

# CHAPTER 6

## IMPACT ASSESSMENT METHODOLOGY



### ANGAS PROCESSING FACILITY

### MISCELLANEOUS PURPOSES LICENSE APPLICATION

2019/0826



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## CONTENTS

6	Assessment Methodology .....	4
6.1	Impact Assessment .....	4
6.2	Identification of Environmental Elements Associated with Project Activities .....	5
6.3	Identification of Potential Impact Events .....	5
6.3.1	Description of Source, Pathway, Receptor .....	5
6.3.2	Description of Limitations and Uncertainty .....	5
6.3.3	Confirmation of Impact Events .....	6
6.4	Risk Assessment .....	7
6.4.1	Identification of Control Measures and Factors that will Limit Impacts .....	7
6.4.2	Categorisation of Impact .....	7
6.4.3	Rating Level of Certainty in Control Strategies and Modelling .....	8
6.4.4	Risk Ranking .....	9
6.5	Outcomes and Criteria .....	11

## LIST OF FIGURES

Table 6-1	Criteria for Categorising Limitations and Sensitivity to Change of Assumptions .....	6
Table 6-2	Criteria for Categorising Residual Project Environmental Impacts and Benefits .....	7
Table 6-3	Rating Level of Certainty .....	8
Table 6-4	Risk Matrix .....	9
Table 6-5	Criteria for Categorising Consequence .....	10
Table 6-6	Criteria for Categorising Likelihood .....	11

## 6 ASSESSMENT METHODOLOGY

This chapter describes the impact assessment methodology that was adopted for the Miscellaneous Purposes Licence (MPL) application area. The minimum requirements to be included in a mining proposal for a mineral lease (ML) and associated MPL are described in Ministerial Determination 006 (MD006). These requirements include an assessment of the actual and/or credible potential impact events associated with each phase of the proposed mining activities (construction, operation and post mine closure). The mining proposal must also describe the controls and management strategies proposed to reduce adverse environmental impacts.

The impact assessment for the proposed Angas Processing Facility (APF) MPL has been undertaken in accordance with MD006 and considers the adverse and beneficial environmental (biophysical, social and economic) effects associated with the proposed activities. In undertaking the impact assessment, the following definitions have been adopted:

- **Environment:** Section 6(4) of the *Mining Act 1971*, states that the environment includes:
  - Land, air, water (including both surface and underground water and sea water), organisms, ecosystems, native fauna and other features or elements of the natural environment;
  - Buildings, structures and other forms of infrastructure and cultural artefacts;
  - Existing or permissible land use;
  - Public health, safety or amenity;
  - The geological heritage values of an area; and
  - The aesthetic or cultural values of an area.
- **Environmental Aspect:** Elements of the project that interact with the environment, including land disturbance, discharges to land, atmospheric emissions, releases to water, resource use, waste generation, energy generation and alteration to amenity.
- **Environmental Element:** An element of the environment that may be impacted by mining activities.
- **Environmental Impact:** Any change to the environment wholly or partially, directly or indirectly, caused by mining operations which is confirmed through the presence of a source, pathway and environmental receptor.
- **Environmental Risk:** Actual or potential threat of adverse effects to environmental, community and economic values arising from unexpected or unplanned events associated with the project. Unexpected or unplanned events include failure of environmental controls, measured impacts being greater than predicted impacts and natural disasters such as bushfire.
- **Environmental Values:** Qualities of the environment, an environmental component or receptor that society values and requires protection from the effects (both real and potential) of proposed activities under legislation, government policy or in response to community and stakeholder expectations.

### 6.1 IMPACT ASSESSMENT

The impact assessment process recognises that, even with controls in place, normal or planned operation of the APF may result in changes to environmental, community and economic values. The aim of the impact assessment was to identify all potential environmental impacts using the steps outlined below.

## 6.2 IDENTIFICATION OF ENVIRONMENTAL ELEMENTS ASSOCIATED WITH PROJECT ACTIVITIES

The environmental elements of the project were identified based on the description of the existing environment (Chapter 2), description of proposed mining operations (Chapter 3) and the results of community consultation/stakeholder engagement (Chapter 5). Environmental elements that could be impacted by, or were seen to be sensitive to project operations, were then the subject of technical studies to further describe the existing environment and validate the views of affected parties.

All environmental elements identified for the MPL were previously identified during the development and approval process of Angas Zinc Mine Mining Proposal (ML 6229) and Program for Environment Protection and Rehabilitation (PEPR).

## 6.3 IDENTIFICATION OF POTENTIAL IMPACT EVENTS

Potential impact events are specific events that may result in an environmental impact, described through the identification of a source, pathway and environmental receptor. Impact events may be natural (eg rainfall, earthquake, wind), caused by third party activities, or caused directly or indirectly by mining operations.

Potential impact events were considered for each environmental element through each phase of operation (Appendix E1). Identification of impact events did not take account of any management controls that may be used to minimise or eliminate an impact.

### 6.3.1 DESCRIPTION OF SOURCE, PATHWAY, RECEPTOR

The **source** of the impact describes the hazard and origin of the event, eg wheel generated dust.

The **pathway** describes the means or route by which a receptor can be exposed to, or be affected by, an identified source, eg wind.

The **receptor** is a specific component of an environmental element, eg health of surrounding residents. A receptor will have a degree of significance or value as determined by stakeholder engagement or recognised in legislative or other standards. Where there has been no value or significance attributed to a receptor, it can be assumed that there could be no potential impact on that receptor.

All environmental receptors identified for the MPL were previously identified during the development and approval process of Angas Zinc Mine Mining Proposal (ML 6229) and Program for Environment Protection and Rehabilitation (PEPR, 2017).

### 6.3.2 DESCRIPTION OF LIMITATIONS AND UNCERTAINTY

Any uncertainties (including knowledge gaps) and assumptions pertaining to the identification and description of the source, pathway and environmental receptors were described. This included whether there was sufficient representative data (baseline environmental data) and information available to perform an assessment, which is particularly relevant when the determination of a source, pathway and environmental receptor involved modelled predictions. The sensitivity of the impact to a change in assumptions applied to the source, pathway, receptor (S-P-R) was also considered.

Limitations could derive from such factors as:

- Availability of baseline and contextual information;

- Any scope limitations in technical studies, for example, whether information is based on desktop studies or fieldwork; or whether the scope was limited to only considering certain factors and not others;
- The competency/experience of the person undertaking the technical studies on which the information is based;
- The proportion of the planned task achieved in the studies. For a range of factors (e.g. adverse weather), it may not have been possible to complete a study as planned;
- The timing of a study, e.g. whether an ecological study was completed at the optimum time of year/season to detect target species;
- Intensity of the sampling/data collection in studies (in retrospect, whether the intensity was adequate); and
- Inadequate information on the effectiveness of proposed control and management strategies.

Limitations and sensitivity to change of assumptions ratings are presented in Table 6-1.

TABLE 6-1 | CRITERIA FOR CATEGORISING LIMITATIONS AND SENSITIVITY TO CHANGE OF ASSUMPTIONS

Category	Criteria
<b>Limitations in the impact assessment</b>	
Low	Sufficient information available to undertake a rigorous science based assessment. Additional studies/sampling would be unlikely to result in any significant new information that would change conclusions reached.
Medium	Some deficiencies in the information available. Additional information may change conclusions reached but not in a substantial way.
High	Significant gaps in the information required and/or low level of confidence in the reliability of information obtained. Potential for improved information to significantly change the conclusions reached in the assessment.
<b>Sensitivity to change of any assumptions</b>	
Low	Sensitivity testing demonstrates conclusions reached in the impact assessment are highly unlikely to change if assumptions are found to be incorrect
Medium	Sensitivity testing shows conclusions reached in the impact assessment may change if assumptions are found to be incorrect but the level of impact would not increase significantly.
High	Conclusions reached in the impact assessment would be erroneous and could not be relied on if assumptions were found to be incorrect. Sensitivity testing not undertaken, or unable to be undertaken with meaningful results.

### 6.3.3 CONFIRMATION OF IMPACT EVENTS

Confirmation of an S-P-R was provided through science-based analysis of the presence of, and interactions between, the source, pathway and receptor, and where relevant was backed by site-specific data. Where an S-P-R was determined not to exist, justification (evidence) was provided to clearly demonstrate how that conclusion was reached.

An impact event will only occur if a source, pathway and receptor are all present. Consistent with MD006, potential impact events were not considered further where no receptors of concern were

identified for an environmental element or where the source/hazard was of such low intensity or concentration that it could not reasonably be expected to cause harm to a receptor.

Where a source, pathway and receptor were all present such that an environmental impact could reasonably be expected to occur, or where knowledge gaps made it uncertain as to whether the source, pathway and receptor were present, an environmental risk assessment was undertaken to determine the expected impact on a receptor.

## 6.4 RISK ASSESSMENT

Faults, failures and unplanned events may occur with the potential to cause environmental impact despite best efforts to avoid or mitigate impacts. Risks may also arise as a result of uncertainties around the assessment of impacts. The effect of these events/uncertainties may be that the actual impact on an environmental value from the project is greater (or less) than expected. Unlike the identification of potential impact events, the risk assessment considers the type and effectiveness of proposed control measures.

### 6.4.1 IDENTIFICATION OF CONTROL MEASURES AND FACTORS THAT WILL LIMIT IMPACTS

During the operation of Angas Zinc Mine under ML 6229, impact control measures have been applied and tested through environmental monitoring in accordance with AZM's approved PEPR. Terramin Australia have adopted a hierarchy of controls applied in the following order:

- Elimination (prevention) – Redesign as to eliminate the impact.
- Design/engineering (physical) controls – Minimise the impact through physical barriers, controls and treatments.
- Management system (procedure) controls – Manage the risk through procedures and the way the activity is conducted by personnel.

### 6.4.2 CATEGORISATION OF IMPACT

Identified impacts and benefits were categorised as being negligible, low, medium or high (Table 6-2). Impact criteria were developed to standardise the assessment and categorisation of impacts for the project. The risk assessment has focused on the major issues associated with the project, being those impacts identified as either medium or high. The impacts identified as low or negligible have been addressed only to the extent necessary to demonstrate that they have been considered.

The factors relevant to developing the project impact criteria included legislative criteria, the duration and frequency of the impact, the nature of the affected receiver and the geographic scale of the impact.

TABLE 6-2 | CRITERIA FOR CATEGORISING RESIDUAL PROJECT ENVIRONMENTAL IMPACTS AND BENEFITS

Category	Impacts		Benefits
	Legislative Criteria Exist	Legislative Criteria Do Not Exist	
Negligible 1	A negative change below detectable limits.	A negative change below detectable limits. OR No change to environmental value(s) <sup>3</sup> .	A positive change below detectable limits.

Category	Impacts		Benefits
	Legislative Criteria Exist	Legislative Criteria Do Not Exist	
Low 2	Detectable negative change that is within regulatory limits/standards.	A short-term (<3 years) negative change affecting receivers located within the MPL area <sup>2</sup> boundary (local receiver) only. OR A long-term (>3 years) negative change with insignificant but detectable change.	A short-term (<3 years) positive change experienced within the MPL area <sup>2</sup> only. OR A long term (>3 years) positive change with insignificant but detectable change.
Medium 3	A periodic and/or temporary non-compliance of a regulatory limit/standard <sup>1</sup> .	A long-term (>3 years) negative change affecting receivers located within the MPL area <sup>2</sup> boundary (local receiver) only. OR A short-term (<3 years) negative change affecting receivers outside of <sup>4</sup> the MPL area <sup>2</sup> boundary, but not regionally.	A long-term (>3 years) positive change experienced within the MPL area <sup>2</sup> only. OR A short-term (<3 years) positive change experienced outside of <sup>4</sup> the MPL area <sup>2</sup> boundary (local receiver), but not regionally.
High 4	A regular or consistent non-compliance.	A negative change affecting regional receivers, state-wide receivers or environmental value(s) <sup>3</sup> .	A positive change experienced by the region (Fleurieu Peninsula), the state or by environmental value(s) <sup>3</sup> .

1. Periodic and temporary impact is defined as a daily exceedance of a specified limit occurring no more than once every two weeks.
2. Project area is defined as the land within the proposed MPL boundary.
3. Environmental value is an element of the environment that is afforded protection under legislation, including through licensing and permitting (e.g. listed species, native vegetation, groundwater abstraction, level of service for roads).
4. Outside of the project area but not regionally considered to be receiving environments within 5 km of the project area to account for the extent of measurable impacts and to capture landowners with property adjacent to the proposed mine site.

### 6.4.3 RATING LEVEL OF CERTAINTY IN CONTROL STRATEGIES AND MODELLING

Significant uncertainties and assumptions pertaining to the likely effectiveness of proposed control measures in managing and mitigating impacts were assessed and a qualitative rating applied as shown in Table 6-3. The risk assessment also provided a description of actions that could reduce the level of uncertainty.

TABLE 6-3 | RATING LEVEL OF CERTAINTY

Level of Certainty	Understanding of Source, Pathway, Receptor	Extent to which Modelling has been Validated	Effectiveness of Design Measures	Effectiveness of Management Measures
High	Limitations in information rated as low.	Excellent baseline data available. Model has been run and provides accurate predictions over different seasons. Model has been extensively used and is regarded by discipline experts as leading practice and/or the impact assessment does not rely to any significant extent on the use of a model.	Widely used and demonstrated to be effective at a range of mining sites including sites with similar topographical/climatic conditions. Requires minimal checking and failure risk has been shown to be low.	Management measures are considered routine and used effectively throughout industry. Reduction in the level of impact from an unmitigated level does not rely primarily on the management measures.

Level of Certainty	Understanding of Source, Pathway, Receptor	Extent to which Modelling has been Validated	Effectiveness of Design Measures	Effectiveness of Management Measures
Medium	Limitations in information rated as medium.	Some baseline data available. Model shows a reasonable approximation of real conditions but relies on a number of assumptions and sufficient data not available to demonstrate the model accurately portrays seasonal conditions.	Has been used at sites with similar conditions but requires regular checking or maintenance to ensure performance. OR: Has only been used at limited sites. Effectiveness has not been established in the long term or at sites similar to the project site.	Management measures have been effectively used at a limited number of sites and have not been demonstrated at similar sites or in the long term and/or reduction in the level of impact from an unmitigated level relies primarily on the management measures.
Low	Limitations in information rated as high.	Minimal baseline data. Model is unable to be validated with current data.	Measures are novel and have not been demonstrated in the field.	Management measures are novel and/or heavily reliant on specialised technical expertise.

#### 6.4.4 RISK RANKING

Risk rankings considered both the consequences and likelihood of each impact event. The risk matrix presented in Table 6-4 uses:

- Credible worst case consequence that could occur if assumptions made were found to be incorrect or unexpected events occur (Table 6-5)
- Likelihood of such a consequence occurring (Table 6-6).

TABLE 6-4 | RISK MATRIX

			Consequences				
			1	2	3	4	5
			Insignificant	Minor	Moderate	Major	Catastrophic
Frequency	A	Almost Certain	Low	Medium	High	Extreme	Extreme
	B	Likely	Low	Medium	High	Extreme	Extreme
	C	Possible	Low	Low	Medium	High	Extreme
	D	Unlikely	Low	Low	Medium	High	High
	E	Rare	Low	Low	Low	Medium	High

TABLE 6-5 | CRITERIA FOR CATEGORISING CONSEQUENCE

Category	Level	Effect on fauna (inc. listed)	Effect on viability of listed species	Effect on behaviour of fauna	Effect on flora community	Ground and surface water	Groundwater - Recharge	Air Quality	Soil Quality	Landform	Cultural	Social	Injury and/or fatality
Insignificant	1	Insignificant effect.	Insignificant effect.	Local short term behavioural effect.	Local short term decrease in abundance of some species without reduction in local community viability.	Minimal change with no significant loss of quality.	Insignificant effect.	Insignificant effect.	Insignificant effect.	Insignificant effect.	No impact to items of cultural significance.	No impact or minor social impacts on local population. Mostly repairable.	No injuries.
Minor	2	Local short term effect.	Local short term decrease in abundance with no lasting effects on local population.	Local long term behavioural effect that does not unduly affect the ecology of the population.	Local long term decrease in abundance of some species resulting in little or no change to community structure.	Local minor short term reduction or change in quality.	Local minor change in recharge patterns within sub-catchments.	Local short term and minor surpass of air quality standard.	Local contamination that can be immediately remediated.	Minor change in geomorphology within localised portions of landform.	Minor damage to items of cultural significance.	Ongoing social issues.	Minor level of injuries resulting in time off work.
Moderate	3	Local long term effect with no significant effects on the ecology of the species.	Local long term decrease in abundance without reduction in local population viability.	Local long term behavioural impact that significantly affects the ecology of the population.	Regional long term decrease in abundance of some species and / or local loss of some species diversity resulting in some change to the community structure.	Local minor long term or widespread short term, or local major short term reduction or change in water quality.	Local moderate changes in recharge patterns within sub-catchments.	Local minor long term surpass of air quality standard. Widespread minor short term surpass of air quality standard. Local major short term surpass of air quality standard.	Local contamination that can be remediated in long term.	Widespread minor changes in geomorphology. OR Localised major changes in geomorphology.	Substantial damage to items of cultural significance.	Ongoing serious social issues. OR Significant damage to local landholder property/ structures repairable/reversible in the short term.	Minor level of injuries requiring off-site (doctor) medical treatment (hospitalisation).
Major	4	Local long term effect that significantly affects the ecology of the species.	Regional long term decrease in abundance and / or local loss resulting in reduction in regional viability.	Local long term behavioural impact that significantly affects the ecology of the species.	Regional long term decrease in abundance of numerous species and / or some loss of species diversity resulting in significant changes to community structure.	Widespread (regional) major short term reduction or change in quality.	Widespread major changes in recharge patterns within sub-catchments. OR Minor changes in regional recharge patterns.	Widespread (regional) major short-term surpass of air quality standard.	Local contamination that cannot be remediated in long term. OR Widespread contamination that can be remediated in long term.	Major changes in geomorphology resulting in effects beyond footprint.	Irreparable damage to items of cultural significance.	Very serious wide spread social impacts. OR Significant damage to local landholder property/ structures repairable/reversible in the long term.	Irreversible disability or impairment or serious injuries requiring long term hospitalisation. OR Single fatality.
Catastrophic	5	Regional extinction of the species.	Regional extinction of the species.	Irreversible widespread behavioural impact that significantly affects the ecology of the species.	Regional long term loss of numerous species resulting in the dominance of only a few species.	Regional long term reduction or change in water quality.	Regional major changes in recharge patterns.	Regional long term surpass of air quality standard.	Widespread contamination that cannot be remediated.	Widespread and ongoing major changes in geomorphology, resulting in effects beyond footprint of landform and flow on instabilities.	Irreparable damage to highly valued items of great cultural significance.	Complete breakdown of social order.	Several fatalities.

TABLE 6-6 | CRITERIA FOR CATEGORISING LIKELIHOOD

Descriptor	Level	General Description	Chance (per annum)	Frequency
Almost Certain	A	This event is expected to occur in most circumstances. <i>Expected to occur at least once each year.</i>	>90%	1/year
Likely	B	This event may occur in some given circumstances. <i>May occur during any given year.</i>	20%	1/5 years
Possible	C	This event might occur at some time. <i>Not likely to occur in any given year, but is possible.</i>	5%	1/25 years
Unlikely	D	This event could occur at some time. <i>Very unlikely to occur in any given year.</i>	1%	1/100 years
Rare	E	This event may only occur in very exceptional circumstances. <i>Examples of this have occurred historically, but it is not anticipated.</i>	<1%	<1/100 years

Note: The intention is to describe the probability or frequency of an event on an annualised basis such that the impacts or exposure (risks) faced by society and the environment are recorded as those present during any given year of the life of the project, including the construction phase.

## 6.5 OUTCOMES AND CRITERIA

Under Section 35(1)(a)(ii)(C) of the *Mining Act*, mining proposals must include ‘a statement of the environmental outcomes that are accordingly expected to occur’, taking into account the findings from the impact and risk assessment, along with ‘a draft statement of the criteria to be adopted to measure the expected environmental outcomes’.

An outcome is a statement of the acceptable impact on the environment (which may be no measurable impact) caused by the proposed mining activities. Outcome statements must be accompanied by measurable assessment criteria which are designed to demonstrate that the outcome has been achieved.

Outcomes have been developed for all impact events where a source, pathway and receptor were present (prior to the implementation of control and management strategies) such that an environmental impact that is not trivial in consequence could reasonably be expected to occur. The environmental outcomes proposed for the MPL are similar as the approved outcomes applicable to ML 6229 where applicable, as community consultation on outcomes resulted in the overwhelming majority stating they were comfortable with the outcomes associated with ML 6229 and would like them to continue.

Each outcome is supported by measurable assessment criteria that will be used during specific phases of the project life to assess compliance against the proposed outcomes. Where there is a high level of reliance on control strategies to reduce risk to the environment, draft leading indicator criteria have been developed, as required by Regulation 65(2)(e). These will be monitored to give an early warning that the control measure is failing and the outcome is potentially at risk of not being achieved. This allows prompt action to be taken to address the risk and ensure ongoing compliance.