Kimberley LNG Precinct

Review of potential sites for a proposed multi-user liquefied natural gas processing precinct in the Kimberley region

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Advice of the Environmental Protection Authority to the Minister for Planning (as the Minister for Environment's delegate) under Section 16(e) of the *Environmental Protection Act 1986*

Environmental Protection Authority
Perth, Western Australia
Report 1306
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Section 16(e) Advice Timelines

Date	Progress stages
7/5/08	**Request to provide Section 16(e) Advice**
11/11/08	**Close of public comment period on Northern Development Taskforce reports**
25/11/08	**Response to public submissions received**
19/12/08	**EPA section 16(e) advice released**

Report Released: 19/12/08
There is no appeal period on s16(e) advice.

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Executive Summary

The purpose of this report is to provide the Environmental Protection Authority's (EPA's) early environmental advice in relation to the Western Australian Government's site evaluation process for a multi-user liquefied natural gas (LNG) processing precinct (hereafter referred to as the LNG precinct) to process gas resources from the Browse Basin. This advice has been requested by Government and is provided in accordance with Section 16(e) of the *Environmental Protection Act 1986* (the EP Act).

The Kimberley region of Western Australia (WA) is largely undeveloped and is recognised as having significant environmental, wildness and heritage values. Much of it is considered to be iconic. In particular, the northern coastal areas of the Kimberley are amongst the least disturbed marine and terrestrial habitats in Australia with intact coastal processes and biota. The tropical marine waters of the Kimberley provide habitat for threatened species such as dugong, turtles and Humpback whales. There is an increasing desire for people, not only from WA, but nationally and internationally, to visit this area and enjoy a unique coastal landscape that is dominated by deep embayments and island archipelagos, areas of ancient cultural significance, outstanding environmental values and one of the largest tidal ranges in the world.

The Kimberley also has significant economic potential in relation to the extraction and processing of LNG from the Browse, Bonaparte and Canning Basins. The Browse and Bonaparte Basins, which host world class gas and condensate discoveries, are located in Commonwealth waters off the Kimberley coast. There are a number of petroleum companies planning development projects, with the possibility of several LNG plants required to process the gas.

In recognition of the potential development pressures on the Kimberley region's exceptional natural and Indigenous heritage values, the Western Australian and Commonwealth Governments commenced a coordinated review of areas in the Kimberley to find the most suitable location for a multi-user LNG precinct for the development of Browse Basin gas.

Site Selection

The EPA has been requested to provide advice on the government's (through the Northern Development Taskforce (NDT)) site evaluation process and the four sites short-listed for a liquefied natural gas processing precinct in the Kimberley. The EPA clearly understands that selection of a site capable of producing 50-70 mtpa of LNG in the Kimberley is a significant, strategic decision that will influence development and the environment there for decades into the future. The EPA notes from a geotechnical siting study recently completed on behalf of the NDT (hereafter referred to as the Worley Parsons' report) that "a total site area of approximately 1000ha is required to accommodate up to two LNG operators" (Worley Parsons, 2008) and has based its advice on a precinct of this size.

Once established, however, the site is likely to attract further large proposals in the future. In providing its advice, the EPA has therefore considered not only the specific

attributes of the short-listed sites, but also the wider implications of selecting a site. It has considered the context of the site and the expandability of the site, beyond the 1000 ha needed for two LNG processing facilities now. The EPA particularly notes Section 3 of the Worley Parsons' report, which indicates that a site of 2000+ ha would be more desirable. Public submissions have also noted that 1000 ha under-estimates the land area needed for 50-70 mtpa of LNG production. It is important that in deciding on a precinct location, government give careful consideration to the sites' capacity to accommodate future expansion without significantly compromising the environment. Any additional developments requiring an increase in the overall footprint of an approved precinct would be subject to further comprehensive environmental assessment at the time, particularly in terms of cumulative impacts.

The EPA is mindful of Worley Parsons' advice that North Head and Gourdon Bay are constrained in terms of space for jetties to link the site to shipping channels in deep water. Given the objective of providing a site to process gas from across the Browse Basin (50-70mtpa of LNG), the EPA considers that it would be unwise to select a site without considering its potential for future expansion. The environmental effect of choosing a constrained site may well be to put unacceptable pressure on the surrounding environment.

For example, at North Head future jetties may have to be located to the north of Tapper's Inlet to access deep water. This would split the precinct in two, diminishing the benefits of a single, consolidated precinct and increasing the environmental footprint. A split site is likely to create larger environmental management overheads and decrease efficiency. Environmental impacts would be greater and their management more costly and more difficult.

Taking these matters and environmental values and constraints into account the EPA has reached the following conclusions about the four short-listed sites, based on currently available information.

Gourdon Bay

Based on the data available, environmental risks and impacts are likely to be manageable for a 1000ha precinct at Gourdon Bay. Management of potential impacts on the migratory bird flyway between Ramsar wetlands at Roebuck Bay and 80 Mile Beach would nevertheless require particular attention. Future expansion may be limited by the frontage available with direct access to deep water if the precinct is laid out with jetties south of Cape Latouche Treville.

Based on the available data, the EPA considers that Gourdon Bay is the least environmentally constrained of all four short-listed sites for a gas processing precinct.

James Price Point

The environmental impacts and risks of locating a precinct in the James Price Point area are likely to be manageable. The risk of future expansion being significantly constrained is likely to be low.

Based on the available data, the EPA considers that the James Price Point area is the least environmentally constrained of the two short-listed sites on the Dampier Peninsula for a gas processing precinct.

North Head

Environmental risks at North Head are unlikely to be readily or reliably manageable. Depending on the outcome of air quality modelling and risk assessment, some of the 12-14 Indigenous settlements between 150 metres and 10km from the site may have to be closed down to ensure that societal risk and ambient air quality standards could be met. The Humpback whale calving and resting ground immediately offshore is a significant environmental constraint. Impacts on this important area are unlikely to be easily or cost-effectively manageable and should be avoided. A precinct in this area is likely to be severely constrained by restrictions on its operational flexibility and require onerous and expensive management controls.

The EPA has concluded that North Head is not suitable for large scale industrial development from an environmental point of view.

Anjo Peninsula

There is a high risk that a precinct at Anjo Peninsula would impact significantly on the remoteness and wildness values of this area. Terrestrial bio-physical values at the precinct and along any necessary road transport route are also likely to be compromised and expensive to manage effectively. If terrestrial transport routes were established, the risk to the region's environmental and wildness values would be increased substantially.

The EPA has concluded that Anjo Peninsula is not suitable for large scale industrial development for both environmental and wildness values reasons.

While the submissions on the matter of alternative sites outside the Kimberley are noted, the EPA's strategic advice at this point is focused on the NDT's site-selection process and manner in which it has identified the short-listed sites in the Kimberley.

National heritage values

The EPA views the current initiative to progress:

- planning for the identification and assessment of an LNG precinct site;
- assessment of national heritage values in the north-west Kimberley; and
- development of an initiative for joint management for biodiversity and Indigenous cultural heritage protection across conservation and Indigenous controlled lands in the region,

as representing a significant and welcome approach to development and conservation in the Kimberley. These three initiatives should continue to be progressed in parallel as they are fundamental to achieving ecologically sustainable development and effective management of conservation and cultural values in the Kimberley. If implemented in a timely manner, the EPA considers that the outcome of the strategic assessment would produce long lasting benefits to the conservation and management of the Kimberley environment and the Indigenous communities of the region.

Future assessment process

The EPA notes that its conclusions and advice in this report are provided under section 16(e) of the EP Act. The sites examined in this report have not yet been subject to formal environmental assessment. An appropriate form of formal assessment is required for whichever site is chosen as the proposed LNG processing precinct. A formal environmental assessment of a strategic proposal will be undertaken under the EP Act to fulfil this requirement. Future proposals which are brought forward and which fit within the assessed strategic proposal, known as derived proposals, will not generally be subject to further assessment by the EPA. This is the desired objective of such a strategic assessment.

Summary of EPA conclusions and advice

The EPA submits the following conclusions and advice:

1. The EPA strongly supports the concept of undertaking a strategic review of potential LNG processing sites in the Kimberley.

2. The EPA strongly supports focusing development at a single site so that environmental impacts can be contained and operational efficiencies maximised in ways that will minimise environmental impacts.

3. The EPA considers that the NDT site evaluation review was a rigorous, inclusive and public process that resulted in the clear identification of high level environmental risks and values based on the data, resources and time available. The outputs from the NDT's review have enabled the EPA to consider the short-listed sites and provide early guidance on the environmental impacts that would require attention during the next stage of the strategic assessment.

4. The EPA provides the following advice about the four short-listed sites for a gas processing precinct in the Kimberley.

    1. **Based on the available data, the EPA considers that Gourdon Bay is the least environmentally constrained of all four short-listed sites for a gas processing precinct.**
    2. **Based on the available data, the EPA considers that the James Price Point area is the least environmentally constrained of the two short-listed sites on the Dampier Peninsula for a gas processing precinct.**
    3. **The EPA has concluded that North Head is not suitable for large scale industrial development from an environmental point of view.**
    4. **The EPA has concluded that Anjo Peninsula is not suitable for large scale industrial development for both environmental and wildness values reasons.**

5. Once government has selected a preferred site, the EPA will undertake a formal, site specific environmental assessment of a strategic proposal under the *Environmental Protection Act 1986* in a timely manner. An outcome of the

strategic assessment would be to recommend conditions that should be applied to specific future LNG proposals. When a future LNG proposal is brought forward, the EPA can declare it is a 'derived proposal' if:

- the proposal was identified in the strategic proposal;
- a decision has been made that the strategic proposal could be implemented;
- the environmental issues raised have been adequately addressed;
- new information does not justify reassessment; and
- no significant change has occurred in the environmental factors relevant to the proposal.

Derived proposals do not require further environmental assessment by the EPA.

6. While the submissions on the matter of alternative sites outside the Kimberley are noted, the EPA's strategic advice at this point is focused on the NDT's site-selection process and manner in which it has identified the short-listed sites in the Kimberley.

7. The EPA also strongly supports evaluation of the national heritage values of the Kimberley with a view to conserving and protecting significant, representative marine and terrestrial areas and determining opportunities for joint management between Government and traditional owners. It is important that this is done in parallel with the LNG precinct assessment process.

8. The EPA has identified a number of important issues that have been raised through the site evaluation process and the public submissions period which the EPA cannot address effectively. Important issues in relation to the downstream planning and infrastructure needs of the precinct, pressures on the coastal environment from an influx of people and socio-economic impacts will require attention by other arms of government. These issues are described in Section 4.3 of this report.

Contents

1. Introduction and background

The purpose of this report is to provide the Environmental Protection Authority's (EPA's) early environmental advice in relation to the Western Australian Government's plans for a multi-user Liquefied Natural Gas (LNG) processing precinct (hereafter referred to as the LNG precinct) to process gas resources from the Browse Basin. More specifically, the EPA's advice is focused on the Government's site evaluation process for the identification of an LNG precinct in the Kimberley and has been requested as a contribution to the Government's determination on a preferred site. This advice is provided in accordance with Section 16(e) of the *Environmental Protection Act 1986* and as such does not constitute a formal environmental assessment of the environmental acceptability of a proposal.

The Kimberley region of Western Australia (WA) is largely undeveloped and is recognised as having significant environmental, wildness and heritage values. Much of it is considered to be iconic. In particular, the northern coastal and inland areas of the Kimberley are amongst the least disturbed marine and terrestrial habitats in Australia with intact coastal processes and biota. The tropical marine waters of the Kimberley provides habitat for threatened species such as dugong, turtles and Humpback whales. There is an increasing desire for people, not only from WA, but nationally and internationally, to visit this area and enjoy its unique coastal landscape that is dominated by deep embayments and island archipelagos, areas of ancient cultural significance, outstanding environmental values and one of the largest tidal ranges in the world.

The Kimberley also has significant economic potential in relation to the extraction and processing of LNG from the Browse, Bonaparte and Canning Basins. The Browse and Bonaparte Basins, which host world class gas and condensate discoveries, are located in Commonwealth waters off the Kimberley coast. There are a number of petroleum companies planning development projects, with the possibility of several LNG plants required to process the gas.

In recognition of the potential development pressures on the Kimberley region's exceptional natural and Indigenous heritage values, the Western Australian and Commonwealth Governments commenced a coordinated review of areas in the Kimberley to find the most suitable location for a multi-user LNG precinct for the development of Browse Basin gas.

The process of identifying and planning for an LNG precinct is subject to a joint strategic assessment under both the WA *Environmental Protection Act 1986* (EP Act) and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act). Figure 1 shows the broad area being considered for the assessment of a potential LNG precinct site. Further information in relation to the strategic assessment process is set out below and in Section 2 of this report.

Identification of the heritage values of the region in preparation for potential national heritage nomination will also be a joint process by Commonwealth and Western Australian Government agencies.

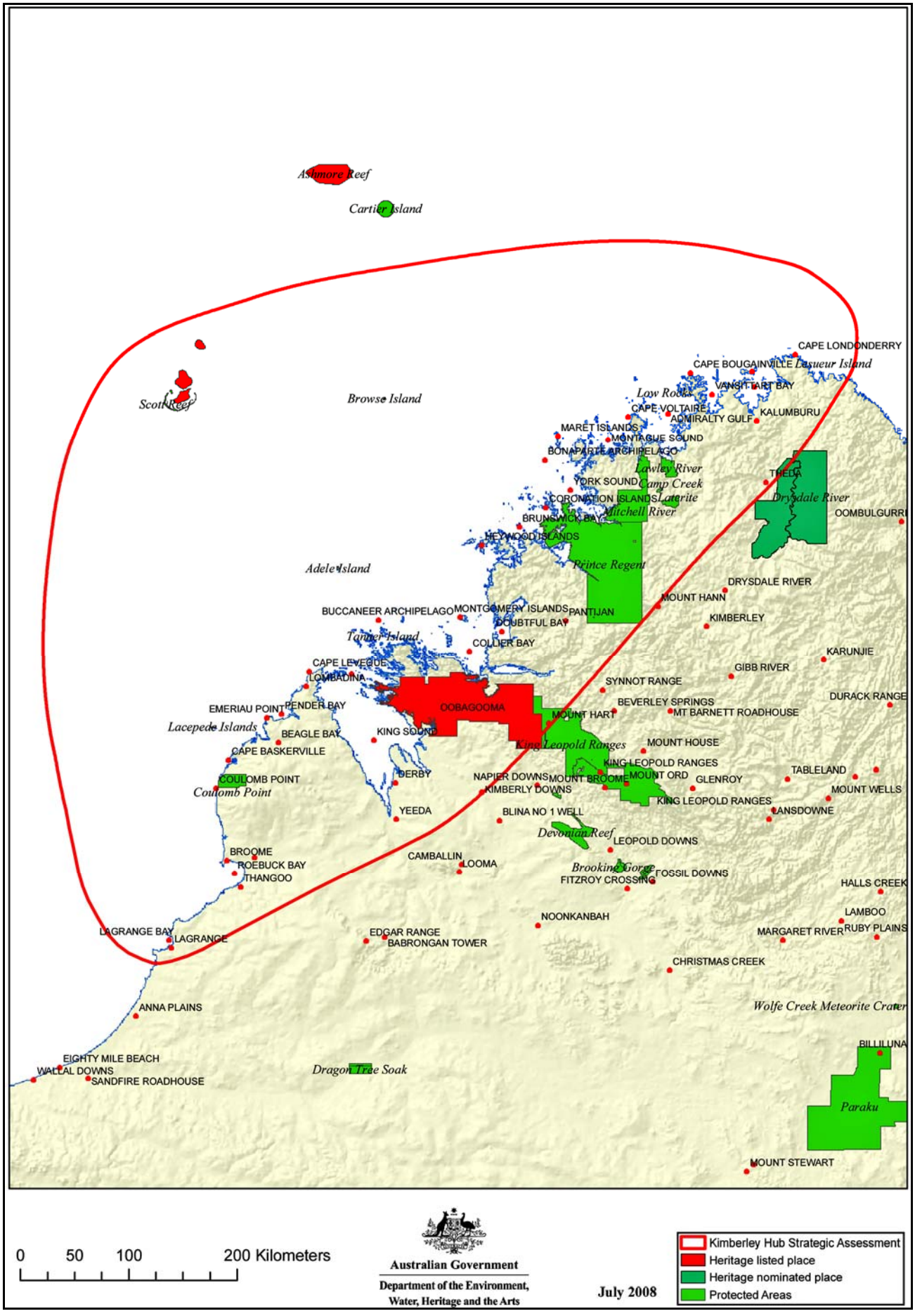

Figure 1: Area being considered for potential LNG precinct site

1.1 The planned LNG precinct

The planned development of an LNG precinct is taken to mean an area of land suitable for the development of gas processing infrastructure, gas storage, port facilities and associated activities. The intended effect of an LNG precinct would be to provide for individual proposals for processing gas resources from the Browse Basin to be co-located on a single site, rather than having multiple gas developments being proposed along the Kimberley coast with consequent cumulative environmental impacts. The precinct will be designed to be capable of processing all Browse Basin gas sent onshore in the Kimberley for processing. Subject to further definition this may be in the order of 50 to 70 million tonnes of LNG a year (Worley Parsons, 2008).

It is currently estimated that the precinct will require a land area of approximately 1000 ha (Worley Parsons, 2008), plus additional land for associated port and ancillary facilities. The final 'footprint' of the proposal will be refined following specialist engineering and environmental studies and a final determination of a precinct model, scope of downstream gas processing to be catered for, and the services to be provided to the precinct, such as potential airport and accommodation facilities.

Once established the site is likely to attract further large proposals in the future. In providing its advice, the EPA has therefore considered not only the specific attributes of the short-listed sites, but also the wider implications of selecting a site. It has considered the context and the expandability of the site, beyond the 1000 ha needed for two LNG processing facilities now. This issue is discussed further in Section 3.4 of this report.

Further information on the planned LNG processing precinct has been outlined in Sections 3 and 6 of the Northern Development Taskforce Interim Report (NDT, 2008a) and Section 4 of Part A of the Site Evaluation Report (NDT, 2008b). The NDT has undertaken site selection studies on behalf of the Western Australian Government.

1.2 Joint strategic assessment process

The Western Australian Government has commenced a process to obtain environmental, planning and other approvals for an LNG precinct and associated infrastructure. In view of the scale and complexity of the project and issues arising from the development of an on-shore LNG precinct, the government is proceeding through a two-stage environmental assessment process. The first stage involves the EPA providing early advice on any environmental sensitivities associated with a short-list of sites. The second stage is the statutory environmental assessment of a defined proposal to examine the environmental detail of precinct construction and ongoing management issues and to evaluate whether the proposal is capable of being managed in an environmentally acceptable manner. The two stage process is further discussed below. The EPA will provide independent environmental advice to government at the conclusions of both steps.

First stage

The first stage involves the EPA providing advice (this report) under section 16(e) of the WA EP Act before the WA Government determines a preferred location (or locations) for a Kimberley LNG precinct. The EPA has focused its advice on the site-selection process and the environmental opportunities and constraints associated with the four sites in the Kimberley region that were identified by that process (Section 3).

This advice is provided to assist the government in making a determination on a preferred site.

In addition to providing advice on the short-listed sites, the EPA has also identified the need to provide early environmental advice on other matters which require consideration by the proponent of the precinct and the attention of other government agencies during the next statutory assessment process. This is provided in Section 4 of the report under *EPA advice on other matters*.

Once advice is received from the EPA, the Commonwealth Department of Environment, Water, Heritage and the Arts (DEWHA) and the NDT, it is understood the WA Government will determine a preferred location and then proceed to the next stage of assessment for obtaining statutory environmental and planning approvals on a well defined strategic proposal.

Second stage
Formal environmental assessment is expected to be undertaken under section 38 of the EP Act. The process under the EP Act has been triggered by the Minister for State Development (the proponent) who referred a strategic proposal for an LNG precinct in the Kimberley Region to the EPA on the 1 April 2008. At the request of the proponent, the EPA agreed to undertake a Strategic Environmental Assessment (SEA) of the proposal and this was advertised on the 14 April 2008.

Formal SEA will involve a detailed review of the plan for the precinct and its associated activities. The objectives of the State process will be to identify the key environmental factors and assess the environmental impacts at the chosen site and its capacity to accommodate future proposals (i.e. LNG processing plants) with defined environmental rules and conditions. It is expected that as the second stage involves a strategic environmental assessment it will allow subsequent future proposals to be considered as derived proposals under the provisions of the EP Act. The desired objective of such a strategic assessment is that future derived proposals will not generally be subject to further assessment by the EPA. This stage will follow the statutory process for the assessment of a 'Strategic Proposal' under the EP Act, and will run concurrently with the Strategic Assessment under the EPBC Act.

The Strategic Assessment under the EPBC Act will address matters of National Environmental Significance (NES) and the items specified in the Commonwealth Terms of Reference, agreed between the State and Commonwealth Governments. To avoid duplication it is expected that the proponent of the precinct would prepare SEA review documentation and plans which meet the requirements of both the EP Act and the EPBC Act.

The strategic assessment provisions of both the EP Act and the EPBC Act are designed to deliver early certainty to developers and achieve greater regional scale environmental protection outcomes *vis-à-vis* assessment of individual development proposals.

The Strategic Assessment process along with the final Terms of Reference are described in the *Strategic Assessment Agreement Relating to the Assessment of Actions under the Plan for the Browse Basin Common-User Liquefied Natural Gas Hub and associated activities* (the Strategic Assessment Agreement), which can be

found at www.doir.wa.gov.au/ndt and www.environment.gov.au. According to the indicative timelines agreed between the State and Commonwealth (Appendix 5 of the NDT Interim Report), the full strategic assessment process is intended to culminate in a Strategic Assessment decision for the LNG precinct by both Governments in 2010.

1.3 Assessment of national heritage values

The Strategic Assessment Agreement mentioned above also commits the WA and Australian Governments to commence a formal assessment of the national heritage (and potentially international heritage) values of the Kimberley region as part of a strategic assessment of broader land use developments in the region (see Clause 4.7 of the Agreement).

The EPA has set out its advice on this aspect of the Strategic Assessment Agreement in Section 4.1 of this report under *EPA advice on other matters.*

Further information on the Government's framework for planning and identifying a LNG precinct is summarised in Section 2 of this report.

2. Process for identifying and planning a gas processing precinct

2.1 Government framework

The Kimberley Region is currently experiencing a rapid increase in exploration for oil and gas in the Browse Basin. Gas volumes discovered in the Browse Basin are considered to be of international significance and are expected to be a source of energy for major cities in China, Japan, Taiwan and Western Australia. Several companies are developing plans to exploit gas and condensate reserves in the Browse Basin. These potential proposals highlight the opportunity for a strategic review to provide for efficient extraction of resources while maximising benefits and reducing impacts of proposed LNG developments in the region.

The State Government has committed to develop a process which will accommodate sustainable development in the Kimberley. In doing so it has adopted a strategic approach to the development of gas resources in the Browse Basin.

Role of the NDT

In June 2007, the then Western Australia Government established the NDT to provide a framework for development in the West Kimberley which provides a balance between economic development, environmental, heritage and tourism values. One of the key tasks was to work through a structured consultative process to identify a suitable location (or locations) in the Kimberley capable of servicing the development requirements of multiple companies with Browse Basin gas resources (Figure 1).

At the time the NDT was established the proposal under consideration was referred to as an LNG hub to accommodate a number of users. The new Western Australian Government, elected on 6 September 2008, confirmed that the NDT process would continue. The proposal under consideration was, however, reformulated as a multi-user LNG processing precinct rather than a hub with a single operator.

The NDT is comprised of senior staff from the Department of Industry and Resources (DOIR) (Chair), Department of Environment and Conservation (DEC), Department of Indigenous Affairs (DIA), Department for Planning and Infrastructure (DPI), the Office of Development Approvals Coordination, Department of Fisheries, LandCorp and Kimberley Development Commission. The terms of reference or purpose of the NDT are as follows:

- Managing across-government planning processes and stakeholder consultation in relation to the selection and development of a suitable location/s for the processing of Browse Basin gas reserves;
- Setting the framework for how the State will protect and manage the important Indigenous heritage, environment and tourism values of the Kimberley area, whilst facilitating structured industrial development;
- Ensuring the Traditional Owners play a significant role in balancing the economic development, wilderness, environment, tourism and heritage values; and
- Ensuring the planning process will be finalised in a timely manner to prevent *ad-hoc* development in the Kimberley.

Further information on the functions of the NDT is available on www.doir.wa.gov.au/ndt.

2.2 The site evaluation process

A summary of the NDT site evaluation process leading to the identification of a preferred site is set out below. Further information on the details of the evaluation process can be obtained at www.doir.wa.gov.au/ndt.

Initial site evaluation

The initial site evaluation (NDT, 2008a) was a screening process of more than 40 Kimberley coastal sites many of which were originally identified by industry. The evaluation was largely based on technical feasibility and examined issues such as marine bathymetry and currents, land area, slope and proximity to gas fields with the aid of geographic information system (GIS) based tools. A number of sites which had environmental or socio-economic constraints but were considered to be technically viable were rejected at this stage (NDT, 2008a).

This analysis identified nine sites for further study. A further two sites (at Anjo Peninsula and Cape Voltaire) were subsequently added at the request of Traditional Owners to form a list of 11 sites that was examined in more detail.

NDT site-selection criteria

As part of the evaluation process, the NDT developed a site-selection methodology and jointly with DEWHA identified site-selection criteria derived from best practice models which have been used previously by industry and government. The site-selection criteria are related to environmental, socio-economic, Indigenous, community and tourism interests and were subsequently incorporated into a multi-criteria matrix. The matrix is intended to provide a means of qualitatively comparing the impacts of a potential LNG precinct at the 11 sites identified in the interim NDT

report (NDT, 2008a). The site-selection criteria were released for four weeks public comment (together with the Commonwealth draft Terms of Reference) and modified accordingly.

NDT working groups

Environmental experts and other interest holders were convened into working groups, who provided input to populate the matrices against the finalised site-selection criteria, to assist in the evaluation of the 11 sites. The NDT working groups included marine and terrestrial environmental experts, general environmental interests (including NGOs), and interests associated with tourism, fisheries, the community, industry and Traditional Owners.

Site evaluation and constraints analysis

A site evaluation and constraints analysis was undertaken with significant stakeholder consultation and involvement. The outcome of the site evaluation of the 11 sites against environmental, socio-economic, industry and Indigenous interests was a series of site evaluation matrices with criteria rankings from 'major advantage' to 'significant disadvantage'. The completed matrices were used to identify a short-list of sites ie, Anjo Peninsula, North Head, James Price Point and Gourdon Bay. These four sites were also identified by the KLC as locations the Traditional Owners were willing to consider further for potential LNG development. From the 11 sites identified through the technical feasibility analysis, 4 were selected for further consideration. The results of this assessment are outlined in the NDT Site Evaluation Report, Parts A and B (NDT, 2008b & c). These sites are shown in Figure 2. The completed site evaluation matrices can be found at www.doir.wa.gov.au/ndt.

Determination of preferred site

Sites which are short-listed are currently undergoing further technical investigations in relation to geotechnical properties, concept design and aboriginal heritage. There has also been further input by way of the public comment received on the NDT site evaluation reports and further engagement with the KLC and the Traditional Owners.

It is understood that following the receipt of the EPA's report, advice from the DEWHA, and consultation with key stakeholders, the WA Government will make a decision on a preferred LNG precinct site.

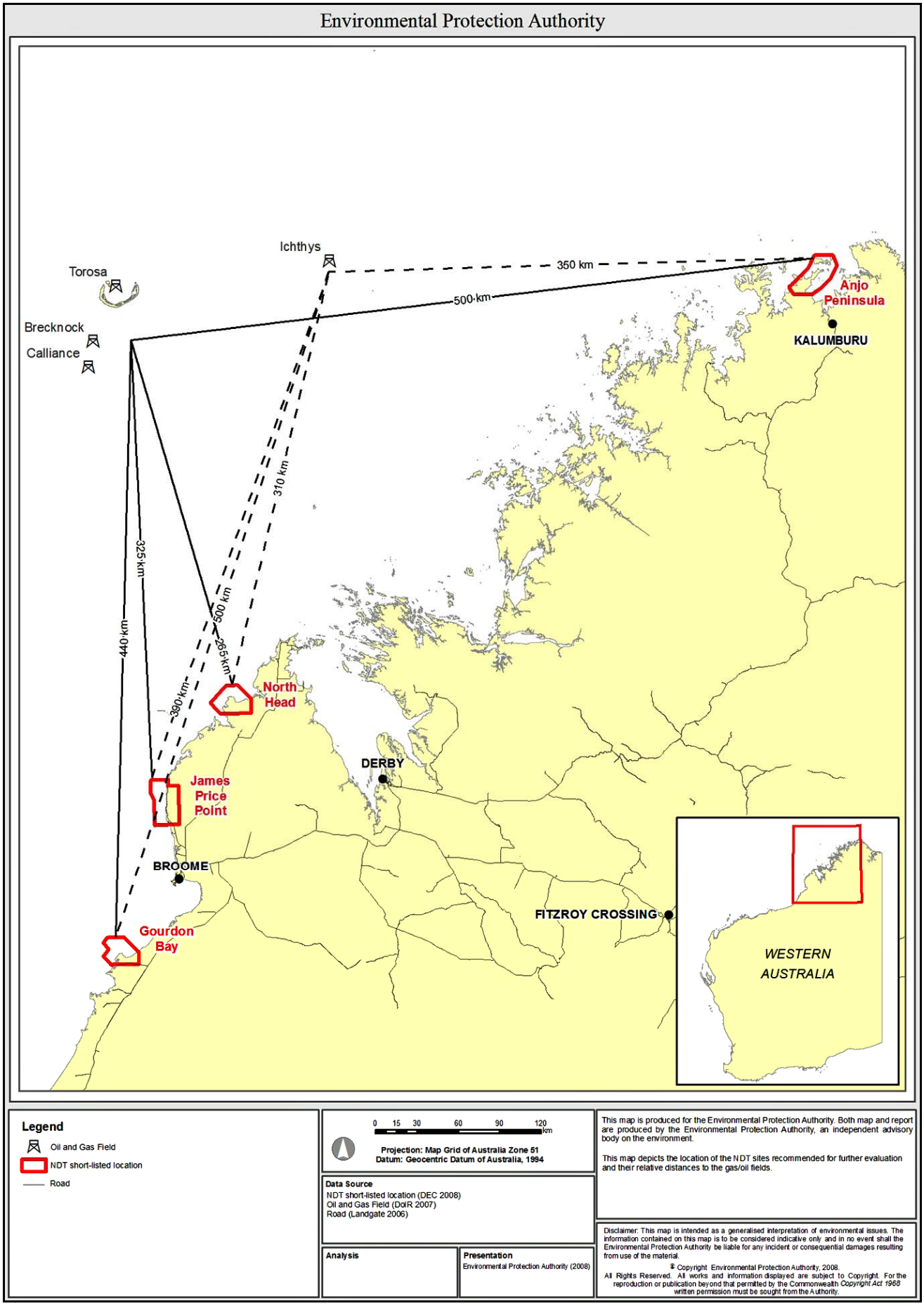

Figure 2: Locations of NDT short-listed sites.

2.3 The stakeholder engagement process

The NDT has provided the output from reports and selection processes to stakeholder groups and the wider public by publishing all relevant material on its web-site at www.doir.wa.gov.au/ndt.

On 23 to 25 July, 2008 the NDT held a three day workshop in Broome to communicate the outcome of each stakeholder group's findings to all other groups. A significant number of Traditional Owners, their representatives, other community representatives and relevant Commonwealth and State government officials also attended, including two EPA Service Unit representatives as observers.

The NDT workshop provided opportunities for all significant interest groups to obtain relevant information, formulate their own views about the 11 site options that were under consideration and put those views to the other interest groups. While a number of interest groups expressed concern about the limited data and time available to come to a view, the NDT executive has striven to provide reasonable opportunities for the interest groups to obtain information and formulate a view, within the overall time constraints applied by Government.

On 21 August 2008 the NDT made a presentation to the EPA on the outcomes of its selection process to date. The EPA has also received a presentation from the KLC on 16 October 2008 and several briefings from terrestrial and marine experts.

The NDT Site Evaluation Reports (NDT, 2008 b & c) were released for a 28 day public comment period from the 15 October to 11 November 2008. During this time the NDT secretariat held community and public meetings in the Kimberley on the 10 and 11 November 2008 where verbal comments were recorded and included in the NDT's responses to public comments. Over 250 submissions were received by the NDT and responses were prepared for all issues raised. The NDT's responses to the public submissions are available at www.doir.wa.gov.au/ndt.

There was a wide range of views expressed in the submissions ranging from opposition to any development on the Kimberley coast to support for economic and social opportunities raised. Of particular note was the widespread support for the process adopted and encouragement for government to continue to support the process.

The EPA would like to thank all those Traditional Owners, experts, shire, industry and government representatives who have assisted in providing information and access to the sites.

3. EPA conclusions and advice on sites

3.1 Advice on overall concept of a gas processing precinct

The EPA recognises that the immediate purpose of the NDT is to manage across-government planning processes and stakeholder consultation to select and develop a suitable location or locations for the processing of Browse Basin gas reserves. The NDT process is also setting the framework for how the State will protect and manage the important environment, cultural heritage and tourism values of the Kimberley

area. These are matters that the EPA has previously identified and raised with government as matters requiring urgent attention.

The process of identifying and developing a common-user LNG precinct would enable individual proposals for processing gas from the Browse Basin to be developed on a single site, rather than having multiple gas developments being proposed along the Kimberley coast. This would have the effect of minimising the overall environmental footprint of development by maximising the sharing or co-location of infrastructure. It would also provide certainty to industry proponents who wish to locate in the precinct in terms of providing early direction on the issues to be addressed during the approvals process and the overall environmental standards and outcomes that are required to be achieved.

The EPA understands there is public concern about the potential for widespread development in the Kimberley because it is highly valued for its wildness, heritage and biodiversity values which are considered to be of international significance. It is preferable that *ad hoc* development not be allowed and that an LNG processing precinct be established prior to any development being permitted.

The EPA notes that the NDT terms of reference recognise the possibility that more than one site could be developed for a precinct. The EPA has therefore given attention to this possibility but notes that one of the opportunities arising from the development of a consolidated gas processing precinct is the chance to share common infrastructure and minimise cumulative impacts arising from multiple developments.

The EPA strongly supports the concept of undertaking a strategic review of potential LNG processing sites in the Kimberley. The EPA also strongly supports the idea of focusing development of any LNG processing precinct at a single site so that environmental impacts can be contained and operational efficiencies maximised in ways that will minimise environmental impacts.

3.2 Advice on site evaluation process

The EPA considers that the NDT's site evaluation process had a number of positive elements and a few limitations, as set out below.

Positive elements

The site evaluation process:

- Examined a wide range of more than 40 sites, without preconceptions of a preferred site.
- Allowed different interest groups to identify site selection criteria important to their interests.
- Used comparative analysis in the absence of comprehensive regional information.
- Included engagement of expert groups to contribute to the site selection process and an independent assessment panel for a 'reality check' of key findings.
- Commissioned quality environmental studies to supply site-specific data to underpin and inform site selection process.
- Synthesised available and purpose-collected information and consulted widely with recognised experts.
- Avoided consideration of project economics in the initial site selection process so as not to bias conclusions towards economically attractive locations.

- Communicated transparently to all interest groups.

Limitations of the process
Limitations of the process included:

- Current knowledge of the Kimberley environment is patchy and incomplete.
- Short timeframe for data collection – restricted to one seasonal cycle.
- Limited quantitative measures were available that could be directly compared across sites.

Overall the EPA considers that the NDT made the best use of the data available and made best endeavours to gather purpose and site specific data in the time available. The EPA considers that the level of data available was appropriate to the current level of analysis required in all material respects.

Selection process
The EPA has considered the wide-ranging array of data assembled by the NDT process, including input from the various specialist working groups and the submissions on the NDT site evaluation reports.

The available data includes analyses by Gaffney, Cline and Associates on the engineering suitability of the terrestrial and marine aspects of each site (Gaffney Cline, 2008). The EPA lacks the technical expertise to determine whether or not LNG processing infrastructure could be physically established at each site and has accepted the findings of the Gaffney, Cline and Associates report on face value. The EPA makes no comment on these technical matters. The EPA has also reviewed the public submissions made on the NDT report and the NDT's response to those submissions. Additional advice has been sought from experts on a number of environmental matters, including whales, dugong and the terrestrial environment. The EPA held meetings in Broome and Perth with community representatives, the KLC and the NDT. The EPA has formulated its advice based on its review of all these sources.

The EPA has reviewed the interim NDT report (NDT, 2008a) which presented the results of a screening analysis of more than 40 sites across the Kimberley. This analysis identified 9 sites for further study. A further two sites (at Anjo Peninsula and Cape Voltaire) were subsequently added to form a list of 11 sites that was examined in more detail. These 11 sites were reduced to 4 sites via the analysis in the NDT site evaluation reports (NDT, 2008b & c).

The EPA understands that the selection of the 11 sites involved a mix of factors including environmental, technical, Indigenous, socio-economic, community and tourism criteria. The EPA has examined the NDT's analysis of the 11 sites which produced the short-list of 4 sites now under consideration. The EPA notes the NDT's statement in the Foreword to Part A of the site evaluation report (NDT, 2008b) that "[the report] short-lists four sites that are considered technically viable for the purpose of gas processing". The EPA is not qualified to comment on site technical criteria but recognises that there is some overlap between the other criteria used in the NDT's detailed analysis and strictly bio-physical environmental criteria. Accordingly, the EPA has considered the environment, Indigenous and socio-economic/community/tourism categories of the NDT's analysis to the extent permitted by the EP Act.

The NDT's comparative analysis of sites involved two parts. NDT representatives rated the 11 sites across sub-sets of the factors listed above. An independent assessment panel (IAP) also rated the sites across the same sub-sets of factors. Both these sets of ratings are set out in the matrices in appendix 11 of the NDT site evaluation reports (which can be found at www.doir.wa.gov.au/ndt). This was a qualitative analysis based on expert judgement as to whether each criterion was a major or minor advantage, neutral, or a minor, major or significant disadvantage for each site. These categories are coded green (major advantage) to red (significant disadvantage) in the matrices. No weighting of categories was applied and no valid numeric analysis can be performed on this qualitative approach.

Noting that it is not valid to numerically combine qualitative judgements from different criteria, a rudimentary means of considering the "pros and cons" of each site is to look at the number of major advantages and significant disadvantages as rated by the NDT and IAP for each site (Table 1, overleaf).

Gourdon Bay, James Price Point, North Head and Anjo Peninsula have been nominated by the NDT as short-listed sites from the list of 11 sites in Table 1. Of the four nominated sites, Gourdon Bay and James Price Point stand out as the candidate sites with the most advantages and the least disadvantages on environmental, Indigenous and socio-economic/community/tourism grounds based on the NDT rating process. North Head, Perpendicular Head and Packer Island are all in close proximity to each other on the central Dampier Peninsula and achieve the same ratings in Table 1. North Head may thus be considered as representative of a site on the northern Dampier Peninsula. Likewise, Anjo Peninsula may be seen as representative of the far north Kimberley coast. It is understood Koolan Island was rejected by the NDT on technical grounds as unsuitable to host a gas processing precinct, despite having a number of advantages and few disadvantages on all other grounds.

Outcomes

The EPA concludes that the NDT review was a rigorous, inclusive and public process that resulted in the clear identification of environmental risks and values based on the available data, resources and time available. The outputs from this process have enabled the EPA to provide advice on the sites with the least potential for environmental impact and early guidance to project proponents on the environmental issues that would require particular attention during project development.

The EPA notes that one of the general themes that emerged from the public comment submissions was that overall there is a high level of support for and commitment to the strategic assessment process despite some disagreement over the sequencing of decisions. In this regard, the EPA supports the future use of a streamlined, strategic approach to selecting project-ready sites for industry in other parts of the state, so that industry can have early advice of locations that are likely to be suitable for development in a setting where adequate information is collected sufficiently ahead of time to facilitate a rigorous and timely assessment process.

Table 1: Number of criteria considered to be either a major advantage or a significant disadvantage by either NDT or IAP in the Environment Matrix, Appendix 11 of the NDT site evaluation report.

	Gourdon Bay	Quon dong Pt	James Price Pt	North Head	Perpen dicular Head	Packer Island	Koolan Island	Wilson Pt	Maret Islands	Cape Voltaire	Anjo Peninsula
Major advantage	10	9	10	5	5	5	8	1	2	0	1
Significant dis-advantage	1	1	1	3	3	3	1	9	6	6	3

Source: NDT, 2008b

The EPA focuses on environmental issues as defined in the EP Act. It is aware that its advice is necessarily shaped by the expertise and experience it has. This expertise is strongly focused on the bio-physical environment and the Authority can make recommendations about these matters with a high degree of confidence. The EPA is also aware that there are very important social, cultural and economic issues around development in the Kimberley. The EPA either does not have a mandate to advise on these issues or is less equipped to do so as there are less formal ways of quantifying the effects of actions.

For example, there is no formal process in Western Australia for the assessment of socio-economic impacts or indeed for their integration with environmental issues into a sustainability assessment. This does not mean that these issues are not important, however. In a number of cases other agencies are best equipped to provide advice or take action in such matters. In the absence of either a legal mandate or appropriate expertise, the EPA has highlighted, in sections 3 and 4 of this report, some of these important issues that have been bought to its attention by participants in the NDT process, particularly Traditional Owners and Kimberley residents, to ensure that their importance is not lost.

The EPA is satisfied that the environmental aspects of these analyses on which it is qualified to comment were undertaken by the NDT with an appropriate level of rigor and with an appropriate level of data. Accordingly, the EPA accepts the four short-listed sites as a representative mix of options across the Kimberley from which a preferred site can be chosen.

3.3 Advice on short-listed sites

The EPA has considered the four sites short-listed by the NDT in order from north to south. A brief summary of information about the characteristics of each site is included for context, based largely on data from the NDT's site evaluation report but also from other sources.

The EPA's consideration of the four short-listed sites was also assisted by the Worley Parsons' report *Browse LNG Precinct Siting Study,* 2008 commissioned by the NDT. The report was finalised following the closure of the public comment period on the NDT reports and forwarded to the EPA for its consideration. The Worley Parsons report can be found at www.doir.wa.gov.au/ndt.

The EPA has taken a high level view of the attributes relevant to determining the environmental values on sites. The attributes listed in Table 2 below have been chosen to cover the broad issues raised via the NDT process, plus others the EPA considers relevant, like proximity to habitation and remoteness. The attributes have been chosen in a way which seeks to avoid obvious overlap i.e. to avoid "double counting". The EPA has rated the attributes in a qualitative way from least impact to most impact, similar to the NDT rating process but with four rather than six categories.

Anjo Peninsula

a) Why Anjo Peninsula was short-listed

Anjo Peninsula was suggested as a short-listed site by the Traditional Owners for this area. It is understood that this suggestion was made due to the site's current and likely

future use as a support base for helicopters servicing the existing offshore oil and gas fields of the north-west Kimberley from the operating Truscott Air Base, together with its suitable physical attributes and access to deep water.

The site on Anjo Peninsula identified by Gaffney, Cline and Associates (Gaffney Cline, 2008) is regarded as likely to be technically and economically challenging due largely to its distance from the gas fields.

According to the NDT report (NDT, 2008b):
"Anjo Peninsula lies within a region of outstanding natural, indigenous and historical values which has potential to include values that meet criteria for national and possibly international heritage listing. The tourism industry believes that development of this site will have some impact on marine and Aboriginal tourism in this area.

It is recommended this site be subject to environmental site studies and a geo-technical assessment prior to further consideration as a site for a LNG hub".

The Peninsula is very remote, being approximately 240km north-west of Wyndham and 620km north-east of Broome. The nearest town is Kalumburu, 35km away, although there is no road access between the two. The NDT has not been able to confirm that a road to Anjo Peninsula would not be required but, if so, it is the EPA's view that it is likely to be a major undertaking with significant adverse impacts to traverse the major river systems and rugged terrain in the area.

Vegetation mapping indicates a diverse environment supporting ten vegetation communities. Savannah woodlands dominated by *Eucalyptus* and *Corymbia* species with a sorghum grassland understorey are present on uplands. Riparian, coastal and mangrove communities are common on suitable substrates. All these communities are generally widespread in the region. Small scattered areas of monsoon vine thickets, which have conservation significance, have been identified in the area. Small communities of fire sensitive *Callitris columellaris* are likely to have conservation significance.

The area is part of the north-west Kimberley region that has generally retained an intact faunal assemblage, although parts with relatively accessible terrain may have allowed feral cattle grazing and repeated fires to have an impact on the terrestrial mammal fauna. Terrestrial environmental studies have indicated that the overall sensitivity of the terrestrial environment has been considered to be "high" (Table 2, overleaf).

Table 2. Comparative impacts for four short-listed LNG precinct sites

Attribute	Site			
	Anjo Peninsula	North Head	James Price Pt	Gourdon Bay
Marine impact[1]	Moderate to high	High to very high	Moderate to high	Moderate
Terrestrial impact[1]	High	Moderate to high	Low	Low
Visual Landscape[1]	Not yet assessed	Suitable, some reservations	Suitable with reservations	Suitable
Habitation[2]	Ranger station, ~10km Truscott base 15km	Beagle Bay 20km, ~12 settlements within 150m to 10km	Willie Creek Pearl Farm 23 to 35km, depending on site	Bidyadanga 25km, Port Smith 3km, two settlements within 10km
Tourism[1]	Recreational fishing, wilderness cruising	Product loss, recreational and subsistence fishing competition for inputs, eco-tourism	Camping, recreational fishing, competition for inputs	Caravan park, recreational fishing, competition for inputs
Fishing industry[1]	Pearl leases, commercial grounds	Commercial grounds, nursery, wild pearl stock	Commercial grounds, pearl leases	Commercial grounds, pearl leases
Heritage[1]	Significant sites	Dreaming track, significant sites	Dreaming track, significant sites	Significant sites
Remoteness[2]	No vehicular access	Dirt road access	Dirt road access	Dirt road access, highway nearby

Source: 1 – NDT Report, September 2008
2 – Google Earth

Key	Least impact	Less impact	More impact	Most impact

Rocky reefs dominated by algal turf and biogenic reefs with live corals are present, with corals more prevalent on the more exposed western and northern sides of the peninsula. Filter feeding communities are patchily distributed and generally of low density and diversity. Significant finfish diversity is expected. Turtles may be common on the west and dugong are known from the area, although no suitable seagrass feeding habitat was recorded in an August 2008 survey. Humpback whales and calves have been observed, although the site is not thought to be especially significant for this species. The EPA notes that there are some technical advantages at Anjo Peninsula that may reduce marine impacts, including ready access to deep water and no requirement for a breakwater. Marine environmental studies have, however, indicated that the overall marine sensitivity of this site has been considered to be "moderate to high" (Table 2).

An Aboriginal eco-tourism operation is based near the existing road to the barge landing at West Bay and sites of significance to Traditional Owners are located in the area. King Leopold Sandstone outcrops occur which contain numerous examples of Bradshaw and Wandjina rock art.

b) Key environmental considerations for Anjo Peninsula

In the EPA's view, the key considerations related to development at Anjo Peninsula are:

- disruption of the remote and natural character of the area,
- opening up the region, with increased pressure for other potential developments, such as bauxite mining and recreational access, and
- increases in co-incident human use, leading to further disturbance, recreational fishing pressure, weed invasion, feral animal incursions and risk of introduction of non-indigenous marine species.

The first two points above do not lend themselves readily to management. Either the area is opened up for development or it is not. Given that there is now no road access to the site and there are few places in Australia with a similar level of undeveloped, natural character this part of the Kimberley has special value in a State and national context. It is also one of the few places in the country with an intact faunal assemblage (NDT, 2008c).

Weed, feral animal and non-indigenous marine species introductions are theoretically manageable but only with a very high level of concerted and continuous effort. While this might be possible for operations confined to a defined precinct, further opening up of the region would make such management increasingly difficult and ultimately compromise its success.

It is noted from the NDT site evaluation report (NDT, 2008c) that Anjo Peninsula lies within a region of outstanding natural, Indigenous and historical values which has the potential to include values that may meet criteria for national and possibly international heritage listing.

c) Level of environmental mitigation required at Anjo Peninsula

The EPA would argue that the most important consideration of "opening up" the Anjo Peninsula region does not lend itself readily to environmental mitigation or management. While development may be a matter of degree, the fundamental decision to open up the area becomes irreversible and likely to lead to increasing

pressure for further future development in the area. This is a fundamental decision for Government but the EPA considers that there is a strong case for not opening up the Anjo Peninsula for a gas processing precinct.

If Anjo Peninsula was selected for a gas processing precinct, then detailed environmental studies would be required in this poorly studied area. Particular attention would need to be paid to preventing the invasion of non-indigenous species and secondary disturbance and threatening processes beyond the footprint of the precinct. A facility supported by road access would significantly increase the risk of opening up the area and of additional cumulative impacts.

d) EPA advice on Anjo Peninsula

Based on environmental considerations, the EPA is of the view that the Anjo Peninsula is not a desirable location for large scale industrial development and particularly not for a gas processing precinct where the supporting gas resources are not tied to this particular location. If a decision were made to use this site, detailed environmental studies would be required before a decision on the environmental acceptability of a particular development concept could be properly evaluated. Management of the site would need to be formulated on an "island" model whereby the site was serviced from the air and sea (as the Truscott Base is now) and the precinct treated as an island from which no invasive species or disturbance processes were allowed to escape into the wider environment.

There is a high risk that a precinct at Anjo Peninsula would significantly impact on the remoteness and wildness values of this area. Terrestrial bio-physical values at the precinct and along any necessary road transport route are also likely to be compromised and expensive to manage effectively. Once terrestrial transport routes are established, the risk to the region's environmental values would be increased.

Any decision to proceed with the planning and assessment of an LNG precinct at Anjo Peninsula, including associated transport infrastructure, would need to have regard for the protection of the potential national heritage values from regional scale impacts.

The EPA has concluded that Anjo Peninsula should not be developed for large scale industrial purposes to protect both environmental and wildness values.

North Head

a) Why North Head was short-listed

The North Head site was identified as one of more than 40 possibilities in the first round of analysis by the NDT. It is suitable for an LNG hub from an engineering perspective according to the Gaffney Cline report (Gaffney Cline, 2008) and may not require significant dredging. A breakwater is likely to be required.

According to the NDT report:

"North Head is considered technically viable for a hub though the marine environment poses significant challenges for the development of port facilities of sufficient size to service known and unknown proponents. As the North Head development would be in conflict with the developing Aboriginal tourism sector, very

innovative design and operational strategies would need to be adopted to avoid significant impact on the whole of the north of the Dampier Peninsula. North Head is situated within a whale migration aggregation area and studies currently underway will be critical to establishing whether any likely impacts can be avoided or minimised to acceptable levels. Development of this site would also present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination, though not to the same extent as Gourdon Bay and James Price Point.

It is recommended this site be subject to the hub design concept study, heritage surveys and regional impacts studies and considered for a LNG hub."

b) Key environmental considerations for North Head

North Head, 125km north of Broome, is at the northern entrance to Beagle Bay and 10km south-west of Pender Bay. The Wilson Report (Marine Parks and Reserves Selection Working Group, 1994) identified Pender Bay as worthy of reservation to protect marine values. The waters off North Head are within an area which has been identified as a Humpback whale (*Megaptera novaeangliae*) calving ground (Jenner et al, 2001) (Figure 3). Seagrass that is seasonally present in the bays and offshore provides food for dugong.

The North Head site is exposed to prevailing weather from the south-west and would require a significant breakwater about two kilometres long (Gaffney Cline, 2008). This would have a significant, direct marine impact and a larger zone of influence. The NDT report states that the reduced land area close to the coast may make it difficult for multiple operators to equally place infrastructure and access port facilities, particularly if buffer zones are required between facilities. The report assumes that feed gas pipelines could be routed across Pender Bay beach or other beaches. Other beaches in the area occur at Tapper's Inlet or in Beagle Bay.

North Head is likely to be the most sensitive of the four short-listed sites with regard to Humpback whales. As mentioned above, this site is within the Humpback whale calving area that stretches from Camden Sound to south of Beagle Bay (Jenner et al, 2001). Within this area whales migrate, calve, aggregate and rest. The most recent information suggests that the waters offshore from Perpendicular Head and North Head are considered to be an aggregation area of high regional significance for Humpback whale cows and calves before southward migration. The waters further offshore are part of a high density migratory corridor.

Corals generally occur at sparse to moderate density. Benthic habitats offshore are generally less diverse than offshore from Perpendicular Head to the north. A wide variety of finfish are present and sawfish are likely in more sheltered areas. Turtles are common off the mainland coast, although nesting is not. The Lacepede Islands are, however, located 35km offshore from North Head and comprise the most important Green Turtle rookery in Western Australia. The islands are gazetted as a class A nature reserve which supports significant seabird breeding colonies. The overall sensitivity of the marine environment off North Head has been rated as "high to very high" (Table 2).

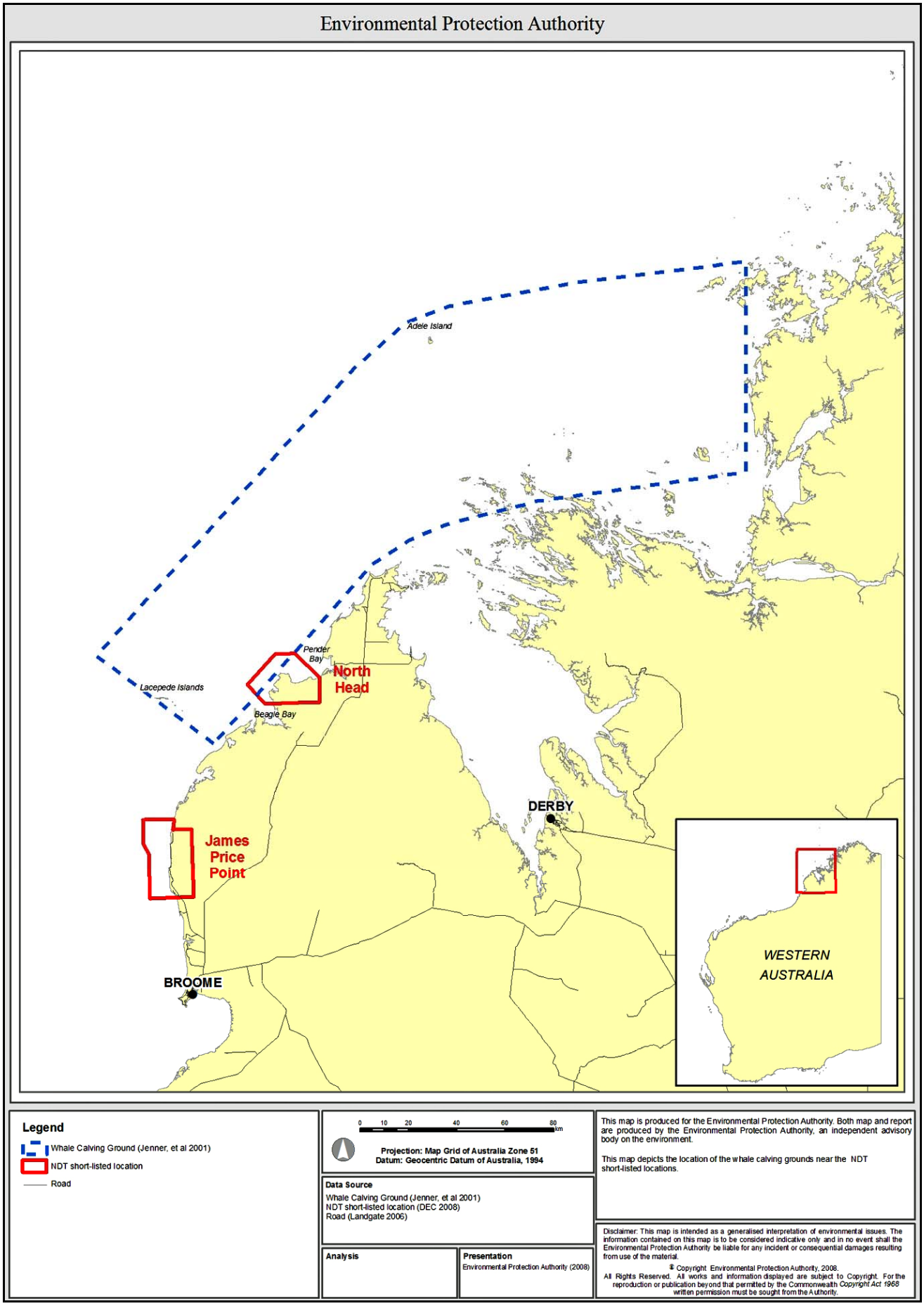

Figure 3: Location and extent of whale calving grounds (Jenner et al, 2001)

The site is adjacent to sensitive coastal environments. These include holocene coastal dunes and mangrove inlets, including Tappers Inlet and drainage lines draining into it. Restricted vegetation types include mangrove forest, monsoon vine thicket, seasonal wetlands and coastal karst communities. Overall the sensitivity of the terrestrial environment at North Head was rated as "moderate to high" (NDT, 2008c). North Head has a high coastal landscape character that was assessed as "suitable with some reservations" for a gas processing precinct (NDT, 2008c).

A number of small settlements, some of which operate as Aboriginal owned eco-tourism ventures are located around North Head and Middle Lagoon, seven kilometres to the north-east (Figure 4). About 12 to 14 settlements with an estimated population of about 200 people are located within 10km of the North Head site. The two communities of Goobiny and Gnylmarung, nearest to the notional boundary of the precinct shown in a report by Worley Parsons (Worley Parsons, 2008), support a total population of about 30 people. About 2.5 kilometres north east of North Head, across Tappers Inlet, the two communities of Tappers Inlet and Goodalargin has a total a population of 48 people. The North Head site is approximately 20km from the Beagle Bay community and according to the latest Australian Bureau of Statistics (ABS) census figures, there were 199 people living in Beagle Bay.

North Head is also within the eco-tourism precinct that has developed from this area to Cape Leveque, 60km to the north-east, at the top end of the Dampier Peninsula. Submitters expressed concerns about the effects of emissions and risk on communities and the prospect of relocation.

Significant commercial fishing grounds occur offshore and the Lacepede Channel has been an important fishing site for wild pearl-oyster stock. Broome based tourism operators are concerned about the impacts a precinct at this site would have on competition for air services, accommodation and workers and the potential loss of tourism product. There are numerous registered Aboriginal heritage sites in the area. Detailed site specific cultural heritage studies and surveys would identify further sites of significance.

c) Level of environmental mitigation required at North Head

If this site were selected, management of gaseous, noise and other emissions would be particularly important, given the close proximity of residents to the site. It may not, in fact, be possible to manage these emissions within acceptable limits at existing residences that are located within 150m of the North Head site.

Significant numbers of Humpback whale cows and calves aggregate offshore from North Head prior to southward migration. Dugong frequent this area, although it is not known if they breed here. Avoidance of this area would prevent dugong feeding habitat from being compromised.

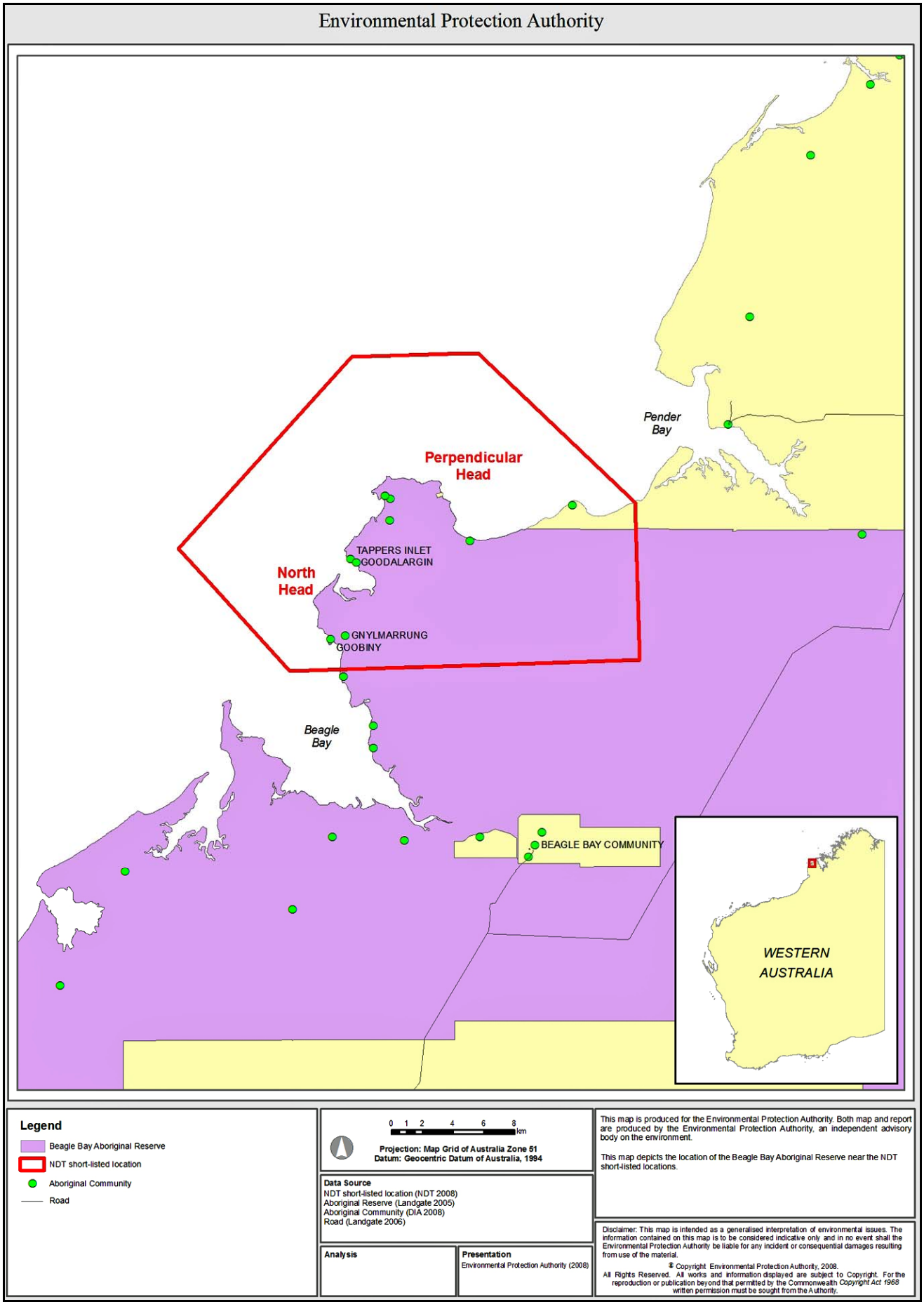

Figure 4: Locations of communities at Beagle Bay Aboriginal Reserve.

Significantly more information would be necessary to determine whether marine construction and operations associated with LNG processing would have population level impacts on Humpback whales or dugong but any impacts are unlikely to be readily managed or mitigated. Avoidance of this important whale aggregation and calving, and dugong feeding area would almost certainly be necessary for at least part of the year. Seasonal restriction of marine operations is unlikely to be feasible in the construction phase, given the long lead times and high mobilisation costs, and would severely restrict availability of shipping to access loading facilities during operations. Loading operations would likely be required to shut down for at least a month to six weeks each year. The required closure period is also highly likely to vary from year to year, depending on seasonal factors that affect the arrival times of migrating and calving whales (Jenner et al, 2001).

It would be important to avoid impacts to Tapper's Inlet and Beagle Bay proper, which directly border North Head to the north and south respectively. It would also be important to avoid impacts to significant environmental values in the karst terrain adjacent to the coast. This zone is limited in distribution and likely to support restricted flora and fauna assemblages. Traditional owners are also concerned about maintaining access to the coast for fishing and other traditional purposes.

d) EPA advice on North Head

Based on environmental considerations, the EPA is of the view that North Head is not a desirable location for large scale industrial development. Management of the site would need to pay particular attention to the potential impact of emissions and industrial risks on nearby residents, who may need to be relocated if appropriate emissions and risk standards are to be maintained where people live.

The EPA is also concerned about the potential risks of placing an industrial precinct within a regionally significant area for calving and resting by Humpback whales on the Western Australian coast. It is the EPA's view that environmental action should be taken at the top of the mitigation hierarchy i.e. 'avoidance' for such a critical part of the life-cycle of a slowly reproducing species like the Humpback whale. The EPA has not been presented with any evidence that effective mitigation measures exist and can be implemented to deal with impacts likely to arise from the construction and operation of marine infrastructure on Humpback whale cows and calves. Accordingly, this area should be avoided by major industrial developments, rather than mitigated or otherwise managed.

The EPA also notes the relative complexity and diversity of benthic habitats at this site compared with those further south. If a decision were made to use this site, detailed environmental studies would be required before a decision on the environmental acceptability of a particular development concept could be properly evaluated.

The EPA is mindful of Worley Parsons' advice that North Head is limited in terms of space for jetties to link the site to planned shipping channels in deep water. Given the objective of providing a site to process gas from across the Browse Basin (50-70mtpa of LNG), the EPA considers that it would be unwise to select a site without considering its potential for future expansion. The environmental effect of choosing a constrained site would be to put unacceptable pressure on the surrounding environment.

At North Head future jetties may have to be located to the north of Tapper's Inlet to access deep water. This would split the precinct in two, diminishing the benefits of a single, consolidated precinct and increasing the environmental footprint. A split site would create larger environmental management overheads and decrease efficiency. Environmental impacts would be greater and their management more costly and more difficult.

Environmental risks at North Head are unlikely to be readily or reliably manageable. Depending on the outcome of air quality modelling and risk assessment some of the 12 to 14 Indigenous settlements between 150 metres and 10km from the site may have to be closed down to ensure that societal risk and ambient air quality standards could be met. The Humpback whale calving ground immediately offshore is a significant environmental constraint. Impacts on this important area are unlikely to be easily or cost-effectively manageable and should be avoided. A precinct in this area is likely to be severely constrained by restrictions on its operational flexibility and require onerous and expensive management controls.

The EPA has concluded that North Head is not suitable for large scale industrial development from an environmental point of view.

James Price Point area

a) Why James Price Point area was short-listed

The James Price Point site was identified as one of the more than 40 possibilities in the first round of analysis by the NDT. It is suitable for an LNG hub from an engineering perspective according to the Gaffney Cline report and may not require excessive dredging (Gaffney Cline, 2008). The site would require a significant breakwater, jetty, turning basin and possibly a shipping channel.

According to the NDT report:
"James Price Point or an area to the north of the Point is recognised as technically viable for development though not without having some impact on sensitive marine areas and the pearling and fishing industries. Development would also present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination. In particular, studies into fish aggregation and whale migration will be critical to establishing whether impacts can be avoided or minimised. The advantage of a site close to Broome is that it would leave the Aboriginal lands in the north of the Peninsula free of industrial development. In addition, shared infrastructure such as the Broome airport would reduce the total hub footprint.

It is recommended this site be subject to the hub design concept study, heritage surveys and regional impact studies and considered for a LNG hub."

The EPA notes that a report prepared by Worley Parsons in November 2008 refers to the possibility of development at a north, central or southern zone in this area (Worley Parsons, 2008). The northern zone is just south of Flat Rocks, the central zone straddles James Price Point proper and the southern zone is located north from Quondong Point. The EPA has considered all three possibilities in its analysis of the James Price Point option.

b) Key environmental considerations for James Price Point area

The James Price Point area, 60km north of Broome, is devoid of permanent human habitation. The nearest habitation at Quondong Point appears to be occupied intermittently. Willie Creek Pearl Farm is between 23 and 35km to the south depending on which zone is considered. Informal camping and recreational fishing are, however, popular between Flat Rocks and Quondong Point, as they are along much of the Dampier Peninsula. Commercial fishers also use the area.

This area has not been formally recommended for conservation and the terrestrial environment is relatively simple, widely represented in the area and does not support biologically diverse vine thickets. The impact of a gas processing precinct on the terrestrial environment here has been rated as "low" (NDT, 2008c). The area is essentially similar from north to south and there appear to be few geographic constraints on this area.

Extensive filter feeding communities occur offshore and turtles are common but turtle nesting is not. Turtles rest at the Lacepedes Islands, 55 km to the north. Dugong occur offshore and Humpback whales migrate along shore at high density (especially during northbound migration) but resting areas are absent. The overall sensitivity of the marine environment is judged to be "moderate to high" (NDT, 2008c).

Tourism operators are concerned about increased impact on air services, short stay accommodation, workforce availability and loss of tourism destinations. There are numerous registered Aboriginal heritage sites in the area. Detailed site specific cultural heritage studies and surveys would identify further sites of significance.

c) Level of environmental mitigation required at James Price Point area

James Price Point is likely to be the least constrained site for a gas processing precinct on the Dampier Peninsula from an environmental point of view. There is sufficient space in this area to locate an industrial facility of 1000 ha or more away from permanent residences and sensitive terrestrial environments. The layout of marine facilities would need careful consideration to minimise impacts but these aspects are likely to be manageable. Particular attention would need to be paid to mitigation of impacts on migrating Humpback whales and dugong feeding in the area. The site is outside the main whale calving and resting area.

The EPA is mindful that the Coulomb Point Nature Reserve is located about five kilometres north of Flat Rocks. Consideration of potential impacts on the reserve would need attention in the detailed design of a precinct located in this area and careful ongoing management during operations.

The effects of emissions on people are unlikely to be a key issue at this site given the lack of permanent residences in this area.

The EPA is aware from submissions that the coast from Quondong Point to Flat Rocks is a popular fishing and informal camping area and that Traditional Owners and others are concerned to maintain access to the coast here. Any development at this site would need to strictly limit the length of coast and sea from which access is excluded. Innovative approaches to providing for access across feed gas and export gas pipelines and jetty access routes should be considered, possibly by placing these facilities in a tunnel beneath a public access road. This would alleviate concerns about

having to deviate public access around the inland side of a ~1000ha site. Careful evaluation and management of the bio-physical and ecological processes underpinning the billfish aggregation off James Price Point would also be required.

d) EPA advice on James Price Point area

Based on the available data, the EPA is of the view that the James Price Point site is likely to be the least environmentally constrained site for a gas processing precinct of the two sites on the Dampier Peninsula. While detailed studies and evaluation would be required to determine the acceptability of a particular layout and design features of a gas processing precinct at this location, notional layouts are shown in the Worley Parsons report (Worley Parsons, 2008). Based on these layouts, environmental risks and impacts are likely to be manageable for a 1000 ha precinct in the James Price Point area. The EPA considers that a site towards the northern end of this area (between James Price Point and Flat Rocks) may be more favourable from a terrestrial environment point of view and may have less impact on the main fishing and camping areas between Quondong Point and James Price Point. A site at this northern end is, however, likely to require more dredging than a more southerly location as deep water is further from shore.

The environmental impacts and risks of locating a precinct in the James Price Point area are likely to be manageable. The risk of future expansion being significantly constrained is likely to be low.

Based on the available data, the EPA considers that the James Price Point area is the least environmentally constrained site for a gas processing precinct of the two sites on the Dampier Peninsula.

Gourdon Bay

a) Why Gourdon Bay was short-listed

Gourdon Bay was selected as a potential site because it had suitable site characteristics, a high level of existing disturbance and low diversity. It is suitable as a gas processing precinct according to the Gaffney Cline report, although access to deep water may require a longer channel than other sites. The site would require a significant breakwater, jetty, channel and turning basin.

According to the NDT report:

"Though this site is significantly technically constrained and economically challenging, it is broadly supported as potentially one of the more benign sites for net environmental impacts subject to further studies on the potential habitat and flight pathways for migratory birds (given that Gourdon Bay is situated between two Ramsar wetland sites). Development would impact on the pearling, fishing and local Aboriginal communities and would present significant pressures and challenges on the tourism infrastructure and the character of Broome as a tourism destination.

It is recommended this site be subject to the hub design concept study, heritage studies and regional impact studies and considered for a LNG hub."

b) Key environmental considerations for Gourdon Bay

The Gourdon Bay site is 70km south-west of Broome across Roebuck Bay and 3.5km north-east of the Port Smith Caravan Park. Bidyadanga Aboriginal community is

25km south-west of the site. It is the least environmentally constrained of the four short-listed sites.

The site is located between two Ramsar wetlands, which are considered to be two of Australia's most important sites for migratory shorebirds. The Roebuck Bay mudflats are 40km to the north-east and Eighty Mile Beach is over 70km to the south-west (Figure 5). Gourdon Bay itself does not have extensive supra-tidal flats that are attractive to migratory shorebirds. If Gourdon Bay is selected as the preferred site, then further studies would be required to identify potential habitats and flight paths of listed migratory birds, and the risks from the construction and operation of an LNG precinct.

Seagrass in the bay is extensive but sparse, although it may be seasonally more abundant. Dugong are known to occur in the area and in Roebuck Bay to the north. Filter feeding communities are generally more patchy and less diverse than at sites on the Dampier Peninsula. A high-density Humpback whale migratory corridor occurs offshore but there are no reports of the bay being important to resting whales. The overall sensitivity of the marine environment at this site is considered to be "moderate" (NDT, 2008c).

Vegetation on the site is widespread in the area and has been extensively degraded by frequent fires. Small ephemeral clay-pans are restricted in distribution. The Bilby (*Macrotis lagotis*), which is a threatened fauna species, has been reported from the area by Traditional Owners. Visual landscape significance studies rate the site as "suitable" and the overall relative sensitivity of the terrestrial environment at this site is considered to be "low" (NDT, 2008c).

The EPA notes that the Worley Parsons report (Worley Parsons, 2008) shows the precinct laid out with jetties to the south-west of Cape Latouche Treville as this is the shortest route to deep water. This layout creates some limits on future use of the site because this piece of coast is confined by high dunes behind the Cape to the north-east and the Port Smith mangrove inlet to the south-west. It is possible that evaluation of a modified layout with jetties in Gourdon Bay proper may reveal that the environmental impact of increased channel dredging required there would be offset by a reduction in impacts if a smaller breakwater was required in the lee of Cape Latouche Treville.

Gourdon Bay has high value for recreational and commercial fishing. Maintenance of pearl-oyster fishing grounds at Eighty Mile Beach was of particular concern to submitters. Two tourism operations are located within five kilometres of the site and the tourism industry is concerned about impacts on air services, short stay accommodation, loss of tourism locations and increased workforce competition.

Gourdon Bay has sites which have mythological significance to Aboriginal people and is important to them for customary practice and food supplementation. A site that is important to Traditional Owners is located near the nominal precinct site but it is understood that it could be avoided effectively. Detailed site specific cultural heritage studies and surveys would identify further sites of significance.

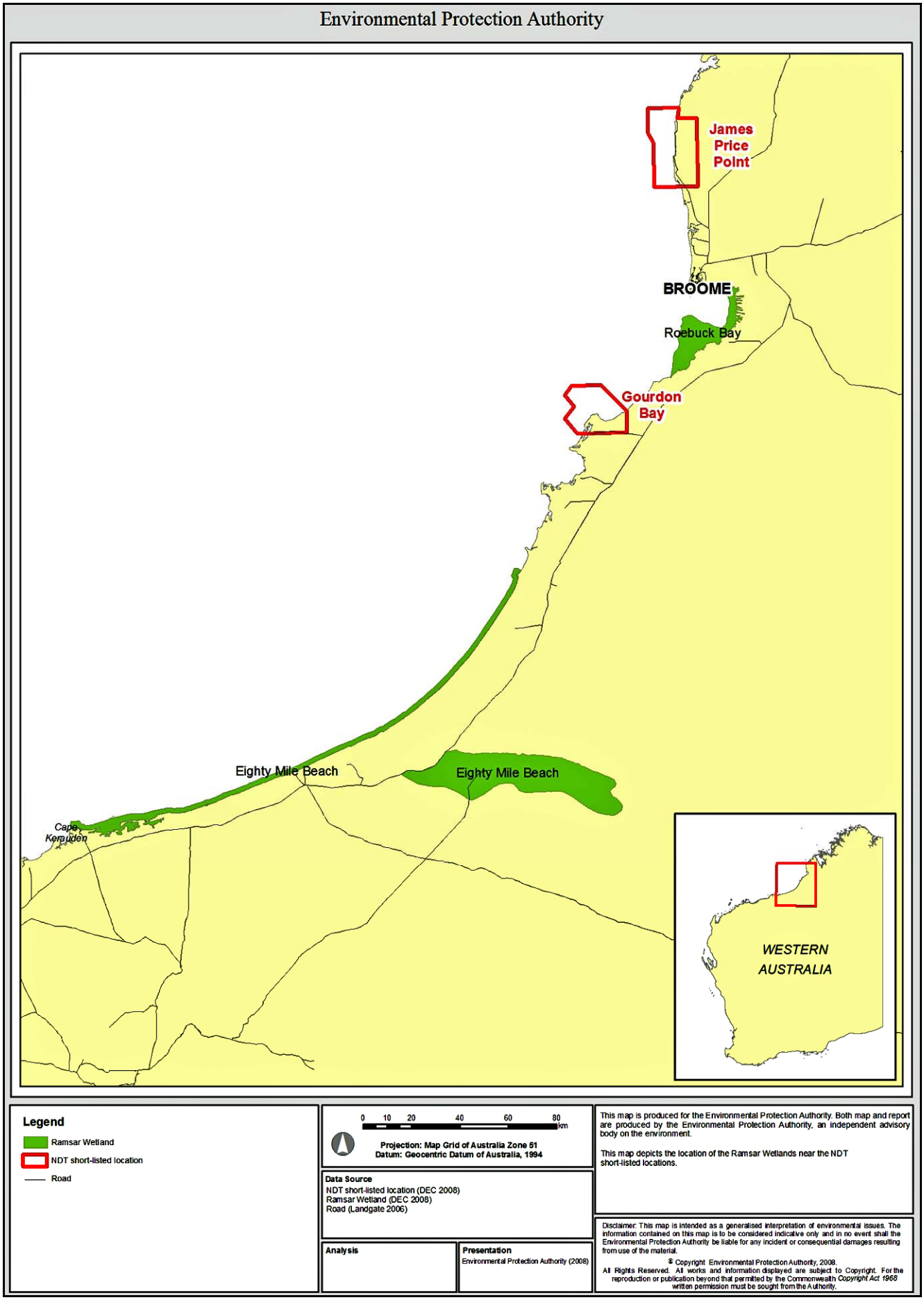

Figure 5: ***Location of Gourdon Bay in proximity to Ramsar sites at Roebuck Bay and Eighty Mile Beach.***

c) Level of environmental mitigation required at Gourdon Bay
Much of the terrestrial part of the Gourdon Bay site comprises common vegetation units that have been heavily disturbed by repeated wildfire. Location of a site here would require avoidance of a site of particular significance to Traditional Owners and careful consideration of erodible dunes behind Cape Latouche Treville.

Construction of a breakwater and dredged channel should be manageable at Gourdon Bay given the limited and common benthic primary producer habitats present. Particular attention would, however, need to be focused on avoiding unacceptable impacts to pearling operations in the area and at Eighty Mile Beach to the south-west.

Containing emissions to acceptable levels at Port Smith caravan park and the few other surrounding residences would need attention.

While Gourdon Bay does not appear to be as popular for informal camping as the Quondong Point to Flat Rocks area, attention should also be paid to strictly limiting the amount of coast and sea from which Traditional Owners and the general public would be excluded at Gourdon Bay. This may be achieved by innovative solutions to crossing the coast with feed and export gas lines and necessary access to a jetty or breakwater.

d) EPA advice on Gourdon Bay site
Based on the available data, the EPA is of the view that Gourdon Bay is likely to be the least environmentally constrained of all four of the sites short-listed for a gas processing precinct. While detailed studies and evaluation would be required to determine the acceptability of a particular layout and design features of a gas processing precinct at this location, a notional layout is shown in the Worley Parsons Report (Worley Parsons, 2008) with jetties projecting from Cape Latouche Treville.

Environmental risks and impacts are likely to be manageable for a 1000 ha precinct based on this sort of layout at Gourdon Bay. Management of potential impacts on the migratory bird flyway between Ramsar wetlands at Roebuck Bay and Eighty Mile Beach would nevertheless require particular attention. Future expansion may be limited by the frontage available with direct access to deep water if the precinct is laid out with jetties south-west of Cape Latouche Treville.

Based on the available data, the EPA considers that Gourdon Bay is the least environmentally constrained of all four short-listed sites for a gas processing precinct.

3.4 Summary of EPA advice on site evaluation

The EPA notes Worley Parsons' advice that "a total site area of approximately 1000 ha is required to accommodate up to two LNG operators" (Worley Parsons, 2008) and has based its advice on a precinct site of this size. Once established, however, the precinct site is likely to attract further large industrial proposals in the future. In providing its advice, the EPA has therefore considered not only the specific attributes of the short-listed sites, but also the wider implications of selecting a site. It has considered the context of the site and the expandability of the site, beyond the 1000 ha needed for two LNG processing facilities now. The EPA particularly notes Section 3 of the Worley Parsons' report, which indicates that a site of 2000+ ha would be more

desirable. Public submissions have also noted that 1000 ha under-estimates the land area needed for 50-70 mtpa of LNG production.

It is important that in deciding on a precinct location, Government give careful consideration to its capacity to accommodate future expansion without significantly compromising the environment. Any additional developments requiring an increase in the overall footprint of an approved precinct would be subject to further comprehensive environmental assessment at the time, particularly in terms of cumulative impacts.

The EPA is mindful of Worley Parsons' advice that North Head and Gourdon Bay are constrained in terms of space for jetties to link the site to shipping channels in deep water. Given the objective of providing a site to process gas from across the Browse Basin (50-70mtpa of LNG), the EPA considers that it would be unwise to select a site without considering its potential for future expansion. The environmental effect of choosing a constrained site may well be to put unacceptable pressure on the surrounding environment.

Taking these matters and environmental values and constraints into account the EPA has reached the following conclusions about the four short-listed sites, based on currently available information.

1. **Based on the available data, the EPA considers that Gourdon Bay is the least environmentally constrained of all four short-listed sites for a gas processing precinct.**
2. **Based on the available data, the EPA considers that the James Price Point area is the least environmentally constrained of the two short-listed sites on the Dampier Peninsula for a gas processing precinct.**
3. **The EPA has concluded that North Head is not suitable for large scale industrial development from an environmental point of view.**
4. **The EPA has concluded that Anjo Peninsula is not suitable for large scale industrial development for both environmental and wildness values reasons.**

The EPA notes that if a site not the subject of the NDT process and this report is chosen, proponents will not have the early guidance of government and the EPA on the likely environmental suitability of that site. This is likely to result in reduced certainty about the ability of such a site to be reliably developed and extend the time required to properly evaluate it and decide on whether or not it is environmentally acceptable.

4. EPA advice on other matters

4.1 Assessment of national heritage values and joint management of lands

In addition to the identification of a potential LNG precinct, the WA and Commonwealth Governments have agreed to carry out an examination of the potential national heritage values in the west Kimberley, an area which currently contains no places listed on the National Heritage list. The National Heritage list, established

under the EPBC Act, includes natural, historic and Indigenous places of outstanding heritage value to the nation.

Clause 4.7 of the Strategic Assessment Agreement states:

"Further to the strategic assessment of the Plan, this agreement acknowledges the outstanding natural, Indigenous and historic heritage values of the region. The parties agree to immediately commence a formal assessment of the National Heritage (and potentially international heritage) values in accordance with the requirements set out in the EPBC Act and as part of a strategic assessment of broader land use development within the Kimberley Region, as generally identified in Map 1. Regular progress reports will be provided to the parties. It is anticipated that this assessment will be completed within 2 years of signing this agreement."

The study area to which this assessment applies is shown in Figure 6 of this report and includes an area of the Kimberley coast and hinterland which is larger than the area considered during the identification of a potential LNG precinct. A formal assessment of the heritage values of the study area commenced in July 2008 and is expected to be completed in or about July 2010.

Any areas which are identified as supporting heritage values and are subsequently listed on the National Heritage list are protected under the EPBC Act as a matter of national environmental significance. This means that any development or activity that has, or is likely to have, a significant impact on the heritage values of a listed place requires assessment by the DEWHA and the approval of the Commonwealth Minister for the Environment. Listing would not necessarily exclude developments from occurring, but would require that they be developed and managed in a manner consistent with the protection of the values identified for the listed place.

A large number of submissions on the NDT report expressed the view that the evaluation of the national heritage values should have preceded the identification and assessment of the LNG precinct as the Kimberley region contains unique natural and cultural environments and is likely to support world heritage values. The EPA, however, recognises that the NDT's prime objective is to facilitate the identification and planning for an LNG processing precinct while the assessment of natural and heritage values of the Kimberley are progressed in parallel.

In addition to the joint assessment, the NDT's original terms of reference also included the development of an initiative for joint management of lands for biodiversity, nature based tourism and Indigenous cultural heritage protection across conservation and Indigenous controlled lands in the region. The EPA understands that the current State Government considers that the NDT should be confined to the consideration of a site for an LNG precinct, and that while this wider role is important and needs to be done properly, it is already catered for within government.

In this regard, the EPA is also mindful that the current State Government has recently made commitments in relation to the Kimberley region. The *Liberal Plan for Environmental Sustainability and Water Management* states *"A Liberal Government will commit up to $9m to develop an integrated Kimberley Science and Conservation Strategy to ensure the region's natural and cultural values are protected as the region fulfils its economic potential."*

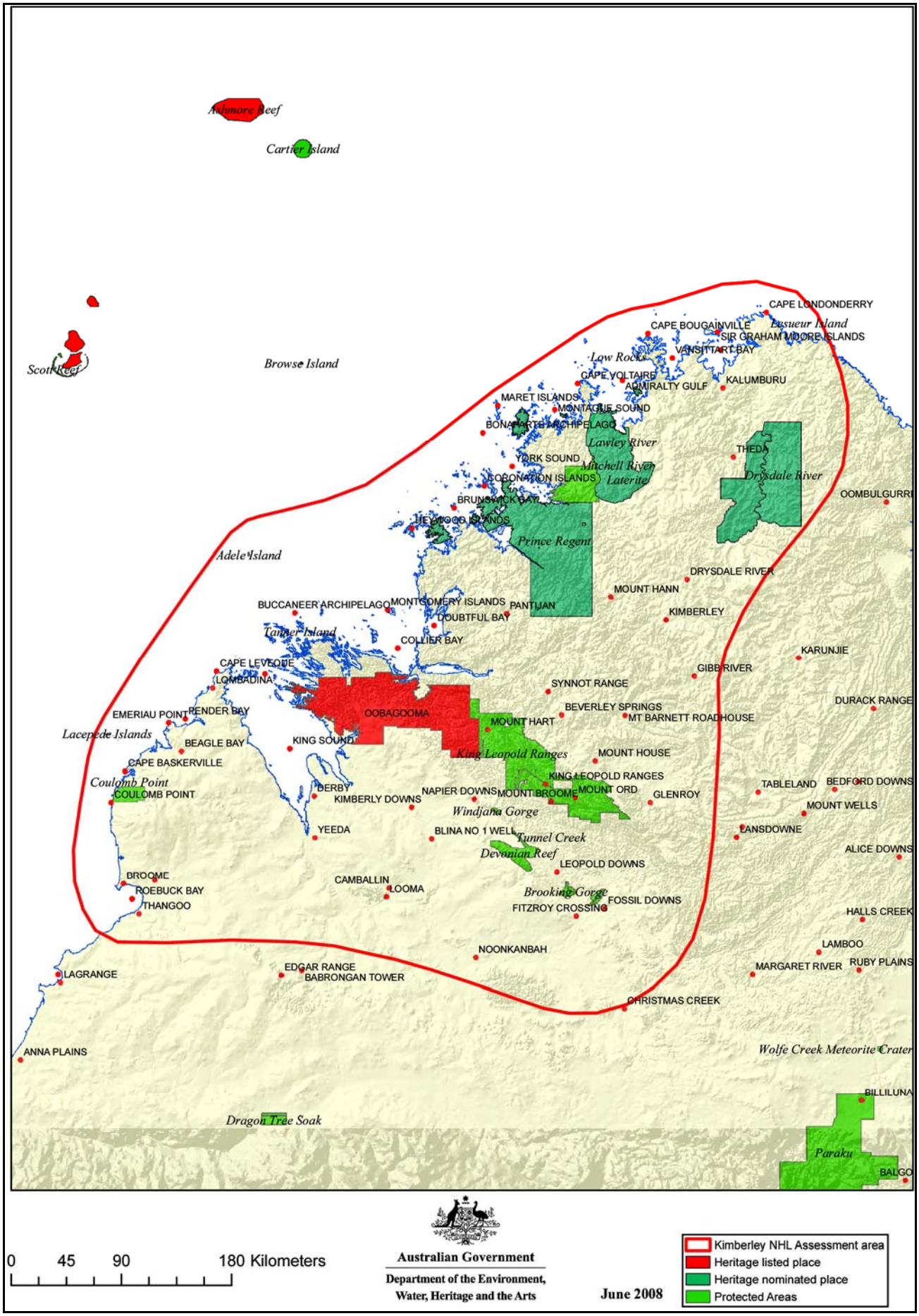

Figure 6: Study area considered for assessment of natural heritage values

While the strategy has yet to be developed and released, the EPA notes that the current State Government's commitment reflects its intent to have the unique values of the Kimberley region identified, recognised and protected by way of conservation and management plans. The EPA considers that the DEC is the government agency best placed to coordinate the development of this strategy.

EPA Advice

The EPA has considered the assessment of the potential national heritage values of the north-west Kimberley in the context of previous recommendations made by the EPA for the Kimberley region and the implementation status of those recommendations. In 1980, the EPA published a report on conservation through reserves in the Kimberley (DCE, 1980). The Kimberley System 7 area recommendations were accepted by the Government of the day as a guide for the establishment of conservation reserves in the Kimberley. The then Department of Conservation and Land Management published an update of the report in 1991 which included additional proposals for reserves (CALM, 1991). In addition, near-shore marine areas have also been recommended for reservation in the report entitled *A Representative Marine Reserve System for Western Australia* by the Marine Parks and Reserves Selection Working Group, referred to as the Wilson Report (CALM, 1994).

The EPA understands that of the 78 recommendations identified in the 1980 System 7 report, only 34 have been implemented to date. Most of the recommendations in the north-west Kimberley have not progressed due mainly to conflicts with potential mining and exploration interests and unresolved native title and joint management issues. As a result, the System 7 area has the lowest success in implementation of any of the 12 system regions in WA. No State marine reserves have yet been implemented in the Kimberley either. This is most disappointing, particularly in view of the outstanding natural heritage values of the Kimberley.

In addition, there are environmental threats, particularly in the form of frequent large-scale intense fires, the encroachment of feral cattle, potential threat of cane toads and inappropriately sited developments, which pose a significant risk to the largely intact nature of the environment in the north-west Kimberley.

In view of the low reserve implementation status and environmental threats facing the Kimberley, the EPA considers the protection of the north-west Kimberley as requiring urgent attention and strongly supports the commitment to assess the national heritage values there. While National Heritage listing does not necessarily lead to a reservation status or tenure, it would provide a new vision and policy for the region which is based on knowledge and formal recognition of the region's values and resources. State Government agencies involved in the assessment of natural heritage values should be resourced adequately to ensure best available knowledge and information is obtained and used in a transparent manner. The EPA strongly supports the evaluation of the national heritage values of the Kimberley region and considers that the assessment should remain a priority throughout the assessment process and closely follow the timelines of the strategic environmental assessment for the LNG precinct.

The EPA also strongly supports the concept of integrated joint-management of terrestrial and marine environments of the north-west Kimberley. The land tenure within the region is mainly comprised of unallocated Crown land, Aboriginal reserves and existing or proposed conservation reserves and therefore offers potential for

integrated joint management initiatives between Government and Traditional Owners. The EPA considers the concept offers great potential to not only benefit conservation of biodiversity and indigenous cultural heritage, but also to facilitate Aboriginal aspirations to manage land that is culturally important, with attendant employment and sustainable social and economic benefits.

The EPA considers that national heritage listing of appropriate areas together with integrated joint management of lands may provide an opportunity to address issues that have historically prevented reserve implementation in the Kimberley and provide an alternative approach to implementing the intent of the EPA's System 7 recommendations.

The EPA views the current initiative to progress:

- planning for the identification and assessment of an LNG precinct site;
- assessment of national heritage values in the north- west Kimberley; and
- development of an initiative for joint management for biodiversity and Indigenous cultural heritage protection across conservation and Indigenous controlled lands in the region,

as representing a significant and welcome approach to development and conservation in the Kimberley. These three initiatives should continue to be progressed in parallel as they are fundamental to achieving ecologically sustainable development and effective management of conservation and cultural values in the Kimberley. If implemented in a timely manner, the EPA considers that the outcome of the strategic assessment would produce long lasting benefits to the conservation and management of the Kimberley environment and the Indigenous communities in the region.

4.2 Advice to proponent of LNG precinct

Once a preferred site has been identified, the proponent of the LNG precinct will be required to commence a strategic environmental impact assessment of a defined proposal to determine the full extent of impacts from the precinct and evaluate the site's environmental capacity for future industrial development. Such assessment will need to evaluate the effectiveness of any management, mitigation and offset measures proposed by the proponent.

Regardless of which site is selected, the EPA has identified a number of matters for the proponent to consider and address during the statutory strategic environmental assessment process under the WA EP Act.

Further definition of LNG precinct plan

A number of public submissions have noted that 1000 ha for the precinct under-estimates the land area needed for 50-70 mtpa of LNG production and also raised the issue of the cumulative extent of the precinct's footprint if supporting infrastructure such as airstrips, workers accommodation, buffer zones and marine infrastructure are accounted for.

The NDT has advised in its response to submissions that, following the identification of a preferred site, the NDT will develop a comprehensive master plan for the LNG precinct which will include the identification of supporting infrastructure and their

area requirements. This will be provided in the proponent's strategic environmental assessment review documentation.

The EPA advises that, through the process of developing the master plan, the proponent should consider and set out layouts for the precinct and its maximum marine and terrestrial footprint. This should include all planned developments and supporting infrastructure to provide a well defined proposal to the EPA for environmental assessment.

The EPA is aware that the detailed design for the various maritime and terrestrial elements of a gas processing precinct will occur during the development of the proponent's master plan. When the proponent progressively refines facility design, the EPA recommends that a philosophy is adopted that seeks to minimise the overall environmental impacts through the life cycle of the project, from design to eventual decommissioning. Such an approach would, for example, balance the impact from additional dredging to reach a more sheltered inshore site against the impact of a more substantial breakwater located further seaward.

This type of approach would also seek to 'design out' potential environmental impacts. The EPA is aware that innovative new LNG loading arms are being developed to accommodate loading of tankers from floating LNG production facilities, without the need for calm sea state conditions normally afforded by a breakwater. If these loading arms could be incorporated into a land-linked loading facility, then the need for a large breakwater, with its associated adverse environmental impacts, could be eliminated or considerably reduced.

Consideration of future proposals

Once government has selected a preferred site, the EPA will undertake a formal, site specific environmental assessment of a strategic proposal under the *Environmental Protection Act 1986*. An outcome of the strategic environmental assessment would be to recommend conditions that should be applied to the construction of the precinct and specific future LNG proposals. When a future LNG proposal is brought forward, the EPA can declare it is a 'derived proposal' if:

- the proposal was identified in the strategic proposal;
- a decision has been made that the strategic proposal could be implemented;
- the environmental issues raised have been adequately addressed;
- new information does not justify reassessment; and
- no significant change has occurred in the environmental factors relevant to the proposal[1].

Derived proposals do not require further environmental assessment by the EPA[2].

The desired objective of such a strategic assessment is to identify all potential environmental impacts and management upfront, as early as possible, and thus avoid further assessment of future individual proposals by the EPA. To realise the benefits of undertaking a strategic assessment it will be important for the proponent of the

[1] Section 39B(4) of the EP Act explains the requirements relevant to derived proposals.

[2] Section 39B(6) of the EP Act provides that if a proposal is declared a derived proposal, it is not assessed by the EPA.

precinct to collaborate with industry proponents and stakeholders to comprehensively identify all potential environmental impacts and mitigation associated with the construction and operation of all common-user facilities in the precinct and future LNG proposals. This will need to occur throughout the strategic assessment process, and particularly during critical steps in the process such as the scoping of environmental studies/investigations and during the preparation of the environmental review documentation.

Greenhouse gases

Greenhouse gas emission is clearly an environmental factor that will require evaluation during the statutory SEA process by both the proponent of the precinct and industry proponents who wish to operate in the precinct.

For the development of Browse Basin gas, emissions of carbon dioxide are expected from the reservoir, transport of gas from the reservoir to the plant, plant processing and from combustion sources used to supply energy for gas processing. The EPA has previously encouraged all large emitters of greenhouse gas to consider abatement measures such as geo-sequestration of reservoir carbon dioxide, best practice minimisation of greenhouse gases generated during processing and greenhouse gas offsets throughout the life of the project.

As a minimum the EPA would expect investigations into suitable locations for the injection and long term geological storage of reservoir carbon dioxide. For the gas transport and gas processing stage, the EPA would expect that best practice technology is proposed to maximise energy efficiency and minimise emissions, and carbon offsets are investigated for any residual impacts. The Commonwealth Government has indicated it will introduce an emissions trading scheme (the 'Carbon Pollution Reduction Scheme' or CPRS) in 2010. In the lead up to the introduction of the CPRS, the role of the EPA in making recommendations in relation to greenhouse gases under the CPRS will be under consideration.

In terms of potential carbon offsets, the KLC has raised the concept of strategic fire management to reduce regional scale greenhouse gas emissions by referring to the West Arnhem Land Fire Abatement Project (WALFA). Under the project, Traditional Owners undertake strategic early season burning across country which reduces overall greenhouse gas emissions by preventing more intense late season wildfires. Apart from reducing greenhouse gas emissions, the EPA considers that this type of project, provided it is evidence based, could also contribute to greater protection of biodiversity, improved scientific understanding and the creation of Indigenous employment.

The KLC has advised that it is advancing the North Kimberley Fire Abatement Project and that the development of LNG processing facilities would provide an opportunity for the project to be developed further in the Kimberley. The EPA recommends that the proponent investigate innovative means of developing carbon offsets such as the WALFA project during the next stage of the SEA process and provide a process by which industry proponents can participate and make contributions.

Environmental Offsets
Although the full extent of the proposal's environmental impacts and its management have yet to be evaluated by the proponent, a large scale industrial proposal of this scale is likely to result in the unavoidable loss of some environmental values in a local and perhaps regional context.

The EPA expects that the proponent of the precinct will demonstrate in its SEA review documentation that it has adequately investigated alternative construction and development strategies and 'best practice' processes and operations to avoid and minimise impacts on environmental values. Where adverse residual impacts are identified during the course of the proponent's investigations, it is expected that the proponent would consider environmental offsets and be guided by the EPA's Guidance Statement No. 19 *Guidance for Environmental Offsets – Biodiversity*.

4.3 Other impacts of LNG precinct

Through the NDT working group process and the public submissions, the EPA has identified a number of considerations associated with the impacts of having an influx of people entering the region as a consequence of a potential LNG precinct. These impacts cannot wholly be addressed effectively through the environmental assessment process under the WA EP Act. The considerations also extend outside both the precinct locality and the jurisdiction of the proponent of the LNG precinct, and hence would require the participation and collaboration of various government agencies to properly address. These considerations include the impacts of an LNG precinct on the strategic planning and infrastructure of towns such as Broome, the management of people pressures and socio-economic impacts generally. These are highlighted below to ensure that they are brought to the attention of the appropriate government agencies for action.

Downstream infrastructure and planning needs
The development of an LNG processing precinct at any site would have flow-on environmental effects that extend outside the locality of the precinct. These flow-on effects would result from the need to construct transport and utility infrastructure such as roads, airfields and water supply, and accommodation and recreational facilities for temporary and permanent workers.

A common concern from representatives of the NDT community working group and public submissions was the effect this could have on the environment and regional centres such as Broome and Derby or surrounding areas. The community working group and submissions also highlighted that adequate resourcing of the region to cope with strategic planning initiatives, the influx of people and the expedient release of adequate land for affordable housing, were critical issues that require urgent attention.

The EPA considers that in planning for an LNG precinct, the proponent and other government agencies should examine every opportunity to minimise the need for constructing new service and transport infrastructure by utilising or enhancing existing facilities. This would have the effect of minimising the overall indirect environmental impacts of the precinct, which if left unmanaged could result in regional scale impacts.

The EPA makes the observation that the James Price Point area is the closest of the four short-listed sites to the town of Broome (between 40 to 60 km north of Broome

depending on site) and hence offers realistic opportunities to use existing facilities in Broome and minimise the need for the construction of new infrastructure. Due to its proximity, a permanent workforce servicing a James Price Point precinct may be able to reside and recreate in Broome and avoid the need for a permanent accommodation village with its supporting services and infrastructure to be established on the Dampier Peninsula. The length of sealed road required from Broome would be relatively small and the use of the existing international airport at Broome could further minimise the overall environmental pressures from the proposal.

In relation to the Broome airport, it is noted that a fundamental decision will need to be made in the short to medium term about whether to increase the capacity of the existing airport through improvements and upgrades or to facilitate the relocation of the airport and therefore free-up supply of residential land in Broome. Should there be a decision to relocate the airport to a site already investigated on Broome Road, the EPA notes that this proposal has received environmental approval under the *Environmental Protection Act 1986*.

It is noted from submissions that a large scale industrial site close to Broome would introduce impacts on the tourism industry in terms of short stay accommodation, air services, pressures on available workforce and also the Shire of Broome's capacity to provide services to the community. The EPA acknowledges these concerns but notes the Shire of Broome's submission that while there are challenges with locating a gas processing precinct at James Price Point there are also opportunities in terms of addressing the significant service and infrastructure gaps with the assistance of the State Government and industry proponents.

In response to the issues raised during the community engagement process, the NDT has identified the need for further social impact studies and planning frameworks to be developed in relation to social and community impacts and has established a Regional Impacts Group to evaluate suitable management responses. The EPA recommends that this Group is best placed to consider the above matters.

Notwithstanding the selection of a site near Broome, if the precinct is located on the Dampier Peninsula, the impacts on cultural, environmental and nature-based recreation and tourism resources would require careful planning, to ensure infrastructure utilities, corridors and demands for additional lands for residential developments are located and managed so that impacts to the environmental and social values are properly dealt with. Similar issues will require attention if Gourdon Bay is selected as the preferred site.

The EPA understands that there is currently a lack of an adequate planning framework for the Dampier Peninsula, which has resulted in incompatible land uses being co-located, uncontrolled access to land of cultural importance to Aboriginal people, inappropriate development setbacks and consequent impacts on the environment.

Population Pressure

Another key issue raised through the submissions is the potential impact from an influx of people and their activities outside the precinct on the environmental and cultural attributes of the Kimberley region, regardless of which site is selected. The cumulative impacts of existing pressures from residents and tourists near Broome,

combined with a new industrial workforce, would raise different impacts for sites on the Dampier Peninsula and Gourdon Bay to those arising at Anjo Peninsula.

The EPA understands that there would be between 3000-4000 employees required to construct the precinct and facilities, over a 3-4 year period. Once constructed a permanent workforce of between 400-600 people would be required for on-going operations plus additional employees in service industries. In addition to the effects of the precinct, there is evidence of an increasing desire for people, not only from WA, but nationally and internationally, to visit the Kimberley and enjoy its unique wildness and other values. One estimate is that visitation is likely to double in the next decade.

From a marine environment point of view, increased boating and fishing would introduce additional pressure on marine resources and management requirements. The Marine Parks and Reserves Authority (MPRA), in its submission indicated that " .. *the impact on the marine environment both during construction and from the permanent workforce is likely to be considerable."* The Department of Fisheries (DoF) also advised that it will require increased resources to manage and maintain a compliance presence for increased recreational fishing pressures that would result from development in the region.

From a terrestrial perspective, there would be increasing numbers of people attracted to the coastal areas for recreational activities such as camping and fishing, which if left unmanaged, could result in localised detrimental impacts in the coastal zones. Additionally, new roads to the precinct could provide additional access and further pressures on certain areas. The EPA notes that the coastal zone on the Dampier Peninsular and south of Broome is already under pressure from tourism, uncontrolled access, informal camping and fishing.

A different set of pressures would arise at Anjo Peninsula. Increased access would likely increase recreation pressure in an area which is currently far removed from any significant management presence.

EPA advice

The EPA advises that, without adequate management, a rapidly expanding workforce associated with the precinct and the demands and pressures it places on the environment through recreational activities has the potential to spill over into impacts on the environmental values of the coastal areas surrounding Broome, and the Kimberley region generally. This will be in addition to the impacts of an already increasing number of visitors to Broome and the region.

The issue identified above is management-dependent and extends outside the sole jurisdiction of the proponent or operators in the LNG precinct and will require the collaboration of State government agencies and local government authorities. Some of these pressures, such as increasing fishing effort and coastal access, require the active management of people's activities and would be unlikely to be achieved without the planning and regulatory support of adequately resourced government agencies and local authorities. The EPA has highlighted this issue for government's consideration.

The EPA considers that timely and effective management strategies are required to ensure that the environmental and cultural values that attract increasing numbers of people to the Kimberley coast, particularly to areas surrounding Broome, are

protected and provide for the long-term sustainability of the coastal environment. In the case of Government deciding not to proceed with a site on the Dampier Peninsula, the EPA advises there would still be value in undertaking a planning study of the Peninsula, because of the already increasing pressure on this area. The study should note the environmental and social values of the area with a view to developing a management strategy for the coastal region.

Socio-economic impacts

The NDT community working group and public comment submissions have raised other socio-economic issues more generally, including the view that a comprehensive social impact assessment should have been conducted before a preferred site is identified. Comments focused on potential impacts on a range of services, including health, education, accommodations, recreation, retail and competition for labour. This is particularly relevant for the town of Broome as it would experience significant impacts from all short-listed sites except for perhaps Anjo Peninsula. It is noted in some submissions that these issues may not have been adequately covered by the site evaluation process due to the difficulty in assigning values and criteria to such complex issues and the lack of available data for all sites.

In its response to the public submissions, the NDT has confirmed that once a preferred site has been identified, the NDT will conduct a comprehensive social impact assessment to predict the potential social impacts and provide a process to mitigate, monitor and manage the predicted impacts. A Regional Impacts Group, chaired by the DPI, has been established by the NDT to manage the process and project outputs.

While the consideration of the above issues is not an environmental matter as such, the EPA is aware that there are very important social, cultural and economic issues around industrial development in the Kimberley and the influx of people it will bring to the region. The EPA supports the NDT's initiative to conduct a social impact assessment given that there will be a wide array of social opportunities and challenges presented by development at the scale proposed in this area which could have spill-over impacts on the environment. It will be important to ensure that the information to be generated from such a study is effectively and transparently communicated to the community and the relevant agencies so that they are able to plan for the anticipated impacts and prioritise actions accordingly. It will also be important to ensure DPI, local government authorities and supporting agencies are well resourced to deal with the analysis and resolution of these matters.

4.4 Alternative precinct locations outside the Kimberley region

Many submissions on the NDT reports recommended that a decision on a preferred LNG precinct site should not occur until an analysis of alternative locations outside the Kimberley region is completed to enable a broader comparison of options. In many cases, submitters were not against the concept of an LNG processing precinct, but more concerned with its proposed location on the Kimberley coast. The primary alternative site raised was the Burrup Peninsula, with suggestions also made in relation to other regional centres such as Port Hedland or Darwin.

The commitment to consider alternative locations was foreshadowed in the Strategic Assessment Agreement which states: *"The process for selection of the Precinct will consider feasible alternatives to locations of the Precinct outside the Kimberley Region."* (see clause 4.6). This has created an expectation from stakeholders and

submitters that an evaluation will be undertaken and information will be available at some stage of the site evaluation process.

The NDT has forwarded to the EPA a report by Worley Parsons titled *Browse Onshore LNG Precinct Siting Study* which contains very preliminary information concerning alternative non-Kimberley sites. In addition, the NDT Report Part B has referred to a preliminary assessment of coastal locations between the Kimberley and the Burrup Peninsula and concluded that the only technically viable options in the Pilbara include piping the gas to the Burrup either offshore from the gas fields or onshore from the Dampier Peninsula. Industry proponents have advised that they have no interest in the development of greenfield sites in the Pilbara north of the Burrup.

The NDT has advised in its response to submissions that a final comparative analysis with other locations outside the Kimberley will be undertaken once a preferred site in the Kimberley is determined. This analysis will be undertaken during the next phase of the strategic environmental assessment process and will be presented in the proponent's strategic assessment report, which is due for release in the middle of 2009. It is understood that the Commonwealth DEWHA has commissioned a comparative analysis of feasible alternatives as part of its advice on the site selection process.

While the submissions on the matter of alternative locations outside the Kimberley are noted, the EPA's strategic advice at this point is focused on the NDT's site-selection process and manner in which it has identified the short-listed sites in the Kimberley.

The EPA notes that the option to pipe and process Browse Basin gas on to the Burrup Peninsula is not necessarily environment-neutral as further industrial projects on the Burrup are likely to increase cumulative impacts on air quality, rock art and other aspects of the terrestrial and marine environment there. Ultimately a decision to utilise the Burrup will be driven by a company's evaluation of the economic and technical viability of such a concept compared with a Kimberley shore based option. Should there be a decision by any company to pipe and process Browse gas on to the Burrup, this would be viewed by the EPA as a significant proposal that would require detailed consideration and extensive evaluation of its environmental impacts and management under the WA EP Act.

5. Summary of EPA conclusions and advice

The EPA submits the following conclusions and advice:

1. The EPA strongly supports the concept of undertaking a strategic review of potential LNG processing sites in the Kimberley.

2. The EPA strongly supports focusing development at a single site so that environmental impacts can be contained and operational efficiencies maximised in ways that will minimise environmental impacts.

3. The EPA considers that the NDT site evaluation review was a rigorous, inclusive and public process that resulted in the clear identification of high level environmental risks and values based on the data, resources and time available.

The outputs from the NDT's review have enabled the EPA to consider the short-listed sites and provide early guidance on the environmental impacts that would require attention during the next stage of the strategic assessment.

4 The EPA provides the following advice about the four short-listed sites for a gas processing precinct in the Kimberley.

- **Based on the available data, the EPA considers that Gourdon Bay is the least environmentally constrained of all four short-listed sites for a gas processing precinct.**
- **Based on the available data, the EPA considers that the James Price Point area is the least environmentally constrained of the two short-listed sites on the Dampier Peninsula for a gas processing precinct.**
- **The EPA has concluded that North Head is not suitable for large scale industrial development from an environmental point of view.**
- **The EPA has concluded that Anjo Peninsula is not suitable for large scale industrial development for both environmental and wildness values reasons.**

5. Once government has selected a preferred site, the EPA will undertake a formal, site specific environmental assessment of a strategic proposal under the *Environmental Protection Act 1986* in a timely manner. An outcome of the strategic assessment would be to recommend conditions that should be applied to specific future LNG proposals. When a future LNG proposal is brought forward, the EPA can declare it is a 'derived proposal' if:

- the proposal was identified in the strategic proposal;
- a decision has been made that the strategic proposal could be implemented;
- the environmental issues raised have been adequately addressed;
- new information does not justify reassessment; and
- no significant change has occurred in the environmental factors relevant to the proposal.

Derived proposals do not require further environmental assessment by the EPA.

6. While the submissions on the matter of alternative sites outside the Kimberley are noted, the EPA's strategic advice at this point is focused on the NDT's site-selection process and manner in which it has identified the short-listed sites in the Kimberley.

7. The EPA also strongly supports evaluation of the national heritage values of the Kimberley with a view to conserving and protecting significant, representative marine and terrestrial areas and determining opportunities for joint management between Government and traditional owners. It is important that this is done in parallel with the LNG precinct assessment process.

8. The EPA has identified a number of important issues that have been raised through the site evaluation process and the public submissions period which the EPA cannot address effectively. Important issues in relation to the downstream planning and infrastructure needs of the precinct, pressures on the coastal environment from an influx of people and socio-economic impacts will require attention by other arms of government. These issues are described in Section 4.3 of this report.

Appendix 1

References

Agreement relating to the assessment of the impacts of actions under the Plan for the Browse Basin Common User Liquefied Natural Gas Hub Precinct and associated activities, between the Minister for the Environment, Heritage and the Arts on behalf of the Australian Government and the Western Australian Minister for State Development and the Western Australian Minister for the Environment and Climate Change on behalf of the Western Australian Government, date 6 February 2008.

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