

14: Social and Cultural Environment – Effects and Management



The Gorgon Development will be a large and sustainable resource development in a relatively remote area off the Pilbara coast. The Joint Venturers have considerable experience and knowledge associated with large and complicated resource developments world-wide, including a working knowledge of north-western Australia, particularly Barrow Island. This knowledge-base provides a substantial contribution to the identification, understanding and management of potential social impacts and benefits associated with the Gorgon Development.

The major social impacts and benefits identified for the Development include:

- local and regional employment opportunities during planning, construction and operational phases
- specific regional development opportunities
- employment, education and training opportunities due to the Development's proposed staffing levels, construction schedule and Fly-In Fly-Out (FIFO) requirements
- risks to industrial relations with the existing workforce community on Barrow Island due to the influx of a large, temporary construction workforce
- cultural and marine heritage resource issues from possible physical disruption of archaeological and historical sites
- Native Title issues related to the acquisition of pipeline easement(s) for the domestic gas pipeline alignment near shore and onshore to connect with the Dampier to Bunbury natural gas pipeline at Compressor Station 1.

The location of major Development components on Barrow Island means that a relatively small proportion of the infrastructure and facilities will be located on the mainland in the Pilbara or elsewhere within Western Australia. The implications are that physical and social impacts on the mainland related to the Development will be relatively few.



A draft Cultural Heritage Management Plan (CHMP) has been developed to assist in avoiding or minimising potential impacts during the construction and operation of the Gorgon Development. This plan will be refined further in the current phase of Development planning. Consultation with Aboriginal groups will continue throughout the Development phases and good-faith negotiations will be undertaken should an easement for the domestic gas pipeline be required.

A number of plans to identify and enhance the social opportunities are being developed. The Gorgon Development has an Australian Industry Participation Policy (AIPP) outlining the approach to local content and procurement. This Policy specifies a commitment to provide full, fair and reasonable opportunity for Australian industry to supply goods and services to the Development. In accordance with the *Barrow Island Act 2003*, a Social Impact Management Plan (SIMP) is being developed in close consultation with Western Australian government agencies to enhance social opportunities. The SIMP is being prepared during the proposal stage of the Development and will be subject to Ministerial approval, but is separate from the EIS/ERMP process. At the local level, the Joint Venturers will continue to work through community groups in the region to ensure potential impacts are identified, managed and activities in the region are coordinated.

14.1 Introduction

The standards, methodology, and assessment of social, health and safety, cultural, aesthetic and tenure impacts of the Gorgon Development are described in this chapter. Methods and procedures to avoid or minimise potential negative impacts or to enhance and develop the positive opportunities and benefits through appropriate proposed management measures are discussed.

Priority has been given to the development of management strategies for medium to high impact or risk activities (identified prior to the implementation of planned safeguards). Management plans and policy, including a Development-specific Social Impact Management Plan (SIMP), an Australian Industry Participation Policy (AIPP), and a Cultural Heritage Management Plan (CHMP) will be developed and implemented as part of the Gorgon Development. The CHMP will form part of the Gorgon Development environmental management system as one of a suite of management plans proposed for the current phase of the Development (refer Chapter 16). Further definition and details of the social and cultural impacts and management strategy planned for the Gorgon Development are outlined below and in the technical appendices accompanying this Draft EIS/ERMP.

14.1.1 Standards for Social Impact Assessment

Currently there are no specified regulatory assessment frameworks for social impact assessment in use in Western Australia. The established operational guidelines currently being used internationally are largely based on adopting those developed by the World Bank (World Bank Operational Policy 4.01 Environmental Assessment, January 1999) as a minimum. These guidelines are supported by the International Finance Corporation (IFC) and are reflected in the Equator Principles (www.equator-principles.com). The Joint Venturers operate globally and will follow world-best practice for social impact assessment, which involves adherence to the World Bank guidelines. The guidelines are consistently used for major resource development projects around the world and have been used as a framework for the Gorgon Development.

The social impact assessment methodology in this chapter incorporates the normal steps in social impact assessment with outcomes presented in a risk-based framework. While this approach is consistent with the environmental assessment, it is important to understand that for environmental factors, risks generally imply negative consequences. Social and economic impacts can be positive and/or negative, both of which should be, and are, considered in this assessment. The assessment approach has been adjusted to identify both positive and negative impacts.

14.1.2 Risk-Based Assessment Approach

A social and economic impact assessment normally follows the broad approach outlined in Section 14.1.1, and is generally aligned with the World Bank and IFC guidelines (where they are applicable). However due to the scale and complexity of the Gorgon Development, the Joint Venturers have adopted a risk-based assessment approach (refer to Chapter 9). This requires that the normal steps in a Social and Economic Impact Assessment (SEIA) be modified to achieve risk-based assessment outcomes. An SEIA would normally refer to:

- scoping including the development of a Stakeholder Consultation Plan
- profiling of the socio-economic environment
- identifying and predicting impacts
- assessing impact significance (taking into account quantification of impacts and consultation with stakeholders)
- identifying mitigation measures to address impacts.

The risk-based assessment follows these broad steps, but has been adjusted to assess their significance with a focus on risks and benefits. The key steps include:

- identifying relevant social and economic factors (ChevronTexaco Australia 2003; ChevronTexaco Australia 2004)
- screening of social and economic factors, and potential receptors, to identify the potential impacts in each stage of the Development
- assessing impacts to determine the level of risk and/or benefit (significance) associated with social and economic consequences
- identifying mitigation measures to minimise negative and enhance positive consequences.

Stakeholder consultation has been, and will continue to be, an important part of the impact assessment process and development of detailed management strategies (Chapter 5).

The overall approach to the risk-based assessment and risk matrices is described in Chapter 9. The risk-based assessment allows for a detailed consideration of individual impacts. General comments on the expected overall positive and negative impacts of the Development are provided in the conclusion to this chapter.

Risk Matrix

The risk matrix, definitions and criteria used for the SEIA are presented in Figure 14-1.

Figure 14-1:
Risk Matrix for Social and Economic Impact Assessment

		Risk Categorisation – Socio-economic				
HIGH	Almost certain – very likely to occur prior to or during construction					
Likelihood	Occasional – likely to occur within the life of the Development					
	Seldom – may reasonably occur within the life of the Development or has occurred at a similar facility					
LOW	Unlikely – not likely to occur with current practices and procedures but has occurred elsewhere					
	Remote – highly unlikely and unheard of in industry but theoretically possible					
Socio-economic	Local, small-scale, easily reversible change on social and economic characteristics, infrastructure and/or values of Shires of Roebourne and Ashburton or Barrow Island. Community can easily adapt or cope with change.	Incidental	Minor	Serious	Major	Severe
		Impacts limited to surrounding locality.	No impact at state, national or international level.	Limited impact at state level. No impact nationally or internationally.	Significant impact at state level. Limited impact at national level. No impact at international level.	Significant impact at state and national levels. Impacts recognised at international level.
Health	Low level, short-term inconvenience or symptoms. No measurable physical effects. No medical treatment.	Impacts limited to surrounding locality.	No impact at state, national or international level.	Limited impact at state level. No impact nationally or internationally.	Significant impact at state level. Limited impact at national level. No impact at international level.	Significant impact at state and national levels. Impacts recognised at international level.
		Low level, short-term inconvenience or symptoms. No measurable physical effects. No medical treatment.	Objective but reversible. Disability/impairment and/or medical treatment injuries requiring hospitalisation.	Moderate irreversible disability or impairment (<30%) to one or more persons.	Single fatality or severe irreversible disability or impairment (>30%) to one or more persons.	Short- or long-term health effects leading to multiple fatalities or significant irreversible human health effects to > 50 persons.

14.2 Social Factors Requiring Assessment

From a social and economic perspective, the proposed Gorgon Development has the potential to result in impacts at local, regional, state, federal and international levels. Potential benefits and impacts range from very minor, incidental effects to long-term and widely felt effects. An initial scoping of factors likely to require assessment was conducted as part of the Scoping Document for the proposal (ChevronTexaco Australia 2004). Prior to undertaking a detailed risk assessment, the various factors requiring assessment and the potential receptors were identified through the social impact assessment research and a consultation process. Potential benefits and impacts have been identified, with the likelihood of an impact occurring at each stage of the Development (planning, construction, operation and decommissioning) being noted.

The social factors requiring assessment include:

- government policy and plans
- local communities
- livelihood and lifestyle
- land and sea use and tenure
- Native Title claim areas
- landscape and aesthetic values
- workforce and public health and safety
- cultural heritage
- social infrastructure
- community development.

14.3 Government Policy and Plans

There are a wide range of social and economic plans designed to provide policy and guidance to local, regional, state and federal governments. The Gorgon Development will have implications for a number of these plans which are discussed in more detail below.

14.3.1 Local Policy and Plans

The Shire of Ashburton Town Planning Scheme No. 7 was gazetted in late 2004 and Barrow Island is included within the Shire of Ashburton. The regulations and building codes referred to in the Scheme would normally apply to building and development approvals on the island. The applicability of the Scheme to the Gorgon Development is currently being determined. Due to its designation as a Class A Nature Reserve, the planning of development on Barrow Island is also a state government issue, pursuant to the *Land Administration Act 1997*.

At the local level, Town Planning Schemes and Structure Plans also provide guidance for development on the near and onshore areas of the Australian mainland. The Onslow Structure Plan (Western Australian Planning Commission 2003) and Karratha Area Development Strategy (Western Australian Planning Commission 1998) designate areas for use for industrial development including downstream processing and support for offshore industries. The Joint Venturers are investigating an area for the location of a supply base in the Dampier area, possibly near King Bay (refer to Chapter 6) as well as in the Fremantle/Jervis Bay area. The Joint Venturers will adhere to the requirements of relevant town planning schemes and other local government policy where these apply to the King Bay area and the proposed mainland pipeline route. Exact requirements will be determined during the current design phase.

Consultation with representatives of both the Ashburton and Roebourne Shires indicates that they would prefer the Development to be located on the mainland in their respective areas. The Roebourne Shire would like the Development to be in the Maitland area to provide the impetus for significant social and economic development opportunities both in the shire and the Pilbara generally.

14.3.2 Regional – Policy and Plans

The key regional plans for the Pilbara are the Pilbara Land Use Strategy and the Pilbara Regional Priority Plan. The former presents a strategic 25-year plan for the Pilbara and identifies broad objectives for land use and development. The Pilbara Regional Priority Plan is recent (October 2003) and has a number of key objectives. Table 14-1 is a summary of the relevant plan objectives and describes the implications of the Development on these objectives.

Table 14-1: Implications of the Proposed Gorgon Development on the Pilbara Regional Priority Plan	
Components of the Priority Plan (Socio-Economic)	Implications of Gorgon Development
Delivery of improved secondary and tertiary education.	<p>Gas processing facility construction and operation workforce located on Barrow Island. No improvements to secondary or tertiary education facilities envisaged as a result of the Development.</p> <p>If a new supply base is required it could generate local employment during construction (130–140 jobs) and operation (12–30 jobs). Some of this employment will be for skilled labour and will generate oil and gas industry training opportunities. Mainland construction workforce is likely to be drawn from existing population and elsewhere. During construction, personnel from outside the region are likely to be accommodated in a temporary facility and the majority are unlikely to be accompanied by families.</p> <p>Operations workforce for the supply base will be located in the local community and may create some additional demand for educational facilities but 12–30 households (maximum: not all operations employees will have children and/or educational requirements) is not likely to be significant.</p>
Focused regional health services.	<p>The workforce for a new supply base, should it be required, would likely access local, general health facilities. If this was in the Dampier and Karratha region, preliminary consultation has indicated that general health facilities in the region would require some improvement and therefore this small workforce (and potential families) may increase pressure on these facilities. This is perceived by some as being advantageous if it results in additional services being provided to the region.</p> <p>Much greater impact from the large and unsustainable influx of temporary construction workers would be felt in the local community if a mainland site had been suitable for the Development.</p> <p>The proposed Development will contribute to the further development of emergency response and health services in the region.</p>
Sustainable and viable funding of local government including application of rating to resource projects.	The State Agreement (<i>Barrow Island Act 2003</i>) for the Gorgon Development provides the Shire of Ashburton with the opportunity to apply rates for the gas processing facility on Barrow Island. Formulae for calculating these rates and quantum of dollars has yet to be determined, but will be levied on a 'non-discriminatory' basis. This will provide a minor benefit from the Development.
Provision of enabling infrastructure in order to meet the needs of the community and industry prepared to invest in the region.	Existing infrastructure is likely to be adequate for Gorgon Development requirements and no implications will be created by the Development.
Land use planning and timely land release.	Industrial land is available in the region. While the majority of the Development will be located on Barrow Island, if a new supply base is required, there currently exists some available land in the King Bay area. Industrial land is also available in Onslow and Perth should other locations be considered for the supply base.

Table 14-1: (continued)

Implications of the Proposed Gorgon Development on the Pilbara Regional Priority Plan

Components of the Priority Plan (Socio-Economic)	Implications of Gorgon Development
Relevant indigenous employment initiatives to increase indigenous employment participation rates by providing educational and training pathways.	The Gorgon Development will include indigenous employment and training activities. Commitment to these activities is included in the Gorgon Development's Australian Industry Participation Policy. Specific details will be developed and included in the SIMP.
Law and order in the community with aim of reducing crime and increasing presence of law and order officers.	Majority of the workforce will be located on Barrow Island reducing the potential incidence of crime associated with construction workforce on local communities in Karratha and Dampier. Supply base construction workforce will be relatively small and is not likely to create significant impacts on local law and order capacity.
Emergency/security awareness and preparation to ensure cyclone preparedness.	The Joint Venturers will manage its own cyclone preparedness for Barrow Island but will liaise and inform the local Fire and Emergency Services Authority (FESA) of Western Australia. No additional requirements for FESA to manage.
Attraction and retention of government staff through housing improvements and career development opportunities.	The Gorgon Development will generate the requirement for full-time Conservation and Land Management (CALM) officers during construction (four officers on a 2-on 2-off shift) and operation (two officers on a 1-on, 1-off shift). Decision as to where these officers will be located rests with CALM (<i>Barrow Island Act 2003</i>) (refer to Chapter 2).
Impact of FIFO on social amenity and reduced economic potential of local businesses requires better understanding by state government.	<p>The Joint Venturers will adopt a FIFO regime from Perth for construction and operation workforce for the gas processing facility. This will continue the FIFO trend in the region and contradicts some state, Pilbara Development Commission and local government policies. It should be noted that this workforce would be FIFO regardless of a Perth or Karratha origin, given the proposed Development location on Barrow Island. Consultation indicates that FIFO is a significant issue of concern for many local and regional stakeholders. However social and economic impacts associated with this issue were a subject of the ESE Review process (ChevronTexaco Australia 2003), with government and the Joint Venturers concluding that the Development should be sited on Barrow Island.</p> <p>Supply base workforce will comprise a mix of local and potentially some FIFO depending on where skilled labour force resides. Details of employment sourcing will be determined during the current phase of design.</p>
Requirement for integrated heritage and natural resource management to overcome piecemeal approach taken by industry to date.	The Joint Venturers have undertaken preliminary heritage surveys and consultation in accordance with relevant federal and state legislation. A draft Cultural Heritage Management Plan has been prepared for the Development. Continued stakeholder engagement is part of the SIMP.

14.3.3 State – Policy and Plans

The key state legislation, policies and plans that have implications for the social impact issues are the *Barrow Island Act 2003*, which includes the Gorgon Gas Processing and Infrastructure Agreement (State Agreement), Western Australian Sustainability Strategy (<http://www.sustainability.dpc.wa.gov.au/docs/Strategy.htm>), and the State Planning Strategy and Regional Development Policy (<http://www.dlgrd.wa.gov.au/rdpmain.html>).

The *Barrow Island Act 2003* provides a legal framework for the Development and the requirement for an SIMP is contained in the State Agreement which is a schedule to the Act. The SIMP will be developed in consultation with, and to the satisfaction of, the Western Australian Government. The Act has a number of requirements in relation to the use of local labour, professional services, materials, employment and training. The Joint Venturers have developed an AIPP for the Development to 'provide full, fair and reasonable opportunity for Australian industry to supply goods and services to the project' (refer to Chapter 8).

The State Sustainability Strategy is very broad but identifies relevant priority action areas including:

- regional development
- indigenous peoples' development
- sustainable communities
- sustainable use of resources.

The decision to locate the gas processing facility on Barrow Island has limited the opportunities for significant new employment opportunities in the region, indirect regional development and indigenous peoples' development. There will be opportunities for local employment, procurement and supply of goods and services at a reduced level, but it was recognised and highlighted in the ESE Review and Response to Submissions that the main benefits from the Development will be economic, because it will be one of the largest single contributors to government revenues once in full production.

As outlined in Chapter 3, Barrow Island is the only commercially viable location for the Gorgon Development. While the location of the gas processing facility on Barrow Island will result in less direct social benefits than if it were located on the mainland, this should be set against the Development not proceeding at all.

The State Planning Strategy identifies a number of actions for the Pilbara. The extent to which the Gorgon Development contributes to these is shown in Table 14-2.

Table 14-2:

Implications of the Gorgon Development for the Western Australian State Planning Strategy

Components of the Strategy (Socio-Economic)	Implications of Gorgon Development
Minimise the impact of FIFO resource development projects.	The Barrow Island location for the Development requires a FIFO workforce for the gas processing facility. Currently there is not an adequate or sustainable labour pool in the Pilbara region to satisfy the manpower requirement of the Gorgon Development and other large-scale resource projects planned for the area. A mainland supply base will have a smaller construction and operational manpower requirement and will likely use a mix of local and FIFO personnel.
Address the need for social services and facilities.	The Joint Venturers will supply sustainable and well-paying jobs for employees assigned to the Development. The Joint Venturers will substantially contribute to the national and Western Australian revenues, a portion of which will be available for social services and facilities in the region.

Table 14-2 (continued):

Implications of the Gorgon Development for the Western Australian State Planning Strategy

Components of the Strategy (Socio-Economic)	Implications of Gorgon Development
Increase the level of resource royalty income to the region.	<p>The Gorgon Development will contribute significant royalty payments. Decision-making regarding distribution/expenditure of royalties is made by the federal government.</p> <p>The Joint Venturers acknowledge the significant concerns of regional stakeholders on the issue of resource revenue sharing particularly between the federal and state governments. The Joint Venturers will be making full contribution to royalties, but it is a matter for the governments as to the way these funds will be distributed.</p>
Coordination of government agencies to minimise delays in resource developments and associated infrastructure needs.	A coordinated federal and state environmental approval process is well advanced for the Development (refer to Chapter 4).
Detailed planning for population growth and urban centres.	The Joint Venturers will provide employment forecasts and requirements to assist the Western Australian Government plan for growth.
Greater emphasis on local recruitment and training of the workforce.	The Joint Venturers have an Australian Industry Participation Policy that outlines approach to local content and procurement, and the SIMP will outline training and recruitment opportunities. Further Development details will be identified in the current phase of design and in Engineering, Procurement and Construction Management contracts prior to finalisation.
Provide strategic transport linkages within and to the Pilbara region.	The Gorgon Development will require additional flights and servicing to Barrow Island both during the construction and operation of the Development. Air and marine supply services will be negotiated with existing suppliers and, where necessary, new linkages will be developed.
Improve industrial and domestic access to water supplies.	The vast majority of the Gorgon Development will be situated on Barrow Island where an independent water supply and treatment system will be installed. Upgrading or developing a marine supply base on the mainland will put very little pressure on existing domestic and industrial supplies.
Ensure infrastructure provision is the focus of government agencies.	The location of the Development on Barrow Island will significantly reduce any pressure being placed on the state's infrastructure development or improvement. Significantly higher infrastructure costs to the state would have been required if the Development were situated on the mainland.
Improve town amenity.	The Gorgon Development situated on Barrow Island will have the least impact on town amenity concerns and issues.
Protect sensitive environmental and heritage areas.	<p>The gas processing facility will be located on a Class A Nature Reserve. Environmental implications are discussed in this Draft EIS/ERMP (refer to Chapters 10–13). Cultural heritage has been identified on Barrow Island and the mainland, and these issues are discussed in Section 14.8. It is noted that the Gorgon Development is subject to a rigorous environmental approvals process at both the state and federal levels (this EIS/ERMP process), and Schedule 1 (Gorgon Gas Processing and Infrastructure Project Agreement) of the <i>Barrow Island Act 2003</i> requires a contribution of \$40 million (indexed) to fund Net Conservation Benefits.</p>

14.3.4 Federal – Policy and Plans

The Commonwealth Government of Australia advocates stronger regions around Australia (http://www.rbda.gov.au/action_plan/index.htm). An Action Plan for implementation of the Policy was developed in 2003. The Action Plan promotes investment in the regions, improved government co-ordination of Commonwealth funding expenditure, review of the current Zonal Tax Rebate Scheme, identification of skills shortages, leadership programs for young people, and development of the regional infrastructure bond market to overcome under-investment in regional infrastructure projects.

The implications for the Gorgon Development are the positive and potentially negative impacts to the government initiatives of regional development, employment, education and training. Specific details will be addressed in the SIMP. Many stakeholders suggested that the Gorgon Development could have additional benefit to the local and regional government agencies by assisting them in their federal government discussions and negotiations relating to the distribution of resource royalties.

14.3.5 Summary of Major Benefits and Risks to Government Policy and Plans

The potential socio-economic impacts (risks and benefits) of the Gorgon Development to the various federal government policy and plans are summarised in Table 14.3. They include:

- Perceived reduction in potential opportunities for industrial development in the Pilbara region as a consequence of developing a gas processing facility on Barrow Island.
- Use of a FIFO workforce with potential loss of opportunities for local personnel and social impacts of FIFO on the workforce.
- Shire of Ashburton will be able to rate the Development based on its location on Barrow Island, thus providing the opportunity for a direct revenue stream from the Development to one local authority (high benefit).
- Opportunities for increasing participation of local indigenous workforce by supplementing education and training pathways (high benefit).
- Transfer of knowledge and technology associated with different aspects of the proposed Development to Western Australia and the region (benefit).

Table 14-3:

Key Benefits and Risks to Government Policy and Plans

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/ Target	Measurement Strategies	Residual Benefit/Risk
Facility to be located on Barrow Island.	Perceived reduction of opportunities for regional development.	<ul style="list-style-type: none"> Construct and operate supply base in the Pilbara Region. Construct a domestic gas pipeline as per commitment under State Agreement. Fulfil AIP Policy and State Agreement commitment to local employment and content. Outline detailed initiatives for local supply, procurement/content, employment and training in the SIMP and consult with stakeholders on development of this aspect of the Plan. 	<ul style="list-style-type: none"> Local, regional and State employment created. Training opportunities for Pilbara region created. Local procurement in accordance with SIMP. 	<ul style="list-style-type: none"> Report on local and regional employment, procurement and development opportunities through the AIPP, State Agreement and/or SIMP. 	Likelihood – almost certain Consequence – minor Risk – not applicable
Use of FIFO regime from Perth.	Disruption to routine family life.	<ul style="list-style-type: none"> Adopt industry guidelines on work and rotation schedules for FIFO developments. Allow appropriate communication facilities for workers. Modify procedures to reduce negative social impacts on workers and families. 	<ul style="list-style-type: none"> Workforce health and safety within acceptable levels. 	<ul style="list-style-type: none"> Monitor social impacts on workforce and families during construction and operation. Report on social impacts in SIMP or other reporting requirement. 	<p>Construction Likelihood – almost certain Consequence – minor Risk – not applicable</p> <p>Operations Likelihood – occasional Consequence – minor Risk – not applicable</p>

Table 14-3: (continued)
Key Benefits and Risks to Government Policy and Plans

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/ Target	Measurement Strategies	Residual Benefit/Risk
Payment of rates to Shire of Ashburton for use of, and development on, land on Barrow Island. Payment of rates to Shire of Roebourne for use of, and development on, land in King Bay area (dependent on whether this site is owned by the Joint Venturers or leased from an existing owner).	Revenue stream for local authorities.	<ul style="list-style-type: none"> Consult with Shire on appropriate level of rates and other revenue sharing opportunities. Pay rates during construction and operation. 	<ul style="list-style-type: none"> Pay rates in accordance with agreement. 	<ul style="list-style-type: none"> Good corporate relationship with Shire. Report on rates structure and payment schedule in SIMP or other reporting requirement. 	<p>Construction Likelihood – almost certain Consequence – minor Benefit – high</p> <p>Operations Likelihood – occasional Consequence – serious Benefit – high</p>
Indigenous education and training initiatives.	Improved Indigenous education, employment and training opportunities in the Pilbara.	<ul style="list-style-type: none"> Develop education, training and employment opportunities for Indigenous people in AIPP. 	<ul style="list-style-type: none"> Opportunities for indigenous employment and training provided. 	<ul style="list-style-type: none"> Report on local and regional education, training, employment, supply, procurement and development opportunities through the AIPP and/or SIMP. 	<p>Construction Likelihood – almost certain Consequence – serious Benefit – high</p> <p>Operations Likelihood – occasional Consequence – serious Benefit – high</p>

14.4 Local Communities

14.4.1 Population

The Gorgon Development will result in some minor population changes in the Pilbara and Western Australia. The most significant changes would occur in Dampier/Karratha area should the Development require the construction of a supply base. Table 14-4 is a summary of the anticipated population change information.

14.4.2 Social Infrastructure and Regional/Local Services

Population change can have direct impacts on social infrastructure such as health, welfare, emergency response, transport and other services. The significant majority of the Development workforce will be located on Barrow Island and will generate limited demand for social infrastructure in the Pilbara region and Perth. This situation would be substantially different if the Development were located on the mainland as demand impacts on social infrastructure would be increased.

The size of the construction workforce on Barrow Island will require management and coordination to minimise the impact on the existing operations. The Joint Venturers have substantial world-wide experience in the planning and construction of large and complicated resource projects and the issues associated with staffing, recruitment and management. The interaction of the Gorgon Development workforce with the existing enterprises on the island, which is also managed by Chevron Australia, will be addressed through continued workplace consultation.

In the Pilbara, the construction workforce of 130–140 workers for a potential new supply base may generate a short-term (40-month) demand for the services described above. Some of these workers may already be present in the Pilbara labour force and therefore do not represent an increase in demand. Some may be employed on a FIFO arrangement and will have limited demand for social infrastructure. The exact details of workforce origins will be determined during the current design phase. The results will be outlined in the SIMP submitted by the Joint Venturers prior to construction.

The towns of Dampier and Karratha currently have approximately 500 vacant rental properties. There is currently sufficient capacity to cater for the full 140 workers in rental accommodation. Should other projects come on-stream at the same time as the Gorgon Development, the demand will increase and this may create the potential for a shortage of accommodation for these workers. Table 1-3 in Chapter 1 is a summary of all the planned and proposed resources projects in the Pilbara and the approximate project cost and timing.

The construction workforce for Barrow Island represents a small proportion of the overall population of Perth. Any increase in population as a result of sourcing skilled labour from outside Western Australia is not likely to result in a significant demand for social infrastructure and services in Perth.

Table 14-4:
Population Change Associated with the Gorgon Development

Location	Existing Population	Direct Development Employment		Increase (%)
		Construction (Peak)	Operation	
Barrow Island	150*	3300	300	100–2200%
Perth	1 339 993	Unknown	Unknown	Unknown but less than .00002%
Onshore Pilbara (total)	15 761	130–140	12–30	Construction – 0.8%
Dampier and Karratha	12 284	130–140	12–30	Construction – 1.13%
Dampier	1492	130–140	12–30	Construction – 9.4%

*Note: all population is FIFO. No full-time residents on Barrow Island

Source:

<http://www.abs.gov.au/Ausstats/abs@.nsf/0/d6c18bf1a2f09e4eca256e8a0077abe7?OpenDocument#POPULATION>

14.4.3 Summary of Major Benefits and Risks for Local Communities

The consequences for local communities of the Development are summarised in Table 14-5, along with proposed management strategies.

The majority of the Gorgon Development will be on Barrow Island and surrounding waters and there will be no major or serious impacts for local communities in the Pilbara region. Minor impacts will be short-term, and only associated with the construction of a marine supply base, should it be required. During operation, the population increase (if any) will be insignificant, and will have no major or serious impact on the local communities or social infrastructure. The residual risk for local communities is low.

This outcome would be quite different if the Gorgon Development was to be located on the mainland. Locating the Development on the mainland would likely result in major or serious consequences for local communities and social infrastructure at least for the short-term.

14.5 Livelihoods and Lifestyle

14.5.1 Changes to Lifestyle

Major resource projects are a key element of the national economic and social fabric of Australia, Western Australia and in particular the Pilbara region. Western Australia is one of the most productive and diversified mineral and petroleum regions in the world. It hosts 480 commercial mineral projects, embracing 770 operating mine sites (open pit, underground mines and quarries) plus 143 processing plants and some 50 different minerals in commercial production (DoIR 2003). These projects have contributed significantly to the social, economic and culture in the region. In 1999/00, the region's total mining and petroleum industry production was valued at \$11.7 billion, 55.1% of the value of the state's total mineral and petroleum production. This is an increase from 50.1% in 1998/99. The Pilbara's economy is based principally on iron ore, petroleum, gold and solar salt, with petroleum products now contributing around 65% of the region's mineral and petroleum wealth.

Future development will be based on the expansion of these industries and value-adding to these commodities.

Woodside's Phase 4 LNG expansion and the familiarity of the regional population with resource projects, and the significant number of major projects occurring or planned (e.g. the establishment of three heavy industry parks, two located in the Shire of Roebourne and one in Port Hedland are being planned to encourage downstream processing of the region's mineral resources), means it is unlikely that the Gorgon Development will create any significant change to this way of life. It represents a continuation of the type of economic activity that is common to the region.

Stakeholders have indicated their concerns about the potential impacts associated with FIFO regimes on regional development including:

- impacts on local amenity as a result of transient workforces which reduce demand and incentives for creating attractive and vibrant communities
- loss of opportunities for local businesses to supply major projects because the FIFO regime makes it more cost-effective to transport goods with employees. This further reduces opportunities for local expenditures (direct and indirect), increased levels of disposable income and creation of new jobs.

The Joint Venturers will work closely with the Commonwealth and Western Australian governments to develop programs to enhance business development in regional areas, facilitate the participation of regional businesses in the Development, enhance communication with business and contractors, and adopt procurement policies that provide opportunities for regional businesses. The location of the Development on Barrow Island will require a FIFO workforce. More details of the workforce source, characteristic and composition will be compiled during the current phase of design and included in the AIPP and SIMP reporting and plans. The social impact of FIFO on workers and their families has not been researched in detail for this specific Development. However some of the potential impacts, as noted by Lambert (2001), include:

Table 14-5: Key Benefits and Risks to Local Communities					
Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/ Target	Measurement Strategies	Residual Benefit/Risk
Construction of gas processing facility and associated infrastructure. Operation of gas processing facility. Operation of mainland supply base.	Employment of peak construction workforce of 3300 on Barrow Island. Employment of up to 30 at mainland supply base. Increased business development opportunities. Potential migration into Western Australia. Employment of 300 on Barrow Island during operations.	<ul style="list-style-type: none"> • Include commitment to maximise local content and employment opportunities in AIPP. • Identify further detailed manpower and service requirements during the current phase of design. • Document detailed initiatives for local procurement/content, employment and training in the SIMP. • Consult/liaise with local government and other stakeholders. 	<ul style="list-style-type: none"> • 10% of total workforce sourced from region. 	<ul style="list-style-type: none"> • Report on local and regional employment, procurement and development opportunities through the AIPP and/or SIMP. 	<p>Construction Likelihood – almost certain Consequence – minor Benefit – high</p> <p>Operation Likelihood – occasional Consequence – serious Benefit – high</p>

- Periodic time away from the family home by the worker results in requirement for spouse to maintain family and friendship networks and run household single-handedly.
- Spouse remaining at home often has to act as a 'single' parent and difficulties can emerge when the worker returns home 'off-shift'.
- Potential for increases in substance abuse as a result of isolation, stress or lack of recreational opportunities.
- Potential for increased instances of family violence, family breakdowns and/or divorce, parenting problems and reduced community involvement.

As stated earlier, it is unlikely the Gorgon Development will change the way of life for a construction workforce which historically is engaged in FIFO employment in the resources sector. While there may be potential impacts or specific Gorgon Development issues it is expected that these differences will be managed through employee relations, employment sourcing and workforce health and safety systems. Some of these issues include: employment opportunities of the existing workforce; the staffing levels during construction and operations; the work schedules during construction and operation; recreation facilities and future access to Barrow Island.

14.5.2 Changes to Sources of Income

The major sources of income associated with the Gorgon Development for communities in the Pilbara region and Western Australia include:

- direct employment on Barrow Island (benefits may accrue to local, regional, other Western Australian, Australian or international employees depending on skill requirements and availability)
- direct employment during construction and operation if a regional onshore supply base is constructed in the Dampier or King Bay area
- business income from providing goods and services to the Development (may be local, regional, state, national or international)
- indirect income associated with 'multiplier effects' of the Development.

Most of the sources of income are similar to existing sources available in the region or in Western Australia. Therefore the source of income is not likely to change; however the opportunities to access additional income associated with Development employment and procurement will increase at all levels.

The most significant opportunities for the Pilbara region will be derived from the employment and procurement that would be required to service a potentially new supply base in the Dampier or King Bay area.

Potential economic impacts of the Development are discussed further in Chapter 15.

14.5.3 Opportunities for Development

The Gorgon Development will generate additional opportunities for development in the region and at a state level. These include:

- potential construction and operation of a supply base in the Dampier/King Bay region, potentially generating increased demand for associated services such as earthworks, transport and logistics services, waste management services and provision of consumables
- operation of a supply base in the Perth region at a location such as the Australian Marine Complex in Henderson. This may also generate demand for additional services such as those described above.

14.5.4 Employment

Employment opportunities associated with the Development have been described above and in detail in Chapter 8. In summary, the majority (greater than 80%) of employment for construction and operation is likely to be sourced from Perth with approximately 10% of the total workforce for the Development expected to be sourced from the region. Lower levels of employment will be generated by the regional supply base.

14.5.5 Summary of Benefits and Risks to Livelihoods and Lifestyle

The Gorgon Development will generally create positive benefits to the livelihoods and lifestyles for the Pilbara community in terms of employment and local business opportunities. The potential benefits and risks are summarised in Table 14-4 and Table 14-5. These tables also contain strategies aimed at enhancing these benefits and managing the risks. The residual benefit is high during construction and high during operation. The residual risks associated with the FIFO workforce, the families of these workforces, and for regional development are high during pre-construction, construction and operation.

14.6 Land and Sea Use and Tenure

14.6.1 Environmental and Conservation Uses of Barrow Island

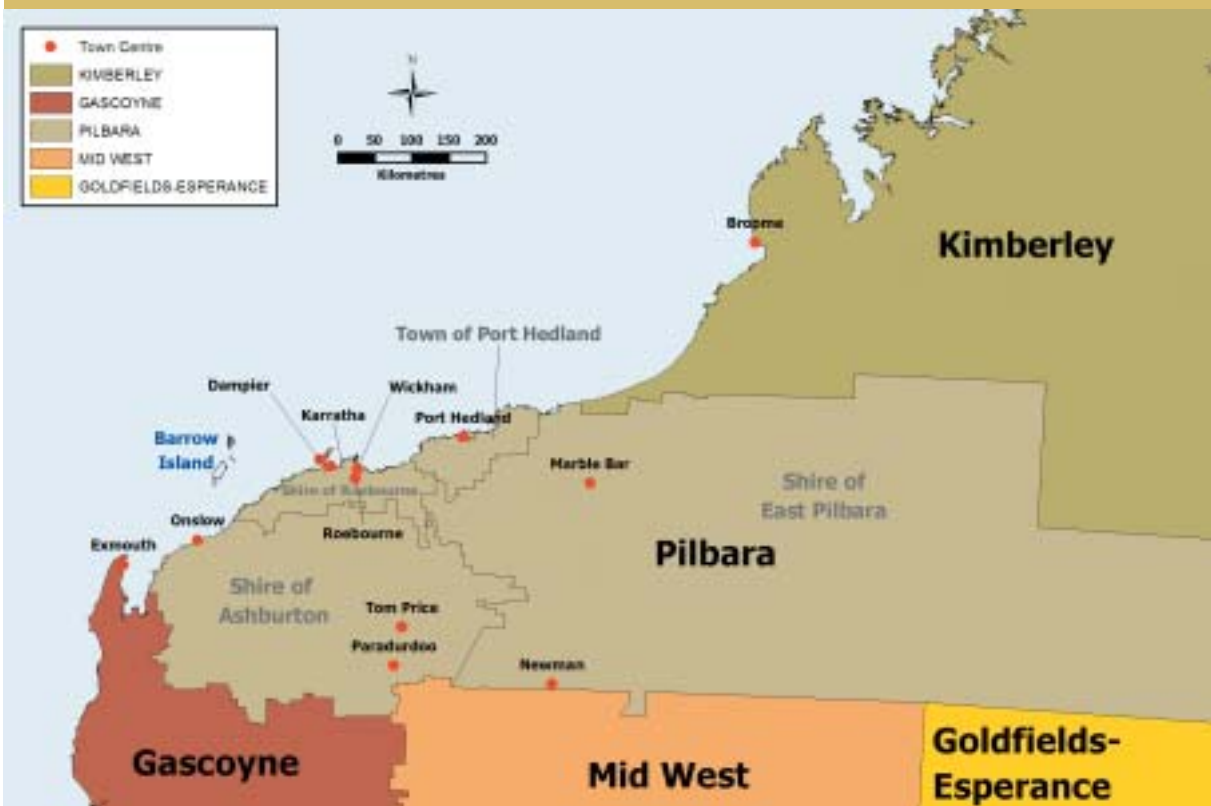
The use of 300 ha of Barrow Island, a Class A Nature Reserve, for industrial development is considered unacceptable by some stakeholders. The Gorgon Development will not change the Class A Nature Reserve designation and tenure of Barrow Island will remain with the state. Although this 300 ha represents less than 1.3% of Barrow Island, the use of the island

for this purpose means that there will be a slight decrease in the use of the island for environmental and conservation purposes. As a counterpoint to this, the *Barrow Island Act 2003* provides for full-time residence for CALM officers for the duration of the Development. This, when combined with the presence of a well-educated (all employees will be thoroughly inducted) and dedicated workforce will make Barrow Island one of the most secure and best supervised remote conservation reserves in the world. Environmental and conservation consequences and residual risk are discussed in Chapters 10–13 of this Draft EIS/ERMP and the Technical Appendices.

14.6.2 Existing Oil Operations on Barrow Island

The existing oil operations on Barrow Island will not be physically impacted by the Development in a substantial manner since most of the infrastructure (pipelines) and gas processing is proposed to be located north and east of the existing oil field; and is not competing for similar hydrocarbon resources. It is expected that there will be synergies between the oil operations and the proposed Gorgon Development including shared use of facilities, worker accommodation, power and water supplies, and opportunities to reduce oil field flaring.

Figure 14-2:
Local Government Authority Boundaries and Towns in the Pilbara Region



14.6.3 Mardie Station Pastoral Lease

Should the domestic gas pipeline tie-in with the existing Bunbury to Dampier pipeline at Compressor Station 1, an easement over Crown lands located on the Australian mainland will be required. The pipeline will be located on a rural pastoral lease area. Currently this Crown land is part of the Mardie Station, an extensive pastoral lease which fronts unallocated crown land extending along the Western Australian coastline between the towns of Karratha and Onslow (refer to Figure 14-2). The lease holder runs cattle on the approximately 220 000 ha station, with numbers varying depending on the type of season and weather. Stock muster occurs annually anywhere between April and November. The pipeline will be buried and will not impact movement of cattle or vehicles on the property. The pipeline will be installed at a safe depth below access roads. Any fencing temporarily removed during construction will be replaced in like or better condition. The lease holder has not indicated that any fencing will be impacted by current alignment of pipeline (Mike Thompson, Mardie Station Owner, pers. comm. 2004).

14.6.4 Sea Use

The water surrounding Barrow Island is part of the area covered by the Montebello–Barrow Islands marine conservation reserves (CALM 2004). The majority of the conservation area is zoned as a Marine Management Area which is recognised for both commercial and conservation values. The Barrow Island Marine Park and Bandicoot Bay conservation area (benthic fauna/seabird protection) will provide additional protection for Biggada Reef and Bandicoot Bay (Figure 8-22). The Marine Park is comprised of Sanctuary Zone that encompasses the Biggada Reef coral assemblages and the surrounding limestone reef.

A large area off the east coast of Barrow Island is currently a designated port. The Barrow Island port was created under the *Shipping and Pilotage Act 1967* and vested under the *Marine and Harbours Act 1981* in the Minister for Transport.

The waters off the Pilbara Coast are used extensively for oil and gas development with the entire proposed Development area covered by leases/licences granted under the *Petroleum (Submerged Lands) Act 1967* (Figure 14-3). The stretch of water between the island and the mainland contains management areas and leases for other purposes, such as: commercial fisheries zones, Native Title Claim areas (near-shore) and a mangrove management zone.

The Gorgon Development will not change the boundaries or underlying designation of the management areas or zones and the potential impact is considered low.

There are shipping channels and shipping activity in the area for the subsea pipelines that will need to be monitored, particularly during construction. There is also a range of shipping activities occurring in the waters around Barrow Island, including over 1000 crude oil tanker shipments from the Barrow Island Port facility and seismic and exploration activities over 40 years. In the future there will be shipping to export LNG and condensate from Barrow Island.

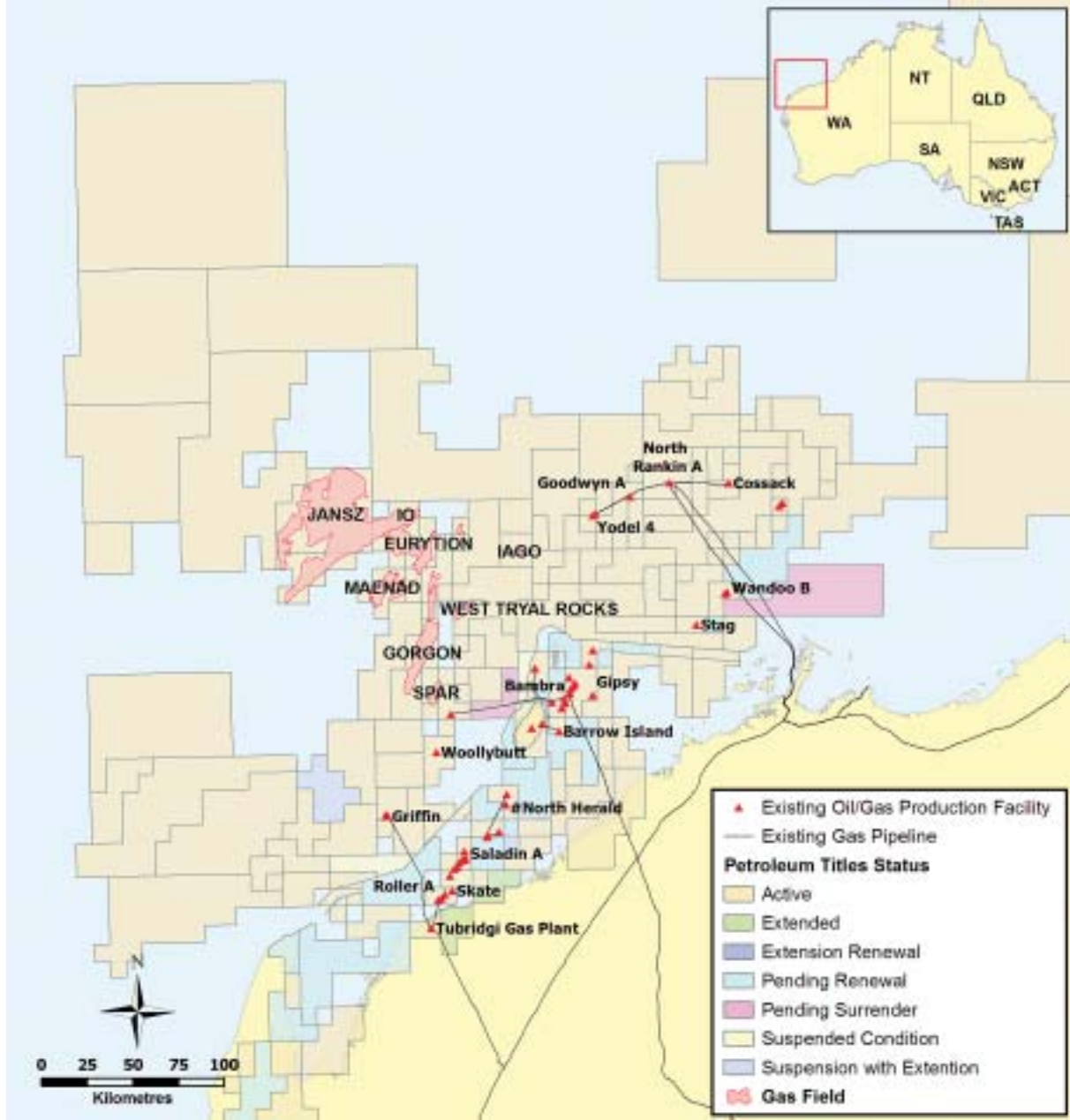
Commercial Fishing

Trawling for both fin fish and prawns occurs in the area between Onslow and Karratha, including Barrow Island. In addition, trap fishing also occurs between Barrow Island and the Greater Gorgon gas fields. Generally, boats engaged in these activities are small, can manoeuvre easily and are not affected by petroleum activities. Prawnning is by far the dominant activity. Licensed boats require at least 1–2 nautical miles to perform a trawl.

The existing Apache Energy export pipelines currently transect the Area 3 prawning area. Cables, cable areas, pipelines and pipeline areas are shown on marine charts. Submarine pipelines are also shown in the chart legend and are usually denoted by the words ‘Pipe’, or ‘Pipeline’, or, in respect of those transporting natural gas, ‘Gas Pipeline’ with an additional cautionary note. These pipelines are protected under the Commonwealth *Submarine Cables and Pipeline Protection Act 1963*. Trawling vessels are not permitted to trawl over a pipeline. However, the trawling patterns obtained through 2003 data indicate that trawl activity is high in the vicinity of the pipeline (Fisheries Department, Karratha, pers. comm.). This could indicate that prawn stocks are high in this location or merely that boats use the boundary created by the pipeline alignment as a turn-around point.

Pearling activities in the vicinity of Barrow Island have generally been confined to Ronsard Island which is not currently in operation. Pearling activity is currently undertaken in the Montebello Islands, north of the Development area.

Figure 14-3:
Petroleum Lease and Permit Area – Barrow Island Area



Consultation with commercial fishermen has occurred, and discussions have not identified any unusual or unique impacts associated with the construction and operation of an additional subsea pipeline.

Recreational Fishing

Recreational fishing is popular in the Pilbara. Discussions with the Fisheries Department in Karratha indicates that pipelines are generally viewed as being beneficial to recreational fishers as they create additional habitat for marine species targeted by this group.

Access to and around the waters off Barrow Island will be incrementally limited by the Development; however this does not represent a significant change to the current activities which is currently restricted offshore seismic activity, oil and gas drilling, pipeline and infrastructure development, and represents only a minor potential impact.

Existing Industrial/Port Related Activities

There are a range of existing operations in the King Bay area including the Dampier Port Authority, Mermaid Marine and the Woodside Supply Base. These operations currently provide support to shipping and major resource projects in the region.

The Gorgon Development supply base would increase the level of activity in this area, creating opportunities for flow-on employment and business. During construction, there would be a significant volume of trucks entering the site (section 14.10.2) and this may cause traffic conflict, and wear and tear on road infrastructure.

14.6.5 Summary of Residual Risk to Land and Sea Tenure

The consequences for land and sea use and tenure of the Development, and proposed management strategies are summarised in Table 14-6. The residual risks are:

- low for tenure arrangements on Barrow Island during construction and operations
- low during the construction and commissioning of the domestic gas pipeline to shore, changing to medium during operations
- low during the construction, commissioning and operation of the onshore pipeline and optical fibre line
- low for the transportation of goods to and from a proposed Dampier/King Bay or Perth supply base.

Table 14-6:

Key Benefits and Risks to Land Use and Tenure

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Grant of lease for gas processing facility. Grant of Pipeline Licences.	No change to Class A Nature Reserve designation.	<ul style="list-style-type: none"> Issue lease in accordance with legislative requirements. 	<ul style="list-style-type: none"> Legislation complied with. 	<ul style="list-style-type: none"> Lease agreements and Licences. 	Likelihood – almost certain Consequence – incidental Risk – low
Installation of industrial infrastructure (Barrow Island).	Loss of area used for conservation purposes.	<ul style="list-style-type: none"> Restrict area available for use of in the <i>Barrow Island Act 2003</i> and Schedule 1. Specify boundaries of facilities on Barrow Island. Precede any site clearing for construction with land surveys to ensure area requirements are met. 	<ul style="list-style-type: none"> Only those areas required for construction or operational facilities cleared. 	<ul style="list-style-type: none"> Implement environmental monitoring and reporting procedures in accordance with Development's EMS (Chapter 16). 	Likelihood – almost certain Consequence – incidental Risk – low
Changed sea use due to construction and operation of: <ul style="list-style-type: none"> port facilities domestic gas pipeline (offshore) optical fibre cable. 	<p>Restricted access during construction.</p> <p>Creation of habitat for fishing (recreational).</p> <p>Creation of additional barrier and exclusion area to trawl and prawn fishing operations.</p>	<ul style="list-style-type: none"> Continue ongoing liaison/communication with Fisheries Department and commercial operators to ensure awareness of construction planning, activities and location of the new marine facilities, pipeline and ship navigation. Inform Mariners of any changes or navigational constraints due to construction and operating conditions. Make appropriate changes to navigational charts and Fishing Management boundaries. Introduce new navigation aids, additional monitoring of shipping and fishing activities. 	<ul style="list-style-type: none"> Negligible impact on commercial fisheries. Additional recreational fishing opportunities created. 	<ul style="list-style-type: none"> Commercial and recreational fishing activity in the vicinity of Gorgon Development. <p>Construction Likelihood – almost certain Consequence – incidental Risk – low</p> <p>Operations Likelihood – seldom, Consequence – incidental Risk – low</p>	

Table 14-6: (continued)

Key Benefits and Risks to Land Use and Tenure

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Construction and operation of the domestic gas pipeline (onshore).	Acquisition of land required for easement from pastoral lease. Increased area of restriction adjacent to existing pipelines.	<ul style="list-style-type: none"> Consult with Mardie Station Owner(s). Negotiate and compensate for the pipeline easement. Develop an access agreement for monitoring and maintenance activity and pipeline security. 	<ul style="list-style-type: none"> No significant interruptions to Mardie Station activities. 	Annual notice to Crown Licensee regarding planned access activities. Cooperative work arrangement regarding Crown issues such as land rehabilitation, weed control, public access, and safety.	<p>Construction Likelihood – almost certain Consequence – incidental Risk – low</p> <p>Operations Likelihood – seldom Consequence – incidental Risk – low</p>
Operation of the marine supply base.	Increased truck traffic. Damage to roads. Increased safety hazards to other road users.	<ul style="list-style-type: none"> Liaise and communicate with Shire of Roebourne and Karratha Police to manage truck activities and times of activity. Comply with Zoning and development plans. Conduct traffic impact assessment and prepare traffic management plans prior to construction. 	<ul style="list-style-type: none"> No fatalities or significant interruptions associated with Development-related traffic. 	Implement monitoring and reporting procedures in accordance with Development's EMS (Chapter 16).	Likelihood – almost certain Consequence – incidental Risk – low

14.7 Native Title

As noted in Chapter 8, there are no Native Title claims over Barrow Island or to the north-west of Barrow Island over the Gorgon or Greater Gorgon gas fields. There are currently three registered Native Title claims that may overlap the proposed domestic gas pipeline route option and onshore seas approach to the mainland. These are large claim areas (13 940, 20 240 and 15 759 km² respectively). As shown in Figure 14-4 the Wong-goo-tt-oo Native Title claim (NNTT number: WC98/40) appears to be east and north of the proposed domestic near shore and onshore gas pipeline area; however the large-scale mapping of the claim area is very general and may be subject to interpretation. The near shore and onshore segment of the proposed optical fibre communication cable also crosses an area under Native Title Claim (Thalanyji). The Rights and Interests claimed by the groups are quite broad, but they recognise that they are not to the exclusion of other rights and interests validly created by the Commonwealth or the State of Western Australia, or accorded under international law.

The Joint Venturers intend to engage in appropriate, good-faith negotiations with the indigenous communities. Constructive and inclusive dialogue will maximise the potential for positive impacts and resolve any potential issues. Native Title issues will be resolved in accordance with relevant policy and legislation. The consultation taken to date is outlined in Chapter 5 of this document.

The potential impacts and proposed management strategies on Native Title issues for the Development are summarised in Table 14-7. The residual risk is considered to be high.

Figure 14-4:
Native Title Boundaries in the Pilbara Region

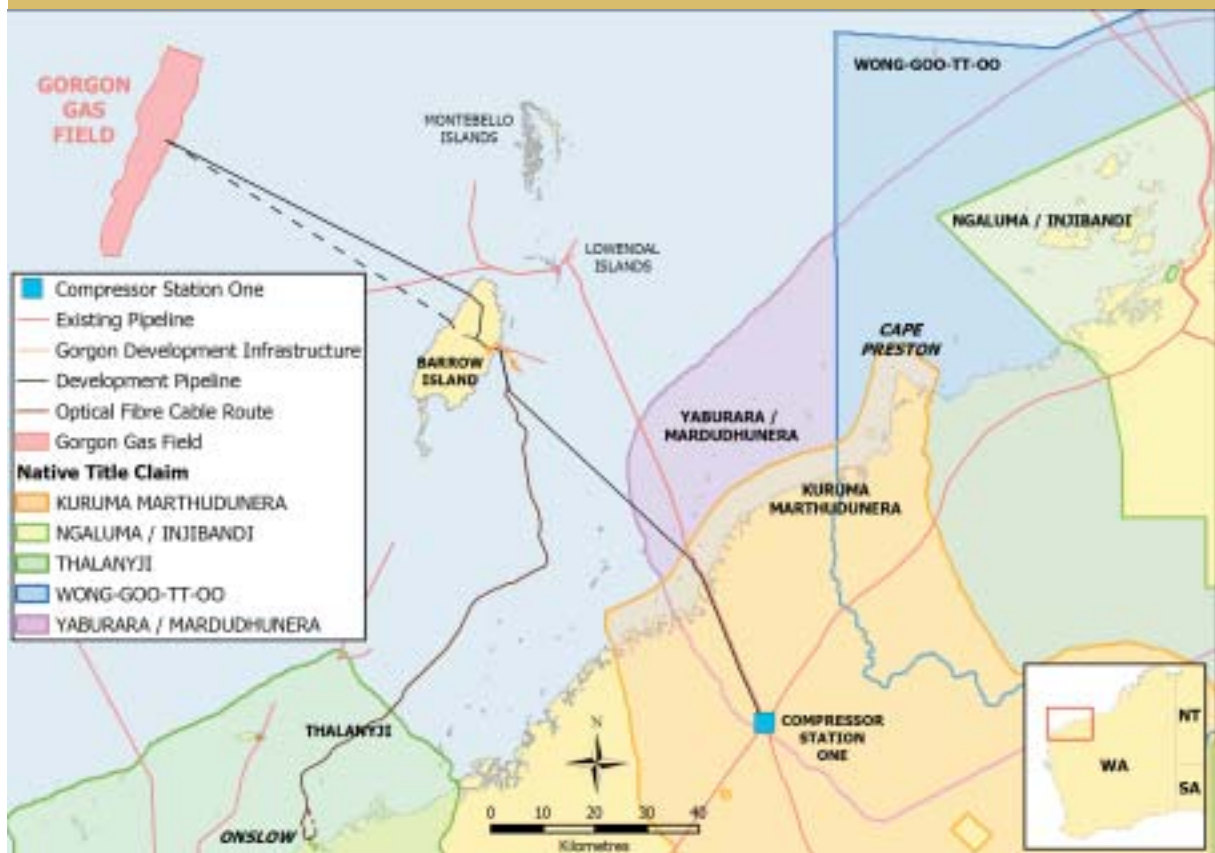


Table 14-7: Key Benefits and Risks to Native Title Claims					
Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Construction and operation of the domestic gas pipeline and optical fibre cable.	Potential diminution of native title rights. Potential Development delay if agreement cannot be reached between the parties.	<ul style="list-style-type: none"> Identify Native Title Claimants. Assess potential impact of pipeline and optical fibre cable to Native Title rights and title. Undertake good-faith consultation and negotiations with indigenous Native Title claimants in accordance with legislative requirements. 	<ul style="list-style-type: none"> Agreement reached with Native Title Claimants to permit construction and operation of pipeline and optical fibre cable within Claim area(s). 	<ul style="list-style-type: none"> Report on Native Title negotiations and outcomes as part of SIMP monitoring. 	Pre-Construction Likelihood – occasional Consequence – serious Risk – high

14.8 Cultural Heritage

14.8.1 Indigenous Anthropology

There are three indigenous groups with a known interest in the region of the domestic gas pipeline route and Barrow Island. Initial discussions with these groups has been undertaken, with the people associated with the Yabbarara/Mardudhunera, Kurama Marthudunera and Thalanyji indigenous groups expressing an interest in being consulted regarding indigenous heritage issues on Barrow Island and the mainland.

At the current time, no ethnographic surveys have been undertaken on Barrow Island or the onshore domestic gas pipeline alignment. However, from earlier work conducted by Apache Energy and their predecessor Hadson Energy Resources Corporation, two ethnographic sites associated with Peters Creek are known to be located adjacent to the Apache Energy export pipeline on the mainland, in the general vicinity of the proposed domestic gas pipeline route. A further detailed survey would confirm whether these sites or other potential sites may be affected and this will be undertaken prior to commencement of construction.

Proposed management strategies are aimed at involving indigenous people in the identification and management of cultural heritage prior to construction on Barrow Island and the mainland. Management strategies are listed in Table 14-8 and outlined in detail in the draft Cultural Heritage Management Plan (CHMP) included in Technical Appendix E1. Further detailed review of this Plan will be undertaken during this phase of the Development when more detailed design information is available to provide a basis for assessment. This will include additional archaeological and ethnographic surveys, involving indigenous people.

14.8.2 Indigenous Archaeology

Barrow Island

Previous archaeological assessment on Barrow Island was undertaken by Quartermaine Consultants (1994; 1997). Further archaeological survey work was undertaken for this Draft EIS/ERMP (refer to Technical Appendix E1). Only two of the 13 registered indigenous sites on Barrow Island were identified as being close to any part of the Gorgon Development. Both were scatter sites: 887 (FS05) and 888 (FS06), and both were located in proximity to an earlier alignment of the reservoir carbon dioxide injection pipeline (CO₂ pipeline) and the proposed injection wells. With the revised location of the CO₂ pipeline and the proposed injection wells, there will be no risk of potentially impacting these sites.

Prior to construction, all proposed ground disturbance areas (including the seabed) will be surveyed for indigenous, historical and maritime cultural heritage evidence. Emphasis will be on areas of high site potential such as clay pans, shore lines, freshwater and drainage areas. Construction activities proximal to any identified cultural sites will be monitored as well as in areas of high potential. Construction, operation, and decommissioning activities will be managed in accordance with the final CHMP.

Although no known sites will be impacted, if new sites are discovered during construction which cannot be avoided by the Joint Venturers, suitable recording work will be undertaken and permits to disturb obtained.

Mainland

A survey for indigenous sites was undertaken for the earlier Apache Energy/Hadson pipeline projects. Six archaeological sites were identified in the general area of these pipelines, but none were disturbed during the construction of these facilities. As one option for the proposed domestic gas pipeline parallels these earlier pipelines, there remains some potential risk that one or more of these sites may be impacted (Figure 14-5). If this option is selected, and once the route is finalised,

an archaeological survey of the proposed disturbance area will be undertaken. Any new sites identified will be avoided where practical. Where avoidance is not possible, the site will only be disturbed in accordance with clearance procedures specified in the Western Australian *Aboriginal Heritage Act 1972* and reflected in the CHMP. Similarly, the short section of near-shore and onshore optical fibre communication cable alignment will also be inspected for potential indigenous sites. However the disturbed (urban) nature of the Onslow area and the alignment of the cable within or along roadways will reduce the likelihood of potentially impacting archaeological sites.

Management strategies are included in Table 14-8 and will be detailed in the CHMP. The residual risk for indigenous heritage is low in the pre-construction and decommissioning stage through to high during the construction stage if appropriate survey, inspection, monitoring, recording and reporting measures are not fully undertaken. Additional archaeological and ethnographic surveys of the proposed Development area will be undertaken as part of the detailed design process. This will provide the opportunity for both surveys to be undertaken simultaneously and efficiently.

Figure 14-5:
Archaeological Sites along the Existing Apache Energy Export Pipeline Route



Table 14-8:
Key Benefits and Risks to Indigenous Anthropology and Archaeology

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Surface disturbing activities.	Damage to anthropological or archaeological sites.	<ul style="list-style-type: none"> Identify potential additional archaeological and ethnographic sites within the Development area by undertaking additional surveys in consultation with the relevant Indigenous communities. 	<ul style="list-style-type: none"> No impact to indigenous heritage sites. 	<ul style="list-style-type: none"> Implement cultural heritage monitoring and reporting procedures in accordance with Development's EMS and CHMP (Chapter 16). 	<p>Pre-construction Likelihood – unlikely Consequence – minor Risk – low</p>
Pre-construction Site selection and design.	Non-compliance with <i>Aboriginal Heritage Act</i> 1972 requirements.	<ul style="list-style-type: none"> Minimise amount of land disturbed for facilities. 	<ul style="list-style-type: none"> Where sites cannot be avoided, sites only disturbed in accordance with procedures specified in CHMP. 		<p>Construction Likelihood – occasional Consequence – serious Risk – high</p>
Construction Clearing, earthworks and drilling.		<ul style="list-style-type: none"> Survey all proposed area of ground disturbance prior to construction. Emphasis will be on areas of higher sensitivity. 			<p>Operations Likelihood – seldom Consequence – minor Risk – medium</p>
Operations Vehicle movement. Maintenance earthworks.		<ul style="list-style-type: none"> Monitor construction activities in areas of high potential for surface and sub-surface cultural material. 			<p>Decommissioning Likelihood – unlikely Consequence – minor Risk – low</p>
Decommissioning Dismantling/removal of facility and rehabilitation and associated activities.		<ul style="list-style-type: none"> Manage construction, operation, and decommissioning activities in accordance with the final CHMP. 			

14.8.3 Historical and Maritime Heritage – Terrestrial Barrow Island

If the alternative shore crossing at Flacourt Bay is selected, one known historical site (a glass artefact scatter) may be impacted by the proposed Development. There is the potential for additional sites to be identified, particularly in the coastal zone of Barrow Island which may include subsurface cultural material buried by cyclone and dune aggradation. A more detailed survey will be undertaken following finalisation of the footprint and well in advance of any surface disturbance or construction.

Proposed management strategies are identified in Table 14-9. The residual risk for terrestrial, historical and maritime heritage on Barrow Island varies from low during pre-construction, operations, and decommissioning to medium during construction.

Mainland

There is one known site that may be impacted by the Development (the remains of a reported shipwreck close to the Apache pipeline, located below the high water mark) and the potential exists for others to be present. Until the location for the domestic gas pipeline and the optical fibre communication cable are finalised, it is not possible to confirm the extent of impacts.

Proposed management strategies to reduce potential impacts and risks are listed in Table 14-9. The residual risk for terrestrial, historical and maritime heritage on the mainland is low to medium with the greatest risk occurring during construction.

14.8.4 Maritime Heritage – Subsea

No shipwreck sites have been identified or recorded in the immediate area of the proposed Gorgon Development. Review of underwater video surveillance, side-scan sonar and bathymetry surveys of the general pipeline routes, the pipeline shore approaches, Materials Offloading Facility (MOF) and LNG shipping channel and turning basin have not produced any evidence of maritime heritage sites. To further reduce the possibility of impacting a shipwreck or heritage site, detailed marine surveys will be reviewed by a marine heritage archaeologist/historian at the time the pipeline and optical fibre routes and disturbance areas are being finalised. Due to the flexible nature of pipelines and the optical fibre cable, it is likely that minor re-alignment can be made to avoid areas of known or suspected heritage value.

Management strategies are listed in Table 14-9. Without further detailed studies the residual risk for maritime heritage on the mainland is low to medium with the greatest risk occurring during construction.

14.8.5 Summary of Heritage Impacts and Management Response

Preliminary site survey work undertaken in the fields of indigenous archaeology and anthropology, historical and maritime heritage (terrestrial and underwater), has indicated that there are relatively few known sites on Barrow Island and the mainland that may be impacted by the proposed Development. Research and consultation does indicate that it is possible that other sites may exist. However until the Development footprint is finalised, it is not possible to evaluate the extent to which sites or cultural heritage areas may be impacted. It is proposed to undertake further investigations in consultation with relevant stakeholders prior to the completion of the current design phase to ensure any known or identified sites can be avoided or impacts minimised and managed.

The following management objectives and strategies have been identified for the proposed Development. These are outlined in the draft CHMP in Technical Appendix E1, and include:

- Consulting with indigenous communities to identify potential archaeological and ethnographic sites within/adjacent to the proposed Development during detailed design and well in advance of construction.
- Conducting detailed surveys (pedestrian transects and/or acoustic or video imaging) well in advance of construction to locate, record and avoid identified sites where possible; and where it is not possible:
 - make formal applications to disturb the site(s) to the appropriate authority
 - make test excavations if required
 - make detailed recording of site(s)
 - collect and store site information pursuant to legislation
- Engaging cultural heritage officer(s) to implement an appropriate cultural heritage induction for supervisors and workers involved with ground/seabed disturbance activities, identify, monitor and protect known sites during construction, and manage potential subsurface material identified during construction.

14.8.6 Summary of Risk

The consequences for cultural heritage are summarised in Table 14-8 and Table 14-9. Overall residual risk for cultural heritage will be low during pre-construction, medium during construction, low during operations, and low during decommissioning.

14.9 Landscape and Aesthetics

14.9.1 Overview

A visual assessment of the proposed Gorgon Development was undertaken to evaluate the degree to which its components (subsea wells, pipelines, gas processing facility and marine infrastructure) would change the 'seen' or visual amenity of the existing landscape. The evaluation commenced at a very broad scale to gain an understanding of the landscape setting and then focussed in greater detail on the position of the components and their relationship within their immediate setting. Through a qualitative and quantitative assessment, the values were then considered for the periods during and immediately after construction, and then operation. Overall, as expected, the visual impact is limited due to the lack of human receptors (almost exclusively the construction and operational workforce) on and around Barrow Island due to the remote location of the Development.

14.9.2 Visual Absorption Capability and Assessment of Visual Amenity

Visual absorption capability is a measure of the relative ability of a landscape character type to absorb visual change. A landscape with a high absorptive capability is able to absorb more visual change than one with a low capability. For example, an existing industrial site in an urban setting with large vessels, gantries, towers, roads and powerlines would have greater ability to absorb the visual impacts of a proposed new industrial plant than the placement of a similar facility on a rural or undeveloped agricultural area or Nature Reserve.

Table 14-9: Key Benefits and Risks to Historical and Maritime Heritage – Terrestrial and Underwater

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Surface disturbing activities:	Damage to historical sites.	• Survey areas of proposed ground disturbance (including the seabed) for historical and maritime cultural heritage.	• No impact to maritime heritage sites.	• Implement cultural heritage monitoring and reporting procedures in accordance with Development's EMS and CHMP (Chapter 16).	Pre-construction Likelihood – unlikely Consequence – minor Risk – low
Pre-construction Site selection and design.	Non-compliance with <i>Maritime Archaeology Act 1973</i> and /or <i>Historic Shipwrecks Act 1976</i> requirements.	• Minimise the amount of land disturbed for facilities.	• Where sites cannot be avoided, sites only disturbed in accordance with procedures specified in CHMP.		
Construction Clearing, earthworks and drilling.		• Monitor construction activities in areas of higher sensitivity.			Construction and commissioning Likelihood – unlikely Consequence – serious Risk – medium
Operations Vehicle movement. Maintenance earthworks.		• Manage construction, operations and decommissioning activities in accordance with the final CHMP.			Operations Likelihood – unlikely Consequence – minor Risk – low
Decommissioning Dismantling/removal of facility and rehabilitation and associated activities.					Decommissioning Likelihood – unlikely Consequence – minor Risk – low

Offshore

The subsea gathering system will be located approximately 200 km from the Australian mainland. Drilling of the wells will be a temporary activity, in line with much of the existing oil and gas development occurring offshore. Completion of the wells will be subsea and all infrastructure will be located on the sea floor. Because none of the wells, manifolds or pipelines will be seen, there will be no impact on the visual absorption capability of the offshore setting and the impact on visual amenity is considered nil.

Barrow Island

The visual absorption capability is influenced by terrain and landscape. On Barrow Island there are five landscape character units:

- West Coastal Complex
- East Coastal Complex
- Valley Slopes and Escarpments
- Limestone Ridges
- Creek or Seasonal Drainage Lines.

Within each of these units, change resulting from the proposed infrastructure can be accommodated to varying degrees without significantly altering the setting. The visual absorption capabilities of the identified Barrow Island landscape units are listed in Table 14-10.

Because Barrow Island has few trees, and is mostly low elevation scrub and *Triodia* species, the overall ability to absorb visual change is considered low.

While Barrow Island has the status of a Class A Nature Reserve, it cannot be considered visually or naturally pristine. Existing man-made built elements exist within this environment due to the existing and historical oil

extractive industry. Oil infrastructure, tanks, pipe and transmission lines are visually present within the proximity of the proposed development. Moreover, due to the lack of human receptors on remote Barrow Island, the potential to impact visual amenity is perceived as low to very low.

Mardie Station (Domestic Gas Pipeline)

With the exception of a block valve and some marker and cathodic protection posts, the domestic gas pipeline will be located underground, in close proximity to the existing buried Apache Energy export pipeline. Because the pipeline infrastructure will not be visible, regard will be given to the construction easement in particular, the clearance of vegetation and disturbance of the ground surface. Long-term visual effects will be negligible, as rehabilitation and construction management will be carried out in an effective manner. An access track, of similar scale to a farm track, will remain for access by four wheel drive vehicles during operation. Therefore visual absorption capability is not considered a limiting factor. Combined with this is a lack of human receptors within close proximity of the proposed pipeline (currently bisecting the middle of the 220 000 ha stock grazing station). Consequently the potential impact on visual amenity is considered as low to very low.

14.9.3 Visual Effect

The visual effect of the Development is the degree of contrast occurring between the proposed works and the existing visual setting.

Offshore

The offshore wells and infrastructure (all subsea) will not be visible from the ocean's surface or from land.

Table 14-10:

Visual Absorptive Capability of Landscape Units in the Proposed Barrow Island Development Area

Landscape Character Units	Visual Absorption Capability
West Coast Complex	Low
East Coast Complex	Moderate
Valley Slopes and Escarpments	Low to Moderate
Limestone Ridges	Low
Creek or Seasonal Drainage lines	Moderate

Barrow Island – Pipeline(s)

The degree of visual effect involved with the feed gas pipeline and CO₂ pipeline, will generally be associated with how the landscape absorbs an elevated linear form within a natural setting. This has the greatest visual impact when the pipeline corridor departs from an established road easement which also has linear components.

The pipeline corridor will not be obviously visible from anywhere except the road and the few vantage points along the alignment. This line will be most visible in the upland ‘Limestone Ridges’ landscape unit. Pipeline infrastructure may also be visible when vegetation is sparse in the shared road corridor, or when the pipeline route intersects with the road.

Consideration will be given to location, alignment and construction, in particular the vegetation clearing and grading the ground surface. Long-term visual effects will be negligible, as the pipelines will be located close to the ground surface and follow existing contours and grades. The visual effect will be consistent with the existing elevated oil flow lines that feed the terminal tanks at Town Point, Barrow Island. The feed gas pipeline will be slightly larger in diameter (900 mm) and sit 750 mm off the ground surface. Appropriate restoration will further reduce the visual effect.

Barrow Island – Gas Processing Facility

The gas processing facility will be a large industrial complex, with some similarities to the existing oil and gas development facilities both on Barrow Island and other adjacent islands (Varanus and Thevenard). The visual effect of the gas processing facility and temporary construction village will depend on the

viewer's position on Barrow Island. The visual impact of the proposed gas processing facility will be moderate to substantial for views within 5 km of the central eastern section of Barrow Island. Within the 5 km viewing area the gas processing facility will be in stark contrast to the low vegetated nature of the landscape.

Although the Development area as a whole will be approximately 300 ha the gas processing facility is not constructed or viewed as a single mass, but as a mixture of steel structural elements of varying size, width and height.

In general it is planned that the Development be sited in a low-lying area to assist minimising visual impact within the surrounding landscape.

The port facilities will consist of a larger MOF approximately 1 km in length and a lighter structured offshore ship gas loading jetty of approximately 3 km in length. While these facilities will protrude for a substantial distance from the eastern coast, these forms will tend to blend into the seascape due to their low lying and light structured nature.

Appropriate measures will be taken to neutralise the colouring of these port facilities to blend with the seascape while night lighting will be minimal and will not have a high visual impact in this coastal area. The anticipated impacts from key viewing locations are summarised in Table 14-11.

If the gas processing facility is viewed beyond the surrounding ridgeline, the visual effect will range from slight to negligible. This is due to the topography screening, the softening of distance, and the

Table 14-11:

Indicative Areas of Visual Impact

Viewing Location		Impact*
View 1	Chevron Camp	Moderate
View 2	Town Point	Substantial to Severe
View 3	Communication Tower	Negligible
View 4	Ocean View at 5 km	Moderate to Substantial
View 5	Road Junction, Old Airport	Substantial
View 6	Current Airport	Negligible to None
View 7	Ridgeline West of Terminal Tanks	Substantial

*Criteria definitions in Methodology Appendices A 1.5 in Technical Appendix: E2 Visual Assessment

Plate 14-1:

Viewing Simulation of the 'Constructed' Gas Processing Facility from Communication Tower



integration of gas processing facility mass with the undulating terrain. Plate 14-1 shows a simulation of the constructed gas processing facility viewed from the communication tower site, the highest vantage point in the central uplands. This modelling exercise incorporates the true, scaled vessel and facility dimensions and design layout at the elevation planned for the gas processing facility.

Where the gas processing facility and construction village are visible within the drainage line flat or upon the nearby surrounding ridgeline (within the 5 km viewshed), the visual effect will be moderate to substantial as the structure contrasts with the immediate landscape (refer to Plate 14-2). This simulation does not include the MOF or LNG jetty which would also be moderate to substantial due to the contrast of these structures with the marine landscape.

The viewshed analysis in Figure 14-6 shows the locations where the proposed gas processing facility will be visible. The flare height will be approximately 150 m tall. Its thin structure contrasts with the gas processing facility structure resulting in a much reduced visual impact. The concentric rings on the figure are to assist the reader in scaling distances.

The gas processing facility will be visible from within the central eastern area of Barrow Island and offshore while approaching the centre of Barrow Island from the east. Visibility of the facility from the central upland area of Barrow Island will be negligible with views mostly screened by the undulating topography and intervening ridgelines.

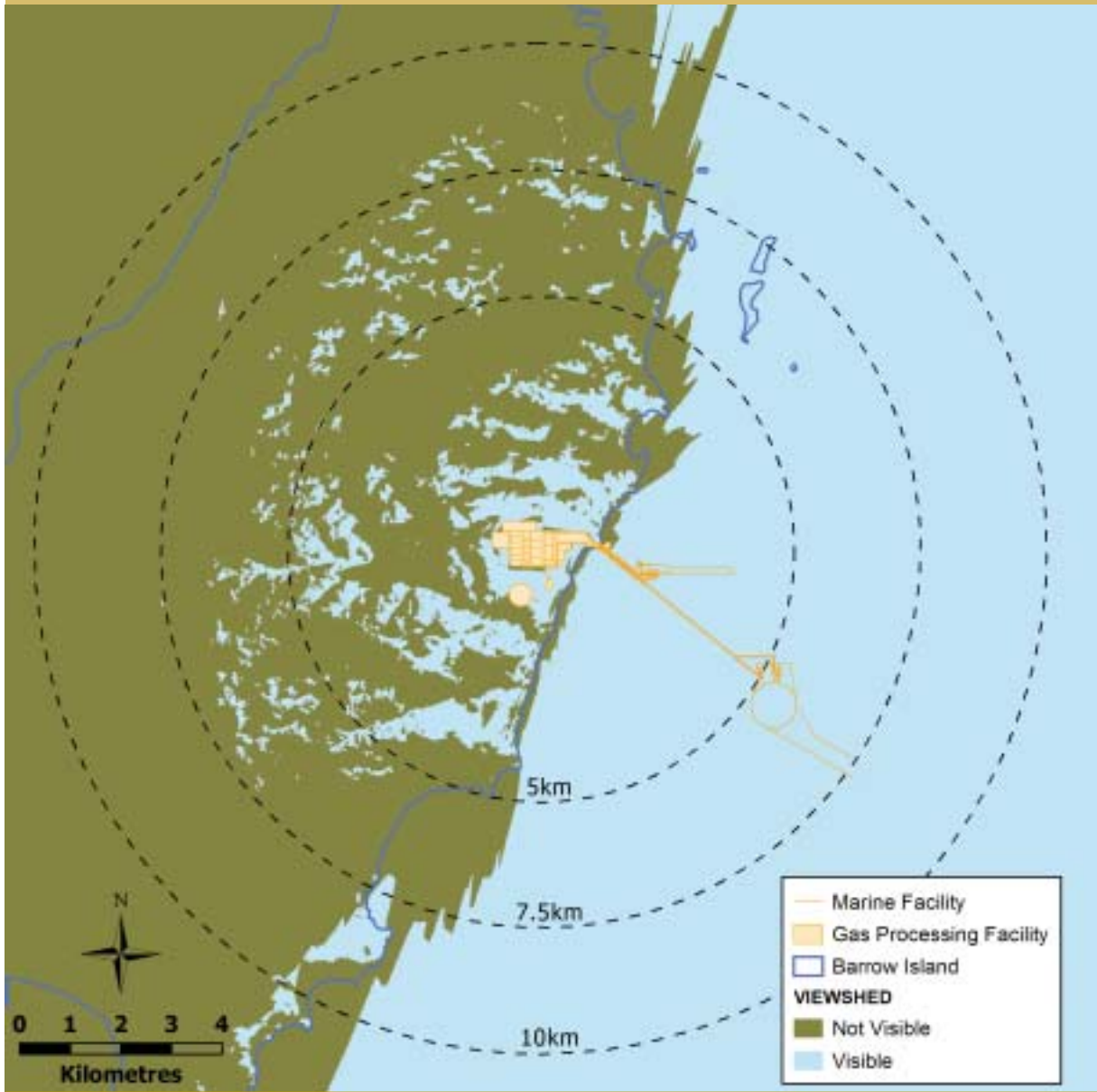
Given the arid conditions and the lack of substantial, high-growing indigenous vegetation on Barrow Island, there is limited ability to screen the gas processing facility with vegetation. Further, because Barrow Island is a Class A Nature Reserve, there is no scope to import different vegetation onto the island to use for screening. Consequently, the level of visual impact is not expected to change over time with vegetation growth.

Plate 14-2:

Viewing Simulation Looking North on Ridgeline from Camp (approximately 4 km from gas processing facility site)



Figure 14-6:
Visibility of the Gorgon Gas Processing Facility



Mardie Station (Domestic Gas Pipeline)

Once operational, the domestic gas pipeline will be located underground, but is likely to result in either the creation of a new easement or widening of the existing easement. The clearing required to create the easement and construct the pipeline will be evident during and after construction. The proposed alignment for the domestic gas pipeline does not cross any roads or highways but interconnects with the Dampier to

Bunbury pipeline at compressor station 1.

Consequently the potential visual receptors are very limited. Over time the visual effects of clearing and surface disturbance will blend in with the surrounding landscape. Marker posts and corrosion test leads (approximately 1.5 m in height) will provide identification of the pipeline location and are designed to keep both the pipeline and the public safe. A minor four wheel drive access track will remain.

14.9.4 Mitigation of Visual Impact

Barrow Island

Barrow Island is a Class A Nature Reserve and the entire ecosystem, including the landscape and visual amenity, is considered sensitive. The existing visual landscape has already been modified to a certain extent by the existing oil field development and operations on the island, including: large tanks for product storage; above-ground pipelines and power cables; roads; an airport; accommodation and office facilities; communication and power facilities; a barge landing and wharfage; plus a pipeline load-out facility and tanker mooring structures.

Given the relative scarcity of vegetation of any physical stature due to the environmental conditions, amelioration methods that rely on topographic shaping or the growth of vegetation to hide the presence of the gas processing facility will not be available and would be considered inappropriate for the size of the proposed Development. Therefore, where practicable during the detailed engineering and design phase, the Joint Venturers will aim to use existing infrastructure (roads) and the location of similar structures (the existing large tankage located immediately to the north of the gas processing facility) to minimise visual disturbance and optimise visual blending and screening.

In general it is planned to locate the Development in low-lying areas to minimise visual impact within the surrounding landscape.

The visual effect of the pipeline easement and benching works around the gas processing facility will depend upon the degree to which it is cleared and the contrast occurring between disturbed areas and the surrounding natural ground surface. This will result from observable differences in the colour of the backfilled material or a change in texture and size of the naturally occurring soil or rock on the ground.

The dominant colour of the weathered and oxidised surface rock is a light (sun bleached) cream to pink colour. However, when the rock is fractured or the surface disturbed the colours become deeper and the underlying rust red-ochre earth becomes dominant (refer to Plate 14-1). Therefore to reduce the visual impact, where practical, different soil profiles will be

stored separately and replaced in the same location, while excavated rock of contrasting colour and texture will be covered or reburied where practicable. Storing surface soils separately and replacing them last will also assist in reducing the soil colour and texture contrasts. In addition, consideration will be given to the use of colours similar to the natural environment during detailed engineering and design. Efforts will also be made to reduce the visual impact of pipework clutter as part of the detailed engineering where practical.

In the harsh environment on Barrow Island, vegetation rehabilitation can be assisted by minimising the area of disturbance and by storing and stockpiling surface soils separately, and placing them over disturbed areas. To expedite reclamation success, revegetation will commence immediately following reinstatement, using direct topsoil placement that matches that of the particular location rather than the broader area wherever possible. Collecting organic matter and propagating plant material from the gas processing facility site prior to clearing and site-levelling work will allow stocks of appropriate revegetation species to be grown. Additional impact mitigation and rehabilitation methods are outlined in Technical Appendix E2.

Mardie Station (Domestic Gas Pipeline)

The landscape of Mardie Station has already been altered by stock grazing, fires, and construction of roads, fence-lines and pipelines. There is evidence of introduced vegetation requiring control efforts, particularly creosote bush (Mike Thomson, Mardie Station owner, pers. comm.). To reduce the visual impact of construction, the construction easement will be rehabilitated.

14.9.5 Summary of Risk

The potential visual amenity and aesthetic impacts of the Development and recommended management strategies are summarised in Table 14-12. The residual risks during construction are medium and during operation low. The medium risk is derived from the fact that landscape values will definitely be impacted by the proposed Development. Overall, however the number of receptors is very low and the impact is of low consequence. Following decommissioning the site at Barrow Island will be rehabilitated and some of the landscape values can be returned.

Table 14-12:
Key Risks to Visual Amenity and Aesthetics

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Installation of infrastructure.	Reduction in landscape and/or aesthetic values of Barrow Island and mainland (where domestic gas pipeline comes ashore).	<ul style="list-style-type: none"> Evaluate environmental, engineering and economic potential to undertake directional drilling to minimise damage to the foreshore. Undertake rehabilitation of works sites and access roads with vegetation rehabilitation, sand, soils and rock profile to match existing. Carefully manage topsoil storage, handling and replacement at disturbed sites. Align onshore feed gas pipeline easement to take advantage of topography with screening from vantage point views when climbing escarpment within the valleys. Where possible, align onshore feed gas pipeline easement with roads and other existing industrial infrastructure. Review colour schemes that will blend processing facility and other facilities into the surrounding landscape. 	<ul style="list-style-type: none"> Visual impacts associated with the Development are minimised. 	<ul style="list-style-type: none"> Photographic recording of construction and physical completion. 	<p>Construction Likelihood – frequent Consequence – incidental Risk – medium</p> <p>Operation Likelihood – occasional Consequence – incidental Risk – low</p>

14.10 Workforce and Public Health and Safety

Protection of the workforce health and safety during both construction and operations is important to the Joint Venturers. Utilising expert personnel and the Chevron Operational Excellence Management System (OEMS), the potential health and safety hazards and risks to Development personnel will be identified and assessed, then the subject of substantial planning, organisation and procedural/facility development.

Hazard and Operability (HAZOP) studies will be conducted for Development components. Hazard and risk workshops will be held with a wide range of professionals in relation to the construction, commissioning and operation phases of the Development facilities to:

- identify all hazards and risks
- assess those hazards and risks identified
- develop controls to manage these hazards and risks.

14.10.1 Occupational Health – Gorgon Development Workforce

Occupational Health and Safety systems have been established by Chevron Australia and will address the relevant legislative requirements for health and safety. These systems will address Development contractors.

Key differences for the Gorgon Development compared to other, similar onshore projects in Western Australia will be: the quarantine restrictions that will apply to the workforce on Barrow Island and those working at the supply bases; and the reduction in access to surrounding areas because of Barrow Island's conservation classification. The construction workforce on Barrow Island will be restricted to particular areas including the camp facility and the job site. That is, they will not have unrestricted access to the island. While some restrictions are currently in place for the existing oil operations, a different set of conditions will need to be applied to the much larger workforce.

The remote location of the Development site and the restrictions on activity has the potential to reduce opportunities for recreation. These are proposed to be managed through a variety of programs and activities including health and safety planning, provision of recreation facilities within the construction village and managed access to areas outside of the village. The Joint Venturers intend to continue to sponsor programs (i.e. conservation) on Barrow Island that will allow the workforce some additional access to the area. Similar types of restrictions on access and activities are standard practice in National and Marine Park settings and Nature Reserves where significant flora and/or fauna are present.

14.10.2 Public Health and Safety

The location of the majority of the Development on Barrow Island minimises the potential for the workforce to interact with the public. With the distance and location separation between workers, the majority of the Gorgon Development and the general public, there will be very few public health and safety impacts.

Construction

One area where the Gorgon Development and the general public may be in close proximity is if a marine supply base were to be constructed in the Dampier/King Bay area. This is an industrial/commercial setting, and the Development will result in a relatively small increase in the onshore construction workforce. The presence of additional workers in a relatively small community may put temporary incremental pressure on the public health facilities and the social environment. This impact would be substantially greater if the Gorgon Development were located on the mainland and not on Barrow Island.

Due to the size of the proposed Development and the importance of the marine supply base as a staging area, there will be significant traffic movements (particularly heavy vehicles and their cargoes). This will range from 40 to 150 movements per day for a period of approximately 30–40 months. Construction materials will be imported through a combination of facilities at the Port of Dampier, local (i.e. aggregate), and road freight from Perth and surrounds. Additional traffic movements will increase the potential risk of traffic accidents. This traffic risk is not expected to be difficult to manage using proven journey management processes and road transport contractor selection. Consultation with the local police during the development of the journey management procedures and practices has proven effective in reducing potential traffic risks. In addition, a system of traffic controls will be developed that ensures that heavy vehicles are held at a central point. The holding point will allow the vehicles to be held at times of high local road use and appropriately spaced for travel into towns or residential areas. The recent North West Shelf Venture 'Train Four' project, for example, was of a similar size and traffic was managed very well utilising similar control measures as those planned for the Gorgon Development.

The Perth supply base will potentially be located within the existing Australian Marine Complex (AMC) area which is Australia's largest shipbuilding, marine engineering and fabrication centre that has been designed to manage public access and safety.

Onshore Domestic Gas Pipeline

The domestic gas pipeline is proposed to be located on a rural pastoral lease area. Potential risks to the public are minimal because public access to this area is restricted (grazing lease) and population density in this location is extremely low (< 1 km²), with the nearest residence greater than 10 km from the pipeline. This will reduce the potential for any public health and safety impacts associated with an accident during construction or pipeline leak or explosion during operation.

The domestic gas pipeline will be constructed adjacent to two existing export gas pipelines operated by Apache Energy and will tie-in with the existing Dampier to Bunbury pipeline at Compressor Station 1. These pipelines are located within well defined pipeline easements and are identified by pipeline markers. The exact location of these facilities will be marked and all construction will be supervised, inspected, tested and protected in accordance with Australian pipeline standards and codes.

14.10.3 Summary of Risk

The consequences and management strategies for health and safety of the workforce and public on the Development are summarised in Table 14-13 and Table 14-14. The level of residual risk is medium overall.

Table 14-13: Key Benefits and Risks to Workforce Health and Safety	Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
	Plant or equipment failure. Cyclone or other natural disaster. Development standards not maintained. Ineffective contract management.	Major on-site emergency. Pressure on emergency and medical facilities on Barrow Island and in Karratha. Personnel injury or fatality (see Section 14.11).	<ul style="list-style-type: none"> • Prepare an Emergency Management Plan that includes an integrated safety and emergency response system. The plan will reference assistance requirements and procedures from FESA and other authorities. • Train emergency response crews. • Locate senior medical personnel on Barrow Island throughout construction phase. • Conduct regular (weekly) formal inspections of the Development site by company safety professionals. • Implement emergency evacuation procedures for injured personnel off Barrow Island to suitable medical facility. • Include health and safety obligations and provisions in contracts. • Review preparedness of medical and rescue services in Karratha and supplementing of existing facilities, if required. 	<ul style="list-style-type: none"> • No fatalities. • No lost-time injuries. 	<ul style="list-style-type: none"> • Audits of HES management systems (procedures, equipment and resources). 	<p>Construction Likelihood – seldom Consequence – serious Risk – medium</p> <p>Operation Likelihood – seldom Consequence – serious Risk – medium</p>
	Security breach on site or at supply bases.	Development delays, loss of property or personnel injury.	<ul style="list-style-type: none"> • Apply appropriate security measures to ensure that personnel are properly screened prior to employment and access to facilities is well managed. 	<ul style="list-style-type: none"> • No security breaches. 	<ul style="list-style-type: none"> • Security audits. 	Likelihood – seldom Consequence – serious Risk – medium

Table 14-13: (continued)

Key Benefits and Risks to Workforce Health and Safety

Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Construction workforce restricted to construction site and village areas.	Worker stress. Reduced standards of health.	<ul style="list-style-type: none"> • Provide appropriate recreational opportunities within the village. • Provide facilities for physical exercise. • Develop programs and activities to improve health. • Manage access to areas outside of the village where potential environmental impacts can be avoided, minimised or managed. • Provide access to counselling (on and off Barrow Island) if required. 	<ul style="list-style-type: none"> • No incidents related to workforce stress resulting from isolation. 	<ul style="list-style-type: none"> • Workforce surveys. • Health monitoring programs. 	Likelihood – seldom Consequence – minor Risk – medium

Table 14-14: Key Benefits and Risks to Public Health and Safety					
Activities/ Causes	Potential Socio-Economic Impact/Consequences	Management Measures	Outcome/Target	Measurement Strategies	Residual Benefit/Risk
Anti-social behaviour of mainland workforce associated with alcohol/drug consumption and abuse. Fights, gambling and prostitution.	Reduced social standards. Reduced public safety. Tainted company reputation.	<ul style="list-style-type: none"> Adopt appropriate security screening of personnel prior to employment. Establish protocols and guidelines for acceptable behaviour of workforce. Apply strict Fitness for Work policies and procedures. Provide access to counselling. Provide recreational facilities. 	<ul style="list-style-type: none"> No anti-social behaviour reported as being associated with Development personnel. 	<ul style="list-style-type: none"> Liaise with local authorities to obtain feedback regarding any issues. Monitor personnel behaviour and report via the SIMP process. 	<p>Operation Likelihood – seldom Consequence – incidental Risk – low</p>
Transport of materials, goods and personnel on local roads. Use of heavy vehicles.	Traffic accidents, injury to public, damage to public and private property.	<ul style="list-style-type: none"> Evaluate traffic flow and volume patterns, assessment of capacity of existing roads. Implement journey management for all delivery trucks developed in consultation with local authorities. Monitor oversized loads. Provide public safety, awareness and signage during construction. 	<ul style="list-style-type: none"> No fatalities or significant interruptions associated with project-related traffic. 	<ul style="list-style-type: none"> Audit journey management procedures. Encourage local police to participate in the audits and suggest improvements. Encourage local police to make attend mainland facilities and make speed and vehicle checks. 	<p>Construction Likelihood – occasional Consequence – incidental Risk – low</p>
Conflict between Development and public/commercial marine activities.	Accidents involving private and/or commercial fishing and boating vessels.	<ul style="list-style-type: none"> Adopt exclusion areas for high traffic zones and provision of Development security personnel in marine areas. Provide appropriate information to commercial fishing operators and the public regarding exclusion zones and Development activities. 	<ul style="list-style-type: none"> No conflict incidents resulting in accidents or loss of income. 	<ul style="list-style-type: none"> Review accidents and incidents in Development marine area. Liaise with relevant authorities regarding marine activities. 	<p>Operation Likelihood – unlikely Consequence – serious Risk – medium</p>

14.11 Public Risk Assessment

This section is a review of the level of offsite risk to human life that could result from the Gorgon Development. It is recognised that the assessment is undertaken at an early stage of Development design; therefore a conservative approach has been adopted. The assessment focused on the primary risk of failure/release frequencies associated with a major plant and associated equipment. All onshore plant failure-case frequencies were multiplied by a factor of five (5) to address the contribution of minor plant and equipment to the failure frequencies, and to ensure that a conservative representation of the level of offsite risk was determined.

The current phase of design will further identify and refine potential risks and threats, such as the security of the Development from natural (e.g. cyclone, lightning) and anthropomorphic threats (e.g. terrorism). This work will focus on and specify appropriate plant, equipment, procedures and controls that will be necessary to reduce the risks to the public and the workforce to as low as reasonably practical.

The methodology used in this assessment is outlined in Technical Appendix E3 and follows an approach consistent with the NSW Department of Planning's Hazardous Industry Planning Advisory Paper No.6 (1997) and in Standards Australia (AS/NZS4360-1999). The level of risk to the public is compared to criteria provided by Standards Australia (AS2885.1, 1997) and the Western Australian Environmental Protection Authority's Public Risk Criteria (EPA 2000).

A Quantitative Risk Assessment (QRA) was also undertaken for all major pipelines associated with the Development. The modelling tools used in the QRA ('TNO Effects 4' and 'Riskcurves') are internationally recognised by industry and government authorities, including Western Australia's Department of Industry and Resources. Results showing individual risk contours are compared to the EPA's Public Risk Criteria.

The applicable individual risk criterion, one in a million per year ($1 \times 10^{-6}/y$), is not exceeded by any of the pipeline routes. The residential areas on Barrow Island are deemed to be the proposed construction village (due to personnel potentially being housed in this village during commissioning and facility start-up) and the existing Chevron camp. Neither of these facilities will be affected by individual risk levels greater than one in a million per year due to the pipelines or the gas processing facility (storage vessels).

Physical and procedural controls incorporated into pipeline design, construction and operation will comply or exceed the controls criteria provided by AS 2885.1 (1997). Therefore, further analysis as per AS2885.1 is not warranted.

14.11.1 Pipelines

Two methodologies were used in undertaking the pipelines risk assessment: AS2885.1 and QRA. The AS2885.1 risk assessment was undertaken for:

- feed gas pipeline – both Flacourt Bay and North White's Beach route options
- LNG export pipeline for both the jetty and cryogenic options
- condensate export pipeline
- domestic gas pipeline.

The level of risk to the public for the all of the Gorgon Development facilities was determined to be acceptable given the surrounding land use and the number of physical and procedural controls incorporated into the pipeline's design, construction and operation complying or exceeding the controls criteria as provided by AS2885.1.

Compliance with this Australian Standard requires that risk from each identified threat be as low as reasonably practicable through all stages of design, construction, operation and decommissioning.

The QRA methodology was applied to all hydrocarbon pipelines with individual risk transects for each pipeline provided in Figure 14-7 to Figure 14-11.

Figure 14-7:
Feed Gas Pipeline – Risk Transect

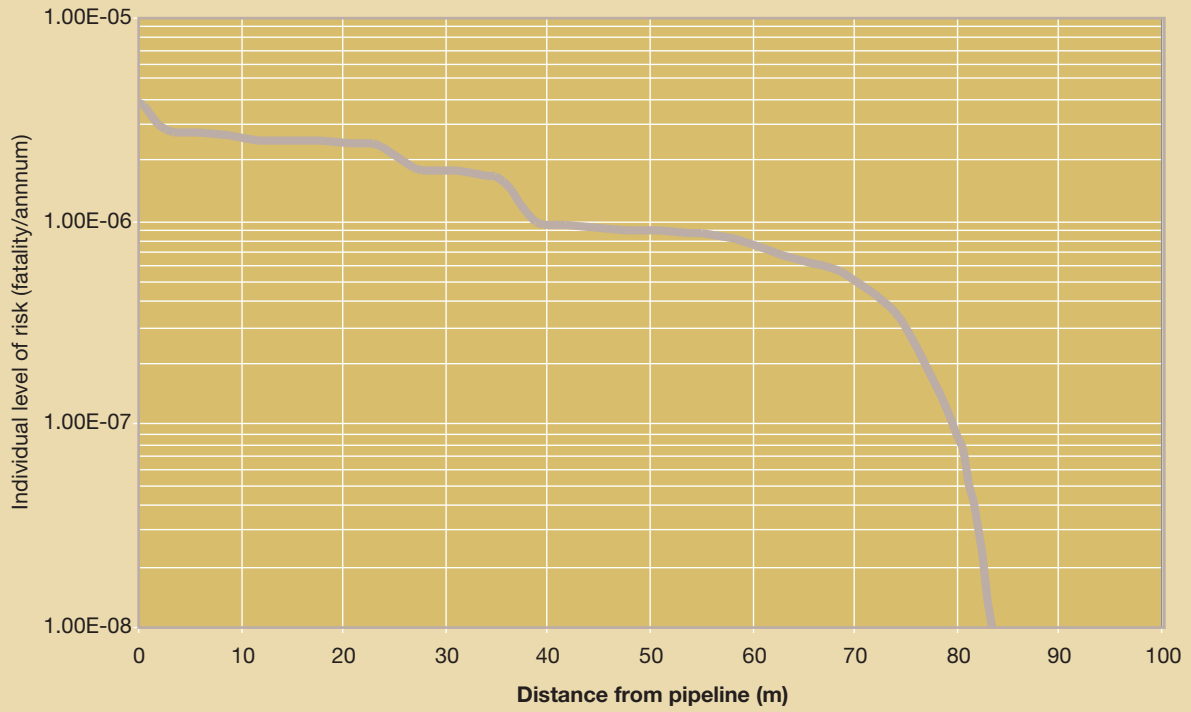


Figure 14-8:
LNG Export Pipeline – Risk Transect

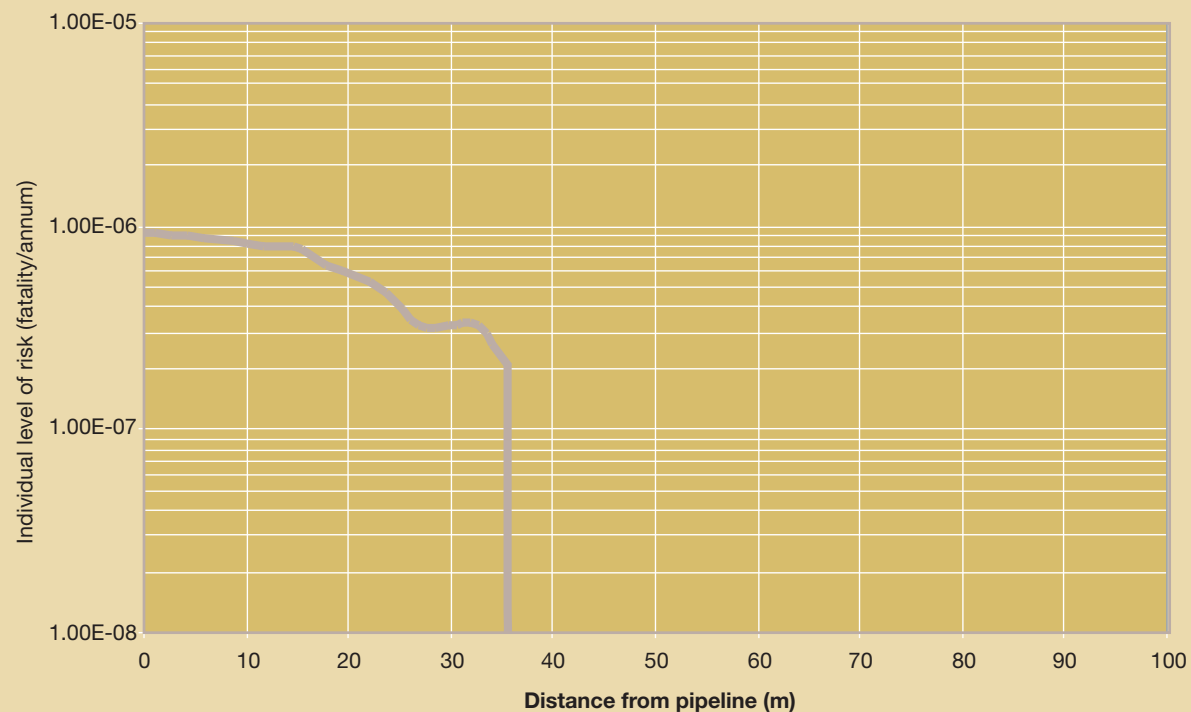


Figure 14-9:
Condensate Pipeline – Risk Transect

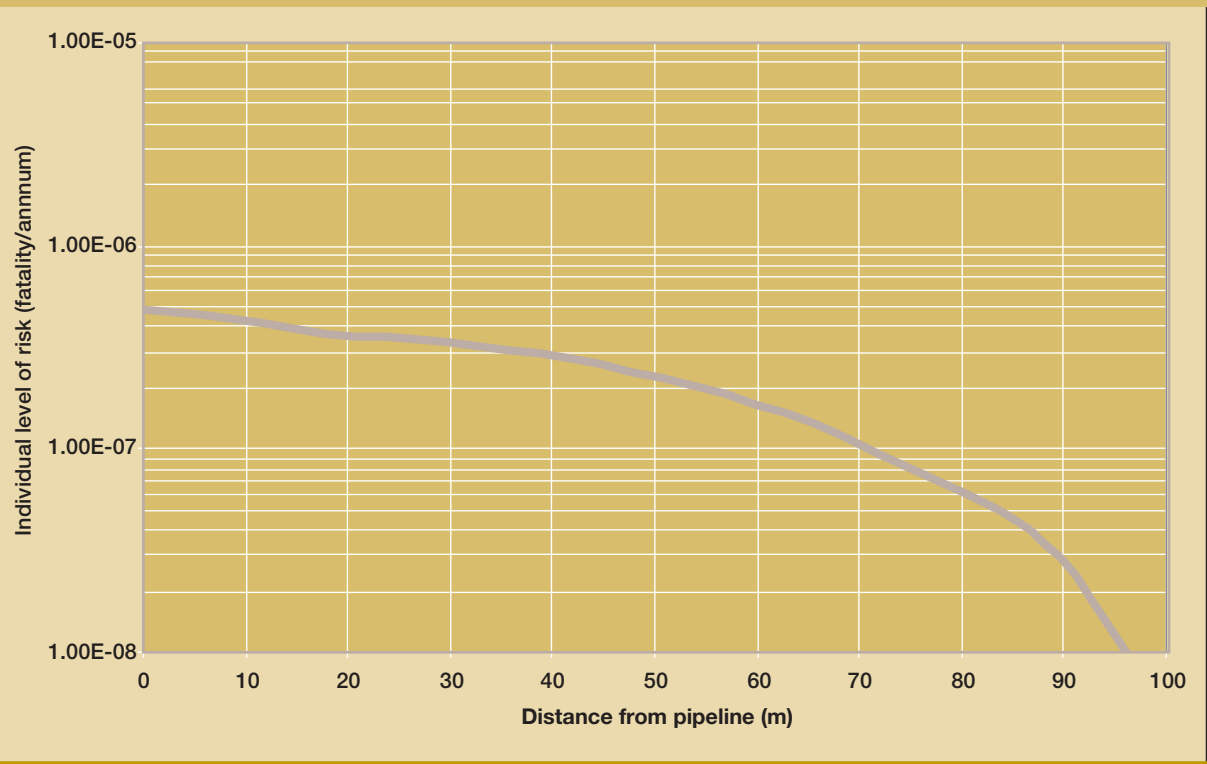
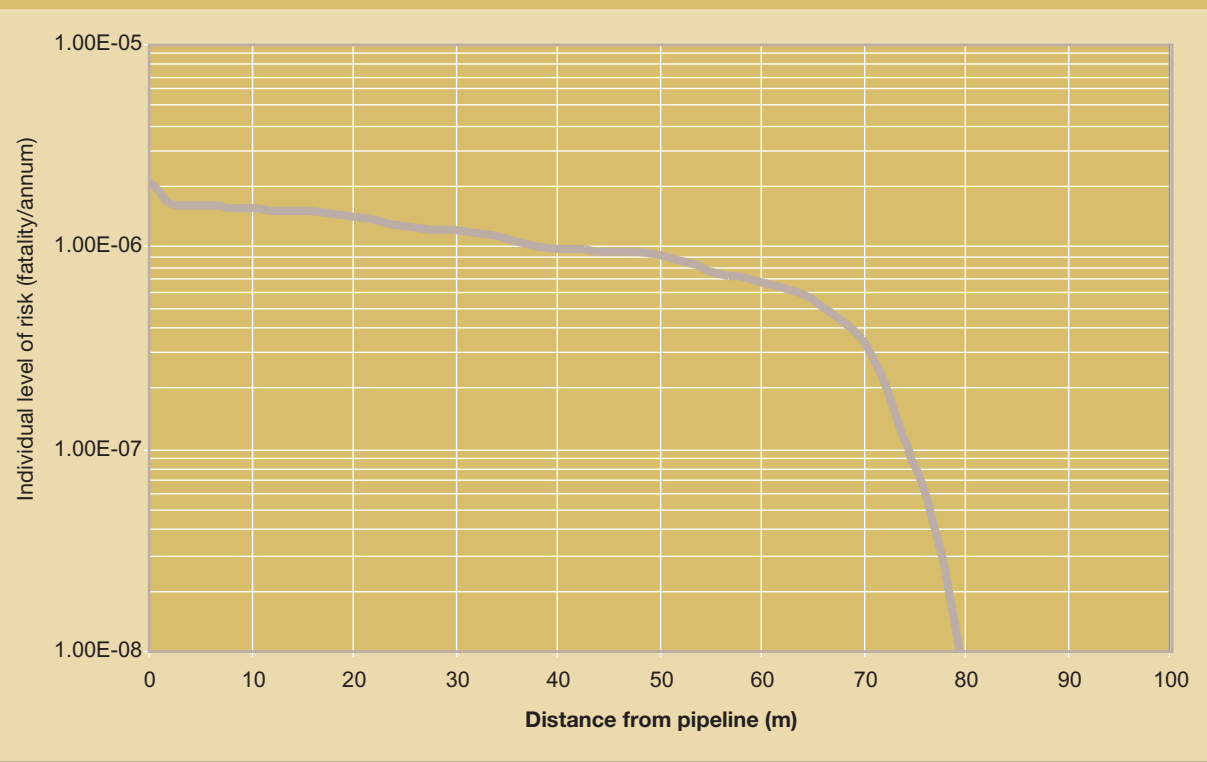


Figure 14-10:
Domestic Gas Pipeline – Risk Transect



The level of individual risk (fatality) is approximately $4 \times 10^{-6}/y$ (per annum) at the centreline for the feed gas pipeline and decreases to $1 \times 10^{-6}/y$ (per annum) over a distance of 40 m either side of the feed gas pipeline route (Figure 14-7). The EPA's individual fatality risk criterion for residential areas is $1 \times 10^{-6}/y$ (per annum). As neither of the feed gas pipeline route options (Flacourt Bay or North White's Beach) pass within 40 m of a residential area (i.e. the construction village or existing Chevron camp), compliance is achieved. These results are indicative for additional feed gas pipelines and both route options (Flacourt Bay and North White's Beach) given that the pipeline's primary content, methane, is modelled as a potential jet fire.

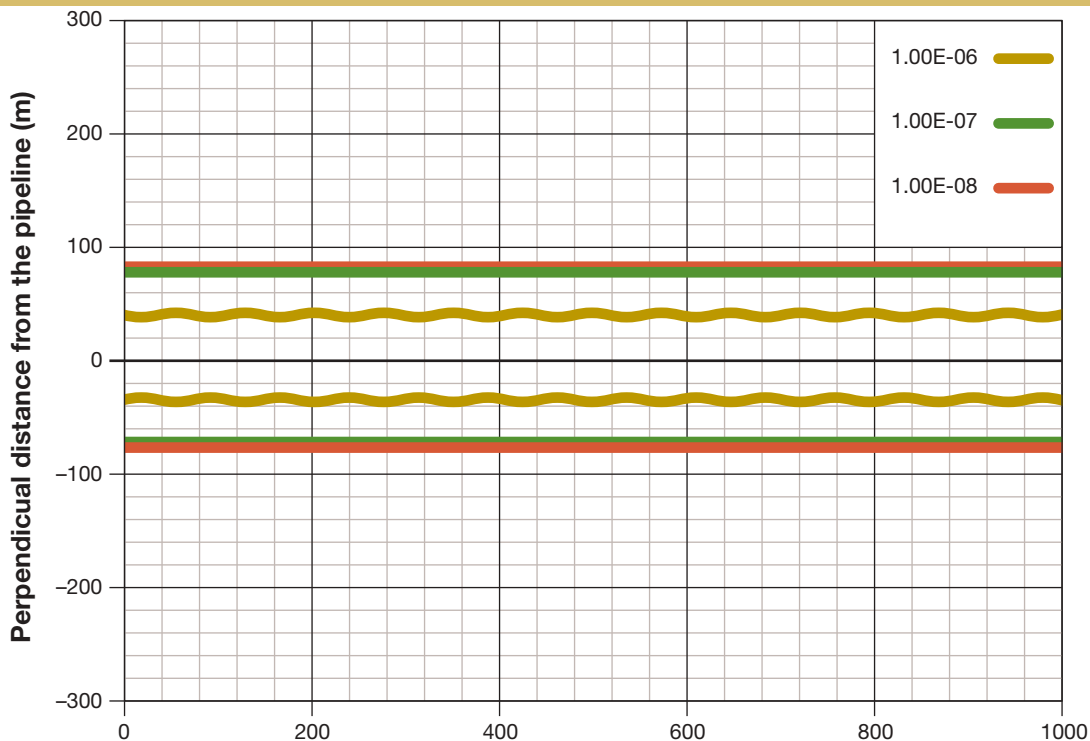
The level of individual risk is approximately $1 \times 10^{-6}/y$ (per annum) at the centreline for the LNG Export route and decreases to $2 \times 10^{-7}/y$ (per annum) over a distance of approximately 40 m either side of the pipeline (Figure 14-8). This level of risk is less than the EPA individual fatality risk criteria and therefore compliance is achieved. These results reflect modelling as methane for jet fires for the jetty option.

The level of individual risk is approximately $4 \times 10^{-7}/y$ (per annum) at the centreline for the Condensate Export Pipeline and decreases to $1 \times 10^{-8}/y$ (per annum) over a distance of approximately 100 m either side of the pipeline (Figure 14-9). This level of risk is less than the EPA individual fatality risk criteria and therefore compliance is achieved. These results are indicative that the material modelled is condensate as pool fires.

The level of individual risk is approximately $2 \times 10^{-6}/y$ (per annum) at the centreline for the domestic gas pipeline and decreases to $1 \times 10^{-6}/y$ (per annum) over a distance of approximately 40 m either side of the pipeline (Figure 14-10). The EPA's individual fatality risk criterion for residential areas is $1 \times 10^{-6}/y$ (per annum). As both route options for the domestic gas pipeline (dedicated line to the mainland and to tie-in to Apache Energy system) do not pass within 40 m of a residential area (i.e. the construction village, the existing Chevron camp or any residential structure on the mainland), compliance is achieved. These results are indicative given that the material modelled is methane as jet fires.

Figure 14-11 is an illustration of the iso-risk contours for a typical 1 km section of the domestic gas pipeline. The black line in the centre of the graph represents the centreline of the pipeline. The yellow line represents the EPA individual fatality risk criteria of $1 \times 10^{-6}/y$ (per annum) and is attained at a distance of

Figure 14-11:
Domestic Gas Pipeline – Iso-Risk Contours



approximately 40 m either side of the pipeline. The orange line, at a distance of approximately 80 m either side of the pipeline is at the iso-risk level of $1 \times 10^{-8}/y$ (per annum) and has been included to provide the reader with an understanding how quickly the risk is reduced with increased distance from the pipeline.

The applicable risk criteria, $1 \times 10^{-6}/y$ (per annum) as published by the EPA (1994), is the level of individual risk for a residential area. This risk level is not exceeded by any of the pipeline routes. The applicable residential areas on Barrow Island are deemed to be the Gorgon Development construction village (due to personnel being housed in this camp during commissioning and plant start-up) and the existing Chevron camp. Both of these 'residential' areas are well outside of the $1 \times 10^{-6}/y$ (per annum) individual risk contours for all of the pipelines.

14.11.2 Gas Processing Facility

The results of the risk assessment for the gas processing facility are provided in Addendum E of Technical Appendix E3. The fatality risk contour of $1 \times 10^{-6}/y$ (per annum) extends approximately 150 m outside the gas processing facility's southern boundary (or approximately 400 m from the centre of the propane storage vessel) (Figure 14-12). This iso-contour does not encroach on any residential area, including the area proposed for the construction village (the contour being approximately 250 m from the construction village boundary, or about 750 m from the propane storage vessel). The major risk contributors were identified as propane and ethane storage vessels (BLEVEs) and jet fires from process equipment. Therefore, compliance with the EPA Criteria for residential areas will be achieved.

Figure 14-12:
Iso-Risk Contour Map – Gorgon Gas Processing Facility



14.12 Conclusions

Both positive benefits and negative social risks will be created by the Gorgon Development. The Development will generally benefit the livelihoods and lifestyles for the Pilbara community in terms of employment and local business opportunities. The level of benefits will be more clearly defined and quantified during later Development phases. At the current level of planning, the positive consequences will be enhanced through appropriate management measures, including the Joint Venturers’:

- commitment to provide full, fair and reasonable opportunity for Australian industry to supply goods and services to the Development through the Australian Industry Participation Policy
- initiatives for local procurement/content, employment and training which will be outlined in the SIMP in consultation with major construction contractors and stakeholder groups
- continued consultation/liaison with local government and others through community groups in the region.

There is a strong linkage between the social and economic benefits of the proposed Development. It has been identified that the most significant benefits will be economic with the details addressed in Chapter 15. In particular, the substantial input into the Australian economy through increased taxation revenues, direct spending, opportunity for local government rating, increased security of supply and availability of natural gas, employment and training initiatives, incremental improvement in the capacity of the economy and the labour force to absorb major oil and gas projects and opportunities for increased participation by indigenous people will be the major Development benefits.

The major adverse social risks identified for the Development may apply to:

- cultural heritage (low to potentially high risk depending on the Development phase)
- Native Title (high – but only for the domestic pipeline option to the mainland and a segment of optical fibre communication cable)
- workforce and family through implementation of FIFO regime (high).

Medium social risks apply to:

- visual amenity
- general health and safety of the workforce on Barrow Island.

Low social risks are associated with:

- population change and the demand for social infrastructure
- changes to land tenure
- changes to sea use
- transportation associated with the location of a potential supply base in the Dampier/King Bay area
- public risk.

The result of the pipeline and gas processing facility risk modelling predicts that the level of individual risk to public health in areas potentially classified as residential (construction village) will be below the one in a million per year ($1 \times 10^{-6}/y$) EPA risk criteria. As this construction village may be used in the future to house personnel working on facility additions or maintenance, it is deemed to be a residential area for planning purposes. For pipelines, residential development would need to be within 40 m of the operating pipeline to be at risk. Planned alignment of all pipelines is well outside of the 40 m zone. For the gas processing facility, the residential development would need to be within 400 m of the major refrigerant storage vessels (propane and ethane storage). Currently the nearest residential area, the construction village, is located approximately 750 m from these vessels.