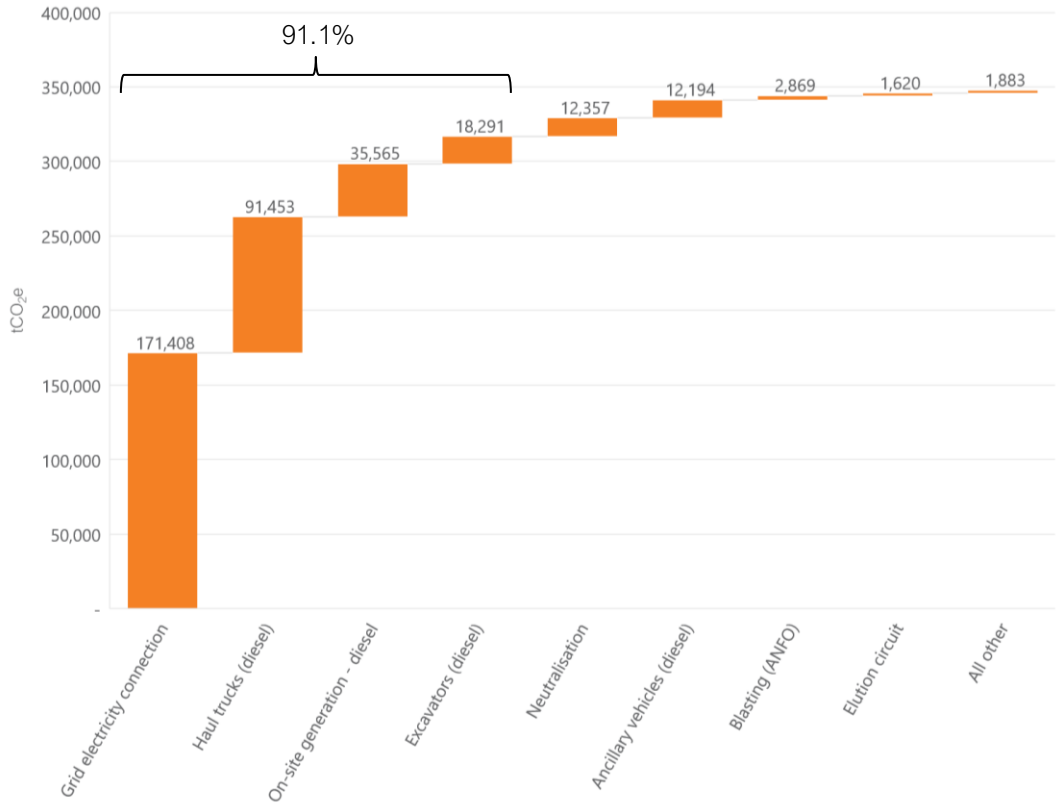



*Figure 8: Emissions breakdown by end use for scenario 2: Hemi base case*

The limited number of fuel types and end uses highlights that any future emissions reduction efforts should target these fuels and end uses to maximise benefit. To this end, the operational areas that should be targeted for emissions reductions are as follows:

- Reduce the emissions intensity of site electricity through:
  - Increases to on-site renewable energy generation
  - Replacing conventional grid electricity with electricity sourced from renewable sources
- Reducing the dependence on diesel for mining vehicles through:
  - Procurement of electric vehicles to replace diesel vehicles (battery-electric and trolley-assisted)
  - Investigate feasibility of biodiesel to displace conventional diesel
  - Monitor commercialisation of hydrogen-fuelled equipment and implement where feasible

# 4.0 Peer benchmarking

## 4.1 Overview of peers and operations

The selection of peers and operations benchmarked have been summarised in Table 6.

*Table 6: Overview of selected peers and operations benchmarked*

| Peer | Total operations | Operations benchmarked | Market cap ($AUD) |
|---|---|---|---|
| Anglo Gold Ashanti | Africa – 5<br>South Americas – 3<br>Australia - 2 | Sunrise Dam (WA)<br>Tropicana (WA) | $9.87B<br>Listed on ASX and JSE |
| Gold Fields | South Americas – 1<br>Australia – 4<br>South Africa – 1<br>West Africa - 3 | Gruyere (WA) | $12.92B<br>Listed on JSE |
| Gold Road | Australia - 1 | Gruyere (WA) | $1.07B<br>Listed on ASX |
| Newcrest | North Americas – 2<br>Australia – 2<br>PNG – 1 | Lihir (PNG)<br>Telfer (WA)<br>Cadia (NSW)<br>Red Chris (Canada) | $21.17B<br>Listed on ASX |
| Newmont | Australia – 2<br>North Americas – 5<br>South Americas – 3<br>West Africa – 2 | Boddington (WA)<br>Tanami (NT) | $72.54B<br>Listed on NYSE |
| Northern Star | Australia – 8<br>North Americas - 1 | Yandal (WA)<br>Pogo (USA)<br>KCGM (WA)<br>Kalgoorlie (WA)<br>Carosue Dam (WA) | $9.44B<br>Listed on ASX |

## 4.2 Peer benchmarking results

The results of the peer benchmarking are summarised in the sections which follow. Peer data was gathered as follows:

- At the peer level: scope 1 and 2 emissions targets, overview of scope 3 reporting
- At the operational level: production output, emissions intensity, energy intensity

All benchmark data was gathered from publicly available reports.

### Peer results

The results of the benchmarking at peer level are presented in Table 7

*Table 7: Peer group emissions reduction targets (scope 1 and 2) and current scope 3 reporting*

| Peer | Base Year | 2030 Target | 2050 Target | Scope 3 | Source |
|---|---|---|---|---|---|
| Anglo Gold Ashanti | 2007 | 30% reduction in scope 1 and 2 emissions intensity | Net-zero scope 1 and 2 emissions | Undertook comprehensive estimate in 2021 but have not formalised baseline or targets | AGA 2020/21 Climate Change Report |
| Gold Fields | 2016 | 30% reduction in absolute scope 1 and 2 emissions | Net-zero scope 1 and 2 emissions | Target and methodology for reduction to be developed by 2023, with elimination targeted for 2040 | Gold Fields 2021 Climate Change Report |
| Gold Road | n/a | To be set in 2023 | Net-zero scope 1 and 2 emissions | Qualitative description of sources only. No targets or detailed reporting. | Gold Road 2021 Sustainability Report |
| Newcrest | 2018 | 32% reduction in scope 1 and 2 emissions intensity | Net-zero scope 1 and 2 emissions | Working with upstream and downstream suppliers to refine scope 3 estimates before committing to a target. | Newcrest 2021 Sustainability Report |
| Newmont | 2018 | 32% reduction in scope 1 and 2 emissions intensity<br><br>32% reduction in absolute scope 1 and 2 emissions | Net-zero scope 1, 2 and 3 emissions. | 30% reduction in scope 3 emissions by 2030 (2019 base year).<br><br>Re-baselined scope 3 emissions in 2021 and continue to refine calculation methodology. | Newmont 2021 Climate Report |
| Northern Star | 2020 | 35% reduction in absolute scope 1 and 2 emissions | Net-zero scope 1 and 2 emissions | Completed a 'partial assessment' of scope 3 emissions in 2020. Yet to establish baseline or targets. | Northern Star 2021 Sustainability Report |

## Operational results

The results of peer benchmarking at operational level are presented in Table 8.

*Table 8: Benchmarking results for selected peer operations*

| Peer | Operation | Location | Operation type | 2021 Production (koz) | Emissions intensity ($tCO_2e/oz$) | Energy intensity (GJ/oz) |
|---|---|---|---|---|---|---|
| Anglo Gold Ashanti[4] | Sunrise Dam | WA | OP/UG | 229 | 0.76 | 13.5 |
| | Tropicana* | WA | OP/UG | 265 | 0.80 | 13.3 |
| Gold Fields[5] | Gruyere | WA | OP | 247 | 0.46 | 4.56 |
| Newcrest[6] | Lihir* | PNG | OP | 737 | 0.92 | 13.7 |
| | Telfer* | WA | OP/UG | 416 | 1.04 | 18.5 |
| | Cadia* | NSW | UG | 765 | 0.78 | 3.9 |
| | Red Chris* | Canada | OP | 46 | 0.46 | 11.1 |
| Newmont[7] | Boddington* | WA | OP | 696 | 1.25 | 9.6 |
| | Tanami* | NT | UG | 485 | 0.37 | 6.6 |
| Northern Star[8] | Yandal* | WA | OP/UG | 426 | 0.57 | 10.0 |
| | Pogo | USA | UG | 210 | 0.74 | 4.9 |
| | KCGM | WA | OP/LHOS | 478 | 0.93 | 9.0 |
| | Kalgoorlie Operations ex. KCGM | WA | OP/UG | 257 | 0.67 | 5.9 |
| | Carosue Dam | WA | OP/UG | 234 | 0.64 | 10.1 |
| **Average (all)** | | | | **392** | **0.74** | **9.62** |
| **Average (WA)** | | | | **361** | **0.79** | **10.50** |

The emissions intensity results have been presented in Figure 9 (from lowest to highest). This chart includes the results of scenario 2 (Hemi base case) and scenario 3 (Hemi low emissions) which are shown in blue and green respectively.

[4] AGA 2021 Sustainability Report, AGA 2021 Annual Report, Operational Profile 2021 Tropicana
[5] 2021 TCFD Report 2021 Update, 2021 Annual Report
[6] 2021 Sustainability Report, 2021 Annual Report
[7] 2021 Climate Report
[8] 2021 Sustainability Report, 2021 Annual Report

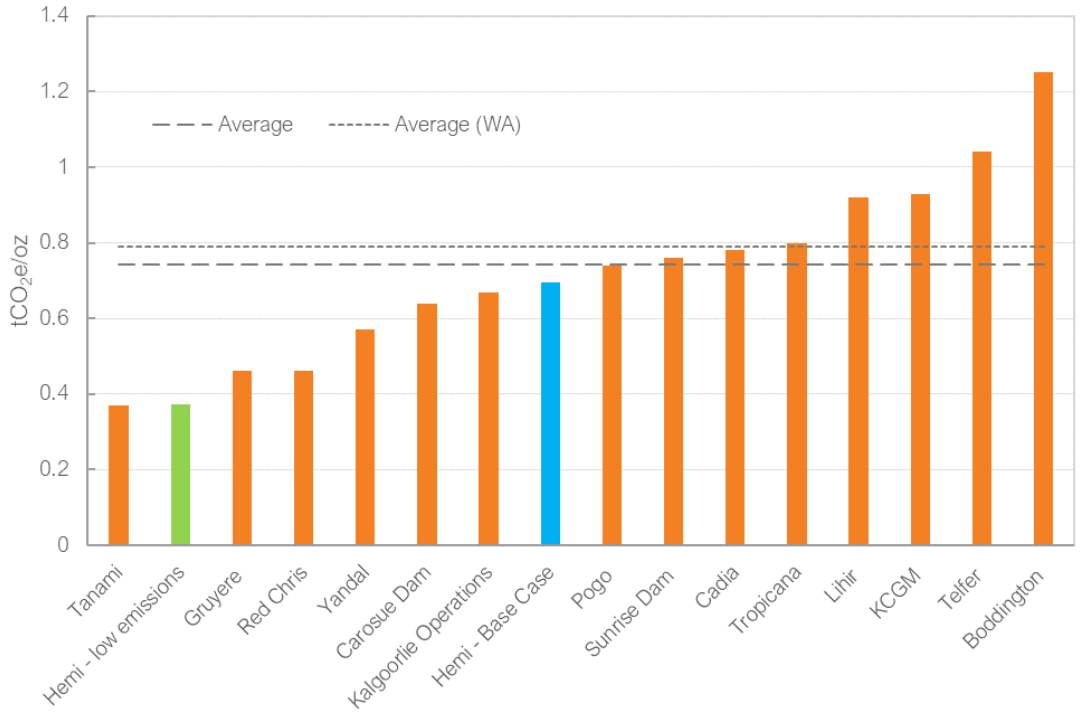



*Figure 9: Emissions intensities of benchmarked operations*

# 4.3 Key findings

From the data presented in sections 4.2, several key themes have been identified and these are discussed further below.

## Medium-term targets

### Industry standard

**Scope 1 and 2 emissions intensity reduction targets of 30-32% by 2030:** With the exception of Gold Road, all of the peers have set an emissions intensity targets of at least 30% by 2030. Emissions intensity targets are less onerous than absolute emissions targets as they allow organisations to increase their overall emissions (through growth, acquisitions etc) provided the targeted emissions intensity reductions are achieved across the organisation

### Market leading

**Scope 1 and 2 absolute emissions reduction targets of 32-35% by 2030:** Of the peers reviewed Northern Star Resources had the most ambitious emissions reduction target, committing to an absolute reduction of scope 1 and 2 emissions of 35% by 2030. Gold Fields and Newmont had similar, albeit a slightly lower targets, of 32%.

## 2050 targets

### Industry standard

**Net-zero scope 1 and 2 emissions:** Widespread adoption of a net zero 2050 target across all peers benchmarked was noted.

### Market leading

**Net-zero scope 1, 2 and 3 emissions:** A single peer (Newmont) has included scope 3 emissions in their 2050 net-zero ambition.

## Varying levels of commitment

It was found that the level of commitment (in terms of size and quantity of decarbonisation projects) to emissions reduction targets varies considerably between peers.

### Industry standard

Across most of the peer group, the following was noted:

- Decarbonisation projects are limited to a select few assets across the organisation
- Established projects are typically limited in scope and size
- Projects with more significant abatement potential remain in planning or prefeasibility stages

*Example: Newmont*
Currently evaluating renewable energy projects at three of its operations: Boddington, Tanami and Yanacocha (large scale PPA). Timelines set for 2026/27 (Boddington and Tanami), and as early as 2022 for Yanacocha.

### Market leading

In contrast to the industry standard, certain peers were found to have:

- Decarbonisation projects that are established or underway across most assets
- Established and future projects are of substantial scope and expected to materially impact emissions
- Structured expansion plans in place for existing renewable infrastructure, accompanied by commissioning milestones aligned with decarbonisation pathways and targets

*Example: Gold Fields*
Renewables projects are either underway or scheduled for 9 out of 10 assets. Examples of major projects include[9]:

- Large scale PPA (50-60% renewable energy fraction) for Agnew facility completed in 2021 enabling 42% net-mine emissions reduction.
- Construction of a 12MW solar farm accompanied by 4.4MWh in battery storage at Gruyere, with commissioning in Q2 of 2022. Expansion plans to 20MW planned for 2030.
- Commissioning of the South Deep solar plant expansion to 50MW in 2022.

## Decarbonisation pathways

Decarbonisation pathways across the industry share a similar approach. Pathways to 2030 targets are almost unanimously centred around the abatement of electricity related emissions. Beyond 2030 the focal point for decarbonisation turns to the electrification of mobile diesel equipment. Hybrid and battery electric replacements make up the core of this shift, however, disruptive emerging technologies such as biodiesel and hydrogen fuel cells are relied upon to varying degrees. The use of carbon offsets and climate solutions are projected to play an important role in addressing the remaining most difficult-to-abate emissions from 2040-2050.

[9] Gold Fields – Climate Change Report 2021

# 5.0 Scope 3 qualitative analysis

Scope 3 emissions quantification within the mining sector are generally calculated in accordance with the GHG Protocol's Corporate Value Chain (Scope 3) Accounting & Reporting Standard. The standard divides scope 3 emissions into 15 specific categories: 8 upstream categories and 7 downstream categories.

The upstream and downstream categories have been briefly outlined in the sections which follow with detailed extracts from the standard presented in Appendix B.

## 5.1 Overview of upstream scope 3 categories

*Table 9: Overview of upstream scope 3 emissions categories*[10]

| No. | Category name | Description | Minimum boundary |
|---|---|---|---|
| 1 | Purchased goods and services | Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year. | All upstream (cradle-to-gate[11]) emissions of purchased goods and services |
| 2 | Capital goods | Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year. | All upstream (cradle-to-gate) emissions of capital goods |
| 3 | Fuel and energy related activities | Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year. This includes emissions losses associated with electricity. | Refer Appendix B |
| 4 | Upstream transportation and distribution | Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations and distribution between a company's own facilities. In all cases: in vehicles and facilities not owned or controlled by the reporting company. | The scope 1 and scope 2 emissions of transportation and distribution providers that occur during use of vehicles and facilities |
| 5 | Waste generated in operations | Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company) | The scope 1 and scope 2 emissions of waste management suppliers that occur during disposal or treatment |
| 6 | Business travel | Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company) | The scope 1 and scope 2 emissions of transportation carriers that occur during use of vehicles |

[10] Greenhouse Gas Protocol (GHG) – Technical Guidance for Calculating Scope 3 Emissions (V1.0) https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf

[11] All emissions that occur in the life cycle of a material/product up to the point of sale by the producer.

| No. | Category name | Description | Minimum boundary |
|---|---|---|---|
| 7 | Employee commuting | Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company) | The scope 1 and scope 2 emissions of employees and transportation providers that occur during use of vehicles |
| 8 | Upstream leased assets | Operation of assets leased by the reporting company (lessee) in the reporting year | The scope 1 and scope 2 emissions of lessors that occur during the reporting company's operation of leased assets |

## 5.2 Overview of downstream scope 3 categories

*Table 10: Overview of downstream scope 3 emissions categories*[12]

| | Category name | Description | |
|---|---|---|---|
| 9 | Downstream transportation and distribution | Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer | The scope 1 and scope 2 emissions of transportation providers, distributors, and retailers that occur during use of vehicles and facilities |
| 10 | Processing of sold products | Processing of intermediate products sold in the reporting year by downstream companies | The scope 1 and scope 2 emissions of downstream companies that occur during processing |
| 11 | Use of sold products | End use of goods and services sold by the reporting company in the reporting year | The direct use-phase emissions of sold products over their expected lifetime |
| 12 | End-of-life treatment of sold products | Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life | The scope 1 and scope 2 emissions of waste management companies that occur during disposal or treatment of sold products |
| 13 | Downstream leased assets | Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in scope 1 and scope 2 – reported by lessor | The scope 1 and scope 2 emissions of lessees that occur during operation of leased assets |
| 14 | Franchises | Operation of franchises in the reporting year | The scope 1 and scope 2 emissions of franchisees that occur during operation of franchises |
| 15 | Investments | Operation of investments (including equity and debt investments and project finance) in the reporting year | |

[12] Greenhouse Gas Protocol (GHG) – Technical Guidance for Calculating Scope 3 Emissions (V1.0) https://ghgprotocol.org/sites/default/files/standards/Scope3_Calculation_Guidance_0.pdf

## 5.3 Anticipated scope 3 profile for Hemi

To qualitatively review the likely scope 3 emissions profile for Hemi, a detailed review of existing scope 3 emissions reporting was undertaken. The review focussed on Australian based gold miners who currently report scope 3 emissions. The following gold miners were used:

- Resolute Mining
- Newmont
- Gold Fields
- Barrick
- North Star Resources
- Perseus

*All the gold miners have quantified scope 3 emissions using the GHG Protocol categories described above.*

Figure 10 presents the breakdown of reported scope 3 emissions, broken down by GHG Protocol category, for the gold miners listed above. A detailed breakdown across all 15 upstream and downstream categories is provided in appendix C.

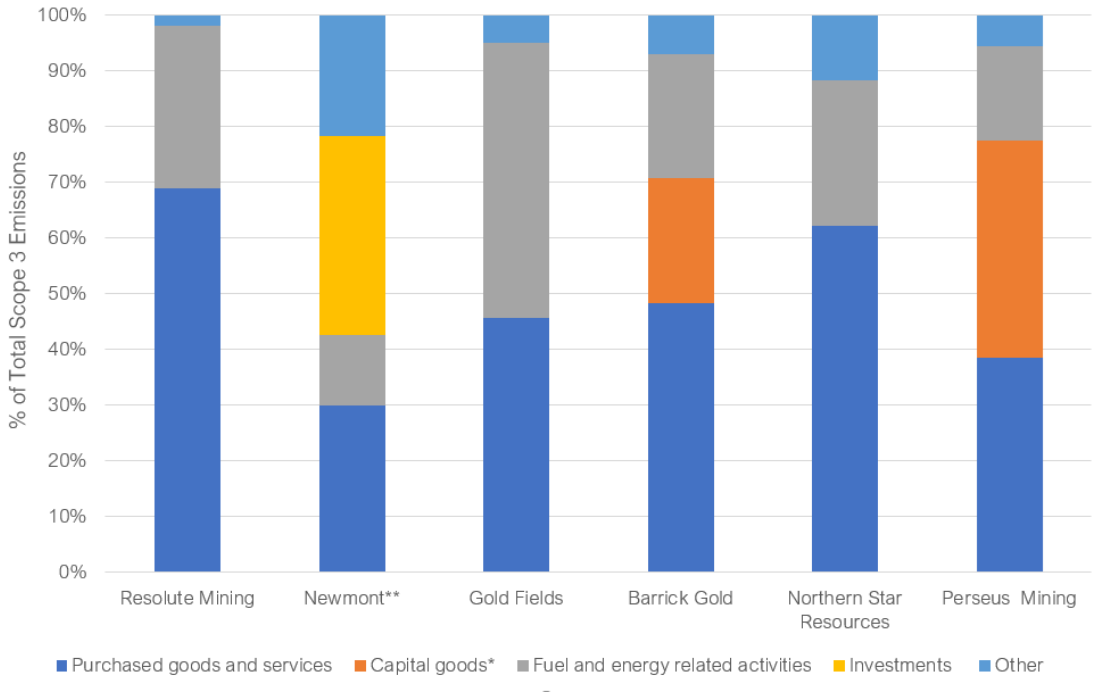



*Figure 10: Breakdown of peer scope 3 emissions by emissions category*

*Resolute and Northern Star report capital goods as part of purchased goods and services

**Newmont maintains a large investment portfolio, resulting in a significant investment category

## 5.4 Key findings

Scope 3 emissions are not universally reported in the gold mining sector and, of the gold miners who do report scope 3 emissions, the level of detail and inclusions/exclusions vary from organisation to organisation. Despite this, a review of the sector yields several important themes.

The clearest insight from peer analysis is that scope 3 emissions are almost entirely attributed to following three upstream categories:

- Category 1: Purchased goods and services
- Category 2: Capital goods
- Category 3: Fuel and energy related activities

Across the gold miners considered (excl. Newmont whose investment emissions distort their scope 3 emissions relative to their peers) categories 1-3 account for between 88% - 98% of reported scope 3 emissions. Given the relative similarity between De Grey and the other organisations, it is likely that scope 3 emissions for De Grey will be predominantly within categories 1, 2 and 3. These categories will be briefly discussed below.

### Categories 1 and 2: Purchased goods and services including capital goods

Gold mining operations rely heavily on the use of specialised goods and services. These include but are not limited to, mining services, operational reagents, consumables, parts and equipment. The embodied emissions associated with the extraction, production, and transportation of these goods and services makes up the most significant source of scope 3 emissions for gold miners.

### Category 3: Fuel and energy related activities

Diesel, used to power mining and fleet vehicles as well as produce onsite electricity, typically represents the primary fuel source for gold mining operations. Scope 3 emissions attributed to diesel procurement include those associated with its upstream extraction, production, and transportation to site. The same applies to alternative onsite fuels such as petrol or natural gas. Scope 3 emissions are also applicable to grid electricity (emissions associated with the extraction, production, and transportation of fuels used for power generation, as well as transmission and distribution losses).

Minimal downstream processing is typically required prior to gold's end use. As such, emissions associated with downstream activities are negligible in comparison to those present in upstream supply chains. A specific focus on supply chains for goods, services, fuel, and energy must therefore be taken to begin accurately reporting and indeed managing scope 3 emissions. Suppliers with the greatest value chain transparency should be preferred.

Care should be taken in interpreting reported scope 3 emissions amongst gold miners. The dependency on supply chains and the influence of location on results cannot be understated. Reported results therefore vary and are highly operation specific. Some examples of notable variances include:

- Ratio of scope 3 emissions to scope 1 and 2 emissions range from 0.6 – 4.
- Northern star indicated only 30% of suppliers provided information necessary to quantify emissions – reporting their scope 3 emissions as a "partial assessment".
- Newmont maintains an investment arm which accounts for 36% of scope 3 emissions, leading to a considerably different emissions profile to its peers.

# Appendix A – Supplementary data for emissions tool

*Table 11: Summary of immaterial consumables*

| Fuel / input name | Description | Where used |
|---|---|---|
| Flotation activator (Copper sulphate pentahydrate) | Copper sulphate pentahydrate solid | Flotation |
| Flotation Collector (PAX) | Potassium amyl xanthate (PAX) solid | Flotation |
| Flotation Frothier (Huntsman W22) | Huntsman W22 | Flotation |
| Flocculant (BASF M10) | BASF M10 solid | Thickening |
| Flocculant (BASF M155) | BASF M155 solid | Thickening |
| Sulphuric acid | 98% H2SO4 | Oxidation circuit (at startup) |
| Activated Carbon | Coconut shell | Leaching circuit |
| Sodium cyanide | Solid >97% NaCN, 30% NaCN solution optional | Leaching circuit |
| Lime | Calcium oxide (CaO) | Leaching circuit |
| Antiscalent (Nalco 9714) | Nalco 9714 or equivalent liquid | Process water storage |
| Hydrogen peroxide | 70% H2O2 liquid | Process water storage |
| Nitric acid | 68% HNO3 w/w | Elution plant |
| Sodium hydroxide | 50% NaOH liquid | Elution plant |

*Table 12: Summary of electrical end uses modelled*

| Fuel / input name | Description |
|---|---|
| Fleet vehicles (electric) | Electric excavators, haul trucks and ancillary vehicles for mining operations. |
| Dewatering infrastructure (electric) | Electrically powered dewatering equipment. |
| Comminution - SABC | Primary crushing / SAG mill / ball mill / pebble crusher. |
| Comminution - HPGR | Three-stage crushing circuit utilising high-pressure grinding rolls plus ball milling. |
| Comminution - VRM | Two-stage crushing circuit plus vertical roller mill (Throughput capacity limited to 9.7Mtpa). |

| Fuel / input name | Description |
|---|---|
| Flotation | Processing step to concentrate sulphide minerals into a small mass stream. |
| Thickening | Subsequent to flotation, excess water removed. |
| Oxidation - POX | Pressure oxidation process. Sulphide minerals oxidised to produce metal salts and sulphuric acid. |
| Neutralisation | Addition of limestone to neutralise acidic product of POX process prior to leaching. |
| Leaching circuit | CIL process. Sodium cyanide and oxygen dissolves gold and activated carbon particles adsorb the soluble gold |
| Elution circuit | Desorption of soluble gold from activated carbon particles. |
| Electrowinning | Application of an electric current to induce plating of gold on a stainless-steel mesh prior to smelting. |
| Smelting | Smelting and pouring of gold bars. |
| Process water storage | Storage and pumping of process water. |
| Oxygen plant | Dedicated oxygen plant to produce oxygen for the POX process. |
| Remaining Plant & Infrastructure | This includes all electrical demand not included in processes listed above. |
| Village & Airstrip | Electrical demand associated with the support operations. |

# Appendix B – Extracts from GHG Protocol (scope 3 category definitions)

***Upstream scope 3 emissions***

| *Category* | *Category description* | *Minimum boundary* |
|---|---|---|
| **1. Purchased goods and services** | • Extraction, production, and transportation of goods and services purchased or acquired by the reporting company in the reporting year, not otherwise included in Categories 2 - 8 | • All upstream (cradle-to-gate) emissions of purchased goods and services |
| **2. Capital goods** | • Extraction, production, and transportation of capital goods purchased or acquired by the reporting company in the reporting year | • All upstream (cradle-to-gate) emissions of purchased capital goods |
| **3. Fuel- and energy-related activities (not included in scope 1 or scope 2)** | • Extraction, production, and transportation of fuels and energy purchased or acquired by the reporting company in the reporting year, not already accounted for in scope 1 or scope 2, including:<br>**a.** Upstream emissions of purchased fuels (extraction, production, and transportation of fuels consumed by the reporting company)<br>**b.** Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling consumed by the reporting company)<br>**c.** Transmission and distribution (T&D) losses (generation of electricity, steam, heating and cooling that is consumed (i.e., lost) in a T&D system) – reported by end user<br>**d.** Generation of purchased electricity that is sold to end users (generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users) – reported by utility company or energy retailer only | **a.** For upstream emissions of purchased fuels: All upstream (cradle-to-gate) emissions of purchased fuels (from raw material extraction up to the point of, but excluding combustion)<br>**b.** For upstream emissions of purchased electricity: All upstream (cradle-to-gate) emissions of purchased fuels (from raw material extraction up to the point of, but excluding, combustion by a power generator)<br>**c.** For T&D losses: All upstream (cradle-to-gate) emissions of energy consumed in a T&D system, including emissions from combustion<br>**d.** For generation of purchased electricity that is sold to end users: Emissions from the generation of purchased energy |

## *Upstream scope 3 emissions*

| *Category* | *Category description* | *Minimum boundary* |
|---|---|---|
| **4. Upstream transportation and distribution** | • Transportation and distribution of products purchased by the reporting company in the reporting year between a company's tier 1 suppliers and its own operations (in vehicles and facilities not owned or controlled by the reporting company)<br>• Transportation and distribution services purchased by the reporting company in the reporting year, including inbound logistics, outbound logistics (e.g., of sold products), and transportation and distribution between a company's own facilities (in vehicles and facilities not owned or controlled by the reporting company) | • The scope 1 and scope 2 emissions of transportation and distribution providers that occur during use of vehicles and facilities (e.g., from energy use)<br>• ***Optional:*** The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure |
| **5. Waste generated in operations** | • Disposal and treatment of waste generated in the reporting company's operations in the reporting year (in facilities not owned or controlled by the reporting company) | • The scope 1 and scope 2 emissions of waste management suppliers that occur during disposal or treatment<br>• ***Optional:*** Emissions from transportation of waste |
| **6. Business travel** | • Transportation of employees for business-related activities during the reporting year (in vehicles not owned or operated by the reporting company) | • The scope 1 and scope 2 emissions of transportation carriers that occur during use of vehicles (e.g., from energy use)<br>• ***Optional:*** The life cycle emissions associated with manufacturing vehicles or infrastructure |
| **7. Employee commuting** | • Transportation of employees between their homes and their worksites during the reporting year (in vehicles not owned or operated by the reporting company) | • The scope 1 and scope 2 emissions of employees and transportation providers that occur during use of vehicles (e.g., from energy use)<br>• ***Optional:*** Emissions from employee teleworking |
| **8. Upstream leased assets** | • Operation of assets leased by the reporting company (lessee) in the reporting year and not included in scope 1 and scope 2 – reported by lessee | • The scope 1 and scope 2 emissions of lessors that occur during the reporting company's operation of leased assets (e.g., from energy use)<br>• ***Optional:*** The life cycle emissions associated with manufacturing or constructing leased assets |

## *Downstream scope 3 emissions*

| *Category* | *Category description* | *Minimum boundary* |
|---|---|---|
| **9. Downstream transportation and distribution** | • Transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), including retail and storage (in vehicles and facilities not owned or controlled by the reporting company) | • The scope 1 and scope 2 emissions of transportation providers, distributors, and retailers that occur during use of vehicles and facilities (e.g., from energy use)<br>• ***Optional:*** The life cycle emissions associated with manufacturing vehicles, facilities, or infrastructure |
| **10. Processing of sold products** | • Processing of intermediate products sold in the reporting year by downstream companies (e.g., manufacturers) | • The scope 1 and scope 2 emissions of downstream companies that occur during processing (e.g., from energy use) |
| **11. Use of sold products** | • End use of goods and services sold by the reporting company in the reporting year | • The direct use-phase emissions of sold products over their expected lifetime (i.e., the scope 1 and scope 2 emissions of end users that occur from the use of: products that directly consume energy (fuels or electricity) during use; fuels and feedstocks; and GHGs and products that contain or form GHGs that are emitted during use)<br>• ***Optional:*** The indirect use-phase emissions of sold products over their expected lifetime (i.e., emissions from the use of products that indirectly consume energy (fuels or electricity) during use) |
| **12. End-of-life treatment of sold products** | • Waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life | • The scope 1 and scope 2 emissions of waste management companies that occur during disposal or treatment of sold products |
| **13. Downstream leased assets** | • Operation of assets owned by the reporting company (lessor) and leased to other entities in the reporting year, not included in scope 1 and scope 2 – reported by lessor | • The scope 1 and scope 2 emissions of lessees that occur during operation of leased assets (e.g., from energy use).<br>• ***Optional:*** The life cycle emissions associated with manufacturing or constructing leased assets |
| **14. Franchises** | • Operation of franchises in the reporting year, not included in scope 1 and scope 2 – reported by franchisor | • The scope 1 and scope 2 emissions of franchisees that occur during operation of franchises (e.g., from energy use)<br>• ***Optional:*** The life cycle emissions associated with manufacturing or constructing franchises |
| **15. Investments** | • Operation of investments (including equity and debt investments and project finance) in the reporting year, not included in scope 1 or scope 2 | • See the description of category 15 (Investments) in section 5.5 for the required and optional boundaries |

# Appendix C – Detailed results: review of scope 3 emissions reporting

| | Resolute Mining[1] | | Newmont[2] | | Goldfields[3] | | Barrick[4] | | Northern Star[5] | | Perseus[6] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Upstream Categories** | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | |
| 1. Purchased goods and services | 664,355 | 69% | 1,771,000 | 30% | 111,677 | 46% | 2,335,000 | 48% | 126,822 | 62% | 106,258 | 39% |
| 2. Capital goods | | | 245,000 | 4% | | | 1,085,000 | 22% | 61 | 0% | 107,246 | 39% |
| 3. Fuel and energy related activities | 281,741 | 29% | 739,000 | 13% | 120,991 | 49% | 1,073,000 | 22% | 53,573 | 26% | 47,113 | 17% |
| 4. Upstream transportation and distribution | 5,215 | 1% | 247,000 | 4% | 3,322 | 1% | 253,000 | 5% | 7,377 | 4% | - | 0% |
| 5. Waste generated in operations | 1,146 | 0% | 16,000 | 0% | 501 | 0% | - | 0% | - | 0% | 1,690 | 1% |
| 6. Business travel | 4,117 | 0% | 3,000 | 0% | 6,505 | 3% | 26,000 | 1% | - | 0% | 4,380 | 2% |
| 7. Employee commuting | 7,320 | 1% | 33,000 | 1% | 869 | 0% | 36,000 | 1% | 15,782 | 8% | 6,290 | 2% |
| 8. Upstream leased assets | - | 0% | - | 0% | - | 0% | - | 0% | - | 0% | 11 | 0% |
| **Downstream Categories** | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | | **$tCO_2e$ p/a** | |
| 9. Downstream transportation and distribution | 341 | 0% | 737,000 | 12% | 22 | 0% | 0 | 0% | 0 | 0% | 122 | 0% |
| 10. Processing of sold products | 23 | 0% | | | 210 | 0% | 27,000 | 1% | 408 | 0% | 2,717 | 1% |

| | Resolute Mining[1] | | Newmont[2] | | Goldfields[3] | | Barrick[4] | | Northern Star[5] | | Perseus[6] | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 11. Use of sold products | - | 0% | - | 0% | 419 | 0% | - | 0% | - | 0% | - | 0% |
| 12. End of life treatment of sold products | 6 | 0% | - | 0% | - | 0% | - | 0% | - | 0% | 26 | 0% |
| 13. Downstream leased assets | - | 0% | - | 0% | - | 0% | - | 0% | - | 0% | - | 0% |
| 14. Franchises | - | 0% | - | 0% | - | 0% | - | 0% | - | 0% | - | 0% |
| 15. Investments | - | 0% | 2,115,000 | 36% | - | 0% | - | 0% | - | 0% | - | 0% |
| TOTAL: | 964,264 | | 5,906,000 | | 244,516 | | 4,835,000 | | 204,023 | | 275,853 | |
| Ratio of scope 3 to scopes 1 and 2 | 4.0 | | 1.7 | | 0.5 | | 0.7 | | 0.17 | | 1.1 | |

*Only 30% of northern stars suppliers provided data required for reporting and as such these figures are acknowledged as gross underestimates.
Sources:
[1] Resolute Mining – Scope 1, 2 and 3 GHG Emissions Calculations Methodology, 2020

[2] Newmont Resources – 2021 Climate Report

[3] Gold Fields – 2021 TCFD Report 2021 Update, 2021 Annual Report

[4] Barrick Gold Corp – 2021 Sustainability Report

[5] Northern Star – 2021 Sustainability Report

[6] Perseus Mining – 2021 Sustainability Report

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| Description | Prepared by | Reviewed by | Approved by | Approval date |
|---|---|---|---|---|
| Initial draft | MN, ZR | RH | RH | 29/06/2022 |
| Final version | MN, ZR | RH | RH | 15/07/2022 |

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