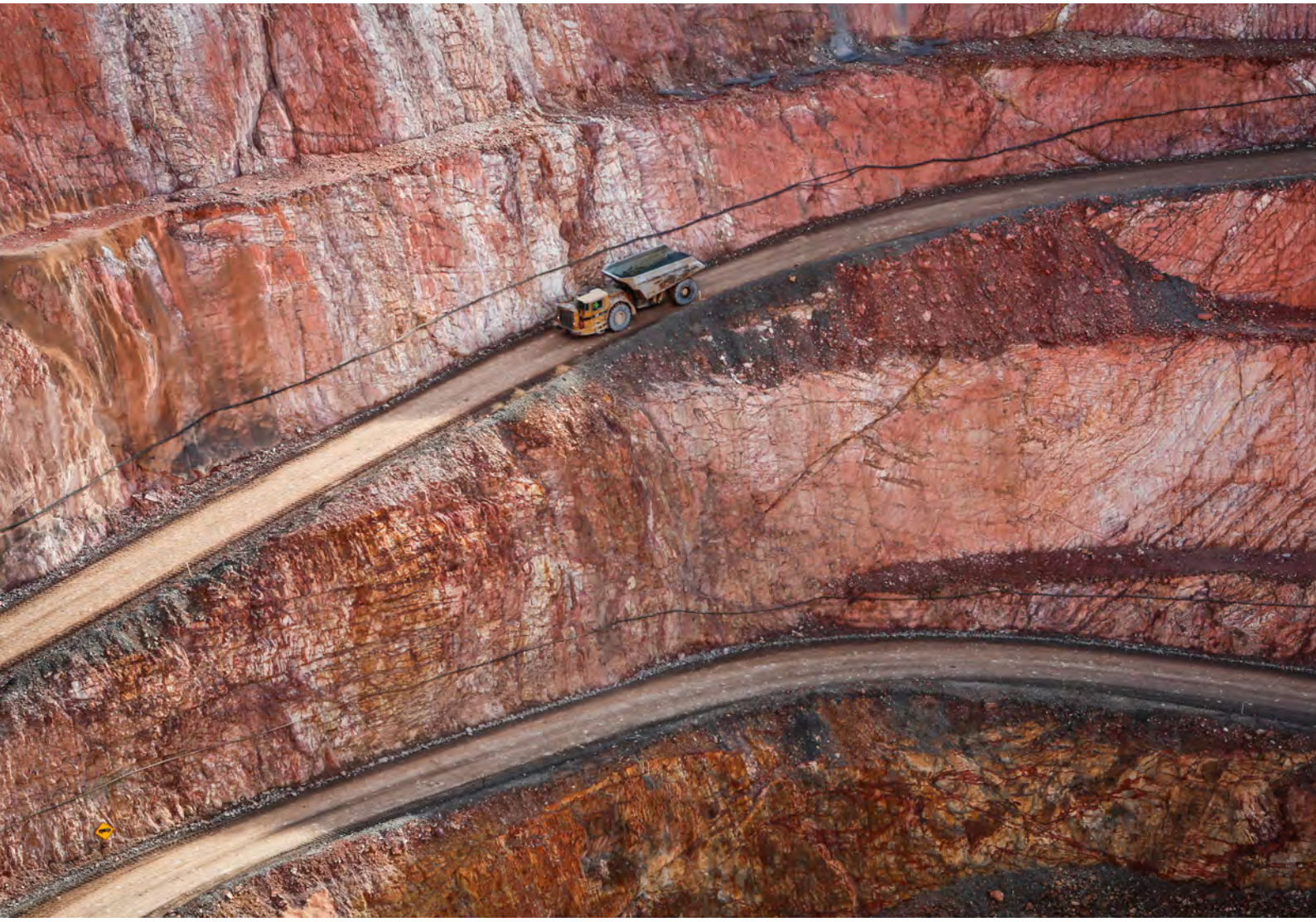
New Cobar Complex Project, State Significant Development (SSD10419)

Environmental Impact Assessment

Prepared for Peak Gold Mines
February 2021



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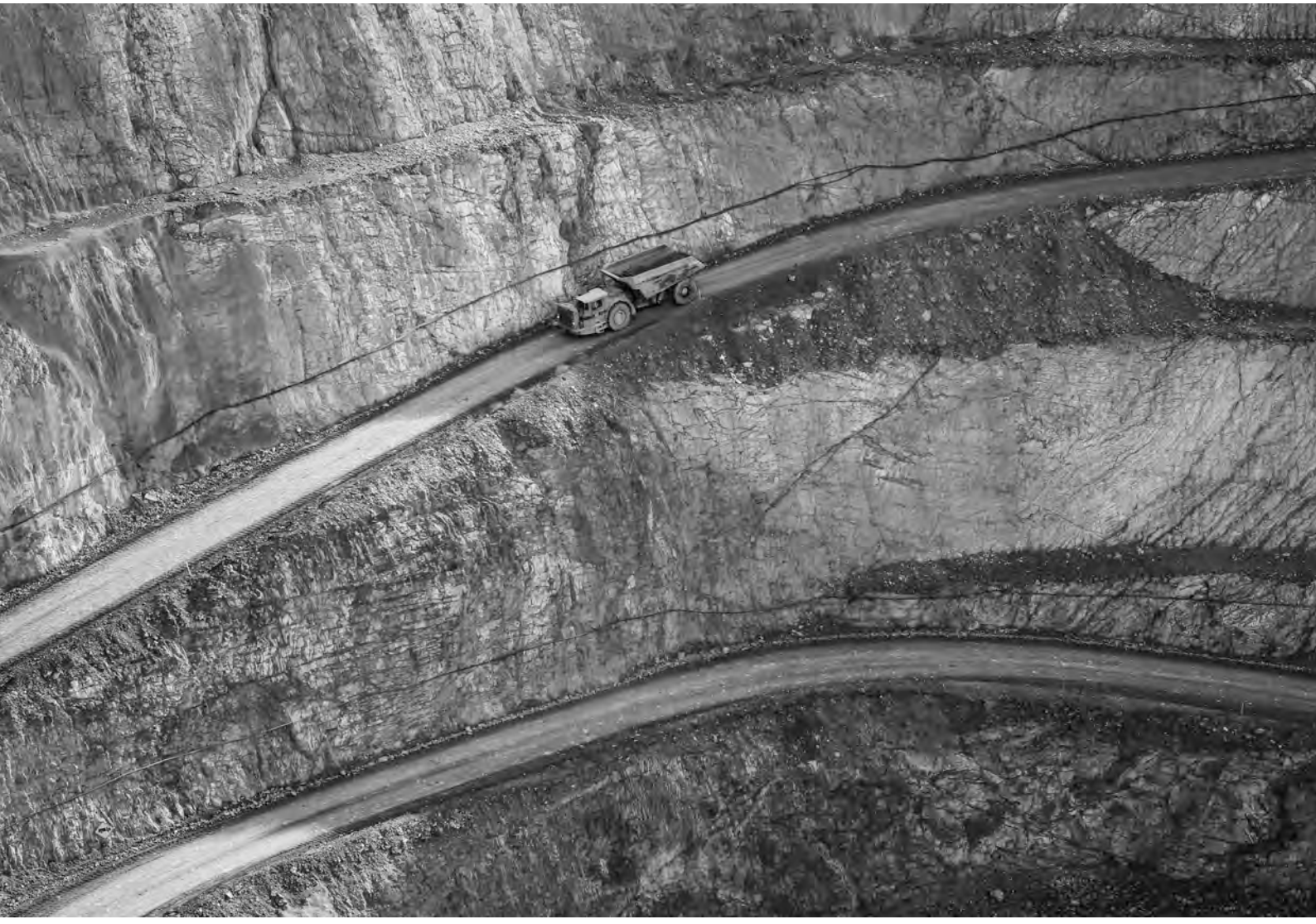

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15 Traffic and transport

15.1 Introduction

A traffic impact assessment (TIA) was completed by EMM to assess the potential traffic and transport impacts associated with the project. The TIA was prepared in general accordance with the relevant government assessment requirements, guidelines and policies.

The TIA is provided in full in Appendix M.

15.2 Assessment requirements

The SEARs require an assessment of the potential transport risks associated with the construction and operation of the project. The specific requirements related to traffic and transport are shown in Table 15.1.

Table 15.1 Traffic assessment requirements

Relevant authority and assessment requirement	Relevant section of the EIS
Details of traffic types and volumes likely to be generated by the project	Section 15.7
An assessment of the likely transport impacts of the development on the capacity, condition, safety and efficiency of the road network	Section 15.8
A description of the measures that would be implemented to mitigate and/ or manage any impacts, including any proposed upgrades, road maintenance contributions, and any other traffic control measures developed in consultation with the relevant road authority	Section 15.9

15.2.1 Methodology

The TIA was prepared generally in accordance with the requirements of:

- Guide to Traffic Generating Developments (RTA 2002).

The method and a detailed summary of assessment for the projects against key policy requirements, is contained in the TIA (Appendix M).

15.3 Existing environment

The New Cobar and Peak complexes are located south-east of the Cobar town centre. The New Cobar Complex is approximately 3 km south east of Cobar along the Kidman Way and Peak Complex is approximately 10 km south east of Cobar. The New Cobar Complex is zoned as Primary Production (RU1) by CSC and is well separated from the other residential, commercial and recreation areas in the vicinity of Cobar town centre.

Access between the two sites via the Kidman Way has the following travel distances:

- travel length along Kidman Way:
    - 6 km between the New Cobar Complex turnoff and the Peak Complex turnoff;

- length of internal roads from Kidman Way:
  - 200 m sealed and 300 m unsealed road from Kidman Way to the existing ROM Pad at the New Cobar Complex; and
  - 1.2 km sealed and 400 m unsealed road from Kidman Way to the existing ROM pad at the Peak Complex.

15.4 Key roads and intersections

A summary description of each of the key roads in this assessment is provided in Table 15.2-Table 15.4, and shown in Figure 2.2.

Table 15.2 Kidman Way (B87)

Road classification and connectivity	State road
Alignment	Generally north-south between Bourke (north) and Bundure (south)
Number of lanes	One lane each way
Carriageway type	Sealed road with 1 m road shoulder on both sides
Carriageway width	Generally 7 m with two travel lanes between the key intersections, each approximately 3.5 m wide
Posted speed limit	Generally 100 km/h and reduced speed at bends, south of New Cobar Complex, 90 km/h north of New Cobar Complex and 50 km/h closer to the Cobar Township
HV access	Road Train approved
Traffic function	Carries regional traffic and provides connectivity between townships

Table 15.3 Barrier Highway (A32)

Road classification and connectivity	State road
Alignment	Generally east-west between Nyngan (east) and Tarlee, South Australia (west)
Number of lanes	One lane each way
Carriageway type	Sealed road with 1 m road shoulder on both sides
Carriageway width	Generally 7 m with two travel lanes, each approximately 3.5 m wide
Posted speed limit	50 km/h in the Cobar central business district (CBD) area; 110 km/h in rural and straight sections
HV access	Road Train approved
Traffic function	Carries regional traffic and provides connectivity between townships

Table 15.4 The Peak Way

Road classification and connectivity	Private road owned by PGM
Alignment	Generally south-west and north-east between Kidman Way and the Peak Complex
Number of lanes	One lane each way
Carriageway type	Sealed road without road shoulder
Carriageway width	Generally 7 m wide with two travel lanes, each approximately 3.5 m
Posted speed limit	80 km/h near Kidman Way and 40 km/h near the mine
HV access	Yes
Traffic function	Carries mine related heavy and light vehicles

15.4.1 Key intersections

The key intersections assessed for the project are described as follows.

1. Kidman Way/New Cobar Complex access

This is a priority control intersection located approximately 2.4 km south of the junction of Kidman Way and the Barrier Highway. The intersection has a wide “turning path” geometry to accommodate HVs turning to and from the New Cobar Complex. Localised widening has also been done on the western side of Kidman Way for unimpeded access for northbound through-traffic travelling along Kidman Way. An informal truck rest area is provided on the western side of Kidman Way. At this intersection, the sight distances to the north and south are considered excellent with all existing and proposed HV movements occurring to/from the south.

2. Kidman Way/The Peak Way

This is a give-way controlled intersection located approximately 5.4 km south of the Kidman Way/New Cobar Complex intersection. This intersection also has a wide "turning path" geometry which was upgraded recently by PGM. Localised widening was done on the eastern side of Kidman Way to accommodate unimpeded southbound through-traffic movement along Kidman Way. Site observations and EMM video footage have confirmed that two opposing 35.4 m long road trains can execute turns simultaneously at ease at this intersection. At this intersection, the sight distances to the north and south along Kidman Way are considered excellent with existing and proposed HV access occurring to/from both the north and the south.

3. Kidman Way / power line construction access

As part of the project a new power line is proposed to be constructed. Construction vehicle access will occur via an unsealed road located approximately 1.8 km north of New Cobar Complex HV access road. No upgrade of the side road or intersection is proposed as the anticipated construction vehicle traffic will be relatively minor. The sight distances to the north and south are considered reasonable as the intersection lies on a straight section of Kidman Way.

15.4.2 Key road traffic volumes and heavy vehicles

Background daily traffic volume surveys for the Kidman Way are summarised in Table 15.5. This includes previous daily traffic volume survey data from an earlier mine EIS report in 2000, Roads and Maritime Service (RMS) daily traffic volume surveys in 2008, a CSC tube traffic count undertaken in 2013 and the latest EMM surveys in April 2020.

Table 15.5 Background daily traffic volume surveys for Kidman Way

Location	Year 1992*	Year 1996*	Year 1999*	Year 2008	Year 2013	Year 2020
South of the Barrier Highway	608	748	817	832		793
North of the Peak Complex access road					851**	830
South of the Peak Complex access road	150	170	269	201		232

Note *: in the earlier survey years the daily traffic volume was reported as 'axle pairs' not 'actual vehicles'
Note **: the count location was reported as being 10 km south of Cobar, but the volume indicates it was probably north of the Peak mine access.

The following proportions of HVs in daily traffic at various locations were also determined by the most recent EMM traffic surveys (April 2020):

- Kidman Way, south of Barrier Highway, 133 daily HVs => 17% of daily traffic;
- Kidman Way, north of Peak Complex access road, 125 daily HVs => 15% of daily traffic;
- Kidman Way, south of Peak Complex access road, 50 daily HVs => 22% of daily traffic;
- New Cobar Complex HV access road, east of Kidman Way, 20 daily HVs => 100% of daily traffic; and
- Peak Complex access road, west of Kidman Way, 81 daily HVs => 13% of daily traffic.

It should be noted that the above traffic volumes are lower than previous surveys undertaken at these locations. The reasons for the range in traffic counts is most likely due a combination of lower than average

mine-related HV traffic on the most recent survey day (April 2020) combined with lower than average levels of 'Grey-Nomad' camper vehicle tourist traffic using the Kidman Way due to COVID-19 travel restrictions in April 2020, compared to the levels occurring in previous years.

Other impacts of COVID-19 on traffic movements in and around Cobar in April 2020 are considered to have been minimal and have not resulted in significantly lower traffic volumes in comparison to the surveys in earlier years. However, in view of the relatively low long term traffic growth rate for traffic volumes on Kidman Way over the past 20−30 year period, no significant further background traffic growth is expected over the next 15 year period corresponding to the proposed mine life extension, which is between 2020 and 2035.

15.4.3 Intersection traffic volumes

Peak hourly traffic volumes were determined by a 24-hour traffic survey completed in April 2020 for the two relevant intersections. The respective peak hours for the two key intersections were as follows:

- AM peak hour:
  - 6 am to 7 am — Kidman Way/New Cobar Complex access; and
  - 6 am to 7 am — Kidman Way/The Peak Way.
- PM peak hour:
  - 6.45 pm to 7.45 pm — Kidman Way/New Cobar Complex access; and
  - 6.45 pm to 7.45 pm — Kidman Way/The Peak Way.

These peak hours were determined primarily by the workforce traffic movements which are concentrated around the two shift changeover periods of 6-7 am and 6-7 pm. Effectively zero truck traffic movements were recorded using the New Cobar Complex access road during these peak hour periods as the ore transport operation is typically conducted during daylight hours.

The surveyed intersection traffic volumes during the AM and PM peak hours are presented in Figure 15.1. The traffic data shows that there was more dominance of the northbound direction traffic movements (from Peak Complex to and from the Cobar direction) during both the AM and PM peak hours, with very few traffic movements travelling to and from the south via Kidman Way. The data collected most likely represents a typical day for peak hour traffic volumes.

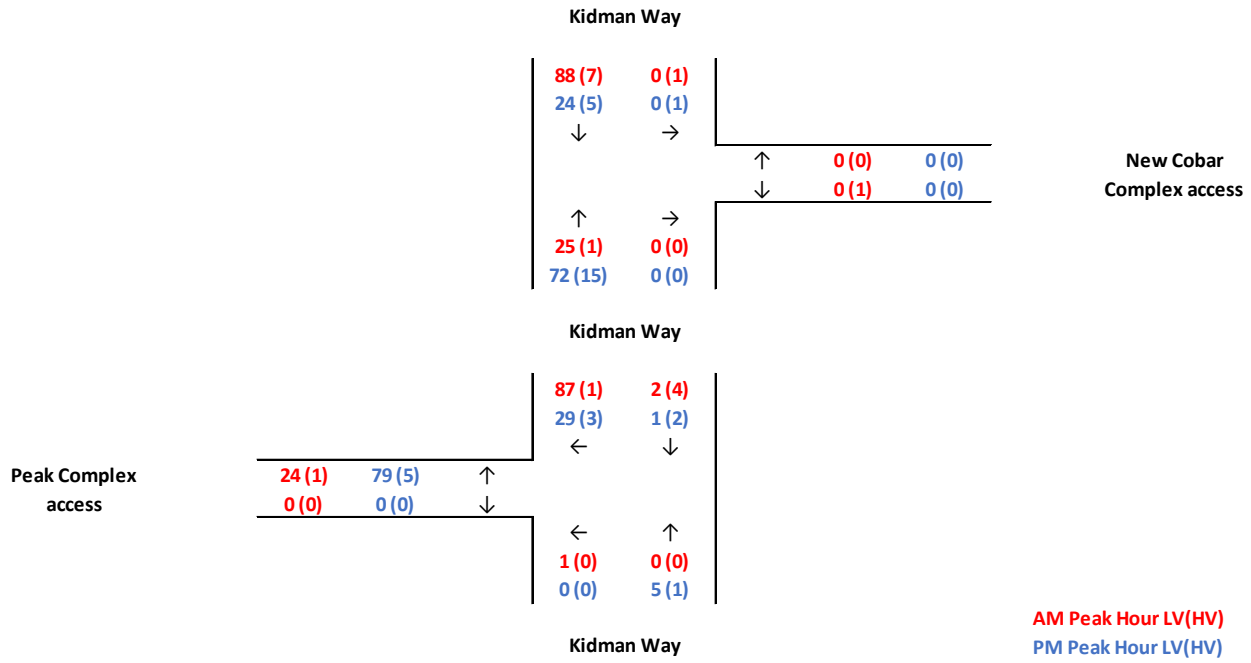


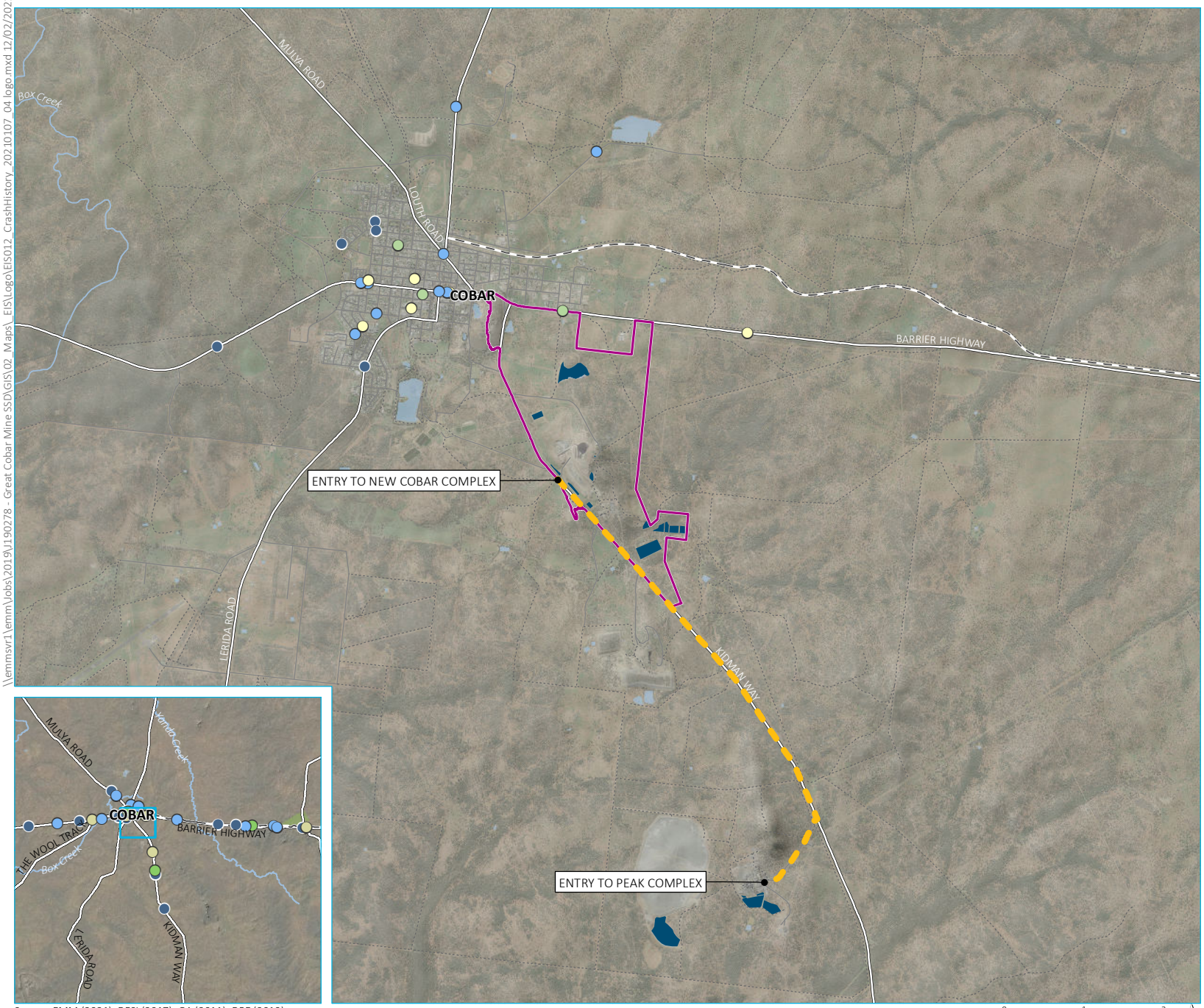
Figure 15.1 Existing traffic volumes

15.5 Crash analysis

Crash data from the TfNSW Centre for Road Safety interactive history database between 2014 and 2018 was studied for the Kidman Way, south of Cobar, as shown on the map in Figure 15.2. The crashes are categorised based on their severity as follows:

- fatal;
- serious injury;
- moderate injury;
- minor/ other injury; and
- non-casualty (eg towaway).

There were three crashes (including non-casualty-towaway accidents) in the five-year period on the relevant section of the Kidman Way south of Cobar in the vicinity of the mine sites. No crashes occurred on the 5.4 km section between the New Cobar Complex and Peak Complex accesses during the 5-year period.



Source: EMM (2021); DFSI (2017); GA (2011); DPE (2019)

Five-year crash history and ore transportation route

Peak Gold Mines
New Cobar Complex Project
Environmental impact assessment
Figure 15.2

15.6 Public and other transport

There are no public transport services along Kidman Way servicing the Peak Complex or New Cobar Complex. One school bus operates along Kidman Way between the periods 8.15-8.30 am and 3.15-3.30 pm, Monday to Friday in NSW school terms.

The Cobar to Nyngan railway line is a branch line from Cobar to the Main Western Railway Line at Nyngan. The line was completed in 1892 with passenger train services ceasing in 1976. Freight services continue to operate along this line.

Pedestrian and cycling infrastructure in the area is limited, reflecting the predominantly rural character of the area where passenger cars are the dominant travel mode. Within the Cobar township, pedestrian and cycling infrastructure is provided to a reasonable standard. The wide residential streets and flat landscape in the town offer safe and convenient cycling opportunities.

15.7 Project traffic

15.7.1 Traffic generation

Project activities at the New Cobar Complex will see an increase in the maximum roadtrain truck trips from 25 trucks per day to 50 trucks per day (or from 50 movements to 100 movements), averaged over a calendar year, for ore transportation to and from the processing facility at the Peak Complex during daylight hours only. The maximum additional peak hour truck traffic is estimated as 3 additional truck movements per hour for this activity on a typical weekday, however this will only be the case when the New Cobar Complex is at peak production between approximately 2026 and 2032.

Light vehicle movements for the transport of PGM employees will vary as workforce numbers ramp up and ramp down and are expected to peak in 2026/2027. However, these will not be new employees, and as such overall light vehicle movements on Kidman Way are not anticipated to increase significantly during this time.

The estimated likely traffic distribution of this traffic is presented in Figure 15.3.

15.7.2 Background traffic growth

As part of this assessment, CSC provided the results of a 27-day tube traffic count undertaken in 2013. The count was undertaken 10 km south of Cobar town centre on Kidman Way south of the Peak Complex. The results of the survey show that Kidman Way had an Annual Average Daily Traffic (AADT) of 851 vehicles at this location. The full set of results are presented in Appendix M.

Daily traffic volumes on Kidman Way have not significantly increased over the last twenty-year period. As a result, no further background traffic growth is expected for the Kidman Way between 2020 and 2035.

15.7.3 Construction traffic

A new power line will be required as part of the project. The power line construction may take up to six months and vehicles will access the construction work sites from an existing local road off Kidman Way, which is situated about 1.8 km north of New Cobar HV access. There will be minimal additional generated traffic during the identified AM or PM peak hours for this activity. Due to the low likely peak hourly or daily traffic numbers and the short duration of the construction traffic activity, no traffic impact assessment was undertaken for the power line construction traffic.

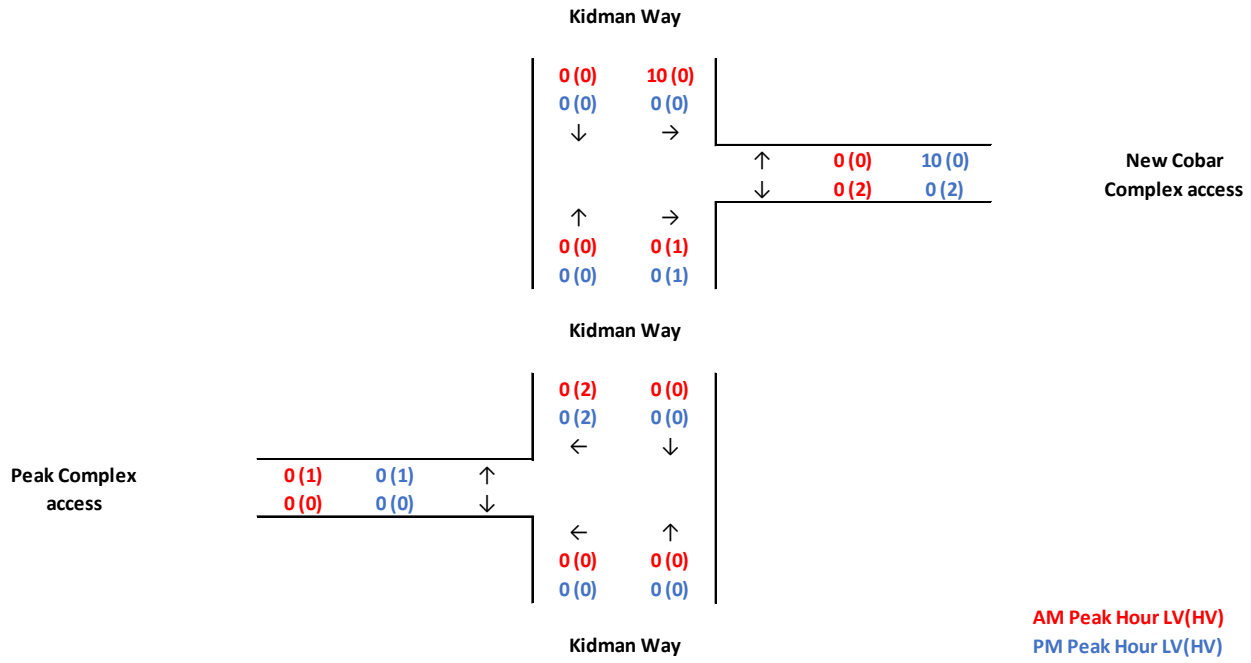


Figure 15.3 New Cobar Complex additional operations traffic

15.7.4 Parking

While overall truck movements will increase, trucks will be able to undertake the proposed movements without overlap. This means that trucks will not be required to park while they wait for other trucks to complete their movements. Therefore, there will be no requirement for additional truck parking at the New Cobar Complex.

The additional trucks will be based off-site overnight so there will be no requirement for any additional LV parking on-site for the truck drivers.

Construction workers for the power line construction, ventilation fan installation, emergency egress winder headframe and winder house and pad mounted transformer installation will park near the work sites for that activity.

15.8 Impact assessment

15.8.1 Intersection performance

The intersections were modelled with the SIDRA Intersection 8.0 software, a micro-analytical tool for individual intersections and linked intersection-network modelling. The modelling is based on the existing traffic survey data detailed in Section 15.4 and the development traffic data which is shown in Figure 15.1.

Level of service (LOS) is the main indicator of overall performance for individual intersections, with each service level summarised in Table 15.6.

Table 15.6 Intersection LOS standards

Level of service	Average delay (seconds per vehicle)	Traffic signals, roundabout	Priority intersection ('Stop' and 'Give Way')
A	<14	Good operation	Good operation
B	15 to 28	Good with acceptable delays and spare capacity	Acceptable delays and spare capacity
C	29 to 42	Satisfactory	Satisfactory, but accident study required
D	43 to 56	Operating near capacity	Near capacity and accident study required
E	57 to 70	At capacity. At traffic signals, incidents will cause extensive delays. Roundabouts require other control mode.	At capacity; required other control mode
F	>71	Unsatisfactory with excessive queuing	Unsatisfactory with excessive queuing; required other control mode

Source: RTA Guide to Traffic Generating Developments

The detailed SIDRA intersection analysis results for the project access intersections are presented in the complete TIA (Appendix M) with a summary of the results provided in Table 15.7 below. The results in Table 15.7 present the average delay for the longest delayed movement at a priority-controlled intersection. Usually the longest delay occurs for the right turning movement from a minor road to a major road.

Under both the existing and the proposed mine traffic conditions, both intersections have an A rated LOS for all approaches, with significant spare capacity (over 90%) and minimal traffic queuing on the minor road approaches. In addition, the existing passing bays already provided at both the New Cobar Complex and Peak Complex access intersections allow for uninterrupted through movements on Kidman Way (with an average delay of only 0.1 seconds on through movements).

Table 15.7 SIDRA results for existing traffic and proposed development traffic

Intersection	Peak hour	Scenario	DOS	LOS	Delay (seconds)
Kidman Way/New Cobar Complex access	AM	Existing	0.055	A	6.7
		Proposed	0.060	A	6.7
	PM	Existing	0.041	A	6.3
		Proposed	0.042	A	6.3
Kidman Way/Peak Complex access	AM	Existing	0.052	A	5.9
		Proposed	0.054	A	7.3
	PM	Existing	0.057	A	5.7
		Proposed	0.058	A	5.7

15.8.2 Mid-block capacity

The existing posted speed limit along Kidman Way is 100 km/h and the road is generally level in the locality of the two mine access intersections. The recent traffic count data in Section 15.4 shows that the northern section of Kidman Way has the highest traffic volume with predominantly mine related traffic using Kidman Way south of Cobar. South of the entrance to the Peak Complex, the daily and peak hourly traffic volumes along Kidman Way are much lower.

Kidman Way currently operates at a mid-block capacity LOS A and will continue at this level of performance with the proposed traffic associated with all development traffic associated with the expansion of the New Cobar Complex and related ore and waste rock transport operations. Therefore, no additional overtaking lanes or other road capacity improvements are required for Kidman Way.

15.8.3 Car and truck parking provision

Additional LV parking for proposed construction workers will be fully accommodated within the Peak Complex existing car park. The majority of employees will travel to the Peak Complex and then car-pool to the New Cobar Complex using company LVs, negating the requirement for any additional parking at the New Cobar Complex.

15.8.4 Impact on road safety

The proposed increases in daily and peak hourly truck traffic activity for ore transport will only occur along Kidman Way between the two complexes and increased construction traffic will only be occurring at the identified construction access intersection 1.8 km north of the New Cobar access intersection.

The additional traffic movements due to the proposed development traffic will represent a small amount of the current peak hourly traffic volumes using this section of Kidman Way and therefore is not expected to have any major impact on traffic safety.

15.8.5 Impact on public transport, pedestrians, and cyclists

There is negligible public transport or active transport infrastructure near the complexes along Kidman Way, therefore the existing facilities and services will not be impacted by the project.

15.8.6 Swept path assessment

Transportation will continue to occur by B-triple road trains up to a length of 35.4 m. Swept path assessments were undertaken to allow for these movements at the primary site access intersections.

The swept path assessments show that:

- New Cobar Complex HV access – simultaneous turning by opposing road trains will require a minor upgrade of the intersection through splaying of the corners by localised shoulder widening with compacted road base materials (see Figure 15.4). Conceptually, the dimensions of the widening (to be confirmed in detailed design) should be:
    - right turn from Kidman Way to New Cobar Complex – widening the shoulder by a maximum of 4 m at its widest point, tapering to existing for a distance of 26 m from the edge of the Kidman Way shoulder extending into the New Cobar Complex; and

- left turn from New Cobar Complex to Kidman Way – widening of the shoulder by a maximum of 3 m at the apex of the turning arc from the property boundary for a distance of 37 m to the asphalted surface of Kidman Way.

Given the low occurrence of this event, this treatment is considered a minor intersection upgrade.

- Peak Complex Access (intersection of Kidman Way and the Peak Way) – simultaneous turning by opposing road trains would require the use of road shoulders. The current road shoulders are sufficient for these movements to occur. There will be some overlap in the Peak Way but no impact on Kidman Way. Therefore, this intersection does not need any upgrade.

15.8.7 Road upgrade work

Minor intersection upgrade work as demonstrated in Figure 15.4 would be required at Kidman Way/New Cobar HV access intersection to allow for simultaneous HV movement at this intersection. The intersection at Kidman Way/The Peak Way does not require an upgrade.

15.9 Commitments and management measures

A traffic management plan (TMP) will be prepared to manage project traffic within the project area and the surrounding road network during construction and operation.

The TMP will identify and provide management strategies to manage the impacts to project related traffic, including:

- haulage of materials to and from the PGM sites via Kidman Way;
- the management and coordination of construction and other staff vehicle movements to and from site and measures employed to limit disruption to other motorists;
- strategies and measures employed to manage the risks of driver fatigue, road hazards and driver behaviour;
- an ore haulage Driver Code of Conduct; and
- load covering to reduce dust;
- additional warning signage requirements for truck traffic movements on Kidman Way during wet weather and/or other poor visibility conditions, eg dust storms.

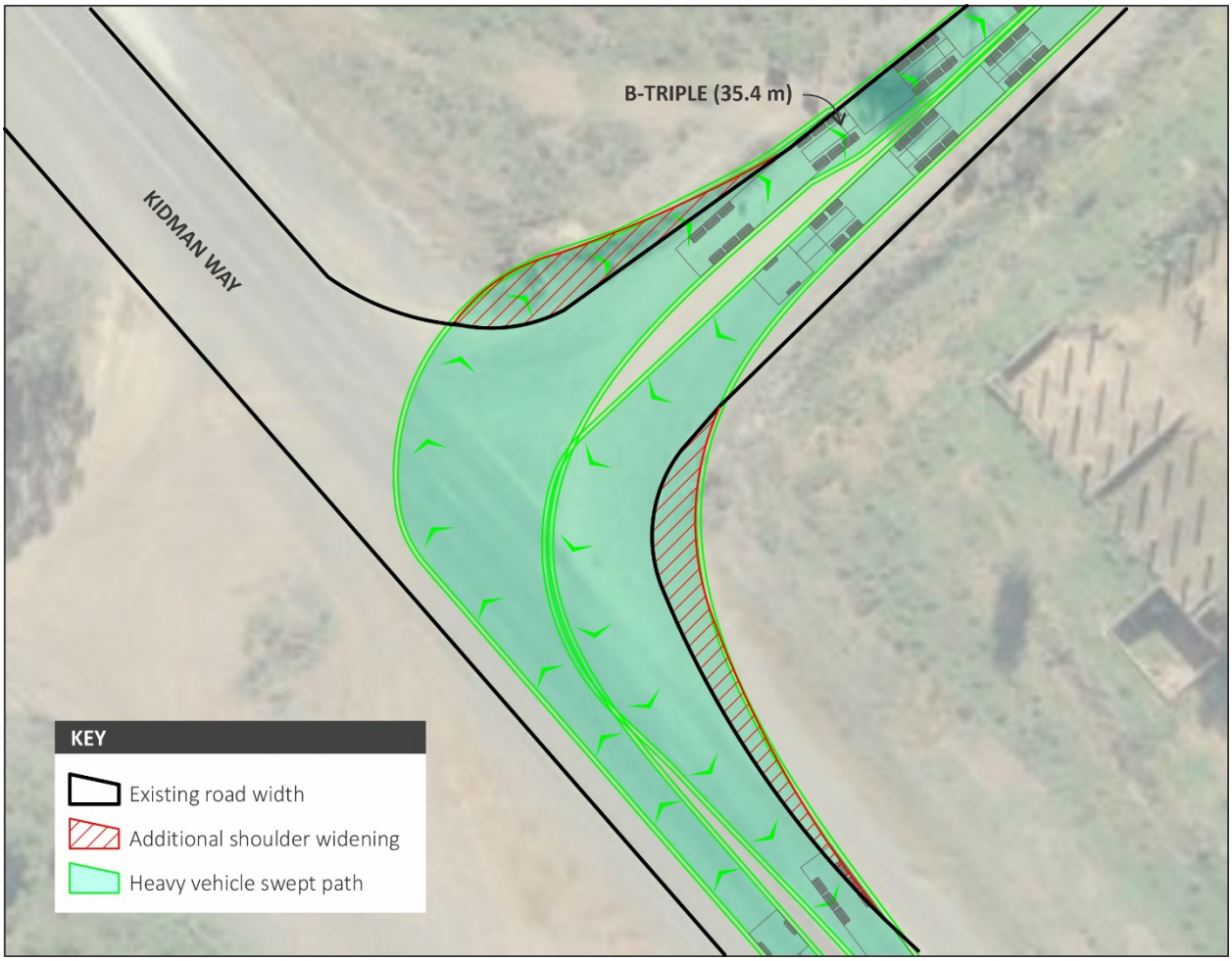


Figure 15.4 Concept New Cobar Complex heavy vehicle access intersection upgrade

15.10 Conclusion

The key findings of the TIA are as follows:

- A comparison between the traffic data in 2013 and 2020 shows that there was a small reduction in the daily traffic volumes along Kidman Way, between Cobar and the recorded proportion of HVs in daily traffic is now significantly lower in 2020, due to a combination of COVID-19 related factors and lower ore transport truck movements on the latest traffic survey day in April 2020.

- The project will require construction of a new power line, with all construction related vehicle access occurring via a separate access from Kidman Way located approximately 1.8 km north of New Cobar Complex.

The increased limit on daily ore transport movements would generate three additional HV traffic movements during the current traffic peak hours.

- All the identified site access intersections currently operate at LOS A with over 90% spare capacity. The increase in project related traffic would not change the existing intersection peak hour operating conditions (which would all remain at LOS A), or the peak hour mid-block level of service for general

traffic flow using the Kidman Way at all locations north of the Peak Complex access, which would also remain at LOS A.

- Swept path assessment shows a minor upgrade is required at the Kidman Way/ New Cobar Complex HV access intersection. The other intersections require no upgrade works.

Based on the above considerations, this assessment shows there will be minimal traffic impact due to the project.

16 Rehabilitation and closure

16.1 Introduction

A Rehabilitation and Landscape Management Strategy (RLMS) was completed by EMM to assess potential land resources and rehabilitation risks associated with the construction and operation of the project. The RLMS was prepared in accordance with the policies and guidelines set out in the SEARs.

The RLMS has been prepared recognising that once conditions of consent are available for the project to proceed, the existing MOP (Peak Gold Mines Mining Operations Plan, 1 August 2019 – 31 July 2022 (PGM 2020b)) which covers both the New Cobar Complex and the Peak Complex will be amended and submitted to the Resources Regulator for approval. The amended MOP will be generally consistent with the commitments relating to rehabilitation and closure outlined in the RLMS.

The RLMS is provided in full in Appendix N.

16.2 Assessment requirements

The SEARs included a requirement to assess potential land resources and rehabilitation risks associated with the construction and operation of the project. The specific requirements relating to land resources and rehabilitation related matters are provided in Table 16.1.

Table 16.1 Land resources and rehabilitation assessment requirements

Requirement	EIS response
Land Resources – include and assessment of:	
the likely impacts of the development on the soils and land capability of the site and surrounds;	Section 16.3.2vii
the likely agricultural impacts of the development including biosecurity risks;	Section 16.3.2vii
the likely impact of the development on landforms (topography), including the long-term geotechnical stability of any new landforms on site; and	The geotechnical risk of the proposed underground mine is addressed in Section 16.3.2i. No new landforms will result from the project.
An assessment of the compatibility of the development with other land uses in the vicinity of the development in accordance with the requirements of Clause 12 of the State Environmental Planning Policy (Mining, Petroleum Production and Extractive Industries) 2007, paying particular attention to the agricultural land use in the region.	Section 3.9
Rehabilitation and Final Landform – including:	
a detailed overview of the final land-use for the development, including the mine site and ancillary infrastructure;	Section 16.4
a description of final landform design objectives, having regard to achieving a natural landform that is safe, stable and non-polluting, fit for the nominated post-mining lands use and sympathetic with surrounding landforms; and	Section 16.5 however no new landforms will result from the project. The landform objectives described herein, therefore accord with the already approved and existing MOP

Table 16.1 Land resources and rehabilitation assessment requirements

Requirement	EIS response
the proposed rehabilitation and mine closure strategies for the site having regard to the key principles in the Strategic Framework for Mine Closure, including rehabilitation objectives, methodology, monitoring programs, performance standards and proposed completion criteria.	Sections 16.4-16.7 and Appendix N

In addition to above SEARs, Resources Regulator in its letter dated 15 January 2020 has raised additional requirements. Specific requirements relating to the request of the Resources Regulator are provided in Table 16.2.

Table 16.2 Agency project-specific assessment recommendations

Requirement	Section addressed
Post-mining land use	
a) Identification and assessment of post-mining land use options;	Section 16.5, section 16.6 and Appendix N
b) Identification and justification of the preferred post-mining land use outcome(s), including a discussion of how the final land use(s) are aligned with relevant local and regional strategic land use objectives; and	Section 16.5, section 16.6 and Appendix N
c) identification of how the rehabilitation of the project will relate to the rehabilitation strategies of neighbouring mines within the region, with a particular emphasis on the coordination of rehabilitation activities along common boundary areas.	The mines neighbouring the project are owned by PGM. There are no common boundary rehabilitation issues.
Rehabilitation objectives and domains	
d) Inclusion of a set of project rehabilitation objectives and completion criteria that clearly define the outcomes required to achieve the post-mining land use for each domain. Completion criteria should be specific, measurable, achievable, realistic and time bound. If necessary, objective criteria may be presented as ranges.	Section 16.8
Rehabilitation methodology	
e) Details regarding the rehabilitation methods for disturbed areas and expected time frames for each stage of the rehabilitation process;	Section 16.7 and Appendix N
f) Mine layout and scheduling, including maximising opportunities for progressive final rehabilitation. The final rehabilitation schedule should be mapped against key production milestone (ie ROM tonnes) of the mine layout sequence before being translated to indicative timeframes through the mine life. The mine plan should maximise opportunities for progressive rehabilitation.	The project will not result in the formation of new landforms. The proposed box cut will be backfilled at the completion of underground mining. There is no opportunity for progressive rehabilitation.
Conceptual final landform design	
g) Inclusion of a drawing at an appropriate scale identifying key attributes of the final landform, including final landform contours and the location of the proposed final land use(s).	The project will not result in the formation of new landforms. The existing landforms are the result of previous approvals and the landform attributes are provided in the approved MOP.

Table 16.2 Agency project-specific assessment recommendations

Requirement	Section addressed
Monitoring and research	
h) Outlining the monitoring programs that will be implemented to assess how rehabilitation is trending towards the nominated land use objectives and completion criteria;	Section 16.8.2
i) Details of the process for triggering intervention and adaptive management measures to address potential adverse results as well as continuously improve rehabilitation practices;	Section 16.3.2xii
j) Outlining any proposed rehabilitation research programs and trials, including their objectives. This should include details of how the outcomes of research are considered as part of the ongoing review and improvement of rehabilitation practices.	Section 16.8.2iii
Post-closure maintenance	
k) Description of how post-rehabilitation areas will be actively managed and maintained in accordance with the intended land use(s) in order to demonstrate progress toward meeting the rehabilitation objectives and completion criteria in a timely manner.	Section 16.7.5
Barriers or limitations to effective rehabilitation	
l) Identification and description of those aspects of the site or operations that may present barriers or limitations to effective rehabilitation, including:	
i) evaluation of the likely effectiveness of the proposed rehabilitation techniques against the rehabilitation objectives and completion criteria;	Section 16.8.2
ii) an assessment and life of mine management strategy of the potential for geochemical constraints to rehabilitation (eg acid rock drainage, spontaneous combustion etc.), particularly associated with the management of overburden/inter-burden and reject material;	Section 16.3.2i
iii) the process that will be implemented throughout the mine life to identify and appropriately manage geochemical risks that may affect the ability to achieve sustainable rehabilitation outcomes;	Section 16.3.2i
iv) a life of mines tailings management strategy, which details measures to be implemented to avoid the exposure of tailings materials that may cause environmental risk, as well as promote geotechnical stability of the rehabilitated landform; and	There are only historical tailings deposits with the project area. Management and rehabilitation strategies for historical tailings are discussed in Section 16.3.2i
v) existing and surrounding landforms (showing contours and slopes) and how similar characteristics can be incorporated into the post-mining final landform design. This should include an evaluation of how key geomorphological characteristics evident in stable landforms with the natural landscape can be adapted to the materials and other constraints associated with the site.	The proposal does not create any new landforms and the existing landforms such as the waste rock emplacement area was approved via a previous approval and are described in the approved MOP.
m) Where a void is proposed to remain as part of the final landform, include:	
i) a constraints and opportunities analysis of final void options, including backfilling, to justify that the proposed design is the most feasible and environmentally sustainable option to minimise the sterilisation of land post-mining;	The proposed Box Cut associated with the exhaust air rise will be backfilled. Management of the existing approved New Cobar open cut is unchanged and is discussed

Table 16.2 Agency project-specific assessment recommendations

Requirement		Section addressed
		in Section 16.4, section 16.6 and Appendix N.
ii)	a preliminary geotechnical assessment to identify the likely long term stability risks associated with the proposed remaining high wall(s) and low wall(s) along with associated measures that will be required to minimise potential risks to public safety; and	The project will not result in the construction of any permanent open cuts. The proposed Box Cut (associated with the exhaust air rise), will be backfilled at the completion of mining. The geotechnical stability of the proposed underground mine and existing New Cobar open cut is discussed in Section 16.3.2i
iii)	outcomes of the surface and groundwater assessments in relation to the likely final water level in the void. This should include an assessment of the potential for fill and spill along with measures required to be implemented to minimise associated impacts to the environment and downstream water users.	Section 16.3.2i
n) Where the mine includes underground workings:		
iv)	determine (with reference to the groundwater assessment) the likelihood and associated impacts of groundwater accumulating and subsequently discharging (eg acid or neutral mine drainage) from underground workings post cessation of mining; and	Section 16.3.2vi
v)	consideration of the likely controls required to either prevent or mitigate against these risks as part of the closure plan for the site.	Section 16.3.2vi
o) Consideration of the controls likely to be required to either prevent or mitigate against rehabilitation risks as part of the closure plan for the site;		A detailed risk assessment has been prepared for the existing, approved MOP, which is directly relevant to the project. A summary of the key risks and associated management and mitigation measures are provided in sections 16.3 and 16.4
p) Where an ecological land use is proposed, demonstrate how the revegetation strategy (eg seed mix, habitat features, corridor width etc) has been developed in consideration of the target vegetation community(s);		Sections 16.5, 16.4 and 16.7.2
q) Where the intended use is agriculture, demonstrate that the landscape, vegetation and soil will be returned to a condition capable of supporting this; and		Section 16.3.2vii
r) Consider any relevant government policies.		Section 16.2.1 and Appendix N

16.2.1 Methodology

The RLMS has been prepared with consideration of the following legislation, policies, guidelines and plans:

- *Mining Act 1992;*
- *Protection of the Environment Operations Act 1997;*
- Cobar Local Environmental Plan 2012;
- Guideline for mineral exploration drilling; drilling and integrity of petroleum exploration and production wells (NSW Department of Industry, Skills and Regional Development – Division of Resources and Energy, March 2016);
- ESG3 – Mining Operations Plan (MOP) Guidelines, September 2013 (NSW Department of Trade and Investment – Division of Resources and Energy, 2013);
- The Strategic Framework for Mine Closure (ANZMEC and MCA 2000);
- Mine Rehabilitation – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia 2006a); and
- Mine Closure and Completion – Leading Practice Sustainable Development Program for the Mining Industry (Commonwealth of Australia 2006b).

The method and a detailed summary of assessment for the project against key policy requirements, and best practice rehabilitation strategies is contained in the RLMS (Appendix N).

16.3 Environmental and socio-economic risk management

16.3.1 Overview

Identifying environmental, social and economic risks associated with rehabilitation and closure is essential for effective closure planning.

Key identified risks during the rehabilitation and closure phases include:

- potential for long term acid rock drainage due to the geochemistry of the ore and waste rock;
- not achieving the agreed post mining land uses on rehabilitated lands;
- failure of erosion and sediment controls;
- noise and dust nuisance;
- establishment and spread of weeds;
- hydrocarbons, chemicals and waste contamination;
- bushfire; and

- socio-economic considerations.

16.3.2 Environmental risk

i Geochemistry and geotechnical stability

Geochemical characterisation of waste streams was undertaken at the New Cobar Complex to understand the potential impact of the waste on the environment, rehabilitation and mine closure activities and the surrounding land users. A summary of project geochemistry is included in Appendix I.

All the New Cobar Complex deposits are in highly mineralised shear zones. The ore and waste rock produced are assumed to be PAF. Weathered and oxidised waste including waste from shallow borrows are generally assumed to be NAF.

A Waste Rock Management Plan (WRMP) was prepared by SLR for the Peak Complex, New Cobar Complex and historical Queen Bee Mine in March 2020 and is appended to the MOP (PGM 2020b). The WRMP details waste rock characterisation work undertaken to date and includes procedures and processes for characterisation of waste rock by project geological and engineering personnel. It also describes management and mitigation measures for the NAF and PAF waste rock material. The WRMP was submitted to the Resources Regulator in March 2020; no response has been received to date.

ii Waste rock emplacement

The WRE was constructed as part of the New Cobar Complex open cut development approved by CSC (LDA99/00:022 29 June 2000). It was constructed in three stages from the south extending to the north with the southern and western sections constructed from NAF waste rock from the upper benches of the open cut (NSR 2000).

The WRE emplacement has a total volume of approximately 2.4M m^3 (PGM 2020b). PAF waste rock will be preferentially used for backfilling of stopes in the underground mines. Some PAF may be used on the internal batters of the TSF at the Peak Complex for embankment lifts and NAF material used for the remainder of the TSF embankments and capping of the TSF. The total volume of waste rock required for the embankment lifts and capping of the Peak TSF is expected to be approximately 1M m^3.

The approved WRE landform is a traditional bench and batter design and much of the WRE has been rehabilitated. There is some rill and gully erosion on the northern and eastern slopes where vegetation cover is low, and channel banks have been breached. All runoff from these areas flows to on-site water management structures which do not discharge from site. PGM anticipates that reworking of the northern and eastern batters will be required to achieve nominated stability and rehabilitation criteria. PGM will undertake additional waste rock and soil characterisation, as well as erosion and landform evolution modelling to inform the WRE batter stabilisation and rehabilitation approach as part of ongoing progressive rehabilitation.

All runoff and seepage from the WRE is contained by a series of water retention structures (NC1, NC2 and NC3) which are monitored and maintained in accordance with the approved WMP incorporating an ESCP.

iii Run of mine pad

Mined ore from the underground mines is trucked to the surface and stockpiled on the ROM pad until it is loaded into trucks and transported to the Peak Complex for processing. The ROM was constructed as part of the New Cobar Complex open cut development from NAF waste rock from the open cut.

Runoff from the ROM pad flows to NC3 and NC4.

At the end of mine life it is anticipated that any ore or PAF material on the ROM pad will have either been processed or used to backfill underground stopes.

iv Open cuts

a New Cobar Complex open cut

The New Cobar Complex open cut and associated final landform was approved by CSC via LDA99/00:022 29 June 2000. It is approximately 100 m deep when measured from the top of Fort Bourke Hill with an overall wall slope of 30.9°. Groundwater modelling completed for the project identified that groundwater levels modelled for the underground operations will be below the floor of the open cut and therefore the pit will not result in groundwater ponding (Appendix I).

Subsidence modelling undertaken for the project (Appendix H) forecasts displacements of up to 50–60 mm in isolated sections of the open cut crests however it is considered that these sections have already broken off during blasting for the open cut and no longer exist. No significant displacement indicating multi-bench or wall scale instability is forecast.

Geotechnical monitoring of the open cut is undertaken by PGM in accordance with the approved GCMP (PGM 2017).

b Chesney open cut

The Chesney open cut is a historical shallow open cut that previously contained two mine shafts that were backfilled (pers.com. S Lloyd). Two ventilation stacks were installed during the backfilling process to provide ventilation to the underground mine workings (see Figure 2.1). As the open cut was excavated in oxidised rock material, there are no known sources of exposed PAF rock or acid mine drainage (AMD).

c Exploration decline

A new box cut and approximately 500 m-long service decline will be excavated at the northern end of the project area as part of the Great Cobar exploration decline. The box cut will be approximately 90 m long, 40m wide with a maximum depth of 20 m with wall slopes of 55 degrees. A 5 m (approximately) diameter ventilation shaft will be installed at the base of the service decline to act as an exhaust air rise. A second ventilation shaft, also approximately 5 m in diameter, will be installed north of the box cut which will be used as the fresh air intake for the project. These features have been approved, but not yet constructed.

At the end of mine life the shafts will be capped, and the box cut will be backfilled and the original land surfaced contours and Land and Soil Capability (LSC) class 6 re-established.

v Historical tailings

Mine tailings associated with the historical Chesney mine workings are located to the east of the existing administration building and car park. There are no known AMD issues with the tailings and any seepage or run-off from the tailings are contained by the Young Australia dams.

It is expected that the tailings will be either be remediated in place (if rehabilitation objectives can be met), excavated and processed at the Peak Complex or simply transported to the Peak Complex TSF for disposal.

vi Underground mine workings

Surface subsidence forecasts are very low (<15 mm) and are considered negligible. Geotechnical aspects of the proposed and existing underground mining are contained in Chapter 9: Subsidence.

Waste rock from the underground operations will be characterised and managed in accordance with the approved WRMP. Rock will be characterised by PGM engineering and geological personnel to be either PAF or NAF both visually and/or using hand-held x-ray fluorescence (XRF) analysis (PGM 2020b). Static testing will be undertaken of identified NAF waste rock for construction or rehabilitation purposes to confirm that it has potential for generation of AMD.

Waste rock from the underground mines will be selectively handled to facilitate:

- the preferential return of PAF waste rock underground for stope backfilling;
- transportation of PAF and NAF waste rock to the surface on a campaign basis for construction projects (PAF to be used on internal TSF wall raises only);
- transportation of NAF waste rock to the surface for storage in designated stockpiles with the WRE footprint for future construction and rehabilitation purposes; and
- transportation of PAF waste rock to the surface and stored within the existing WRE footprint if there is insufficient storage areas available underground.

Based on the findings of the groundwater assessment (Appendix I) no preventative or mitigating controls are required to manage the potential for acid mine drainage in underground workings.

vii Land and soil capability

A desktop assessment of LSC was undertaken for the project area. All proposed new land disturbances and the bulk of the existing land disturbances for the project will be on the Cobar Land System (OEH 2016). The Cobar Land System is strongly associated with red earths and lithosols on the lower slopes and drainage lines, with the upper slopes and residual hills characterised by acid red earths and earthy or sandy lithosols with variable outcropping rock, surface quartz and gravel. The existing New Cobar open cut, WRE and mine infrastructure areas are located within the Mineshaft Land System which is characterised by sandy and earthy lithosols grading to neutral red earths or alluvial soils within drainage lines.

Imagery of the project area potentially indicates the presence of areas of historical mine tailings within and adjacent to the project area that overlie the natural soils further limiting the LSC.

Field inspection of the project area reveals that the remains of current and historical mining activities are extensive, including the remains of former towns, stockpiles, dams, settling ponds, mining cuts, and a range of surrounding ancillary activities.

Overall, there appear to be few parts of the project area that are unaffected by previous disturbance in the form of vegetation clearance, settlement, historical and more recent mining activities, and this is likely to have had a significant effect on the soils within the project area. The disturbance associated with the proposed surface infrastructure is minimal and temporary and will only have a short-term impact on the historically impacted LSC.

At the end of mining, the ventilation fans and all associated infrastructure will be removed and the associated shafts capped and backfilled. The box cut will also be backfilled and the pre-mining LSC re-established.

PGM also has a program of capping and backfilling derelict mine shafts, reprocessing historical tailings (colloquially called ‘pinkie’ due to its colour)) and undertaking general rehabilitation on historical mining disturbances and essentially re-establishing some LSC on otherwise permanently impacted lands.

viii Soil chemical limitations

Previous soil sampling and analysis has determined the soils at the New Cobar Complex to have the following characteristics:

- texture – loamy sands with one clay loam;
- medium to slight acidity;
- low salinity;
- low plant available nitrogen;
- low to adequate plant available phosphorus; and
- elevated iron, lead, manganese and zinc levels.

In areas where historical mine tailings are present, the potential for AMD and associated elevated metals and salinity may have impacts on the success of revegetation.

ix Erosion and sediment control

Erosion hazard for the project area was determined using the procedure described in section 4.4.1 of Landcom (2004) which considers slope of the land and the rainfall erosivity. Results indicate a low erosion hazard. No further assessment of erosion hazard for natural landforms is therefore required.

The highest area of existing erosion hazard for the project area is the WRE (approximately 14.9% slope on outer batters). However this was assessed as part of the New Cobar Open Cut approval (LDA99/00:022). There is some rill and gully erosion present on the northern and eastern slopes of the WRE where vegetation cover is low and some of the channel banks have been breached. Runoff from this erosion is captured onsite in NC1, NC2 and NC3 limiting any potential impacts to the environment.

PGM will undertake progressive rehabilitation of the northern and eastern batters to achieve nominated stability and rehabilitation criteria. As part of this process, PGM will also undertake additional waste rock and soil characterisation, as well as erosion and landform evolution modelling during mining operations to inform the revised WRE batter stabilisation and rehabilitation approach.

x Weeds

Weeds will be managed in accordance with the PGM Biodiversity and Land Management Plan which will be updated for the rehabilitation and closure phases if necessary. Weed management measures will include but will not be limited to:

- if machinery to be used for rehabilitation is brought to the site from another site, and if there is a risk of weed seeds having been transported on the machinery, it will be washed down in an approved wash down area before entry to the project area;
- herbicide spraying or scalping weeds from soil stockpiles prior to re-spreading;
- rehabilitation inspections to identify potential weed infestations; and
- identifying and spraying existing weed populations together with ongoing weed spraying over the life of the project.

xi Hydrocarbons, chemicals and wastes

There is a low risk that land within the surface infrastructure area could be contaminated during de-commissioning (eg from hydrocarbon spills, storage of fuel and chemicals, refuelling activities, sewage, etc). To manage any potential contamination sources, waste management practices in accordance with the PGM environmental management system will continue to be implemented during rehabilitation.

There is a low risk that hydrocarbon spills may occur during recontouring, backfilling and soil spreading associated with rehabilitation (eg a burst hydraulic hose), but the impact would be isolated and spill-clean-up procedures would mitigate any potential impacts.

xii Contingency measures

A detailed rehabilitation risk assessment was undertaken as part of the approved MOP development. A TARP was developed based on the key outcomes from the risk assessment. The TARP identifies key risks or threats to rehabilitation success at the New Cobar Complex and details the risk treatment measures or contingency measures that will be undertaken to mitigate the identified risks.

The MOP and rehabilitation risk assessment will be updated following project approval to address any additional identified rehabilitation and mine closure risks.

The triggers identified in the TARP will be reviewed and updated (if necessary) following implementation of the rehabilitation monitoring programme and/or evaluation of the rehabilitation monitoring programme results in the Annual Review.

16.3.3 Socio-economic impacts

Community consultation has been, and will continue to be, key to project planning and understanding the project's potential impacts on the local community. Relevant stakeholders will be engaged in the rehabilitation and closure planning and implementation process, including in the development of a detailed closure plan as the project progresses towards completion. The closure plan will address socio-economic impacts at closure, post-mining land-use and rehabilitation objectives.

16.4 Rehabilitation domains

16.4.1 Overview

The project area is divided into a series of primary closure domains as described in the approved MOP, with each domain having similar bio-physical characteristics. These domains have been assigned in accordance with the requirements of the ESG3: Mining Operations Plan (MOP) Guidelines (DTI 2013) (the MOP guidelines).

16.4.2 Primary and secondary domains

Primary domains are based on land management units within the project area, usually with a unique operational and functional purpose during operation and therefore, have similar physical and geochemical characteristics that require management. The primary domains form the basis of conceptual closure and rehabilitation planning for the RLMS.

The secondary domains are the post-mining land-use domains and are characterised by similar post-mining land-uses. These domains form the basis of performance criteria used for measuring rehabilitation and closure success.

The primary and secondary domains for the project are derived from the existing approved MOP, summarised in Table 16.3 and shown on Figure 16.1 and.

For the purposes of the RLMS and this chapter, voids refer to areas of excavation associated with an open cut operation that will remain after project rehabilitation is complete.

Table 16.3 Primary and secondary domains

Primary domain	Project element	Secondary domain
1. Voids and portals	New Cobar open cut Chesney void Southern void Box cut void New Cobar portal	A – LSC class 6 grazing C – Final void (New Cobar open cut only)
2. Historical shafts	Gladstone and Tharsis shafts and other historical shafts	B – Modified ecosystem
3. Infrastructure	Workshop/Laydown Yard Administration Carpark Explosives magazine ROM Pad Haul roads Access roads Ventilation Fans Water Lines Bathhouse	A – LSC class 6 grazing
4. Water management	Spain's Dam Young Australia 2a, 2b, 2c, 2d dams Young Australia 1 dam Young Australia 3 dam Settling ponds 1 to 4 NC1 to NC4	D – Water management (Salty's, Spain's and Young Australia dams) A – LSC class 6 grazing
5. Mineral waste emplacement	Waste Rock Emplacement	B – Modified ecosystem
6. Tailings storage	N/A – located at Peak Complex	N/A
7. Other (disturbed land)	Historical tailings (Pinkie/ Chesney)	A – LSC class 6 grazing B – Modified ecosystem (Chesney tailings)
8. Processing Plant	N/A – located at Peak Complex	N/A
9. Stockpiled material	Soil stockpiles T15, T16, T17 and T18	A – LSC class 6 grazing

KEY

- Project area
- Rail line
- Major road
- Minor road
- Historical shaft*

Primary domain

- Voids and portals
- Infrastructure
- Water management
- Mineral waste emplacement
- Stockpiled material
- Other (disturbed land)

Secondary domain

- Final void
- Grazing unimproved pasture
- Modified ecosystem
- Water management

*Secondary domain: modified ecosystem

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Source: EMM (2021); DFSI (2017); GA (2011); DPE (2019); PGM (2020)

0 0.5 1 km

GDA 1994 MGA Zone 55

N

New Cobar Complex primary and secondary domains

Peak Gold Mines
New Cobar Complex Project
Environmental impact assessment
Figure 16.1

aurelia METALS Ltd.

EMM creating opportunities

16.5 Land use options following closure

The project area is currently consistent with the historical land-use of low intensity grazing and mining. Domains currently under agricultural land use (grazing) will be rehabilitated to this same land use.

All soil resources will be stripped from the footprint of the box cut, ventilation shafts, laydown area and access roads and preserved for future rehabilitation.

The existing New Cobar Complex open cut will remain a void as previously approved and will be a focal point for tourism. The existing New Cobar Complex WRE will have a modified ecosystem post mine land-use to protect the integrity of the capped PAF. The WRE will not be restored to a grazing land use as the slopes are too steep for grazing and stock pads may concentrate flow and damage the existing drainage structures.

There are some infrastructure areas associated with the project that may be able to provide an alternate beneficial post mining land use, such as:

- the mine infrastructure areas that may be used for industrial purposes; and
- a workshop that may be suitable for storage of agricultural or industrial machinery.

Such alternative options will be considered, along with any other identified options by PGM during operation of the mine as part of detailed closure planning, and in consultation with relevant stakeholders, including DPIE, the Resources Regulator and CSC.

16.6 Rehabilitation objectives

The rehabilitation objectives for the project are set out in Table 16.4.

Table 16.4 Rehabilitation objectives by primary domain

Primary domain	Project element	Objectives
1. Voids and portals	New Cobar Complex open cut Chesney void Southern void Box cut void New Cobar portal	Mine portals and voids are safe, stable and non-polluting. All infrastructure not required for the post-mine land use is removed, unless otherwise agreed with the landowner/land manager. Mining heritage values are preserved to facilitate tourism.
2. Historical shafts	Historical shafts	Final landforms are stable and do not present a risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Mining heritage values are preserved.

Table 16.4 Rehabilitation objectives by primary domain

Primary domain	Project element	Objectives
3. Infrastructure	Workshop/Laydown Yard Administration Carpark Explosives magazine ROM Pad Haul roads Access roads Ventilation Fans Water Lines Bathhouse	All infrastructure not required for the post-mine land use is removed, unless otherwise agreed with the landowner/land manager. Final landforms are stable and do not present a risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Proposed grazing post-mine land use does not preclude other beneficial post mine land use options.
4. Water management	Spain's Dam Young Australia 2a, 2b, 2c, 2d dams Young Australia 1 dam Young Australia 3 dam Settling ponds 1 to 4 NC1 to NC4	All infrastructure not required for the post-mine land use is removed. Dam walls to remain are stable and do not present an unacceptable risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Dam water quality is compatible with nominated post mine land use.
5. Mineral waste emplacement	Waste Rock Emplacement	Final landforms are stable and do not present an unacceptable risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. The vegetation structure of the rehabilitation is recognisable as, or is trending towards, the target plant community (PCT 72 White Cypress Pine-Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion as described within the NSW Vegetation Information System). Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable.
6. Tailings storage	N/A – located at Peak Complex	N/A

Table 16.4 Rehabilitation objectives by primary domain

Primary domain	Project element	Objectives
7. Other (Disturbed land)	Pinkie and historical Chesney	Final landforms are stable and do not present an unacceptable risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination on site that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Runoff water quality is compatible with nominated post mine land use. The vegetation structure of the rehabilitation is recognisable as, or is trending towards, the target plant community (PCT 72 White Cypress Pine-Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion as described within the NSW Vegetation Information System). Levels of ecosystem function have been established that demonstrate the rehabilitation is self-sustainable
8. Processing Plant	N/A – located at Peak Complex	N/A
9. Stockpiled material	Soil stockpiles T15, T16, T17 and T18	Final landforms are stable and do not present a risk of environmental harm to the receiving environment or safety risks to the public, stock and native fauna. There is no residual soil contamination on site that is incompatible with the final land use or that poses an unacceptable risk of environmental harm. Runoff water quality is compatible with nominated post mine land use.

16.7 Rehabilitation methods for closure

Full details of rehabilitation methods are presented in Appendix N.

16.7.1 Soil management

Stripping of relevant available soil resources will be undertaken prior to rehabilitation. As soils within the project area are generally shallow, soil stripping and stockpiling will involve disturbance and mixing of soil, and hence a reduction in soil stability and fertility can be expected. The amelioration of soils to ensure stability is likely to be required as rehabilitated areas will initially be completely bare of vegetation, with increased rates of runoff and erosion risk (particularly on slopes).

i Soil testing

Prior to stripping, soil sampling will be undertaken to determine if the soil requires amelioration to ensure the soils physical and chemical characteristics are within ranges necessary to address any erosion or revegetation constraints posed by the soils. Additional assessment of soil for the presence of weeds will be undertaken as part of soil sampling.

ii Clearing and grubbing

During the clearing and grubbing process stumps and roots ≥100 mm in diameter to a depth of 0.5 m will be removed and placed on the WRE to provide erosion protection and fauna habitat.

iii Soil amelioration

Soil testing as discussed previously will be undertaken to determine amelioration requirements and rates. Some ameliorants may be mixed in with the soil as part of the stripping operation, irrespective if the soil is to be placed in storage or directly applied to a rehabilitation area. Mine soils are typically ameliorated with agricultural gypsum to treat dispersion, and improve the structure, water holding capacity and agricultural lime to increase pH to improve nitrogen and phosphorous availability. Soil stockpiles will require amelioration and/or good mixing of the anaerobic and aerobic layers when returned to rehabilitated areas.

iv Soil stripping

All staff and contractors will be required to obtain the Permit to Dig/Disturb prior to clearing activities. The responsible environmental personnel or their delegate will advise on permits required and authorise permits prior to commencement of works.

The following process for stripping soil will be followed:

- the area to be stripped of soil will be clearly demarcated and surveyed;
- soil will not be stripped during excessively wet or dry conditions;
- as part of the planning process, sufficient area for stockpiling will have been identified and these areas will be accessible;
- as part of the planning process, temporary drainage, sediment control and structures to prevent erosion will be developed for the area if required; and
- grading or pushing soil into windrows with graders or dozers will be undertaken for later collection by trucks and front-end loaders.

v Soil stockpiling

A soil management plan is incorporated in the MOP, which identifies where the stripped soil is placed.

The following process for soil stockpiling will be followed:

- where possible, soil stockpiles will be located away from concentrated flow paths;
- sediment controls will be installed downstream from stockpiles to prevent contamination of clean water; and
- stockpiles will be limited to a maximum height of 3 m.

a Soil re-spreading

The following will be considered during soil re-spreading:

- soil requirements for rehabilitation areas will be balanced against stored stockpile inventories, proposed post mine land use and proposed stripping volumes;

- during the removal of soils from the stockpiles, care will be taken to minimise structural degradation of the soils; and
- material will be spread in even layers at an appropriate thickness to meet the rehabilitation goals of the area being rehabilitated. Further detail on rehabilitation methods are included in the MOP.

b Monitoring

The soil management process will be monitored through each step to ensure that the health of the soil is maintained, and the rehabilitation and biodiversity objectives can be achieved.

16.7.2 Establishment of vegetation

Vegetation species for rehabilitation purposes are anticipated to consist of:

- introduced and native pasture species for soil stockpile protection and rehabilitation for grazing purposes; and
- selected species that comprise the vegetation communities previously thought to be present within the project area, and within the Cobar Peneplain Bioregion:
  - White Cypress Pine-Poplar Box woodland on foot slopes and peneplains; and
  - Gum-Coolabah-Mulga open woodland on gravel ridges.

Seed for cover crop and pasture species will be obtained from commercial suppliers along with undertaking the collection of native seed. Given the limited availability of open woodland on site for seed collection and the significant reductions in seed viability that can occur when seed is stored, purchase of additional seed from commercial suppliers is anticipated.

Hand seeding is likely to be used on small areas or where machinery access is difficult such as soil stockpiles and backfilled historical mine shafts. Broadcast seeding is likely to be used to sow natives on the top of the WRE where gradients are flatter. This will be followed by harrowing using pasture harrows to lightly cover the seed with soil to ensure intimate soil contact. On the slopes of the WRE, native seed is likely to be sowed using a hydro-seeder followed by the application of a straw-based hydro-mulch and hydro-colloid binder to protect the seed and soil from rain and wind erosion.

Cover crops will be used with all seeding activities to provide erosion protection and minimise the potential for weed invasion.

16.7.3 Fauna and habitat enhancement measures

Bush rock and tree debris will be retained from land clearing and stripping activities for placement on the WRE to provide erosion protection and habitat enhancement for small invertebrates and reptiles.

Cleared timber may also be placed on the slopes on the contour and track rolled to ensure intimate soil contact and to minimize the concentration of flow under the timber.

16.7.4 Erosion and sediment control

An assessment of soil erosion hazard was undertaken for the proposed disturbance areas in accordance with the requirements of Landcom (2004). The WMP incorporating the ESCP for the project area (PGM 2016) will be revised to include the new proposed disturbance areas and submitted to DPIE for approval.

Erosion and sediment control for the existing project disturbances will be managed in accordance with the approved ESCP.

16.7.5 Post-closure maintenance

i Rehabilitation monitoring

Rehabilitation monitoring has been undertaken at the New Cobar Complex since 2011 using analogue sites and Landscape Function Analysis (LFA) to assess rehabilitation progress and success. Annual rehabilitation reports have been prepared, and a summary of these reports will be included in future Annual Review's following project approval.

Rehabilitation monitoring informs areas requiring maintenance and identifies and addresses deviations from the expected outcomes. Rehabilitated areas are assessed against performance indicators and regularly inspected for the following aspects:

- evidence of any erosion or sedimentation;
- success of initial establishment cover;
- natural regeneration of improved pasture;
- weed infestation (primarily noxious weeds, but also where rehabilitation areas are dominated by other weeds);
- integrity of diversion drains, waterways and sediment control structures; and
- general stability of the rehabilitation areas.

Where rehabilitation criteria have not been met, maintenance works will be undertaken.

ii Weed management

The spread of declared noxious weeds (and other invasive weeds that could impact revegetation success and/or plants that are undesirable to grazing stock) will be managed across the project area through a series of control measures, including:

- herbicide spraying or scalping weeds;
- post-mining use of rehabilitated areas as a working farm, with associated management practices; and
- rehabilitation inspections to identify potential weed infestations.

iii Access and public safety

Access tracks may be required to facilitate the revegetation and ongoing maintenance of the project. These tracks will be kept to a practical minimum and will be designated prior to the completion of the project.

Controls will be implemented to minimise the potential for impacts on public safety, and may include maintenance of fencing and warning signs around areas that have the potential to cause harm and that are accessible to the public including bunding and fencing of the void.

iv Rehabilitation resources

The PGM General Manager will be responsible for achieving the rehabilitation criteria. The MOP includes a structured and documented process for managing and improving rehabilitation activities at the mine. The plan will serve as a process map for interdepartmental administration of rehabilitation activities within the mine planning and implementation process.

16.8 Performance indicators and completion criteria

16.8.1 Rehabilitation criteria and reporting

Rehabilitation completion criteria are used as the basis for assessing when rehabilitation of the project is complete. Indicators are measured against the criteria, and are set for the six phases of rehabilitation, consistent with the MOP guidelines and the approved MOP as follows:

- Phase 1 – Decommissioning (ie removal of equipment and infrastructure);
- Phase 2 – Landform Establishment (ie land shaping);
- Phase 3 – Growth Medium Development (ie soil physical and chemical properties);
- Phase 4 – Ecosystem and Land Use Establishment (ie vegetation establishment);
- Phase 5 – Ecosystem and Land Use Sustainability (ie established vegetation is supporting post-mining land use); and
- Phase 6 – Land Relinquishment.

Whether rehabilitation criteria have been met depends on the trending of measurements over time compared to pre-mining or analogue site conditions. The criteria will be refined and confirmed in the amended MOP and in the detailed closure plan as the project progresses towards closure.

Further details regarding the respective rehabilitation criteria and post-mining land use objectives are provided in Appendix N.

16.8.2 Rehabilitation monitoring and research

i Monitoring methodology and frequency

As proposed rehabilitation works require the establishment of pastures and woodland areas, a combination of LFA and agricultural productivity analysis is an appropriate and generally accepted rehabilitation monitoring methodology for demonstrating the success of rehabilitation works.

Rehabilitation monitoring will continue to be undertaken annually during operations and for five years following mine closure. At this time, a review of the monitoring frequency will be undertaken based on the performance of the revegetation and an appropriate monitoring frequency determined. The frequency will be determined by a suitably qualified person(s) and in consultation with the relevant regulatory authorities. Informal monitoring of rehabilitation by mine environmental personnel will also be undertaken.

As detailed in the approved MOP, representative analogue sites have been established for grazing areas and modified ecosystem communities.

ii Rehabilitation monitoring

Permanent transacts and quadrats have been established for rehabilitation monitoring in analogue and some of the rehabilitation areas over time. These include permanent photo monitoring points. Additional rehabilitation monitoring transects, and photo monitoring points will be established as required.

The monitoring results are used to assess whether rehabilitation areas are on a trajectory towards a self-sustaining landscape.

For the modified ecosystem rehabilitation, various biodiversity components are assessed to monitor the successional phases/changes of plant development and to identify the requirements for ameliorative measures and guide adaptive management.

As large portions of the site will be returned to a grazing post mine land use, rehabilitation monitoring will also include indicators of grazing productivity such as:

- stock carrying capacity (DSE/ha);
- pasture crude protein levels;
- digestibility; and
- dry matter content.

iii Research and continual improvement

Knowledge of appropriate rehabilitation practices required to achieve the rehabilitation objectives is continually growing. PGM has and will continue to engage with industry specialists in the development of rehabilitation landform designs and techniques through the EIS development process and will consult with various experts as required during the operational, rehabilitation and closure phases of the project to address any rehabilitation and closure knowledge gaps.

16.9 Conclusion

The RLMS prepared for the project recognises that once conditions of consent are available for the project to proceed, the existing MOP (PGM 2020b), which covers both the New Cobar Complex and the Peak Complex, will be amended and submitted to the Resources Regulator for approval. The amended MOP will be generally consistent with the commitments relating to rehabilitation and closure outlined in the RLMS.

17 Visual amenity

17.1 Introduction

A landscape and visual impact assessment (LVIA) was completed by EMM to assess the predicted impacts of the project on visual amenity. The LVIA was prepared in accordance with the requirements set out in the SEARs.

17.2 Assessment requirements

The SEARs require an assessment of the likely visual impacts of the project. The specific requirements are provided in Table 17.1.

Table 17.1 Visual amenity assessment requirements

Agency Requirements	Location in chapter
DPIE	
• Visual – including an assessment of:	
– the likely visual impacts of the development on private landowners in the vicinity of the development and key vantage points in the public domain, paying particular attention to the creation of any temporary or permanent modification to the landscape;	Section 17.4 and 17.5 and Appendix O
– the lighting impacts of the development.	Section 17.5 and Appendix O

17.2.1 Methodology

The LVIA was prepared with consideration of:

- Guidelines for Landscape and Visual Impact Assessment (GLVIA 2013);
- Guidance Note for Landscape and Visual Assessment (AILA 2018);
- Standards Australia (AS4282) Control of Obtrusive Effects of Outdoor Lighting;
- Land and Environment Court's 2013 direction on the use of photomontages (http://www.lec.justice.nsw.gov.au/Pages/practice_procedure/directions.aspx).

Viewpoint analysis was further guided by Landscape Institute technical guidance notes (Landscape Institute 2018 and 2019).

The detailed methodology for the visual assessment is contained in the LVIA technical report (Appendix O).

17.3 Existing environment

The project area is part of the Canbelego Downs subregion of the Cobar peneplain bioregion. It is characterised by undulating plateau with low ridges and stony rises, underlain by metasedimentary and

sedimentary rocks, such as chert and slate. Topography on the older rocks around Cobar comprises residual hills, low rounded ridges, and stony slopes formed on softer, more weathered shales, phyllites and cherts, with only occasional features standing the plain (NPWS 2003).

Mining and mining related activities have played a significant role in shaping the post contact cultural landscape of the region, including within the project area. Much of the resultant mining relicts and landscape changes such as the Cobar sign and Fort Bourke Hill viewing platform are viewed by locals as being significant in their own right and are promoted as tourist attractions.

The landscape features of the locality are determined by physical, biological and social elements[1]. In combination they create distinct, recognisable and consistent patterns of elements that make one landscape different from another and often, conveys a distinctive 'sense of place'.

17.4 Visibility assessment

Visibility analysis mapping presented in Figure 17.1 was based on the visibility of both existing and approved (but not yet constructed) mine elements and proposed new surface infrastructure associated with the project. The mapping takes into account the surface screening of views by vegetation and buildings and gives an indication of where project elements will be visible from.

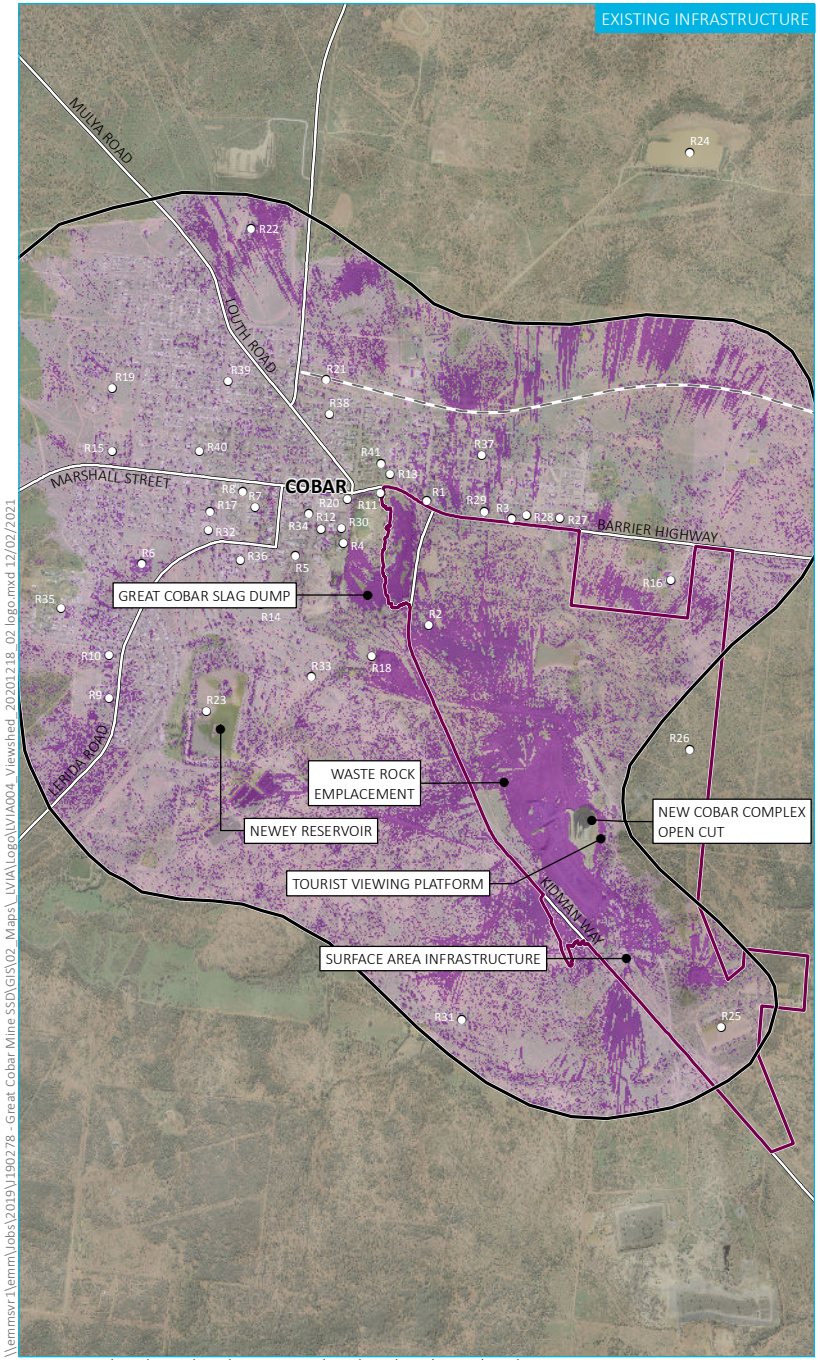
The following project elements were identified as having moderate to high visibility:

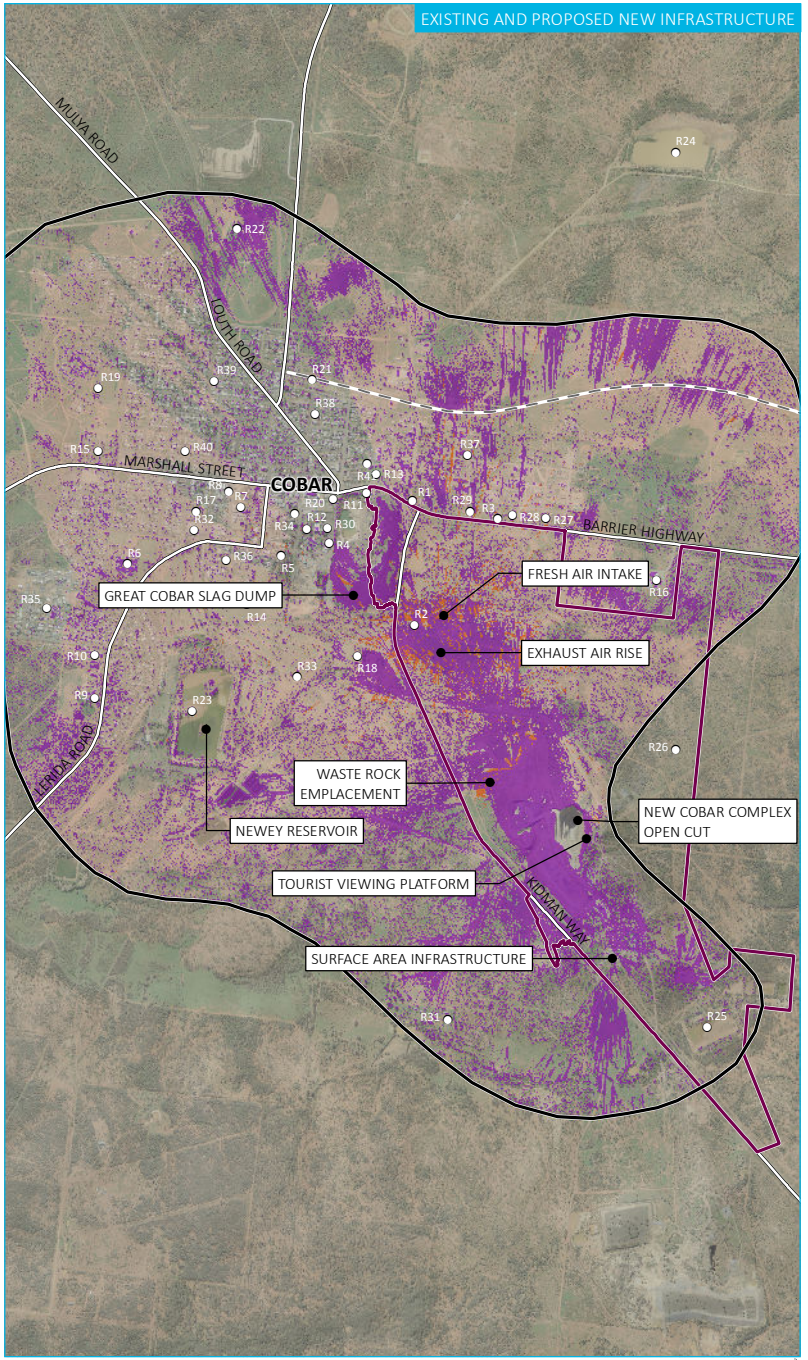
- Proposed emergency egress winder – this will be the tallest of the proposed elements with a height of approximately 14 m. Outside the project area, it is most prominent from public vantage points in the local setting (<1 km). The height and lattice structure, combined with its position in a low point within the landscape and surrounding vegetation mean that the structure will either be screened by foreground vegetation or blend with the background such that visibility is diminished. This structure will be a temporary feature in the landscape being removed at the end of mining. The proposed winder integrates well in the landscape, therefore the visual effect is low.

  WRE – this is an existing, permanent modification to the landscape and is prominent in both the local and sub-regional settings (1-5 km) where it appears as a flattened plateau. The WRE integrates moderately well in the landscape, therefore the visual effect is moderate.

The existing surface infrastructure area (including the New Cobar open cut) where the majority of the New Cobar Complex infrastructure is located has limited visibility from sensitive receivers as a result of terrain and topography and vegetation shielding any views. Therefore, the visibility of the of the surface infrastructure area is negligible and is not considered further for the purpose of this impact assessment.

[1] physical elements – include terrain, topography and waterways; biological elements include vegetation and vegetation cover; social elements include land use and cultural significance.





KEY

- Project area
- Significant potential view zone
- Sensitive receiver
- Rail line
- Major road

Existing infrastructure

- Visible project infrastructure - accounting for shielding features in the landscape
- Visible project infrastructure - bare earth surface

Proposed new infrastructure (only)

- Visible proposed project infrastructure - accounting for shielding features in the landscape
- Visible proposed project infrastructure - bare earth surface

Source: EMM (2021); DFSI (2017); Aerometrex (2020); GA (2011); PGM (2019)

0 1 2 km

GDA 1994 MGA Zone 55

N

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Visibility analysis

Peak Gold Mines
New Cobar Complex Project
Environmental impact assessment
Figure 17.1

aurelia METALS Ltd.

EMM creating opportunities

17.5 Impact assessment

Visibility analysis mapping demonstrates that the emergency egress winder will be potentially visible up to 5 km away. However, due to the size and mass of the structure and the presence of vegetation, it will be largely indistinguishable at distances beyond 2 km.

The structure will be in keeping with other elements of the historical and contemporary mining landscape and will not look out of place in a landscape that has evolved as a result of over 150 years of mining and related activities. Therefore, the visual impact of the emergency egress winder will be negligible and is not considered significant for the purpose of this impact assessment.

The WRE is an (already) approved feature of the landscape since open cut mining began at the New Cobar Complex in 2000. The project proposes no change to the existing approved location and form of the structure. In line with current approvals, the WRE will remain after mining has ended. The WRE is subject to ongoing rehabilitation as outlined in the MOP. The WRE is visible from much of the local and sub-regional setting as an elevated, flattened plateau rising above the surrounding plain. In its present form, because of the flattened plateau, the lower levels of vegetation establishment when compared with Fort Bourke Hill and the contrasting colour of the exposed rock material, the visual impact is moderate. With rehabilitation and revegetation, this would be reduced to slight/moderate (not significant).

17.5.1 Photomontages

The visual impact of the project has been demonstrated by a number of photomontages from relevant viewpoints prepared for three of the seven viewpoints assessed in the LVIA (Appendix O). Photomontages show what can be seen in the existing landscape setting as well as different timeframes in the future project timeline.

Photomontages show the project elements at the end of construction (year 1), 5 years after the end of construction and at the end of mining. The location of photomontages and the direction of the image is presented in Figure 17.1. Full resolution copies of the photomontages are included in Appendix O.

i Viewpoint 2 – looking north-west from Filtration Plant Road

This viewpoint shows the location of the exhaust air rise and fresh air intake and the proposed emergency egress winder frame, winder house and power line located to the north of Filtration Plant Road. This is representative of views for motorists travelling to and from Fort Bourke Hill. Views are static when stopped, however most motorists would be likely to experience this transient view at the posted speed of 80 km/hr.

The lower structures (winder house, power line and fresh air intake) are screened by foreground vegetation, with the winder frame rising slightly above the surround vegetation but being blending in with background vegetation. Plate 17.1 and Plate 17.2 show images of these elements in different timeframe scenarios.

Plate 17.1 Photomontage for Viewpoint 2 – existing

Plate 17.2 Photomontage for Viewpoint 2 – year 1

ii Viewpoint 4

This viewpoint shows the location of the proposed emergency egress winder frame, winder house and power line, situated to the east of Kidman Way. The viewpoint is situated at the driveway to a house owned by PGM from Kidman Way. This viewpoint is representative of views for motorists travelling along Kidman Way which at this point is used to access Fort Bourke Hill, to access the Rugby Club, CSC infrastructure (filtration plant and sewage treatment plant), for local mine traffic, local traffic associated with rural properties and long-distance trucks travelling north/south. Views are static when stopped, however most motorists would experience this transient view at the posted speed of 90 km/hr.

The lower structures (winder house, power line and fresh air intake) are screened by foreground vegetation, with the winder frame rising above the vegetation line and extending into the skyline.

Plate 17.3 and Plate 17.4 show images of these elements in different timeframe scenarios.

Plate 17.3 Photomontage for Viewpoint 4 – existing

Plate 17.4 Photomontage for Viewpoint 4 – year

iii Viewpoint 6

This viewpoint is representative of view towards the project area from vacant land on the northern edge of Cobar. Views are toward the existing WRE (~2.2 km) and the emergency egress frame (~1.3 km). The sparsely vegetated WRE is noticeable against the skyline as a flattened plateau to the right (west) of Fort Bourke Hill. The lack of woody vegetation on the upper slopes of the WRE does little to screen or visually break up landform.

The RLMS (Appendix N) identified that the western slope of the WRE (facing Kidman Way) has well established vegetation (especially on the lower slopes) and the northern and eastern slopes of the WRE will undergo further revegetation. Over time, this will break-up the skyline above the WRE plateau and vegetation will soften the appearance of the exposed or lightly vegetated slopes which contrast in colour with the surrounding vegetation.

The egress winder frame and power line will not be visible due to buildings and vegetation screening the proposed infrastructure. Plate 17.5 to Plate 17.8 show images of these elements in different timeframe scenarios, where the establishment of vegetation is noticeable over time.

Plate 17.5 Photomontage for Viewpoint 6 – existing

Plate 17.6 Photomontage for Viewpoint 6 – year 1

Plate 17.7 Photomontage for Viewpoint 6 – year 5

Plate 17.8 Photomontage for Viewpoint 6 – end of mine

17.6 Commitments and management measures

17.6.1 New infrastructure

As with all existing infrastructure, the proposed emergency egress winder and headframe will be removed at the end of the project. As these will not have a significant visual effect, no mitigation treatments are proposed.

17.6.2 Rehabilitation of post closure landform

The progressive rehabilitation implemented as part of the MOP will result in the slopes of the WRE undergoing further revegetation with the planting mix in keeping with existing PCTs. WRE revegetation will be analogous to White Cypress Pine-Poplar Box woodland on footslopes and peneplains mainly in the Cobar Peneplain Bioregion (PCT 72). PCT72 grows to about 14 m in height in natural conditions. It is expected that the revegetation of the WRE will achieve a similar height and structure. Upon maturity, this will break-up the skyline above the WRE and vegetation will soften the existing exposed/lightly vegetated slopes which contrast in colour with the surrounding vegetation. Progressive replanting of the WRE slopes is ongoing and will continue through the life of the mine.

The overriding objective of rehabilitation activities is that disturbed land at the New Cobar Complex will be returned to a condition that is safe, stable, non-polluting and supports the proposed post-mining land use, which is primarily grazing on improved pasture. This is outlined in Chapter 17 and the RLMS (Appendix N). The surface infrastructure area is on land currently zoned for agriculture, and it is therefore anticipated that it will be rehabilitated and revegetated to land suitable for grazing.

17.6.3 Lighting

Existing significant night-time lighting at the locality is from the town of Cobar. Lighting appears as a diffuse glow against the night sky. Project lighting has the potential to have a visual impact and become a focal point in night skies associated with rural lands to the south of the mine away from Cobar town.

Australian Standard 4282(AS4282) Control of Obtrusive Effects of Outdoor Lighting sets out guidelines for the control of obtrusive effects of outdoor lighting and gives recommended limits for relevant lighting levels to limit these effects within tolerable levels.

As an underground mining operation, lighting is kept to the minimum required for safe operation. Lighting at the New Cobar Complex is typically directed inwards to the site infrastructure area and significantly shielded from Cobar by terrain and vegetation.

Existing lighting associated with the surface infrastructure will remain throughout the life of the project and is not likely to change. Much of the present lighting visibility is associated with diffuse (non-direct) lighting visibility resulting in night glow, however this is minimal when viewed from Cobar town.

Kidman Way is a significant HV haulage route with a significant daily and nightly HV movement. Current and proposed truck movements associated with the New Cobar Complex only occurs during daylight hours, therefore impact from vehicle lighting will occur. LV movements within the New Cobar Complex and between the Peak Complex and the New Cobar Complex will continue to occur at night. Within the New Cobar Complex the movement of vehicles is not visible to receivers in Cobar on account of the screening effects of terrain and vegetation. Additional night-time LV use of Kidman Way will not be significantly greater than existing movement patterns.

The emergency egress winder and winder house will have motion-sensor lighting installed for safety purposes, however this will only be illuminated when in use during emergency situations or when maintenance is required.

If community complaints regarding lighting are received, these will be investigated and a light spill assessment undertaken if needed.

17.7 Conclusion

Cobar is the administrative centre of Cobar Shire and a regionally important town with a rich mining heritage. Mining still contributes significantly to the local economy and the community has always considered Cobar to be primarily a mining town. The proposed project elements will be in keeping with the existing landscape and associated socio-cultural expectations.

The visual impacts as a result of the project will not be significant. The proposed new surface elements have a slight to slight/moderate visual effect, will be removed from the landscape at the end of mining and will not be visibly significant. The WRE is an already approved and established landscape feature, and its visual impact on the landscape will reduce over time as further rehabilitation takes place. This landscape feature will remain post mining with a visual effect of slight/moderate and is not visibly significant.

The lighting arrangement at the New Cobar Complex will not change. Lighting cannot be directly seen from the town due to building and vegetation screening. Project related light glow is minimal, and lights are effectively directed so as to avoid unnecessary light impacts. Motion sensitive lighting will be required for safety purposes at the emergency egress winder house and headframe, however this would only be used during night-time emergency situations or maintenance.

The visual impacts associated with the constructed mine elements will be temporary and cease at the end of mining. At the end of mine life all elements will be removed and the surface recontoured as necessary and the area returned to the uses outlined by the rehabilitation plan. The New Cobar Complex open cut and WRE, the prominent features of views from Fort Bourke Hill, which is an established tourist attraction will remain, reinforcing Cobar's mining identity. The WRE will undergo further rehabilitation and revegetation at the end of mining to improve its integration in the local landscape.

18 Hazards, risk and public safety

18.1 Introduction

A hazard, risk and public safety assessment (HRPSA), bushfire hazard assessment and geochemistry review were completed by EMM to assess potential safety impacts to the local community associated with activities and hazardous materials associated with the project.

Geotechnical and subsidence impacts as a result of the project were assessed by Beck Engineering and are discussed in Chapter 9. Health impacts relating to dust emissions were assessed by SLR Consulting and are discussed in Chapter 10.

The HRPSA is provided in full in Appendix P, with the bushfire hazard assessment included as appendices to that report. The geochemical review is included as an appendix to the GIA included as Appendix I.

18.2 Assessment requirements

The SEARs require an assessment of the likely hazard and public safety impacts of the project. The specific requirements relating to human health are provided in Table 18.1.

Table 18.1 Hazard, risk and public safety assessment requirements

Authority comments	EMM responses
DPIE Key issues	
Hazards: - including an assessment of the likely risks to public safety, paying particular attention to potential subsidence risks, geochemical risks, and the handling, transport and use of any dangerous goods, in accordance with State Environmental Planning Policy No. 33 – Hazardous and Offensive development;	Subsidence is addressed in Chapter 9. Geochemical risks are addressed in Section 18.5 and Appendix I. The handling, transport and use of dangerous goods is discussed in Sections 18.3 and 18.6 and Appendix P.
The EIS must take into account the following environmental planning instruments, policies, guidelines and plans: - Planning for Bush Fire Protection 2006 (RFS)	Bushfire hazards are addressed in Section 18.4 and Appendix P.

18.2.1 Methodology

The full methodology for this assessment is contained in the hazard, risk and public safety assessment technical report (Appendix P).

i Hazardous materials

Potentially hazardous or offensive development is defined in State Environmental Planning Policy No. 33 – Hazardous and Offensive development (SEPP 33) as development which poses a significant risk to, or which would have an adverse impact on, human health, life, property or the biophysical environment, if it were to operate without employing any control measures.

The types and volumes of hazardous materials to be used as part of the project were assessed against thresholds set out in Applying SEPP 33 (DoP 2011) to determine if they were exceeded, and therefore whether the project would be classed as an offensive or hazardous development.

ii Bushfire hazard

The bushfire hazard assessment was undertaken in accordance with the guidelines set out in Planning for Bushfire Protection 2019 (PBP 2019) prepared by the NSW Rural Fire Service and included a review of existing and proposed infrastructure and activities.

iii Geochemical hazard

Successful implementation of mine ore and waste material management and rehabilitation strategies relies on a comprehensive understanding of the geochemical risks of the material involved. The geochemistry review was conducted as a desktop technical study and included a review of existing geochemical information and current mine waste management plans.

18.3 Hazardous materials

The bulk hazardous materials that will be used by the project are explosives. Diesel will also be used by the project but is not considered a hazardous material for the purposes of SEPP 33. Diesel and explosives will continue to be stored at the surface infrastructure area and magazine, respectively.

It is noted that the New Cobar Complex is an existing mining precinct and as such, the hazardous materials discussed in this chapter are already stored on-site, in compliance with requirements from SafeWork NSW and WorkCover NSW. The quantity of hazardous materials required on-site is not expected to increase as a result of the project.

18.3.1 Combustible liquids: diesel

Diesel is stored at the New Cobar Complex in an above ground bunded tank at the surface infrastructure area. The maximum storage capacity of the tank is 55,000 L; however, approximately 40,000 L is typically stored within the tank at any one time. Diesel will continue to be stored and handled on-site in accordance with AS 1940:2004. No flammable liquids are stored on site.

18.3.2 Explosives

Explosives are stored at the New Cobar Complex in an external magazine (storage IDs 1N and 2N). The maximum storage capacity of storage 1N is 50,000 kg or 50 t with a typical storage quantity of approximately 40,000 kg or 40 t ammonium nitrate emulsion. The maximum storage capacity of storage 2N is 7,500 kg or 7.5 t of ammonium nitrate emulsion suspension or gel with a typical quantity of 7,500 kg or 7.5 t. Both types of explosive are classified as Class 5.1 dangerous goods.

The magazine is approximately 340 m east of Kidman Way at its closest point. The closest privately-owned residence (R31) is approximately 1.4 km west of the magazine at its closest point (Figure 18.1).

Table 3 of Applying SEPP 33 (DoP 2011) defines the threshold level for storage of Class 5.1 dangerous goods as 5 t. The project exceeds the SEPP 33 threshold for Class 5.1 dangerous goods and is therefore considered potentially hazardous and a preliminary hazard assessment (PHA) is required.

However, the New Cobar Complex is an existing mining precinct and as such, the quantities of ammonium nitrate emulsion described above are already transported, stored and used on-site. The nearest residence is also well outside the threshold distance for the combined amounts of ammonium nitrate emulsion stored on

site if they were classed as the more volatile Class 1.1 dangerous goods. The quantity of hazardous materials required on-site is not expected to increase as a result of the project, and therefore a PHA has not been prepared.

Ammonium nitrate emulsion is transported directly to the New Cobar Complex magazine from the Orica manufacturing facility in the Hunter Valley, NSW. The materials are transported by Orica in accordance with the Australian Code for the Transport of Explosives by Road and Rail (WRMC 2009).

There are a number of approved plans and procedures already in place at the New Cobar Complex to reduce the potential hazards and risks associated with the manufacture, supply, transport and storage of explosives on-site. On-site explosives storage has been designed and constructed in accordance with Australian Standard 2187.1:1998 Explosives – Storage, Transport and Use: Storage (AS2187.1:1998).

18.3.3 Offensive development

The storage and use of hazardous materials will continue to be undertaken in accordance with the following Australian Standards:

- Australian Standard 1940:2004 The Storage and Handling of Flammable and Combustible Liquids; and
- Australian Standard 2187.1:1998 Explosives – Storage, Transport and Use – Storage.

Emissions from the project will be prevented or reduced to acceptable levels with the implementation of management measures. Therefore, the project does not qualify as potentially offensive industry under SEPP 33.

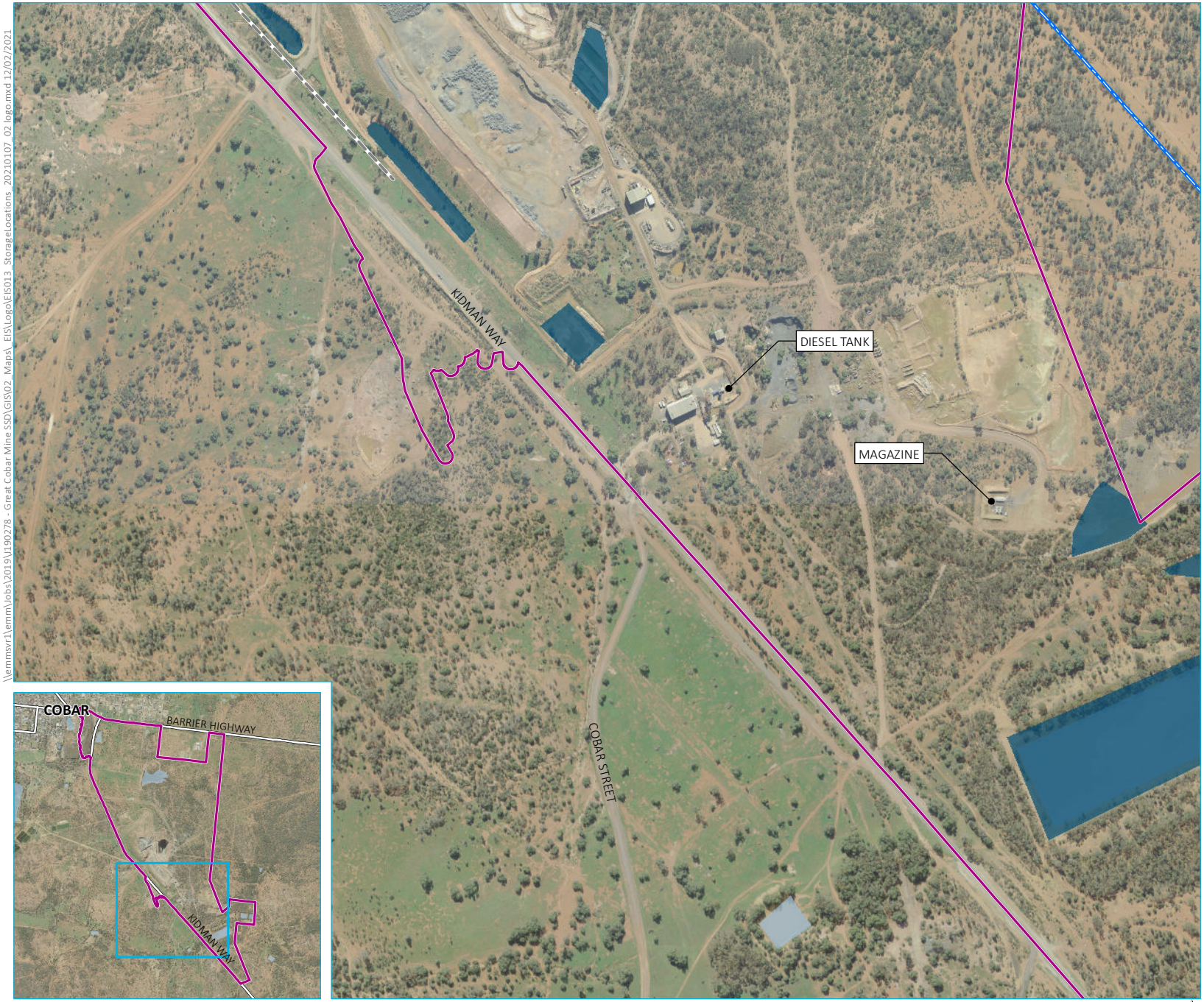
18.4 Bushfire hazard

Bushfire is capable of damaging surface infrastructure associated with the project infrastructure and consequently impacting upon the safety of staff and contractors during the construction and operation of the project. Bushfire also poses a risk to human safety and property, as well as threatening native flora, fauna, and ecosystems.

A bushfire hazard assessment was undertaken by EMM and is appended to the HRPSA in Appendix P.

The potential ignition of unplanned bushfires from the project are likely to be from the following sources:

- inadequate storage of flammable liquids (eg fuel) and other chemicals;
- vehicle and machine movement over vegetation;
- sparks generated from permitted hot works (eg welders and grinders);
- human error, such as non-compliance of hot works procedures;
- diesel generators, causing ignition of vegetation;
- powerline failure, causing ignition of vegetation; and
- electrical equipment failure, causing ignition of vegetation.



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Source: EMM (2021); DFSI (2017); DPE (2019); ELA (2018)

Material storage locations

Peak Gold Mines
New Cobar Complex Project
Environmental impact assessment
Figure 18.1

The project has very few new above-ground infrastructure elements, consisting only of the single new power line, compact substation, and emergency egress winder. All other surface works associated with the project will be located in an approved existing, operational mining complex, with all management measures associated with bushfire risk included within the existing MOP and related processes and guidelines.

Bushfire prevention and protection measures described in section 18.6 will assist in mitigating the identified bushfire impacts during the construction and operation of the project.

18.5 Geochemical hazard

Geochemical properties of ore and waste rock mined as part of the New Cobar Complex have the potential to negatively impact the environment, in particular surface water. Ore will be extracted from the New Cobar Complex and transported to the Peak Complex for processing and disposal of tailings. This is outside the scope of the project; therefore, the geochemical risks of ore processing and tailings management are not discussed further in this EIS.

A geochemistry review of relevant project information was undertaken by EMM and is appended to the GIA in Appendix I.

Waste rock is geochemically classified as either NAF or PAF. PAF material has the potential to generate acid mine drainage as a result of pyrite oxidation when the material exposed to air and water. The New Cobar Complex deposits are in highly mineralised areas, which means that some of the waste rock in the existing WRE is classified as PAF, and waste rock generated by the project may also be classified as PAF.

Existing and proposed mining activities have been designed to limit the amount of waste rock (especially PAF) brought to the surface and exposed to air and water. Waste rock classified as PAF will be preferentially retained underground for the backfill of stopes, or transferred to the Peak Complex on a campaign basis to be used for TSF wall raises (PAF will be used on internal TSF walls only to prevent exposure). This will minimise the likelihood that PAF will be exposed to air and water.

Monitoring of surface and groundwater quality will be undertaken to ensure that PAF material is handled appropriately and does not impact the environment through acid mine drainage.

As a result of the project design and existing commitments and management measures, geochemical hazards are not expected to impact the environment or public safety.

For more details on waste rock management procedures, please see Chapter 19: Waste management. For more details on surface water monitoring, please see Chapter 11 and Appendix J. For details on the rehabilitation of waste rock, please see Chapter 16 and Appendix N.

18.6 Hazard and risk assessment

Four hazard scenarios for the project were considered for risk assessment. These are scenarios that may occur during the project life, and were assessed in accordance with DPI's (2011) quantitative risk assessment to determine if the project would be acceptable from a public risk perspective. The risk assessment is presented in full in Appendix P and summarised below. The hazard scenarios and their respective risks are detailed below.

Table 18.2 Hazard scenarios – risk assessment

Scenario	Description	Risk
Explosives – uncontrolled detonation in the magazine	The magazine meets the requirements of the Australian Standards – and as such the occurrence of this event would require all of the signage and magazine integrity measures to be defeated in the one event. This is prevented by: fire-proof construction, removal of vegetation in the magazine compound, firefighting equipment present in the magazine compound, training and authorisation of workers handling explosives, procedures for storing like with like in magazines, licensing audits of magazines, regular inspection and auditing of magazines, and supervision of workers involved in explosives handling. As for other hazardous materials on site, storage and handling of explosives will be in line with PGM's Fire and Explosion Control Plan. If all these controls fail then the magazine could potentially detonate which is countered by: preferential failure of the roof of the magazine to direct the blast upwards, cleanliness of the magazine compound (to limit debris), protective bunds around the magazine (again to redirect energy (over-pressure, flying debris, etc.) from leaving the magazine compound), and distance of the magazine from populated locations. It is conceivable in extreme circumstances that the magazine could explode but if this were to happen then only negligible injuries to the public could arise due to the distance of the magazine from the project boundary, therefore a risk of **low** has been determined.	Low
Explosives – uncontrolled detonation in transit	Explosives are regularly transported around Australia at a tolerable level of risk. PGM uses reputable providers and transport companies – confirming that they are implementing transport in line with applicable Codes and using qualified and approved workers. This could lead to a conceivable in extreme circumstances event where nearby members of the public could suffer fatal injuries, therefore a risk of **moderate** has been determined.	Moderate
Combustible materials –fire on site	Diesel stored on site is a combustible substance. The potential for fire is mitigated by a combination of: fit for purpose storage locations kept in asset protection zones (APZ) clear of ignition sources and other fuel (eg vegetation, waste, etc.); storage containers/tanks appropriately rated for the material; training and induction of workers so they are alert to the requirement to not smoke or introduce ignition sources to these storage areas; signage of the compound (including HAZMAT codes to aid emergency responders); firefighting equipment around the storage location; site emergency responders capable of executing the best response for the arising situation, and; linkage and/or agreements with off-site responding agencies. A risk of **low** has been determined.	Low
Combustible materials –fire in transit	Combustible materials are regularly transported around Australia at a tolerable level of risk. PGM uses reputable providers and transport companies – confirming that they are implementing transport in line with applicable Codes and using qualified and approved workers. This could lead to a conceivable in extreme circumstances event where nearby members of the public could suffer fatal injuries, therefore a risk of **moderate** has been determined.	Moderate

It should be noted that the hazard scenarios described are ones which have the potential to occur with ongoing activities at the New Cobar Complex. In the 20-year history of operations at the New Cobar Complex, none of the above scenarios have eventuated.

18.7 Commitments and management measures

The health, safety and wellbeing of PGM's employees and contractors is its number one priority. The pursuit of ongoing safety performance improvement has seen a recent renewed focus on workplace hazard reporting and action plans, fatigue management, increased visible safety leadership, improved communication channels between contractors and site management and root cause analysis of all reportable incidents.

18.7.1 Infrastructure design

Existing buildings and new and proposed infrastructure are not within mapped bushfire prone land, therefore, there are no requirements for specific APZ or bushfire construction standard according to AS 3959-2018. However, due to vegetation hazard being in proximity to these structures, and in accordance with PBP 2019 (section 8.3.5 and 8.3.6), it is recommended:

- a minimum 10 m APZ for the structures and associated buildings; and
- that the APZs must be maintained to the standard of an Inner Protection Area for the life of the mine.

These recommendations should include the explosives magazine and diesel fuel tanks. It is noted that the existing explosives magazine currently has an APZ of approximately 30 m.

No additional design measures are required to minimise the geochemical risks of acid mine drainage.

18.7.2 Proposed mitigation measures

The following measure is recommended for existing and proposed surface infrastructure for the project:

- The proposed overhead power line should be designed and maintained so that it will not serve as a bushfire risk to surrounding bush, with no part of a tree being closer to a power line than the distance set out in ISSC3 Guideline for Managing Vegetation Near Power Lines.

18.7.3 Existing PGM management plans

PGM has a portfolio of existing management plans and procedures relevant to the New Cobar Complex that will continue to be implemented and reviewed as part of the ongoing operation of the project. These include, but are not limited to:

- Emergency Management Plan (PLN-06-040);
- Emergency Preparedness Procedure (PRO-06-040-01);
- Emergency Response Procedure (PRO-06-040-04);
- Fire Prevention and Protection Procedure (PRO-06-040-02);
- Incident and Crisis Management Procedure (PRO-08-028);
- Fire and Explosion Control Plan; and
- Waste Rock Management Plan.

18.8 Conclusion

An assessment of potentially hazardous substances has found that the project exceeds the SEPP 33 screening threshold for explosives for new development. However, the New Cobar Complex is an existing project and explosives are already stored on site at quantities greater than the SEPP 33 screening threshold for new development, and remains incompliance with requirements from SafeWork NSW and WorkCover NSW. The quantity of hazardous materials required on-site is not expected to increase as a result of the project, therefore the project is not considered to represent an offensive or hazardous development.

The project is not located in an area mapped as bushfire prone. Existing APZs surround existing infrastructure, and new infrastructure that presents a bushfire risk will be located in areas already cleared of vegetation.

As a result of the project design and existing commitments and management measures, geochemical hazards are not expected to impact the environment or public safety.

Four hazard scenarios were assessed to determine risk to public safety or the environment, and no scenario was found to have the potential for moderate or greater offsite consequences.

The continuation of PGM's management and mitigation measures will manage the risks to the environment and public safety to acceptable and compliant levels.

19 Waste management

19.1 Introduction

This chapter outlines the current waste management and waste rock management approach for the New Cobar Complex and outlines waste streams and waste rock likely to be generated by the project.

19.2 Assessment requirements

The SEARs require an assessment of waste management including details of the waste streams generated by the project and their management. The specific requirements relating to waste are provided in Table 19.1.

Table 19.1 Waste assessment requirements

Relevant authority and assessment requirement	Relevant section of the EIS
Waste – including estimates of the quantity and nature of the waste streams that would be generated by the development (including tailings and waste rock) and any measures that would be implemented to minimise, manage or dispose of the waste streams;	Tailing storage occurs at the Peak Complex which operates under CSC approvals. Tailings production, handling and storage is therefore not considered by this SSD for the New Cobar Complex. The management and disposal of waste streams in accordance with the Waste Classification Guidelines is contained in Section 19.4.1. Waste rock handling generation and disposal is contained in Section 19.4.2 and section 19.5.2. Management measures are discussed in Section 19.6.

19.3 Applicable legislation, policies and guidelines

19.3.1 Waste and Resource Recovery Strategy 2014-21

The Waste and Resource Recovery Strategy 2014-21 (EPA 2014a) provides guidance on how to improve the wellbeing of the environment and community by reducing the environmental impact of waste and using resources efficiently. Amongst other things, it outlines the preferred approach and goals for efficient resource use and management.

Waste generated from the project will be managed in accordance with the Waste and Resource Recovery Strategy 2014-21 (EPA 2014a), including incorporating management measures to ensure waste is appropriately reused, recycled or disposed. The primary aim of waste management is the prevention and avoidance of waste generation, recycling and the use of renewable and recycled materials.

19.3.2 Protection of the Environment Operations Act 1997

The POEO Act is the key piece of environmental legislation administered by the EPA.

Schedule 1, Part 3, Clause 49 of the POEO Act outlines the different types of waste classifications, including general solid waste (non-putrescible), general solid waste (putrescible), hazardous waste, liquid waste, restricted solid waste and special waste. The different types of waste that will be generated by the project have been classified as per the POEO Act (and the Waste Classification Guidelines – Part 1: Classification of waste (EPA 2014b)) and are further discussed in Section 19.4.1.

19.3.3 Waste Classification Guidelines

The Waste Classification Guidelines – Part 1: Classification of waste (EPA 2014b) outlines a step-by-step process for classifying waste. It is split into five parts, which cover classifying waste, immobilising waste, waste containing radioactive material and acid sulfate soils.

Waste generated from the project will be classified in accordance with Waste Classification Guidelines: Part 1 Classifying Waste (EPA 2014b) and as defined in Schedule 1, Part 3, Clause 49 of the POEO Act.

19.4 Existing environment

19.4.1 Waste management

PGM implements a Waste Management Plan which outlines the waste generated at its operations, and establishes a framework for the management of waste. The Waste Management Plan is applicable to both PGM's operational and historical sites. Waste generated primarily consists of general waste (putrescible wastes, such as food scraps), routine maintenance consumables, waste oils and grease, sewage, scrap metal and recyclables such as plastics, glass, paper and cardboard.

Waste is managed in accordance with the hierarchy of waste management described below:

1. reduce;
2. re-use;
3. recycle or compost; and
4. dispose.

The underpinning strategy for waste management is minimisation and segregation at the source. The benefits for minimising and separating waste streams include:

- reducing the potential for contamination of general waste streams;
- improving the ease of waste storage, handling, disposal and tracking;
- educating employees of the importance of waste stream segregation and recycling;
- potentially generating an income from recyclable waste streams; and
- reducing the potential disposal costs for some items.

Waste streams are classified in accordance with the Waste Classification Guidelines (EPA 2014b), which outlines a step-by-step process for classifying waste into six waste classes:

- special waste;
- liquid waste;
- general solid waste (putrescible);
- general solid waste (non-putrescible);
- hazardous waste; and
- restricted solid waste.

Table 19.2 outlines existing waste types generated by PGM and their classification and management.

Table 19.2 Existing waste classification, source, handling transport and disposal

Waste type	Waste classification	Major source	Handling	Transport/disposal
Office and packaging waste	General solid waste (non-putrescible)	General office activities	Waste collected on site	Removed from site by licenced waste contractor and taken to Cobar landfill
Scrap metal	General solid waste (non-putrescible)	Construction site waste and process plant building waste	Waste segregated in fit for purpose bins or stockpiled in the designated scrap metal pile	Removed from site by licenced waste contractor
Used lead acid batteries	Hazardous	Mining fleet	Stored on site in concrete bunded area	Removed by licenced waste contractor as required
Degreasing fluids, diesel and other petroleum fluids	Hazardous	Mining fleet	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required
Lubricating oils and hydraulic oils	Liquid	Mining fleet	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required
Used/rejected tyres	Special	Mining fleet	Segregated and stored on site in designated tyre storage area. Used on site if required	Removed by licenced waste contractor as required
Used oil/fuel filters	Hazardous	Mining fleet	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required
Drained/crushed oil/fuel filters	General solid waste (non-putrescible)	Mining fleet	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required

Table 19.2 Existing waste classification, source, handling transport and disposal

Waste type	Waste classification	Major source	Handling	Transport/disposal
Used absorbents – no free liquid	General solid waste (non-putrescible)	Spills associated with maintenance of mining fleet	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required
Used absorbents –free liquid	Hazardous	Spills associated with maintenance of mining fleet	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required
Domestic waste	General solid waste (putrescible)	Waste food scraps and other general domestic waste	None generated	
Pesticide/ herbicide containers (water based)	General solid waste (non-putrescible)	Rehabilitation/weed control	None generated. Licenced contractor performs this task and removes their own waste	
Pesticide/ herbicide containers (solvent based)	Hazardous	Rehabilitation/weed control	None generated. Licenced contractor performs this task and removes their own waste	
Used/empty bulk chemical containers	Hazardous	Used on site	Used on site. Segregated and stored on site	Removed by licenced waste contractor as required
Liquid waste from sewage system	Liquid	Human waste	Sewerage treatment plant	Tanks pumped out approximately once per quarter to remove solids
Laboratory wastes	Hazardous	Used on site	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required
Material contaminated with hydrocarbons	General solid waste (putrescible)	Minor spills	Segregated and stored on site in bunded area	Removed by licenced waste contractor as required

19.4.2 Waste rock management

i Waste rock generation

Waste rock is generated by mining operations undertaken within CML 6, 7, 8 and 9, ML 1483 and MPL 854 (refer Figure 2.2). A WRMP was prepared for the Peak Complex, New Cobar Complex and historical mining areas, particularly Queen Bee Mine which forms part of the MOP. The WRMP was submitted to the Resources Regulator in March 2020. The WRMP details waste rock characterisation work undertaken to date and includes procedures and processes for characterisation of waste rock by project geological and engineering personnel. It also describes management and mitigation measures for the NAF and PAF waste rock material. The WRMP applies to the following areas (see Figure 2.2):

- Peak Mining Complex (CML8) – currently operational;

- New Cobar Complex (CML6, ML1805, ML1483, MPL854) – currently operational; and
- Queen Bee (CML9) – historical mine site.

Three primary waste rock streams are identified in the WRMP:

- waste rock;
- tailings; and
- slag.

In addition, there are some stockpiles of historical mineral processing waste materials (generally referred to as 'pinkie material') that are stockpiled for either reprocessing or rehabilitation. This chapter describes the generation and management of waste rock only. Tailing storage occurs at the Peak Complex which operates under CSC approvals. Tailing production, handling and storage is therefore not considered by this SSD for the New Cobar Complex. PGM is seeking a parallel approval from CSC for TSF lifts are necessary for the containment of additional tailings produced during the extended mine life of the project. A SoEE seeking development approval from CSC for additional storage capacity in the TSF to support this SSD application was submitted in July 2020. PGM is working with CSC to secure this approval.

ii Waste rock characterisation, handling and management

Based on the similarity in lithology and geochemical properties for the Great Cobar and Gladstone deposits, geochemistry data was used to provide an understanding of the likely geochemical behaviour of the waste rock at the New Cobar Complex. This is summarised below and discussed in detail in the RLMS (see Appendix N and Chapter 16: Rehabilitation and closure). As described in Chapter 18: Hazard, public safety and health, waste rock can generally be categorised as PAF or NAF. All the New Cobar Complex deposits are in highly mineralised shear zones and therefore the ore and waste rock produced are assumed to be PAF. Weathered and oxidised waste including waste from shallow borrows are generally assumed to be NAF.

Waste rock from underground is generally handled using one of the following methods:

1. Preferentially sent to backfill underground.
2. Brought to surface in campaigns when needed for Peak Complex construction projects such as TSF lifts.
3. Brought to surface if there is insufficient area available underground and stored in the WRE. This is not the preferred option (but sometimes necessary) as it requires double handling and adds significant cost to the business.

The process for characterisation and management of waste rock from the underground operations is described in the WRMP and summarised below. The approach generally assumes all waste rock generated is PAF.

Rock is characterised by PGM engineering and geological personnel to be either PAF or NAF both visually and using hand-held x-ray fluorescence (XRF) analysis. Where NAF waste rock is identified for construction or rehabilitation purposes, static testing is undertaken to confirm whether it has potential for generation of AMD.

Waste rock from the underground mines is selectively handled to facilitate:

- the preferential retention of PAF waste rock underground for stope backfilling;
- the preferential return of PAF waste rock underground from existing above ground areas of the WRE for stope backfilling;
- transportation of PAF and NAF waste rock to the surface on a campaign basis for construction projects (PAF to be used on internal TSF wall raises only);
- transportation of NAF waste rock to the surface for storage in designated stockpiles with the WRE footprint for future construction and rehabilitation purposes; and
- transportation of PAF waste rock to the surface and stored in temporary designated stockpiles within the WRE footprint if there is insufficient storage areas available underground.

As described in Chapter 2: The project, the primary infrastructure for waste rock management is the WRE, which was constructed as part of the New Cobar Complex open cut project approved in 2000. The WRE has a total volume of approximately 2.5 Mm^3. The approved, as constructed WRE landform is a traditional bench and batter design and much of the WRE has been rehabilitated. The total volume of waste rock required for the embankment lifts and capping of the Peak TSF is expected to be approximately 1 M m^3 which means approximately 1.5M m^3 of waste rock will remain at the end of the mine life. The WRE is discussed further in the RLMS (Chapter 16: Rehabilitation and closure and Appendix N) and Chapter 18: Hazards, public safety and health.

iii Water quality monitoring

Monitoring of water quality is undertaken to assess the success of management strategies implemented under existing operation to identify potential AMD. The following changes are monitored to identify potential AMD:

- increases in sulfate concentrations or the sulfate to chloride mass ratio in groundwater over time;
- progressive reduction in the alkalinity of groundwater over time; or
- progressive increases in the total acidity of groundwater over time.

The surface water quality monitoring program is described in Chapter 11: Surface water.

19.5 Impact assessment

19.5.1 Waste management

The project will not introduce any new waste streams, and as a result, no changes are required in the existing management measures for waste.

19.5.2 Waste rock management

The project will not alter the management of waste rock compared to existing operations and will be undertaken generally in accordance with the WRMP. It is proposed that waste rock will be harvested and managed as follows:

- PAF waste rock will be deployed underground for use in stope backfilling operations – as a preference, PAF waste rock will remain underground rather than being transported to the surface (but this is not always possible given operational requirements);
- some PAF waste rock will be brought to the surface and stored within the existing WRE; and
- NAF material will be characterised in accordance with the WRMP and transported to the surface for use across the complexes for construction and rehabilitation activities as required (eg tailings dam lifts and capping of the TSF) or stored in the WRE if surplus to PGM's needs.

The management and reuse of waste rock is discussed in further detail in the RLMS provided in full in Appendix N.

Post-mining, the groundwater assessment (refer to Appendix I and Chapter 10: Groundwater) determined that there is limited potential for acid or neutral mine drainage to occur within underground workings as a result of groundwater accumulation and discharge and interaction with PAF waste rock. The groundwater assessment determined that:

- a large proportion of the lithologies affected by drawdown are anticipated to be NAF and is not expected to adversely affect groundwater quality;
- exposed PAF rock may present an increased risk of adverse effects on groundwater, however the recovery (rise) of groundwater heads will result in inward draining of groundwater into the project voids and prevent outward seepage of acidic and metalliferous water.

Based on these findings, no preventative or mitigating controls to manage the acid mine drainage in underground workings are required.

19.6 Commitments and management measures

As the project will not result in material changes to generation, handling and transport of waste and waste rock on site, no specific commitments or mitigation measures are proposed. The Waste Management Plan and the WRMP will be reviewed, and where necessary, updated to reflect any changes due to the project.

The following measures will continue to be implemented to manage waste consistent with the Waste Management Plan:

- waste streams will continue to be classified and managed in accordance with the Waste Classification Guidelines (EPA 2014b);
- waste streams will be appropriately segregated prior to reuse, recycling/composting or disposal;
- designated waste storage bins and areas will be appropriately sign posted and regularly inspected in accordance with the Waste Management Plan;
- volumes of wastes generated and disposed will be tracked and collated monthly and a monthly site inspection will continue to identify any additional waste that needs separation or disposal; and
- waste disposal off site will be conducted by relevant appropriately licenced contractors, depending on the waste type.

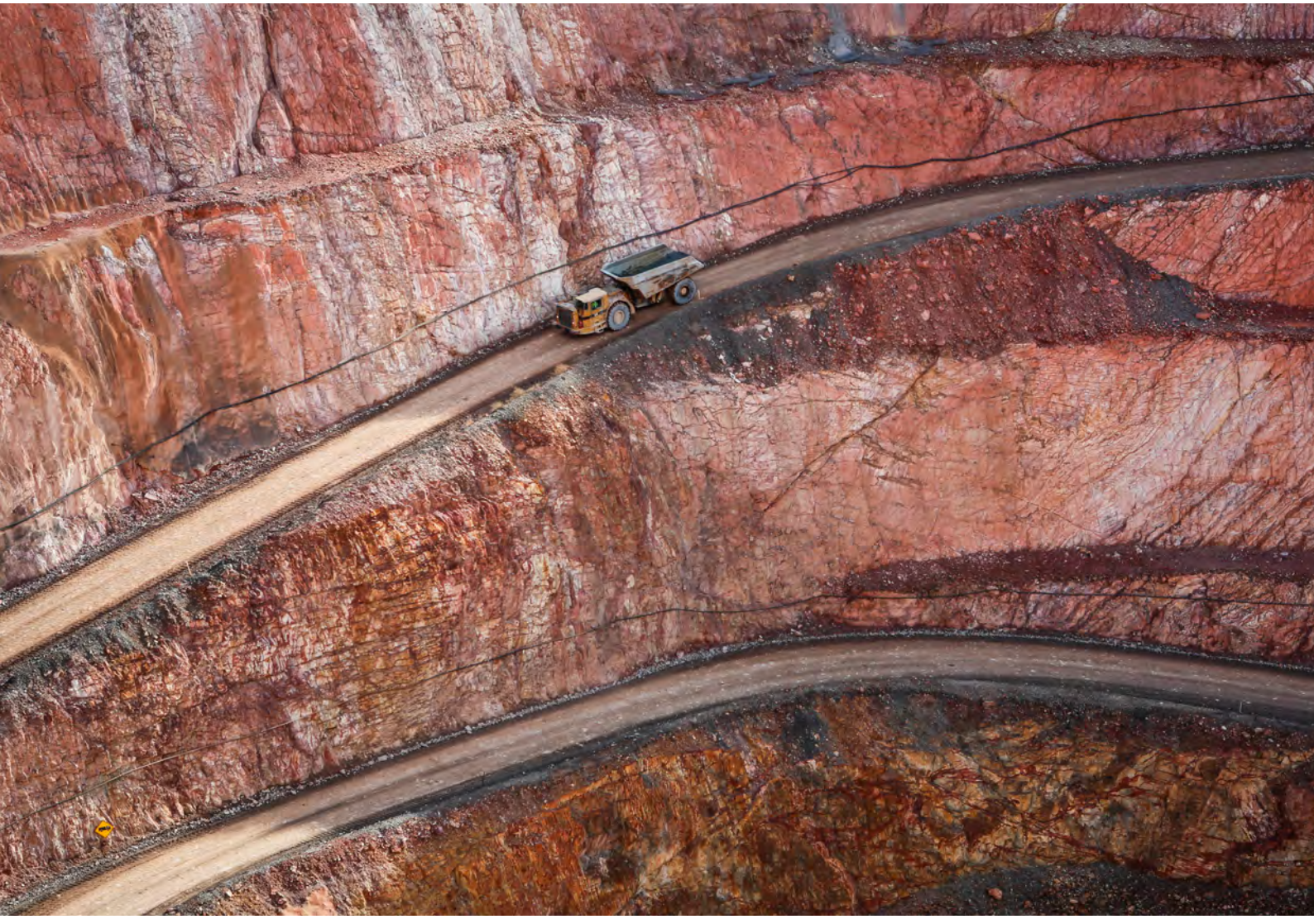
To minimise the handling of PAF waste rock at the surface, the principles described in the WRMP will continue to be implemented including:

- preferential deployment of PAF waste rock underground, rather than being transported to the surface for stockpiling;
- if necessary, transfer of PAF waste rock to the surface for storage within the existing WRE; and
- re use of NAF material on site where possible following characterisation in accordance with the WRMP.

The groundwater assessment determined that no preventative or mitigating controls are required to manage potential acid mine drainage in underground workings.

19.7 Conclusion

The project will not result in material changes to generation, handling and transport of waste and waste rock on site. The Waste Management Plan and WRMP will continue to be implemented to manage waste consistent with existing operations.



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