

PEMBROKE

Olive Downs Coking Coal Project
Draft Environmental Impact Statement

Appendix O
Preliminary Risk
Assessment



Operational Risk Mentoring

Practical Solutions for Operational Risk Management

Pembroke Olive Downs Pty Ltd

Olive Downs Coking Coal Project Preliminary Risk Assessment

Prepared for:

**Pembroke Olive Downs Pty Ltd, Olive Downs Coking
Coal Project, Preliminary Risk Assessment**

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1 INTRODUCTION

Pembroke Olive Downs Pty Ltd (Pembroke) proposes to develop the Olive Downs Coking Coal Project (the Project), a metallurgical coal mine and associated infrastructure within the Bowen Basin, located approximately 40 kilometres south-east of Moranbah, Queensland (Figure 1). The Project provides an opportunity to develop an open cut metallurgical coal resource within the Bowen Basin mining precinct that can deliver up to 20 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal.

The Project comprises the Olive Downs South and Willunga mining domains and associated linear infrastructure corridors, including a rail spur connecting to the Norwich Park Branch Railway, a water pipeline connecting to the Eungella pipeline network, an electricity transmission line (ETL) and access roads (Figure 2). The coal resource would be mined by conventional open cut mining methods, with product coal to be transported by rail to the Dalrymple Bay Coal Terminal. Up to 20 Mtpa of ROM coal would be extracted over the anticipated Project operational life of approximately 79 years.

1.1 AIM AND OBJECTIVES

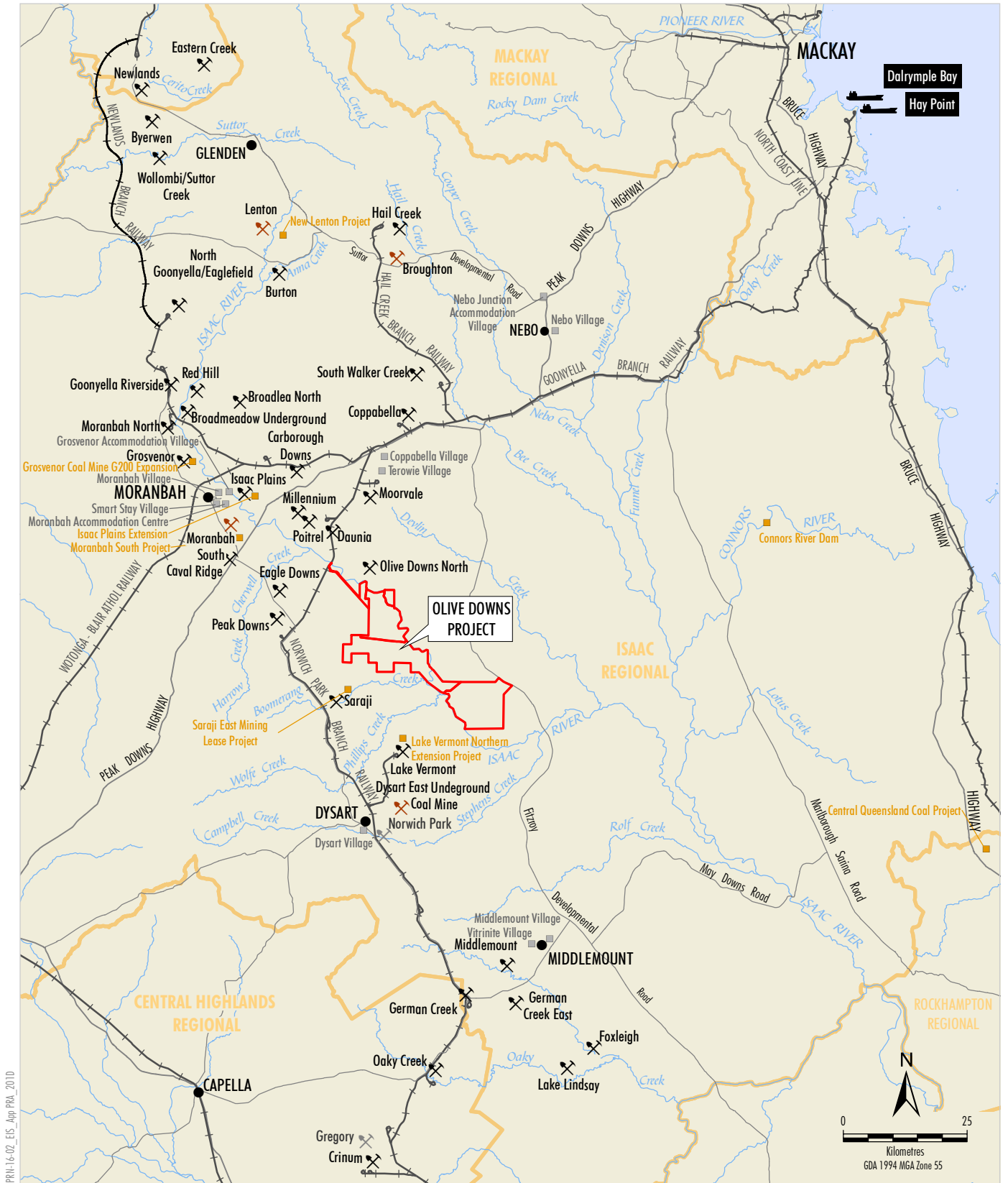
The aim of the Preliminary Risk Assessment (PRA) workshop was to identify potential issues related to the the Project in the context of the Coordinator-General's Draft Terms of Reference which require:

Describing the potential risks to public safety, people and property that may be associated with the project and which should include:

- (a) Potential hazards, accidents, spillages, fire and abnormal events that may occur during all stages of the project, including estimated probabilities of occurrence*
- (b) Identifying all hazardous substances to be used, stored, processed or produced and the rate of usage*
- (c) Potential hazards posed by wildlife interactions, natural events and implications related to climate change*
- (d) How the project may potentially affect hazards away from the project site (e.g. changing flooding characteristics).*

The team identified the following items as desired outcomes from the process:

1. identify key issues to be addressed in the Environmental Impact Statement (EIS);
2. identify potential controls which should be confirmed as appropriate in the detailed studies of the EIS; and
3. develop a document suitable for inclusion in the Project EIS and prepared in accordance with Australian Standard/ New Zealand Standard International Standards Organisation (AS/NZS ISO) 31000:2009 *Risk Management – Principles and Guidelines* (AS/NZS ISO 31000:2009).



PR14-16-02_EIS_Apr PRA_2010



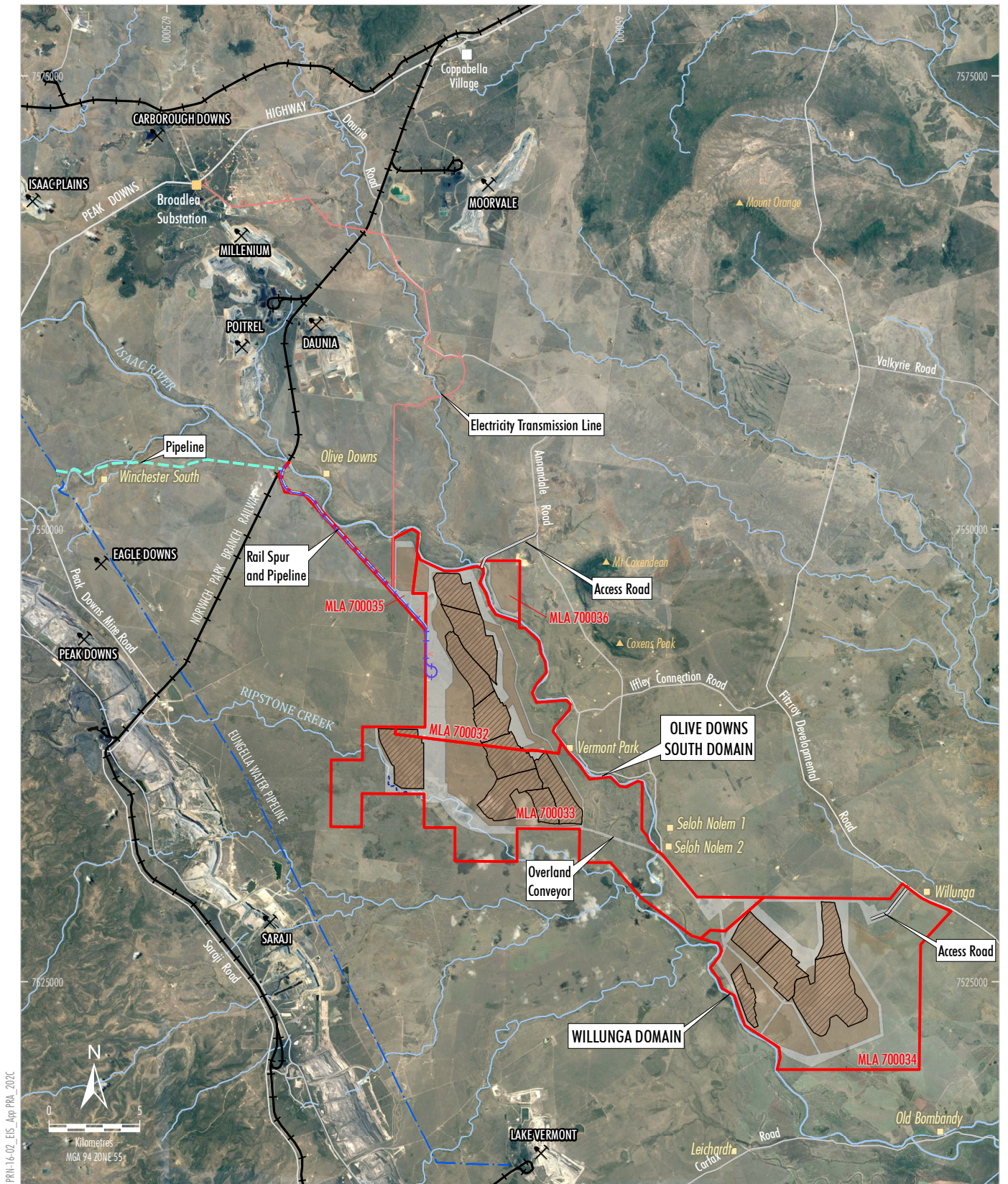
- LEGEND**
- Mining Lease Application Boundary
 - Local Government Area
 - Major Road
 - ++ Railway
 - Port
 - Approved/Operating Coal Mine
 - Proposed Coal Mine
 - Under Care and Maintenance
 - Workforce Accommodation Facility
 - Coordinated, Major and Other Relevant Project

Source: Geoscience Australia - Topographical Data 250K (2006); Department of Natural Resources and Mines (2016)



OLIVE DOWNS COKING COAL PROJECT
Regional Location

Figure 1



PR14-16-02_EIS_App_PRA_2020

Source: Geoscience Australia - Topographical Data 250K (2006)
 Department of Natural Resources and Mines (2016)
 Orthophotography: Google Image (2016)

- LEGEND**
- Mining Lease Application Boundary
 - Approved/Operating Coal Mine
 - Dwelling
 - Eungella Pipeline Network
 - Railway
 - Proposed Access Road
 - Proposed Electricity Transmission Line
 - Proposed Rail
 - Proposed Water Pipeline
 - Proposed Creek Diversion
 - Open Cut Pit Extent
 - Out-of-Pit and In-Pit Waste Rock Emplacement
 - Infrastructure Area



OLIVE DOWNS COKING COAL PROJECT
 Project General Arrangement

Figure 2

1.2 CLIENT

The client for the PRA is Pembroke Olive Downs Pty Ltd.

1.3 RISK ASSESSMENT PROCESS

The risk assessment process was based on the framework provided on Figure 3 (based on AS/NZS ISO 31000:2009, Recognised Standard 02 from the QLD Department of Natural Resources, MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* [NSW Department of Trade and Investment, 2011] and Handbook 203:2006 *Environmental Risk Management – Principles and Process* [HB 203:2006]).

This PRA draws upon the outcomes of a team workshop conducted in May 2017.

1.4 RESOURCING, SCHEDULE AND ACCOUNTABILITIES

The following resources were allocated in order to effectively conduct the PRA:

1. a team of personnel with suitable experience and knowledge of mining operations, water management and environmental issues in the area associated with the Project;
2. external facilitators for the risk assessment and write-up of results; and
3. aerial photographs, drawings and the Coordinator-General's Draft Terms of Reference.

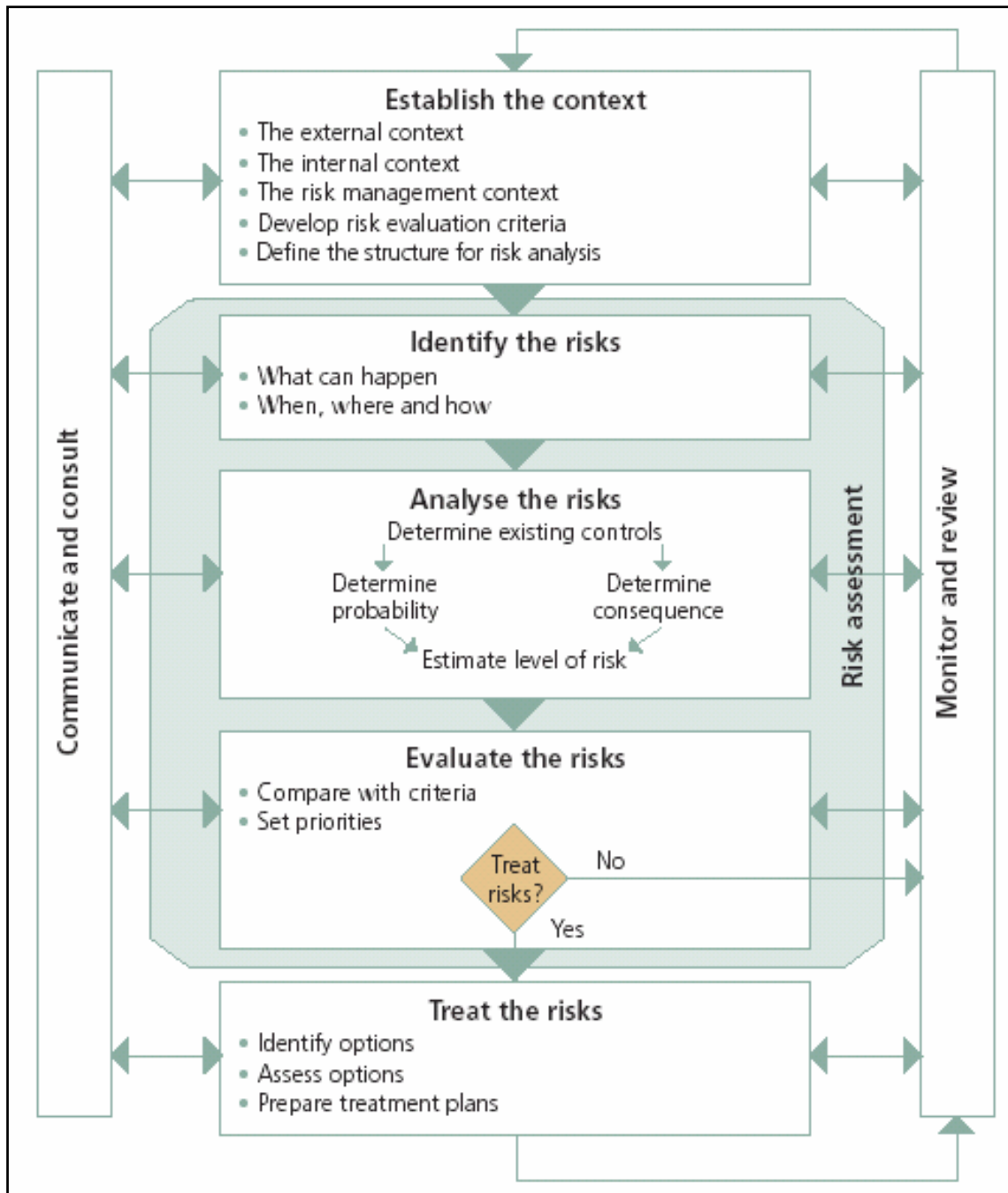
The outcomes of the PRA and associated accountabilities were understood by the team as being intended to be integrated into the EIS and overall Pembroke's management systems so that they are effectively reviewed, implemented and monitored.

1.5 METHODOLOGY

1.5.1 Framework

Figure 3 outlines the overall framework utilised for the PRA. This framework is further discussed in Section 1.5.2 with respect to the Project area.

Figure 3 - Risk Management Process (AS/NZS ISO 31000:2009)



Source: after AS/NZS ISO 31000:2009.

1.5.2 Key Steps

The key steps in the process included:

1. confirming the scope of the PRA;
2. listing the key assumptions on which the PRA is based;
3. reviewing available data on the Project including reports, plans, maps and aerial photos (both prior to and during the workshop);
4. conduct a team-based risk assessment that:
 - a) provided detailed descriptions of the tasks to be undertaken and the proposed method;
 - b) identified hazards and assessed the level of risk; and
 - c) developed a list of recommended controls to treat the risk (through prevention, monitoring, management and rehabilitation strategies);
5. reviewing documentation and presentations by Pembroke's personnel on the intended Project elements;
6. preparing a draft report in accordance with AS/NZS ISO 31000:2009 and *Recognised Standard 02 Control of Risk Management Practices* (Department of Natural Resources, 2004) for review by Pembroke's personnel and PRA team members;
7. incorporate comments from Pembroke and the PRA team; and
8. finalise the report and issue as controlled copy for ongoing use.

With respect to the overall framework (Figure 3), steps 1 to 3 above represent the 'establish the context' phase and steps 4 and 5 represents the 'identify risks', 'analyse risks', 'evaluate risks' and 'treat risks' phases.

As described in Section 1.1, the outcomes of the PRA and associated accountabilities will be integrated into the EIS and Pembroke's overall management systems so that they are effectively reviewed, implemented and monitored.

1.5.3 External Facilitation

The team was facilitated through the process by **Operational Risk Mentoring** – a company specialising in Risk Assessment and risk management programmes. The facilitator, Dr Peter Standish, is experienced with open cut coal mining and many aspects of safety management systems and environmental monitoring and rehabilitation.

The team was encouraged and "challenged" to identify a wide range of potential environmental impacts or hazards.

It is important to understand that the outcomes of this PRA:

1. are process driven;
2. challenge current thinking and may not necessarily reflect “pre-conceived” ideas; and
3. are the result of the team assembled to review the topic and not the result of any one individual or organisation.

2 ESTABLISH THE CONTEXT

2.1 RISK MANAGEMENT CONTEXT

This PRA has been conducted in accordance with the Coordinator-General's Terms of Reference for the Project (Section 1.3).

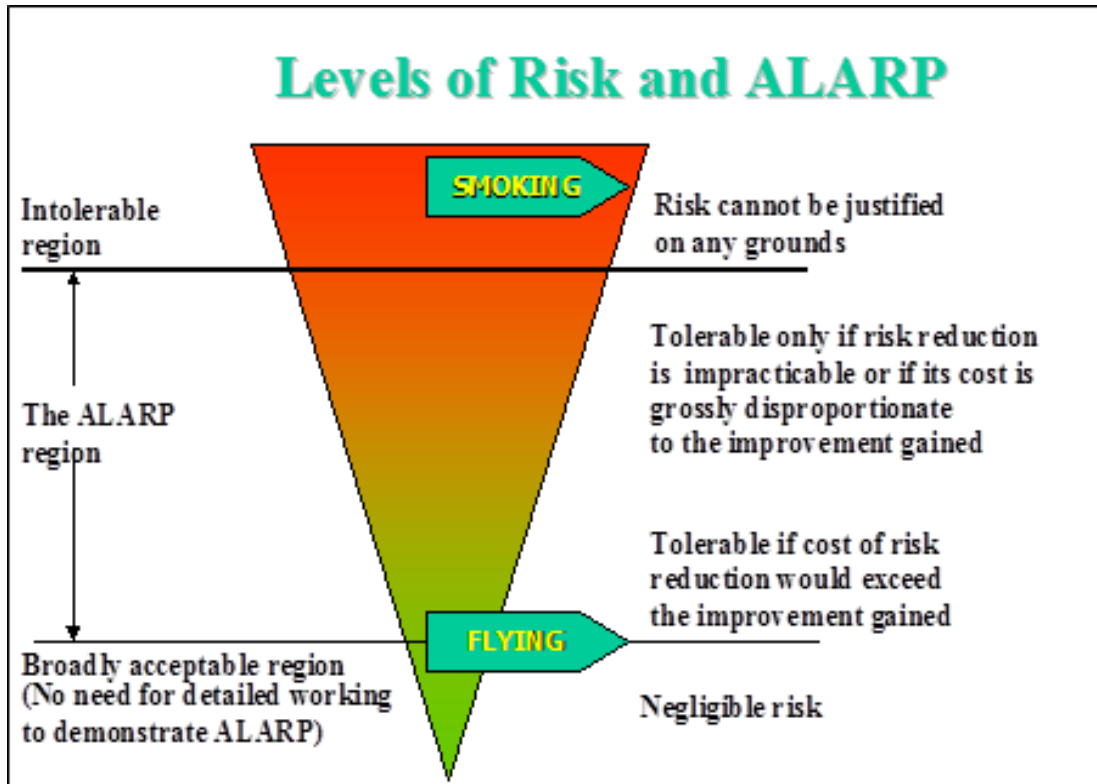
In addition, the PRA was prepared cognisant of the following documents:

- AS/NZ ISO 31000:2009;
- HB 203:2006;
- Recognised Standard 02 – QLD Department of Natural Resources; and
- MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* (Department of Trade and Investment, 2011).

2.2 RISK CRITERIA

The risk criteria utilised is to reduce the risk to As Low As Reasonably Practicable (ALARP) or lower. Figure 4 schematically shows the three risk management zones *viz.* intolerable, ALARP and tolerable. The middle zone is referred to as the ALARP zone.

Figure 4 - Risk Criteria "ALARP"



Flying is an example of a risk considered by most people to be a tolerable risk; whilst smoking is generally considered to be an activity which cannot be justified from a risk perspective. This is shown graphically in Figure 4. Intolerable items such as smoking are at the top of the pyramid, while much lower risks, such as flying, sit at the lower end of the ALARP zone (close to tolerable).

The risk ranking matrices used during the PRA workshop are presented in Section 4.

3 IDENTIFY RISKS

3.1 OVERVIEW

The identification of risks involved the use of risk assessment “tools” appropriate for identifying potential loss scenarios associated with the Project. The tools used were:

- Introduction – before the potential issues were discussed it was important that the whole team had a good understanding of the Project, and this was confirmed by the facilitator.
- Presentation Review – the project was described in detail by knowledgeable team members and this generated development of potential loss scenarios that were added to the Risk Ranking Table.
- Modified Hazard and Operability (HAZOP) analysis – this involved the review of key words (drawn from the Terms of Reference for the Project) and aerial photographs, plans, and the consequent identification of potential issues at each logical location / node during each phase of operation.

3.2 ENVIRONMENTAL RISK ASSESSMENT TEAM

The review team met for the PRA workshop in Brisbane in May 2017. A team based approach was utilised in order to have an appropriate mix of skills and experience to identify the potential environmental issues and potential loss scenarios. Details of the team members and their relevant qualifications and experience are included in Table 1.

Table 1 – Review Team

Name	Position / Affiliation	Relevant Qualifications & Experience
Peter Standish	Facilitator, OpRM	Formal qualifications in mining and over 30 years industrial experience at similar operations to the Project.
Blair Richardson	Development Manager, Olive Downs Coking Coal Project, Pembroke Olive Downs Pty Ltd	B Sc (Geol), over 30 years industrial experience.
Shaun Nugent	Director, Phronis Consulting	B Eng, 28 years delivering mine infrastructure design and build projects.
Tom MacKillop	Senior Environmental Project Manager	B Eng, B Sc, 8 years industrial experience.
Joseph Fittell	Environmental Project Manager	B Sc, 5 years industrial experience.

3.3 RISK IDENTIFICATION

3.3.1 Modified HAZOP

The main “tool” applied with the team was that of a modified HAZOP. In this process the aerial photographs and plans of the pipeline route and surrounding district were referred to along with a consideration of the phases of operation and the potential impacts that could arise.

The generic key words used in the HAZOP process representing environmental issue subject areas (generally based on the headings in the Terms of Reference for the Project) were:

- Surface Water;
- Groundwater;
- Noise and Blasting;
- Air Quality;
- Hazardous Chemicals;
- Public Safety;
- Land Management;
- Soil and Land Resource;
- Fauna (Terrestrial and Aquatic);
- Flora;
- Visual;
- Road Transport;
- Socio-Economic;
- Land Contamination;
- Aboriginal Cultural Heritage;
- Historic Heritage; and
- Geochemistry.

The key issues identified in the PRA are addressed in the relevant specialist assessments appended to the EIS. A summary of these issues is also provided in Section 3 of the EIS.

3.3.2 Referred Issues

Where issues raised during the PRA workshop brainstorming were either outside the scope of the PRA, outside of the Project scope, or beyond the control of Pembroke, they are therefore not considered to be key potential environmental issues. The “referred issues” were considered to warrant consideration in the development of the EIS.

The team identified that ISO20 relating to flooding impacts arising from public access to private property would require further consideration by Pembroke during the operational phase of the Project.

4 ANALYSE RISKS

4.1 PROBABILITY AND MAXIMUM REASONABLE CONSEQUENCE

Potential loss scenarios (primarily based on the identified key potential environmental issues) were ranked for 'risk' by the PRA team. A tabular analysis was used for this risk ranking process, based on the probability and consequence of a loss scenario occurring as decided by the PRA team.

The following definition of 'risk' was used:

- the combination of the probability of an unwanted event occurring; and
- the maximum reasonable consequences (MRCs) should the event occur.

Tables 2 to 4 present the PRA matrix tools that were utilised for ranking risks.

Table 2 – Qualitative Measures of Probability

Rank (P)	Probability	Descriptor
A	Almost Certain	Happens often.
B	Likely	Could easily happen.
C	Possible	Could happen and has occurred elsewhere.
D	Unlikely	Hasn't happened yet but could.
E	Rare	Conceivable, but only in extreme circumstances.

Table 3 – Qualitative Measures of Maximum Reasonable Consequence

Ref (C)	Consequence	Comment
1	Extreme environmental harm	E.g. widespread catastrophic impact on environmental values of an area.
2	Major environmental harm	E.g. widespread substantial impact on environmental values of an area.
3	Serious environmental harm	E.g. widespread and considerable impact on environmental values of an area.
4	Material environmental harm	E.g. localised and considerable impact on environmental values of an area.
5	Minimal environmental harm	E.g. minor impact on environmental values of an area.

Note: MRC: The worst-case consequence that could reasonably be expected, given the scenario and based upon experience at the operation and within the mining industry.

Table 4 – Risk Ranking Table

		Probability (P)				
		A	B	C	D	E
Consequence (C)	1	1 (H)	2 (H)	4 (H)	7 (M)	11 (M)
	2	3 (H)	5 (H)	8 (M)	12 (M)	16 (L)
	3	6 (H)	9 (M)	13 (M)	17 (L)	20 (L)
	4	10 (M)	14 (M)	18 (L)	21 (L)	23 (L)
	5	15 (M)	19 (L)	22 (L)	24 (L)	25 (L)

Notes:

L = Low; M = Moderate; H = High

Risk Numbering:

1 = highest risk, 25 = lowest risk

Legend:

Risk Levels:	
	Tolerable
	ALARP
	Intolerable

4.2 RISK RANKING

Risk ranking was undertaken by the team on loss scenarios based on the key potential environmental issues (Table 5).

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Table 5 – Risk Ranking Results

Ref	Incident Type	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
IS013	Animal Attack	Inappropriate land management leading to increase in pest fauna (e.g. pigs, snakes) encounter with members of the public.	Feral animal control measures; Appropriate land management practices; Communications with nearby landowners if increase in potentially aggressive fauna observed; Awareness training in relation to dangerous fauna; Select and train an appropriate number of staff in first-aid and injury management; Keep appropriate first-aid equipment readily available.	Personal injury arising from interaction with a dangerous animal - mitigated by reduced numbers of unwanted animals, site ability to respond, and land management practices.	D	3	17 (L)
IS012	Bushfire	Bushfire enhanced due to increased fuel storage on-site compared with surrounding properties.	Construction and maintenance of fire breaks; Provision of fire fighting equipment; Emergency Response Procedure prepared in consultation with emergency services; Induction and refresher training for all staff in emergency response procedures.	Regional fire which impacts on safety and assets being impacted - potential for a fatality (2) and less than \$5 million (M) asset loss (4). Considers the controls intended to be in place regarding fire and bushfire prevention, fire fighting and emergency response.	E	2	16 (L)
IS008	Bushfire	Construction activity near diesel/chemicals storage results in a fire leading to off-site impacts.	Fire fighting equipment in appropriate locations; Regular inspections and maintenance of fire fighting equipment; On-site emergency response team; Operator training.	As for IS012	E	2	16 (L)
IS010	Bushfire	Malfunction of on-site power reticulation resulting in off-site fire.	Power reticulation designed to Australian Standards and legislation – including security measures; Fire fighting equipment in appropriate locations; Regular inspections and maintenance of fire fighting equipment; Power usage monitoring and alarms; On-site emergency response team.; Operator training.	As for IS012	E	2	16 (L)
IS026	Cultural Heritage	Impact on cultural heritage in the construction/access corridors.	Cultural Heritage Assessment that leads to a Cultural Heritage Management Plan.	Damage to cultural heritage items or sites without appropriate licensing. Mitigated by surveys, consultation, and cultural heritage training for all workers.	D	5	24 (L)

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Ref	Incident Type	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
IS005	Explosion	Coal dust explosion at coal stockpiles or coal handling infrastructure leads to off-site explosion related impacts.	Water carts with water cannon available for stock pile dust suppression if required, as well as use of fixed stockpile sprays; Fire fighting equipment and spill kits in appropriate locations; Regular inspections and maintenance of fire fighting equipment; Operator training; Wet treatment process; Low frequency of dust explosions on surface away from bins.	Extremely rare event mitigated by stockpile management and water as the carrying medium in the CHPP. Safety impact causing a single death.	E	2	16 (L)
IS029	Explosives	Impacts related to the explosives plant/magazine with potential for security issues and / or unintended initiation of explosives.	Operational Plan conforming with requirements to meet standards and limit the potential for unwanted SSAN incidents.	Unintended initiation of explosives either during operations or at the plant - leading to multiple deaths. Mitigated by relatively insensitive product, explosives handling protocols and other management plans required activities.	E	1	11 (M)
IS029	Explosives	Impacts related to the explosives plant/magazine with potential for security issues and/or unintended initiation of explosives.	Operational Plan addressing conforming with requirements to meet standards and limit the potential for unwanted SSAN incidents.	Theft of explosives leading to off-site impacts - mitigated by security systems and potential impact on the site's licence to operate. Ranked on the basis of a significant business impact.	D	3	17 (L)
IS021	Fauna	Vehicle to fauna impact (e.g. kangaroo).	Road Transport Assessment that will guide requirements for road upgrades, speed limits, intersection designs and a transport management system.	Potential injury to native species - mitigated by Biodiversity Management Plan activities and site clearance protocols. Minimal environmental harm in a localised area.	C	5	22 (L)
IS006	Fire	Spontaneous combustion event leads to off-site fire related impacts (fume/emissions).	Design of ROM pad; Fire fighting equipment in appropriate locations; Regular inspections and maintenance of fire fighting equipment; Operator training.	Localised heating, fume impacts and health effects (largely for personnel on-site). Mitigated by Rangal measures low propensity for spontaneous combustion, early identification of issues, stockpile management, and equipment to control any identified hot spots. Impact is on worker health, and potential fume effects on a neighbour working on a nearby property. Loss considered was a medical treatment for fume inhalation.	D	4	21 (L)

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Ref	Incident Type	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
IS003	Fire or Explosion	Poor maintenance, poor design, collision or human error leading to off-site fire/explosion/fume emissions-related impacts.	Design of structures/tanks/pipes/blasts to relevant standards; Fire fighting equipment in appropriate locations; Regular inspections and maintenance of fire fighting equipment; Protection of storage facilities; Operator training.	As for IS012	E	2	16 (L)
IS011	Flood	Mine landform exacerbates impacts of natural flooding event.	Design of mine landforms in consideration of flood modelling; Construction of highwall emplacements. Surface Water Impact Assessment leading to development of a Water Management Plan. Liaison with relevant community emergency groups.	Changes in flooding characteristics impacts high value assets on neighbouring properties - mitigated by Surface Water management practices and requirements developed with local emergency management groups. Considered a financial impact of less than \$5M.	D	4	21 (L)
IS037	Greenhouse Impacts	No credible scenario could be developed to link the Project to a material change in climate.	Potential climate changes from global external influences are covered by Air Quality and Water Management analyses and intended Plans.	No ranking applied as issue identified as not being a credible, rank-able loss scenario for the Project.	-	-	-
IS001	Leak/Spill	Failed tank or associated fittings, pump or pipework or operator error leading to off-site impacts including chemical or fuel contamination.	Storage tanks located to minimise potential impacts of leaks/spills; Design of structures/tanks/pipes to relevant standards and legislation; Bunding of storage facilities; Regular inspections and maintenance (where required); Spill management equipment (i.e. spill kits), procedures and training; Operator training; Operational procedures; Signage.	Considered a release of hazardous substance to the surrounding environment mitigated by spill response, water management, and containment facilities. Considered a spill beyond containment to impact the community downstream - leading to a minor impact on environmental values of an area.	C	5	22 (L)
IS002	Leak/Spill	Failed storage vessel due to mechanical impact or corrosion leading to off-site impacts including chemical or fuel contamination.	Design of structures/tanks/pipes to relevant standards legislation; Bunding of storage facilities; Protection of storage facilities; Spill management equipment, procedures and training; Regular inspections and maintenance (where required); Operator training; Operational procedures; Signage.	As for IS001	C	5	22 (L)
IS027	Leak/Spill	Release of water from the incoming raw water pipeline which generates erosion, scour etc.	Project Management Delivery Plan identifying the requirements for controls related to pipelines.	Clean water release leading to minor erosion - mitigated by water management, corridor design and maintenance. Considered a minor impact.	D	5	24 (L)

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Ref	Incident Type	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
IS034	Leak/Spill	Release of coal to water courses impacting water quality for downstream water users.	Surface Water Impact Assessment leading to development of a Water Management Plan.	As for IS001	C	5	22 (L)
IS035	Leak/Spill	Coarse and fine rejects disposal leads to impact on surface water and ground water causing impacts to downstream water users.	Surface Water Impact Assessment leading to development of a Water (Surface and Ground) Management Plan and Tailings Management Plan; Dam Safety Management Plan.	Dam wall failure leads to a release of coarse and fines rejects beyond containment capacity and downstream impacts on surface water users. Mitigated by controls around dam safety and ability to respond to spills on site (recovering coarse and fine rejects). Considered loss of ability to produce for an extended period and subsequent loss of regional revenues / economic impacts. Considered an impact of <\$100M.	E	3	20 (L)
IS036	Leak/Spill	Planned and unplanned releases of water outside of release criteria - leading to impacts to downstream water users.	Surface Water Impact Assessment leading to development of a Water Management Plan and appropriate release conditions.	As for IS001	C	5	22 (L)
IS007	Leak/Spill	Spill of diesel, oils, lubricants, solvents, sewage wastes or domestic wastes leading to offsite impacts on nearby watercourses or land.	Water Management Plan; Fuel, oils and lubricants stored in accordance with relevant legislation; Spill management equipment (i.e. spill kits), procedures and training; Dangerous goods register (safety data sheets [SDS]); Construction specific environmental controls; Operator training.	As for IS001	C	5	22 (L)
IS009	Leak/spill	Leak or spill from Project water management system (e.g. coal contact water) leading to off-site impacts associated with water quality.	Regular inspection and maintenance of water containment structures for structural integrity and effectiveness; Operator training; Water Management Plan.	Mine affected (elevated salinity and turbidity) water release leading to adverse impacts on downstream water quality and downstream water users. Ranked as causing minor financial impacts.	C	5	22 (L)
IS020	Loss of Access	Flooding, weather events, and change from public access to private property.	Project Management Delivery Plan identifying the requirements for access points to limit access to third parties.	No ranking applied as issue identified as not being a credible, rank-able loss scenario for the Project.	-	-	-

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Ref	Incident Type	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
IS024	Public Amenity	Additional road movements along the road network near other land users - with impacts including noise and dust.	Road Transport Assessment that will guide requirements for road upgrades, intersection designs and a transport management system. Social Impact Assessment that will lead to a Community Interaction Management Plan (or similar).	Considered the impact of project related vehicles on private vehicles using the road network. Worst case scenario would be a vehicle related fatality - mitigated by road transport measures (times of movement, escorts, etc.)	D	2	12 (M)
IS025	Public Amenity	Restriction of access for farming activities with the on either side of the route(s).	Social Impact Assessment that will lead to a Community Interaction Management Plan (or similar).	Considered impact on local landholder and agricultural grazing enterprise. Mitigated by stock crossing facilities and other measures. Relatively minor financial impact < \$250 thousand (k).	C	5	22 (L)
IS028	Public Amenity	Additional train movements along the main line and more frequent level crossing closures and dust impacts from wagon movements.	Transport Assessment to identify whether impacts to the road network are acceptable. Air Quality Assessment leading to development of an Air Quality Management Plan.	Considered the existing regional rail network and current high usage of level crossings (small increment from the project). Small increment in rail movements and dust release. Considered a minor financial impact from delays at crossings.	C	5	22 (L)
IS033	Public Amenity	Dumps, final voids, rehabilitated areas and other mine landforms not having a good integration with other landforms in the area or not establishing as intended.	Geotechnical design of landforms, including the final void, and landform stability considerations. Rehabilitation Strategy Development leading to a Rehabilitation Management Plan.	Poor rehab results in a final landform that releases sediment or presents a poor visual amenity. Mitigated by intended rehabilitation processes and inability to surrender leases until stable landform is demonstrated.	D	4	21 (L)
IS017	Safety	Community threats - worker(s) assaulted or threatened.	Social Impact Assessment - that will guide the formation of the: Community engagement processes; External agencies liaison protocols (Police interaction etc.).	Considered a confrontation with potential for minor injury. Mitigated by the land holder's exposure to current mining operations, current relationships, and land access agreements.	D	5	24 (L)
IS018	Safety	Interaction with over head power lines, the proposed gas pipeline, telecoms, or a neighbour's infrastructure.	Project Management Delivery Plan that includes identification of potential unwanted interactions and requirements for developing appropriate controls. Operational Management Systems in place that is expected to include all aspects of interacting with infrastructure.	Potential for a single fatality related to exposure to external energy sources. Mitigated by multiple redundant operational controls (permitting etc.) and infrastructure designs which protect third parties.	E	2	16 (L)

Pembroke Olive Downs Pty Ltd – Olive Downs Coking Coal Project Preliminary Risk Assessment

Ref	Incident Type	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
IS032	Safety	Release of dust, blast fumes, and other contaminants leading to health impacts (on and off-site personnel).	Air Quality Assessment leading to the development of an Air Quality Management Plan and associated site Safety and Health Management System.	Possible fume and dust release off-site - mitigated by blast protocols that restrict blasting by wind direction.	B	5	19 (L)
IS022	Sediment Release	Construction or surface disturbance release of sediments from the road corridor to surrounding properties.	Surface Water Impact Assessment leading to development of a Water Management Plan.	Considered a release of sediment to the surrounding environment mitigated by spill response, water management, and containment facilities. Considered a spill beyond containment to impact the community downstream - leading to a minor impact on environmental values of an area.	C	5	22 (L)
IS023	Sediment Release	ROM Coal release from haul trucks using the road corridor.	Surface Water Impact Assessment leading to development of a Water Management Plan.	As for IS022	C	5	22 (L)
IS014	Spread of disease	Inappropriate land management leading to increase in mosquito encounter with members of the public.	Appropriate land management practices; Appropriate draining of standing water on-site and site water management.	Public health impacts from poor control of native and feral animals/pests. Mitigated by Weed and Feral Species Management plan activities.	E	5	25 (L)
IS015	Spread of disease	Proliferation of rodents and other pests leading to increase in predatory species, such as snakes, and potential interaction with members of the public.	Purpose designed waste management and transfer zones; Refuse bins would be covered to prevent vermin; Appropriate control measures would be utilised.	Feral species populations increase on-site - mitigated by Weed and Feral Species Management plan activities. Considered an impact on surrounding/neighbouring properties and land prices <\$5M.	D	4	21 (L)
IS004	Theft	Malicious act that results in off-site impacts.	Restriction of access to storage areas, including securing storage facilities; Provision of adequate lighting around storage facilities; Installation of fencing and/or signage to discourage access to the site.	No ranking applied as the only potential impact is to Pembroke..	-	--	
IS016	Vehicle Incident	Fatigued worker runs off road/into community traffic during commute.	Proposed development of a site employee travel management plan - that covers requirements for personnel moving to/from site.	Considered the impact of Project related vehicles on private vehicles using the road network. Worst case scenario would be a vehicle related fatality - mitigated by road transport measures (times of movement, escorts for larger vehicles, fatigue management processes, etc.)	D	2	12 (M)

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Ref	Incident Type	Scenario	Existing and Proposed Preventative and Mitigating Measures	Ranking Basis	P	C	R
IS019	Vehicle Incident	Movement of ROM coal on-site, or heavy vehicles delivering gear during construction.	Road Transport Assessment that will guide towards requirements for road upgrades, intersection designs and a transport management system.	As for IS016	D	2	12 (M)

R= Risk - Ranking basis 1 (highest risk) to 25 (lowest risk).

Risk rankings defined as 1 to 6 – High; 7 to 15 - Medium (or ALARP) and 16 to 25 - Low.

5 MONITOR AND REVIEW

5.1 COMMUNICATION AND CONSULTATION

Consultation, involvement of personnel (Pembroke and their advisers) and communication of the process and outcomes of the PRA are intended to be achieved by the inclusion of this report and the relevant specialist assessments addressing the key potential issues in the EIS, and consideration of the report's outcomes in the overall Pembroke's management systems to be implemented for the Project (Attachment B).

5.2 CONCLUDING REMARKS

The risk assessment process conducted by the team was aligned with AS/NZS ISO 31000:2009, QLD Department of Natural Resource's Recognised Standard 02 and MDG1010 *Minerals Industry Safety and Health Risk Management Guideline* (NSW Department of Trade and Investment, 2011), with the intention of identifying the key potential environmental issues for the Project.

OpRM would like to thank all of the personnel who contributed to the risk assessment, in particular those personnel from Pembroke and Resource Strategies who prepared source material for the team session.

Peter Standish, July 2017

6 REFERENCES

QLD Department of Natural Resources – Recognised Standard 02 Control of Risk Management Practices, V1 18 July 2003 (available at [this link](#))

ATTACHMENT A – DEFINITIONS

ALARP	“As Low As Reasonably Practicable”. The level of risk between tolerable and intolerable levels that can be achieved without expenditure of a disproportionate cost in relation to the benefit gained.
AS/NSZ ISO 31000:2009	Australian Standard/New Zealand Standard on Risk Management.
Cause	A source of harm.
Control	An intervention by the proponent intended to either Prevent a Cause from becoming an incident or to reduce the outcome should an incident occur.
CHPP	Abbreviation - Coal Handling and Preparation Plant
Hazard	Is the source of potential harm or a situation with a potential to cause injury or illness to a person or harm to the environment
SEARs	Secretary’s Environmental Assessment Requirements.
MDG1010	Department of Trade and Investment guideline on risk management.
OpRM	Abbreviation - Operational Risk Mentoring a trading name of Salbury Pty. Ltd.
Outcome	The end result following the occurrence of an incident. Outcomes are analogous to impacts and have a risk ranking attached to them.
Personnel	Includes all people working in and around the site (e.g. all contractors, sub-contractors, visitors, consultants, project managers etc.).
Practicable	The extent to which actions are technically feasible, in view of cost, current knowledge and best practices in existence and under operating circumstances of the time.
Review	An examination of the effectiveness, suitability and efficiency of a system and its components.
Risk	The combination of the potential consequences arising from a specified hazard together with the likelihood of the hazard actually resulting in an unwanted event.

ATTACHMENT B – CONTROLS INTENDED FOR APPLICATION TO THE PROJECT

The following controls were identified in the team session (with similar items combined and duplicates removed) for each of the potential loss scenarios developed by the team. The team’s understanding of Pembroke’s approach to this was that they were intending to confirm that these controls were considered in subject matter expert’s contributions to and studies for the EIS – and ongoing adoption into the Olive Downs’ Site Management Systems.

Table B1 – Identified Controls / Control Strategies for the Project

Nominated Control	Pembroke Confirmed
Air Quality Assessment leading to the development of an Air Quality Management Plan and associated site Safety and Health Management System.	Agreed as Intended
Appropriate draining of standing water on-site and site water management.	Agreed as Intended
Appropriate land management practices.	Agreed as Intended
Awareness training in relation to dangerous fauna.	Agreed as Intended
Bunding of storage facilities.	Agreed as Intended
Communications with nearby landowners if increase in potentially aggressive fauna observed.	Agreed as Intended
Construction and maintenance of fire breaks.	Agreed as Intended
Construction of flood levees.	Agreed as Intended
Construction specific environmental controls.	Agreed as Intended
Cultural Heritage Assessment that leads to a Cultural Heritage Management Plan.	Agreed as Intended
Dangerous goods register and generation of appropriate site responses with reference to Safety Data Sheets (SDS) for containment and spill/fire/chemical reaction mitigation requirements.	Agreed as Intended
Design of mine landforms in consideration of flood modelling.	Agreed as Intended
Design of ROM pad.	Agreed as Intended
Design of structures/tanks/pipes to relevant standards and legislation.	Agreed as Intended
Emergency Response Procedure prepared in consultation with emergency services.	Agreed as Intended
External agencies liaison protocols (Police interaction etc.).	Agreed as Intended
Fire fighting equipment in appropriate locations.	Agreed as Intended
Fuel, oils and lubricants stored in accordance with relevant legislation.	Agreed as Intended
Geotechnical design of landforms, including the final void, and landform stability considerations.	Agreed as Intended
Induction and refresher training for all staff in emergency response procedures.	Agreed as Intended
Keep appropriate first-aid equipment readily available.	Agreed as Intended
Low frequency of dust explosions on surface away from bins.	Agreed as Intended
On-site emergency response team.	Agreed as Intended
Operational Management Systems in place that is expected to include all aspects of interacting with infrastructure and equipment - including development of maintenance strategies and execution of required work orders through allocating resources to conduct maintenance activities.	Agreed as Intended
Operational Plan addressing conforming with requirements to meet standards and limit the potential for unwanted Security Sensitive Ammonia Nitrate incidents.	Agreed as Intended
Operational procedures and associated training for workers.	Agreed as Intended
Potential climate changes from global external influences are covered by Air Quality and Water Management analyses and intended Plans.	Agreed as Intended
Power reticulation designed to Australian Standards and legislation – including security measures.	Agreed as Intended

Table B1 (continued) – Identified Controls / Control Strategies for the Project

Nominated Control	Pembroke Confirmed
Power usage monitoring and alarms.	Agreed as Intended
Project Management Delivery Plan identifying the requirements for controls related to pipelines.	Agreed as Intended
Project Management Delivery Plan identifying the requirements for access points (with appropriate fencing and gates) to limit access to third parties.	Agreed as Intended
Project Management Delivery Plan that includes identification of potential unwanted interactions between on and off site parties (workers/members of the public) and requirements for developing appropriate controls.	Agreed as Intended
Proposed development of a site employee travel management plan - that covers requirements for personnel moving to/from site (Olive Downs and Willunga).	Agreed as Intended
Provision of adequate lighting around storage facilities.	Agreed as Intended
Provision of fire fighting equipment.	Agreed as Intended
Purpose designed waste management and transfer zones.	Agreed as Intended
Refuse bins would be covered to prevent vermin.	Agreed as Intended
Regular inspection and maintenance of water containment structures for structural integrity and effectiveness.	Agreed as Intended
Regular inspections and maintenance of fire fighting equipment.	Agreed as Intended
Rehabilitation Strategy Development leading to a Rehabilitation Management Plan.	Agreed as Intended
Protection of Storage Facilities including restriction of access to storage areas, including securing storage facilities.	Agreed as Intended
Road Transport Assessment that will guide towards requirements for road upgrades, intersection designs and a transport management system.	Agreed as Intended
Select and train an appropriate number of staff in first-aid and injury management.	Agreed as Intended
Signage and work area standards for locations across site that have high incident potential/larger numbers of workers present.	Agreed as Intended
Social Impact Assessment that will lead to a Community Interaction Management Plan (or similar).	Agreed as Intended
Spill management equipment (i.e. spill kits in appropriate locations), procedures and training.	Agreed as Intended
Storage tanks located to minimise potential impacts of leaks/spills.	Agreed as Intended
Surface Water Impact Assessment leading to development of a Water Management Plan with appropriate measures to confirm only licensed releases occur. Liaison with relevant community emergency groups.	Agreed as Intended
Tailings Management Plan and development of an appropriate supporting Dam Safety Management Plan.	Agreed as Intended
Transport Assessment to identify whether impacts to the road network are acceptable.	Agreed as Intended
Water carts with water cannon available for stock pile dust suppression if required, as well as use of fixed stockpile sprays.	Agreed as Intended
Wet treatment process for coal with inherent controls of fire and dust risks that flow from using this type of process.	Agreed as Intended

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