

Jemena Northern Gas Pipeline Pty Ltd

Northern Gas Pipeline

Draft Environmental Impact Statement

CHAPTER 5 - ENVIRONMENTAL RISK ASSESSMENT

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5. ENVIRONMENTAL RISK ASSESSMENT

A risk assessment has been conducted to support the identification, analysis and mitigation of potential environmental, social and economic impacts associated with the NGP. The purpose of the environmental risk assessment is to demonstrate that:

- Jemena has fully considered the environmental risks associated with the Project
- risk prevention and mitigation are properly addressed in the design specifications
- risks will be managed effectively throughout the planning, construction, operation and decommissioning phases of the Project.

This chapter provides details of the environmental risk assessment process and methodology adopted by Jemena. The environmental risk register is provided and the risk assessment findings are summarised. The subsequent chapters of this EIS (chapters 6 to 12) provide a more detailed discussion of risks relating to Biodiversity, Water, Heritage, Economic & Social, Human Health & Safety, Air & Noise, and Matters of National Environmental Significance (MNES) protected under the Environment Protection and Biodiversity Conservation Act (EPBC Act).

The risk assessment procedure used is an adaptation of Jemena's corporate risk management procedures, and has been developed to align with AS/NZS ISO 13000:2009 – *Risk Management – Principles and guidelines*. The approach meets the requirements of Section 5.1 and 5.3 of the *Terms of Reference (ToR) for the preparation of an EIS for the Jemena NGP* (NT EPA, December 2015) (EIS ToR).

The risk assessment presented in this EIS will form the basis for ongoing management and review of risks throughout the life of the Project under the guidance of Jemena's Environmental Management System (EMS) risk management procedures. The outcome of the risk assessment undertaken as part of the EIS process will be scrutinised by the public, government and non-government stakeholders through the EIS public comment period. As the Project progresses through to detailed design, Jemena will review and update the NGP environmental risk register in response to feedback received from stakeholders.

Management controls identified through the risk assessment process are included in the framework Environmental Management Plan (EMP) provided in Chapter 13.

5.1 TERMS OF REFERENCE

Section 5 of the EIS ToR outlines the requirement for an environmental risk assessment of the NGP. The risk assessment approach is to be based on international best-practice. The Northern Territory Environment Protection Authority (NT EPA) recommends the use of processes for risk management that are formalised in Australian/New Zealand Standards (e.g. AS/NZS ISO 13000:2009; HB 436:2004; HB 203:2006; HB 158:2010).

The following general guidance is provided in the EIS ToR in relation to the risk assessment:

- information provided should permit the general reader to understand the likelihood and potential severity of each risks presented by the Project
- levels of uncertainty that preclude robust quantification of risk should be clearly acknowledged
- risk rankings assigned should be fully justified

- where a risk score is reduced by proposed mitigation measures, clear justification should be provided for the reduction
- the adequacy and feasibility of proposed mitigation measures must be demonstrable
- sufficient quantitative analysis should be provided to indicate where risks are likely to be acceptable or tolerable
- a comparison can be made with similar ventures in Australia and Internationally
- assumptions used in the analyses should be explained.

Section 5.3 of the EIS ToR requires an assessment of cumulative impacts that considers the potential impact of the Project in the context of existing developments, and reasonably foreseeable future developments, to ensure any potential environmental impacts are not considered in isolation.

5.2 APPROACH AND METHOD

Risk, for the purposes of this EIS, is defined as the probability of an activity having an impact on the objectives defined by the EIS ToR. The environmental objectives of the risk assessment process are defined by the EIS ToR. This section identifies those objectives and describes the risk assessment approach and method.

Consistent with ISO 31000:2009, the approach taken to risk assessment involves:

- communication and consultation
- establishment of context
- risk identification
- risk analysis
- risk evaluation
- risk treatment
- monitoring and review.

Communication and consultation is central to the risk assessment process. Jemena's approach to stakeholder engagement is described in Chapter 4 of this EIS. Further, Chapter 9 details further planned consultation processes in relation to identification and management of economic and social risks. A range of internal and external stakeholders were consulted through the risk assessment process, and further engagement with the public and other stakeholder will occur through the EIS public comment process. It is anticipated the environmental risk assessment will be reviewed following the EIS public comment phase, to take into account the feedback received where relevant.

Chapter 13 Environmental Management Plan describes the framework for monitoring and review of environmental risks over the Project life.

5.2.1 ESTABLISHMENT OF CONTEXT

The context for assessment of environmental risks is determined by external requirements defined by the EIS ToR, the characteristics of the existing environment, the Project details and Jemena's internal risk management requirements.

5.2.1.1 Objectives

The objectives for the risk assessment, as defined in the EIS ToR, are documented in Table 5-1.

Table 5-1. NGP environmental objectives

Environmental value	Objective/s
Biodiversity	Maintain the conservation status, diversity, geographic distribution and productivity of flora and fauna at species and ecosystem levels through avoidance or management of adverse impacts (on the Project area and adjacent areas that may be impacted).
Water	Ensure surface water and groundwater resources are protected both now and in the future, such that ecological health and land uses, and health, welfare and amenity of people are maintained. Available water supplies will be sufficient to fulfil the Project needs over the predicted life of the Project, without causing environmental or social impacts.
Historic and Cultural Heritage	To identify and protect items or places which have historic and/or cultural heritage values.
Human Health & Safety	Ensure that the risks to human health and safety are identified, understood and adequately mitigated.
Socio-economic	To monitor and manage the intended and unintended social and economic consequences, both positive and negative, of the Project.

These objectives and the risk assessment requirements prescribed in the EIS ToR were used to scope the risk assessment process.

5.2.1.2 Existing environment

The environmental context for the risk assessment was established using a combination of desktop review and field-based surveys to establish the:

- components or features of the environment in the Project footprint
- components or features of the environment that may be impacted by the Project
- sensitivity of the environment to impacts
- history, current use and condition of the environment which is likely to be impacted.

The characteristics of the existing environment relevant to assessing each area of environmental risk are described in chapters 6 to 12; under the section heading of Existing Environment. The information presented in each chapter is collated from desktop review and field-based assessments, and in most cases references technical reports included as appendices to the EIS.

5.2.1.3 Project details

The Project details upon which the risk assessment is based are provided in Chapter 2.

5.2.1.4 Internal context

Jemena’s Health Safety and Environment Management Systems (HSEMS) establish criteria for analysis and evaluation of risk. These criteria incorporate Jemena’s internal business and company stakeholder

requirements. For the purpose of the EIS risk assessment process, Jemena's criteria were adapted to incorporate the external requirements prescribed by the EIS ToR.

5.2.2 RISK IDENTIFICATION

Individual risks were identified through:

- considering the Project details in relation to the existing environment
- using the existing knowledge and experience held by Jemena and the Construction contractor in relation to identification and management of environmental risks in gas processing facilities and pipelines
- feedback from stakeholder engagement activities, including targeted consultation with NT Government agencies
- consideration of the risks specified in the EIS ToR prepared by the NT EPA through a public comment process.

The Project components and activities that will take place during each phase were identified through review of Project design documentation and engagement with key Jemena personnel and the Construction Contractor. The Project is detailed in Chapter 2; this information was consolidated into a standard list of Project phases/activities for the purpose of the risk assessment process as follows:

- transportation of personnel, machinery and materials
- construction of the pipeline and facilities
- establishment and operation of construction worker's camps
- workforce accommodation in/near Tennant Creek and Mount Isa
- storage and handling of fuel and other hazardous substances
- construction and operation of water retention ponds (dams)
- hydrostatic testing and disposal of associated water
- reinstatement and rehabilitation of construction the construction footprint
- operation and maintenance of the pipeline and facilities
- operation of the Phillip Creek Compressor Station
- operation of the Mount Isa Compressor Station
- decommissioning of the pipeline.

For each Project phase/activity, potential causes of environmental impacts (sources of risk) were then identified. For example, for the activity 'Transportation of personnel, machinery and materials', a potential 'cause' of environmental impact is 'Contamination of vehicles with weeds'.

The potential adverse impacts of the Project were then predicted by considering each potential cause against the key components of the existing environment for a possible interaction. The potential for interaction was considered by the technical specialists who undertook the technical assessments in relation to each area of risk (refer Appendix D). An impact was defined as any change to the environment, human safety, socio-economic situation, and/or historic and cultural heritage that may be caused by the Project.

Chapters 6 through 12 list the potential impacts identified for each Project phase; planning, construction, operations and decommissioning. The potential impacts of the planning, construction and operational phases of the Project are then detailed. Potential decommissioning impacts are noted; however, no risk assessment or further analysis of impacts is undertaken. The life of the pipeline is expected to be in excess of 30 years, and details of the decommissioning process and legislative requirements that will be applicable at the time are not known with enough certainty to inform assessment of risk. Prior to decommissioning, a decommissioning management plan will be prepared to the satisfaction of the regulators at the time, which will detail potential risks relevant to decommissioning activities and risk mitigation strategies.

5.2.3 RISK ANALYSIS AND EVALUATION

5.2.3.1 Assessment of likelihood and consequences

The consequences and likelihood of each identified potential impact were assessed in relation to the Project environmental objectives (refer Section 5.2.1.1). The ratings used for consequence and likelihood are presented in Table 5-2 and Table 5-3 respectively.

Table 5-2. Ratings for the assessment of likelihood

Categories		Measures of likelihood	Measures of likelihood for health impacts from Spikett et al 2011
1	Rare	<ul style="list-style-type: none"> The impact may occur only in exceptional circumstances. The impact is not likely to occur in this location. 	<ul style="list-style-type: none"> An incident or outbreak with non-chronic health effects that occurs once in more than 10 years. Up to 5% chance of a chronic health effect occurring during the life of the project.
2	Unlikely	<ul style="list-style-type: none"> The impact would be an uncommon occurrence and would occur in remote circumstances. The impact has occasionally occurred on pipeline developments. 	<ul style="list-style-type: none"> An incident or outbreak with non-chronic health effects that occurs once in 5-10 years OR 6-30% chance of a chronic health effect occurring during the life of the Project.
3	Possible	<ul style="list-style-type: none"> The impact occurs on an irregular basis. The impact has occurred on pipeline developments. 	<ul style="list-style-type: none"> An incident or outbreak with non-chronic health effects that occurs once in 3-5 years. 31-60% chance of a chronic health effect occurring during the life of the project.
4	Likely	<ul style="list-style-type: none"> The impact has a history of occurrence for pipeline developments. The impact is difficult to control due to external influences. 	<ul style="list-style-type: none"> An incident or outbreak with non-chronic health effects that occurs once in 1-3 years 61–90% chance of a chronic health effect occurring during the life of the Project.
5	Almost certain	<ul style="list-style-type: none"> The impact has occurred recently and is likely to occur again. The impact is an expected occurrence on a pipeline development project in similar regions. 	<ul style="list-style-type: none"> An incident or outbreak with non-chronic health effects that occurs more than once a year. Over 90% chance of a chronic health effect occurring during the life of the Project.

Table 5-3. Ratings for the assessment of consequence levels

Category Ranking	Environment	Threatened species	Historic & cultural heritage	Social health and well-being	Economy	Human health and safety ¹
A Minor	<ul style="list-style-type: none"> • Nil or minor localised impacts to, ecosystems, water resources or air. • Impact does not require specific management or rehabilitation. • Non-reportable incident. 	<ul style="list-style-type: none"> • No or negligible loss of a population's² critical habitat³ (<0.01%). • Temporary reduction in the quality (due to dust, noise and bushfire) of <0.01% of critical habitat. • No mortality. • Negligible impact to a population's breeding cycle. • Impact recoverable without management. 	<ul style="list-style-type: none"> • Low level or no disruption to cultural life or damage to cultural heritage sites, places or objects. • Minor or repairable damage to low significance heritage sites or items protected under the NT Heritage Act without a permit. 	<ul style="list-style-type: none"> • Low level or no impacts on social health and well-being. • Community can easily adapt or cope with the change. • Little or no stakeholder concerns and no impact to reputation. 	<ul style="list-style-type: none"> • Low level or no negative impacts on local economy and development. 	<ul style="list-style-type: none"> • No fatality. • No permanent disability. • No non-permanent injuries requiring hospitalisation. • No acute health effect requiring hospitalisation. • No evacuation. • No chronic health effect requiring medical treatment.
B Serious	<ul style="list-style-type: none"> • Minor impact to ecosystems, water resources or air. • Damage is recoverable through short-term management and rehabilitation. • Minor non-compliance of approval conditions. 	<ul style="list-style-type: none"> • Temporary loss of 0.01 – 0.1% of a population's critical habitat. • Temporary reduction in the quality (due to dust, noise and bushfire) of 0.01 – 0.1% of critical habitat. • Mortality of a few individuals with negligible impact to the population. • Disruption to a single breeding cycle of some individuals with negligible impact to the population. • Impact recoverable through short term management; no long term impact on any individuals. 	<ul style="list-style-type: none"> • Minor short term disruption to cultural life and / or minimal damage to cultural heritage sites, places or objects i.e. that can be avoided or mitigated. • Minor damage to medium significance heritage items or sites protected under the NT Heritage Act without a permit. 	<ul style="list-style-type: none"> • Minor short term potential impacts on social health and well-being that are easily manageable. • Community has the capacity to adapt or cope with the change. • Stakeholder concern that can be managed through good communication and reputation is maintained. 	<ul style="list-style-type: none"> • Minor short term impacts on the local economy and its development that can be easily absorbed. 	<ul style="list-style-type: none"> • No fatality. • No permanent disability. • Non-permanent injuries requiring hospitalisation for 1-5 persons. • No acute health effect requiring hospitalisation. • No evacuation. • Chronic health effect requiring medical treatment for about 0–1% of population at risk.

¹ Consequence definitions from Health Risk Assessment Scoping Guidelines (Spickett et al. 2011)

² The definition of 'population' is 'a group of the same species occurring in a geographically-distinct area, and have the capability of interbreeding'

³ The definition of 'critical habitat' is the same as that in the EPBC Significant Impact Guidelines 1.1 (DOE 2013)

Category Ranking	Environment	Threatened species	Historic & cultural heritage	Social health and well-being	Economy	Human health and safety ¹
C Severe	<ul style="list-style-type: none"> • Temporary but localised effect on ecosystems, water resources or air. • Rectification and rehabilitation required over the medium-term. • Significant non-compliance of approval conditions, reportable to regulatory authorities. 	<ul style="list-style-type: none"> • Temporary loss of 0.1 – 1% of a population's critical habitat. • Long term or widespread reduction in the quality (due to dust, noise and bushfire) of 0.1 – 1% of critical habitat. • Mortality of a few individuals leading to a temporary diminishment of a population • Disruption to breeding cycle leading to a temporary diminishment of a population. • Rectification and rehabilitation required over the medium term; no permanent impact on a population. 	<ul style="list-style-type: none"> • Serious medium term disruption to cultural life and / or serious damage to cultural heritage sites, places or objects, i.e. that cannot be avoided or mitigated. • Serious damage to medium or high significance heritage items or sites protected under the NT Heritage Act without a permit. 	<ul style="list-style-type: none"> • Serious medium term negative impacts to community health and safety and that are not easily manageable. • Community has some capacity to adapt and cope with change - requires some support. • Serious stakeholder concern that cannot be easily managed through good communication. • Adverse local media coverage. 	<ul style="list-style-type: none"> • Serious medium term negative impacts to the local economy and its development that are not easily absorbed. 	<ul style="list-style-type: none"> • No fatality. • No permanent disability. • Non-permanent injuries requiring hospitalisation for 1-2% of population at risk. • Acute health effect requiring hospitalisation for 1-2% of population at risk. • No evacuation. • Chronic health effect requiring medical treatment for 1-2% of population at risk.
D Major	<ul style="list-style-type: none"> • Major temporary effect on ecosystems, water resources or air. • Rectification difficult but may be possible in the long term. • Major breach, resulting in investigation by regulatory authorities. • Potential restriction on operations and/or fines. 	<ul style="list-style-type: none"> • Long term loss of 1 – 10% of a population's critical habitat. • Permanent reduction in the quality (due to dust, noise and bushfire) of 1 – 10% of critical habitat. • Mortality of sufficient individuals to lead to a long term diminishment of a population. • Disruption to breeding cycle leading to a long term diminishment of a population. • Rectification difficult but may be possible in the long term. 	<ul style="list-style-type: none"> • Major medium to long term disruption to cultural life and cultural heritage sites, places or objects. • Major irreparable damage to high significance heritage sites or items protected under the NT Heritage Act without a permit. 	<ul style="list-style-type: none"> • Major medium to long term negative impacts to community health and safety that cannot be managed. • Community has some capacity to adapt and cope with the changes - requires significant support. • Significant and major concern from stakeholders, community, prolonged community annoyance. • Adverse regional media coverage. 	<ul style="list-style-type: none"> • Major medium to long term negative impacts to the local economy and its development. 	<ul style="list-style-type: none"> • 1 fatality. • 2-5 permanent disabilities. • Non-permanent injuries requiring hospitalisation for 2-5% of population at risk. • Acute health effect requiring hospitalisation for >2-5% of population at risk. • Chronic health effect requiring medical treatment for 5-10% of population at risk.

Category Ranking	Environment	Threatened species	Historic & cultural heritage	Social health and well-being	Economy	Human health and safety ¹
E	<p>Catastrophic</p> <ul style="list-style-type: none"> Major permanent effect on ecosystems, water resources or air. Rectification difficult and unlikely to result in recovery. Restriction of operations due to investigation by regulatory agencies. Potential prosecution. 	<ul style="list-style-type: none"> Permanent loss of >10% of a population's critical habitat. Permanent reduction in the quality (due to dust, noise and bushfire) of >10% of critical habitat leading to a long term or permanent diminishment of a population. Mortality of a significant number of individuals leading to a permanent diminishment of a population. Disruption to breeding cycle leading to a permanent diminishment of a population. Rectification difficult and unlikely to result in recovery. 	<ul style="list-style-type: none"> Major long term disruption to cultural life and/or major, irreversible damage to cultural heritage sites, places or objects. Destruction of high significance heritage sites or items protected under the NT Heritage Act without a permit. 	<ul style="list-style-type: none"> Significant long term negative impacts to community health and safety. Community has no capacity to adapt and cope with the changes. Significant and major stakeholder concern and community outrage. Adverse national media and significant reputation damage. 	<ul style="list-style-type: none"> Significant long term negative impacts to the local economy and its development that cannot be reversed. 	<ul style="list-style-type: none"> >1 fatality. >5 permanent disabilities. Non-permanent injuries requiring hospitalisation for 5-10% of population at risk. Acute health effect requiring hospitalisation for >5-10% of population at risk. Chronic health effect requiring medical treatment for 10-15% of population at risk.

5.2.3.2 Risk rating

The overall risk rating was determined by combining the likelihood and consequence categories with reference to Jemena’s risk matrix (Table 5-4).

Table 5-4. Risk matrix

LIKELIHOOD	CONSEQUENCE				
	A - Minor	B - Serious	C - Severe	D - Major	E - Catastrophic
5 - Almost certain	Moderate	High	Extreme	Extreme	Extreme
4 - Likely	Moderate	Significant	High	Extreme	Extreme
3 - Possible	Moderate	Moderate	Significant	High	Extreme
2 - Unlikely	Low	Low	Moderate	Significant	High
1 - Rare	Low	Low	Moderate	Moderate	Significant

5.2.3.3 Evaluation

Risk evaluation occurred with reference to Jemena’s risk level and target action matrix (Table 5-5). Each potential impact was reviewed to determine the level of risk likely to be tolerable to stakeholders. The evaluation was used to determine which risks require treatment to reduce risk to As Low As Reasonably Practicable (ALARP).

Table 5-5. Risk level and target action

Risk level	Target action
Extreme	<ul style="list-style-type: none"> • Risk is unacceptable • Immediate action is required • Activity should not commence until risk can be reduced to an acceptable level • Where risk cannot be reduced an alternate activity should be considered • Corporate management attention required
High	<ul style="list-style-type: none"> • Risk is generally unacceptable • Immediate attention is required to reduce risk to ALARP and the activity should not proceed without further mitigation • Risk requires targeted management plan • Senior management attention required at an operational management level
Significant	<ul style="list-style-type: none"> • Risk is generally intolerable • Proactive action is required to reduce risk to ALARP • Risk requires targeted management plan • Senior management attention required at an operational management level
Moderate	<ul style="list-style-type: none"> • Risk is tolerable • Action may be required to reduce risk to ALARP • Mitigation through Project-specific environmental management and monitoring plans • Requires routine to periodic monitoring • Line management responsibility must be specified
Low	<ul style="list-style-type: none"> • Business as usual • Should not require much attention but should be reviewed at least annually • Manage at a supervisory level by routine policies and procedures i.e. in accordance with <i>Code of Environmental Practice – Onshore Pipelines (APIA 2013)</i>

5.2.4 RISK TREATMENT

In accordance with Jemena's risk level and target action matrix, all potential impacts with an inherent (pre-mitigation) risk level of Moderate or above may require risk treatment. Potential treatment options (controls) were considered for each risk. Suitable controls were generally identified using the *Code of Environmental Practice – Onshore Pipelines (APIA 2013)* and using the past project experience of Jemena and the Construction Contractor.

Management plans were developed to provide sufficient information to Jemena and the Construction Contractor for the purpose of implementing controls across the planning, construction and operational phases of the Project. The management plans also prescribe objectives, performance indicators and monitoring requirements relevant to management of risks. The framework for monitoring and review of the Project environmental risk profile over time is described in Chapter 13 of this EIS.

The practicability and effectiveness of the proposed controls in reducing risk levels was assessed based on the experiences of Jemena, the Construction Contractor and the Environmental Consultant on other pipeline projects.

5.2.5 RESIDUAL RISK

Once all practicable control measures were documented, the risk of the impact occurring was re-assessed. Where there was uncertainty in relation to the effectiveness of the mitigation measures, the precautionary principle was applied and taken into account when assigning the residual likelihood and consequence ratings.

The resulting risk level is referred to as the 'residual risk'. The assigned rating is based on the assumption that the control measures described will be effectively implemented.

A residual risk rating of High or above, generally indicates there is potential for the Project to cause a significant impact which will require on-going management attention and/or offsets in accordance with the requirements of the EPBC Act. The Environmental Assessment Act (NT) (EA Act) does not require offsets; however, in the event that the risk assessment process identifies a residual significant impact, the NT EPA will take this into account when making its recommendation to the Minister responsible for approval of the Project.

5.3 RISK ASSESSMENT RESULTS

The Environmental Risk Register (Appendix F1) and Social and Economic Risk Register (refer Appendix F2) summarise the outcomes of the risk assessment process. For each potential environmental impact, the registers document:

- **Context and assumptions:** a summary of the key aspects that influence the likelihood and consequence of impacts to the Project biodiversity objective
- **Inherent risk:** the likelihood and consequence of the impact occurring without additional controls
- **Controls:** the measures that will be taken to reduce the inherent risk to ALARP
- **Assessment of effectiveness:** the anticipated effectiveness of the controls in reducing risk levels based on the experiences of Jemena, the Construction Contractor and the Environmental Consultant on other pipeline projects
- **Residual risk:** the risk level following risk treatment; assuming all controls are implemented effectively.

The risk assessment process identified and assessed 162 potential environmental, social and economic impacts. The residual risk ratings are summarised in Table 5-6, Table 5-7 and Table 5-8.

Table 5-6. NGP planning phase – residual environmental risk summary

ENVIRONMENTAL ASPECT	LOW	MODERATE	SIGNIFICANT	HIGH	EXTREME
BIODIVERSITY & THREATENED SPECIES	3	1	-	-	-
WATER	3	-	-	-	-
HISTORIC & CULTURAL HERITAGE	3	-	-	-	-
ECONOMIC AND SOCIAL	8	1	-	-	-
HUMAN HEALTH AND SAFETY	-	-	-	-	-
AIR QUALITY	1	-	-	-	-
NOISE & VIBRATION	1	-	-	-	-

Table 5-7. NGP construction phase – residual environmental risk summary

ENVIRONMENTAL ASPECT	LOW	MODERATE	SIGNIFICANT	HIGH	EXTREME
BIODIVERSITY & THREATENED SPECIES	26	4	1	-	-
WATER	9	2	-	-	-
HISTORIC & CULTURAL HERITAGE	3	-	-	-	-
ECONOMIC AND SOCIAL	42	9	-	-	-
HUMAN HEALTH AND SAFETY	5	3	-	-	-
AIR QUALITY	1	-	-	-	-
NOISE & VIBRATION	3	-	-	-	-

Table 5-8. NGP operations phase – residual environmental risk summary

ENVIRONMENTAL ASPECT	LOW	MODERATE	SIGNIFICANT	HIGH	EXTREME
BIODIVERSITY & THREATENED SPECIES	6	2	-	-	-
WATER	4	1	-	-	-
HISTORIC & CULTURAL HERITAGE	2	-	-	-	-
ECONOMIC AND SOCIAL	5	2	-	-	-
HUMAN HEALTH AND SAFETY	3	2	-	-	-
AIR QUALITY	-	2	-	-	-
NOISE & VIBRATION	1	3	-	-	-

The risk assessment process demonstrates that with mitigation the majority of environmental risks associated with the NGP can be reduced to Low or Moderate. There is one risk with a residual risk level of Significant; this is related to risks to biodiversity resulting from the construction phase of the Project. No residual risks were rated as High or Extreme.

Chapters 6 to 12 of this EIS provide a detailed discussion of the environmental risks identified through the risk assessment process.

5.4 CUMULATIVE IMPACTS

Cumulative impacts can be defined as effects on environmental social values, which are caused by the combined results of past, current and future activities. There are no specific guidelines for assessing cumulative impacts under the EA Act (NT); however, the EIS ToR states the potential impact of the Project should be assessed in the context of existing developments, and reasonably foreseeable future developments. The EPBC Act does not make specific mention of cumulative impact, but requires consideration of the combined effects of the action and any facilitated actions.

5.4.1 ASSESSMENT APPROACH

The assessment of cumulative environment impacts undertaken for the NGP focuses only on those impacts to which the Project may be a contributing factor. Jemena is aware there are many other environmental and social issues of regional concern to landholders, the community, government agencies and other stakeholders; however, for the purpose of scoping the cumulative impact assessment, if the NGP Project does not contribute to impacts they were considered to be outside the scope of the cumulative impact assessment process.

The potential environmental impacts associated with the NGP were identified and assessed using the environmental risk assessment process described in the Chapter 5. The risk assessment results are documented and discussed in chapters 6 to 11 of this EIS. The Project related environmental impacts assigned a residual risk rating higher than Low (i.e. Moderate, High or Extreme) are considered to have some level of residual risk, and therefore have potential to contribute to cumulative impacts. Where the environmental risk assessment indicates a Low residual risk, it is assumed there is no residual risk and therefore the impact is unlikely to contribute to cumulative impacts more broadly.

The sections below provide further detail in relation to the past, currently proposed, and reasonably foreseeable future activities, considered as part of the cumulative impact assessment. A major consideration in selecting the actions that should be considered in the cumulative impact assessment is whether the action causes similar effects on the same environmental values/sensitive receptors as the NGP Project; these values are described in the 'Existing Environment' section of each chapter.

5.4.1.1 Past/current land use

The main land use in the Barkly region is beef production. Pastoral land-use is typically associated with the following types of environmental impact:

- biodiversity impacts caused by habitat alteration that occurs through land clearing, pasture improvement, addition of water points and/or weed invasion
- water quality impacts caused by erosion and sedimentation of watercourses
- biodiversity and land-use (socio-economic) impacts caused by alteration of fire regimes
- alienation of land and restriction of access for Aboriginal people.

Of these, the NGP environmental risk assessment indicates the Project has potential to contribute to cumulative environmental impacts associated with weed invasion that has already occurred as a result of current pastoral land-uses. Habitat alteration caused by land clearing will be localised, and mostly temporary, with the majority of the construction footprint to be re-instated following completion of the

construction phase; therefore, the Project is not expected to contribute to cumulative biodiversity impacts through habitat alteration. Similarly, erosion and sedimentation of watercourses is assigned a low residual risk rating as this risk will be minimised by constructing the NGP during the dry season, and further mitigated through implementation of progressive ESCP. Whilst there will be an increased risk of fire during the NGP construction phase, the Project is not anticipated to change fire regimes; the operational phase does not involve activities that are likely to increase the frequency of bushfires in the region. The Project will not alter existing land use or access beyond the initial construction phase.

In proximity to the proposed Phillip Creek Compressor Station (PCCS) there is some existing gas pipeline infrastructure; the Amadeus Gas Pipeline and a compressor station.

The main impact of these facilities similar to the NGP for the purpose of assessing cumulative impacts is related to air and noise emissions. The Air Quality Assessment Report (Appendix V) considers the potential impacts of the NGP in the context of regional air quality objectives. The Noise Assessment Report (Appendix T) models cumulative noise impacts through the use of baseline (background) noise monitoring undertaken in April/May 2016. Both assessments indicate that cumulative air quality and noise emissions are unlikely to exceed assessment criteria.

Also in the broader region around Tennant Creek, there are a number of old abandoned mine sites with legacy contamination issues. It is not anticipated the NGP Project would contribute the same types of impacts as these mine sites, as the residual risks of soil and water contaminated associated with the NGP Project activities were rated as low.

The Mount Isa Compressor Station is located on the outskirts of Mount Isa, within an industrial area used by Mount Isa Mining. The most notable land-use in terms of potential contribution to cumulative environmental impacts is the Mount Isa Mine. The main impact of these facilities that is similar to the NGP for the purpose of assessing cumulative impacts is related to air and noise emissions.

5.4.1.2 Currently proposed projects

Around KP 230, the NGP traverses a mining lease granted over a phosphate deposit. Minemakers Australia Pty. Ltd. completed an EIS for the Wonarah Phosphate Project in 2010; however, the Project has been placed on hold.

There are numerous exploration leases within the NGP project footprint, however there is no publically available information to indicate any of these leases will be developed into mines in the near to medium term.

5.4.1.3 Reasonably foreseeable future activities

Detailed assessment of the potential impacts of onshore gas development is considered to be outside of the scope of this EIS. There is a high degree of uncertainty in relation to the location, scope and timing of future gas projects, so there is currently insufficient information available for a reliable assessment of the extent of development that may follow from the construction of the NGP

Operational water use at the PCCS and MICS is relatively small amounts, and the quantities of hazardous materials and wastes stored at the sites are unlikely to contaminate water sources, given that waste storage areas will be designed and maintained in accordance with the requirements detailed in the Waste Management section of Chapter 13 EMP.

The Wonarah Phosphate Project will likely be developed at some stage in the future. The EIS prepared for the project indicates the following moderate to high residual environmental risks:

- decrease in air quality due to dust emissions

- soil erosion
- reduced habitat quality for threatened species
- introduction of new weeds and/or increased density of existing weeds
- increased abundance of pest animal species
- adverse downstream impacts due to sediment entering waterways
- social disruption to local population in Wunara community and Tenant Creek
- disturbance to sacred sites and/or archaeological heritage sites
- increase risk of traffic accidents on Barkly Highway.

If the NGP Project construction phase was to occur at the same time as the development of the Wonarah Phosphate Mine there could be potential for cumulative impacts to occur, mainly in relation to the potential social disruption to the local population. There is currently no indication the two projects will overlap.

