NOTICE OF INTENT

PROPOSED LNG PLANT AND

SUBSEA GAS PIPELINE

1.0 INTRODUCTION

Phillips Petroleum Company through a subsidiary company is operator of, and holds exploration and productions rights to ZOCA Block 91-13. Phillips and partners drilled a gas and gas condensate discovery during 1995 (Bayu). Subsequent appraisal drilling has resulted in the confirmation of a gas and gas condensate field known as Bayu-Undan. Phillips proposes to utilise the gas development of Bayu-Undan as feedstock for a liquified natural gas (LNG) plant to be built in the vicinity of Darwin in the Northern Territory. This project will also include the construction of an approximately 470km subsea pipeline from Bayu-Undan field to the LNG Plant.

1.1 BACKGROUND

Phillips Petroleum Company has over 27 years operating experience with LNG. Phillips was the first company to market LNG to Japan with the startup of it's Kenai Alaska Plant in 1969. Since that time, Phillips has completed over 27 years of safe and reliable operations in the pristine environment of Cook Inlet and the Aleutian Mountain Range. A setting abundant with wildlife such as moose, brown bear, caribou and bald eagles. Where white Beluga whales enter Cook Inlet to feed in the summer and an area active in commercial as well as recreational fishing. Phillips is committed to conducting safe and environmentally responsible projects/operations. Phillips is aware of the potential impacts of our project and is committed to address each of them as the project proceeds. This proposed development is consistent with the projected land use application for the proposed plant site and is consistent with the Industrial-Trade Development Strategy of the Northern Territory.

For the purposes of this NOI, the project comprises the construction of a subsea gas pipeline which will commence at the central production platform in the Bayu-Undan Field (approximate location longitude 126° 40" 40" E, latitude 11° 04' 26" S) and will head in a south east direction to Darwin, terminating at the lease boundary of the proposed onshore LNG plant (Figure 1). Two routes are currently being evaluated as described in Section 2.1 below. This project will utilise gas supplied from the Bayu-Undan Field located within ZOCA and outside Australian territorial waters. As such, the offshore components associated with the ZOCA development are not addressed in this NOI.

The proposed site of the LNG plant is Wickham Point on Middle Arm Peninsula in Darwin Harbour (Figure 2). Wickham Point is located in Section 1812 Hundred of Ayers. The site is currently undeveloped Vacant Crown Land, zoned "Future Use" in the Litchfield Area Plan 1992.

1.2 NAME AND CONTACT DETAILS OF PROPONENT

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2.0 PROJECT DESCRIPTION

The proposed Project will comprise a subsea pipeline, LNG plant and associated infrastructure at Wickham Point, including a 2km long jetty for loading LNG, liquified petroleum gas (LPG) and natural gas liquids (NGL's), and an access road from Channel Island Road to the LNG plant site.

2.1 SUBSEA GAS PIPELINE

The gas pipeline will be approximately 470 km in length, depending on selection of the preferred route. Options currently under consideration, include a direct approach to Darwin Harbour and a route to the south entering Northern Territory land at Fog Bay and travelling overland to Middle Arm (Figure 1).

2.2 LNG PLANT

A three million tons per annum (MTPA) LNG plant is proposed to be constructed at Wickham Point. A feasibility study is currently in progress to determine the most optimum feed composition for the plant. The options range from dehydrated full wellstream, to a lean gas with LPG being removed offshore. However, conceptual studies to date have shown the most likely feed would be a rich gas with the LPG's containing some C5+ condensate being removed on shore.

Process Description

The feed gas from the LNG plant battery limits will be initially processed through a vapour-liquid separation system to provide gas with a minimal amount of water and liquid hydrocarbons. The liquid hydrocarbons will be further processed to produce propane, butane and stabilised condensate that is stored within the LNG plant battery limits for sale and export.

The gas will be processed in a Methyldiethanolamine (MDEA) gas treating system to remove carbon dioxide, hydrogen sulphide, mercaptans, aromatics and other sulphur components contained in the gas. The gas will be chilled and dried in a three-bed molecular sieve system to remove the final traces of water. The dry gas is further processed through activated carbon bed system to remove any mercury. The dry, mercury-free gas is subsequently fed to the refrigeration system where it is

liquefied as the LNG product. The refrigeration or liquefaction system utilises the Phillips Optimised Cascade LNG Process, a process with over 27 years of proven safe and reliable operation.

There are three refrigeration services - propane, ethylene and methane - which are optimally cascaded to provide maximum LNG production utilising the maximum available power of the gas turbine drivers. Each of the three refrigeration systems uses two 50 percent capacity refrigerant turbine/ compressor sets with common condensers, chillers and accumulators. Each of the compressors is driven by a gas turbine.

Onshore LNG storage will be in two storage tanks of 95,000 m^3 capacity each. The storage system will include product pumps for ship loading and a boil off compressor for handling the flashing gas and heat leak.

Additional Utilities and Support Facilities will include:

- LNG storage and boil off compressor;
- Recovery, storage and loading of LPG;
- Flares;
- Refrigerant Storage ;
- Miscellaneous Storage (diesel fuel, lube oil etc);
- Fuel Gas System;
- LNG Loading;
- Effluent Treatment;
- Power Generation/Distribution - all electric power will be generated on site with no purchased power required;
- Fire Protection Systems;
- Compressed Air;
- Water Systems - it is proposed that water requirements will be supplied by PAWA. As an alternative, water can be supplied by Seawater Desalination units;
- Nitrogen Systems ; and
- Buildings (including MCC - Motor Control Centre, analyser shelter, maintenance buildings, offices and staff amenities building).

Construction activities will include:

- Site clearance and levelling;
- Construction of access road;
- Piling and construction of the jetty;
- Dredging and disposal of spoil; and
- Minor land reclamation.

Product Specifications

The LNG product will be composed of:

HHV	1050-1150 Btu/scf
C4 Content	2.00% max
C5+ Heavier	0.10% max
CO2 Content	100 ppmv max
H2S Content	0.25 grain/100scf max
Total Sulphur Content	1.30 grain/100scf max
Heavies	4 ppm mole max

LPG Products

The objective is to recover LPG's in salable products (ie, fractionated into propane and butanes and condensate). This will be developed further during the Feasibility Study.

Propane Products

Composition	Propane HD-5 (>90% Liquid Volume Basis)
Butane and Heavier	2.50 vol % maximum
Vapour Pressure	208 psig @ 100°F (max) (4.8 barg @ 37°C)
Corrosion	# copper strip
Total Sulphur	185 ppmw
Moisture Content	Pass

Butane Product

Composition	Predominately butanes
Pentane and Heavier	2.00 vol % maximum
Vapour Pressure	70 psig @ 100°F (max) (4.8 barg @ 37°C)
Corrosion	# copper strip
Total Sulphur	140 ppmw
Moisture Content	No free water

Stabilised Condensate

Reid Vapour Pressure	12 PSI @ 100°F (37°C)
BS & W	1.00% maximum
Temperature	120°F (49°C) maximum
H_2S	10 ppmw maximum

3.0 EXISTING ENVIRONMENT

3.1 PHYSICAL ENVIRONMENT

3.1.1 Climate

Wickham Point is located within the monsoonal tropics. Rainfall is approximately 1660 mm, most of which falls in the November to March wet season. Humidity over this period averages 70-80%, while in the dry season humidity averages 40% and there is virtually no rainfall. Maximum temperatures are hot all year with November being the hottest month with an average of 33 °C. The monthly minimum average temperature is 19°C in July. Prevailing winds in the wet season are light west to north-westerly, freshening in the afternoon due to sea breezes. In the dry season the prevailing winds are south-easterly trade winds (Parkinson, 1986).

3.1.2 Land Systems

The Wickham Point area encompassing the site for the proposed LNG plant comprises two land systems:

- Keefer's Hut land system; and
- Littoral land system (Wood *et al.* 1985).

The Keefer's Hut land system consists of gentle gravelly slopes with relief up to 30m. There may be scattered laterite outcrops and drainage is usually rapid. Soils of this land system may be shallow gravelly massive earths, gravelly red massive earths or moderate deep lithosols. (Wood et al. 1985).

The Littoral land system which borders the Point includes the mangrove fringe of the coast and rivers. The mangrove fringe is up to 600m wide with slopes up to 0.9%. The area is flooded daily by high tides. The soils of the Littoral land system are saline muds which can be interspersed by laterite outcrop (Dames & Moore 1990).

3.1.3 Physical Characteristics of Darwin Harbour

Darwin Harbour is a large ria system of about 1,000 km^2 formed by post-glacial marine flooding of a dissected plateau. It has three major sections known as East, Middle and West Arm respectively, plus a fourth small inlet (Woods Inlet). The harbour is relatively shallow, although deep channels (to 18m depth) do occur in places. Most of the harbour area is less than 10m deep and much of it is intertidal.

Tides in Darwin Harbour are semi-diurnal with a maximum range of 8m. Water clarity in Darwin Harbour varies significantly on both a tidal and seasonal basin. Spring tides create fast currents which mobilise shallow sediments and increase water turbidity. Water clarity is best during neap tides in the dry season. The wet season results in substantial input of turbid freshwater into the

harbour. Negligible freshwater inflow occurs in the dry season.

The sediments of Darwin Harbour include:

- calcareous sand and gravel occur in the harbour mouth and locally near Channel Island;
- Terrigenous gravels occur in the bed of the deeper channels;
- Muds (silt and clay) and fine sands characterise the shallow subtidal and intertidal environment; and
- Terrigenous sands containing 10-50% carbonate occur as beach deposits.

A number of rocky reefs and coastal rock platforms also occur within the harbour and near its mouth. Intertidal rock is generally a beach rock comprised of conglomerate of quartz sand and calcareous gravel.

The major substrates/habitats of the harbour include:

- intertidal beaches;
- intertidal mud and sand flats;
- intertidal rock platforms and reefs;
- subtidal sand and mud;
- subtidal gravel beds; and
- subtidal rock.

3.2 BIOLOGICAL ENVIRONMENT

3.2.1 Terrestrial Flora and Fauna

Keefer's Hut and the Littoral land system support a number of discrete vegetation units, delineated by topographic elevation, the extent of tidal inundation, and soil salinity. Vegetation units represented include: coastal monsoon vine-thicket characterised by an abundance of vines and a diversity of plant species; melaleuca woodlands; scattered mixed shrub land/woodland occurring on skeletal soils; salt flats largely devoid of vegetation due to hypersaline nature of soils; and extensive mangals characterised by well-developed zonation and high density occurring at the littoral fringe and extending up to 600 m inshore.

A small hill, Peak Hill, 30m high on the southern end of Wickham Point island supports monsoon vine thicket which is of conservation interest as monsoonal vine thickets are relatively rare compared to other vegetation types in the Top End. The thicket is recorded in the Department of Lands, Planning and Environment's Coastal Resources Atlas.

There has been no detailed terrestrial fauna survey of the area; however, it is expected that wildlife on the island would be typical of that found in mangrove and coastal areas of the Top End.

3.2.2 Marine Biological Environment

Mangroves: The most conspicuous biotic assemblage of the harbour is the large mangrove forest which fringes most of the mid to upper intertidal parts of the harbour. This mangrove forest is recognised as one of the largest repositories of such species in Australia and as such is considered of national conservation significance. Approximately 25,000 ha of mangrove forest occur in the harbour. A wide diversity and high abundance of invertebrate, and vertebrate species inhabit the forest.

The mangrove within the proposal area are part of a reasonably extensive area of 'excellent' bird habitat (Coastal Resources Atlas) which adjoins 'good' bird habitat around Middle Point from Creek A to Jones Creek (McKean and Martin 1986). The mangrove communities of the proposal site were considered diverse and above average, supporting most common bird species as well as supposed 'rarities'. One of the rocky islands near Oyster Rocks (to the south of the proposal site) in Middle Arm has a small breeding colony of Pied Cormorants *(Phalacrocorax varius)* one of only four known breeding colonies in the Northern Territory. The sparsely distributed Great-billed Heron (*Ardea sumatrana*) breeds in mangroves along Middle Arm. Middle Arm is one of the few accessible places in the Top End where the white-breasted whistler (*Pachycephala lanioides*) is known to occur. The Great-billed Heron, White-breasted whistler and Mangrove Golden Whistler (*Pachycephala melanura*) are all mangrove specialists confined to the northern Australian coastline, but occurring in disjunct populations of apparently low densities.

Darwin Harbour Waters: Waters of the harbour support a high abundance and wide diversity of both resident and (at times) pelagic fish species. Dolphins are commonly observed within the harbour and crocodiles occur infrequently, as do dugong. Turtles tend to occur on the beaches outside the harbour or near the harbour mouth, but rarely occur within the harbour.

The Darwin Harbour area is a known habitat for dugongs which feed on seagrass and frequent shallow bays and channels that are protected from strong winds and heavy seas (Bayliss 1986). An aerial survey in 1983 detected dugong in low to moderately high concentrations of 0.01 - 0.1 animals per square kilometre in all waters of East and Middle Arms, excluding minor creeks (Coastal Resources Atlas). Dugongs are listed as endangered in the IUCN Red Data Book but they are not included on the CONCOM List of Endangered Vertebrates of Australia and its Island Territories.

Reefs: A number of intertidal and subtidal rocky reefs occur in the harbour. The intertidal rock platforms tend to support encrusting or cryptic fauna such as oysters/bunades and crabs, and in some cases, substantial quantities of brown algae (Weed Reef).

Subtidal rocky reefs support a diverse coral, sponge community plus associated reef fish, crustaceans and polycheaetes among other invertebrates.

Channel Island coral reef is within the area of impact of the construction and operation of the LNG Plant. This unique reef, along the north east of the Island is a specialised coral community supporting a wide spectrum of fish and invertebrate life. It is considered of high conservation

priority due to its vulnerability, proximity to Darwin and projected future use for recreation (Coastal Resource Atlas).

Mudflats: Low spring tides reveal substantial expanses of mud and sand flats which support a burrowing benthos of worms, and shellfish, and at times, seasonal feeding grounds for flocks of wading birds. During rising and high tides, these areas provide feeding grounds for fish and (in places) for the rare and protected dugong which graze on seagrass beds.

Subtidal channels: The benthic fauna of the subtidal channels is less well known, but generally comprises a benthic infauna of worms, crabs and shellfish. The gravel beds in the base of the deeper channels are believed to be relatively barren of macro-benthos.

3.3 SOCIOECONOMIC ENVIRONMENT

3.3.1 Current and Proposed Land Use

The Wickham Point Area is currently zoned for "Future Use", in accordance with the Litchfield Area Plan 1992. Development of an LNG plant in the area will therefore require Ministerial Consent. However, it is noted that industrial development such as the LNG plant conforms with accepted landuses in the earlier Darwin Regional Structure Plan 1990.

There are various aquaculture developments planned and in operation on Middle Arm Peninsular. A pearl culture farm is located in Creek B off East Arm.

The waterways adjacent to Middle Arm Peninsular are a major recreation resource for fishing and boating. Direct access to East and Middle Arms is afforded by the public concrete boat ramps at Elizabeth River, Quarantine Station and Channel Island, and to Middle Arm from the informal boat launching areas at Oyster Point, Haycock Reach and Blackmore River. The Channel Island coral reef is a specialised community with a low level of current usage by scientists, naturalists and scuba divers. Fish and shell collectors have caused some damage to the reef since access via the Channel Island access road improved (Coastal Resources Atlas). The water off Channel Island, in particular Town Hall Hole, are good fishing areas with medium usage at present (Coastal Resources Atlas).

There are several extractive industries operating or proposed in the general area. Some areas were cleared for borrow areas for the construction of the Channel Island access road and transmission tower pads. Clearing has also occurred for the Amadeus Basin to Channel Island natural gas pipeline and power lines from Channel Island to Darwin and Palmerston. Fires are common throughout the area in the dry season.

3.3.2 Current and Proposed Services

At present road access is restricted to a few dirt tracks to the north and south of the main bitumen Channel Island road. There is currently no road access to Wickham Point. The natural gas pipeline and electricity power lines to Channel Island run generally parallel to the main access road.

3.3.3 Significant Sites

Environmental assessment investigations will involve seeking an Authority Certificate from the Aboriginal Areas Protection Authority. It is known that there are culturally significant sites in the general area. In a recent archaeological survey of the coastline of the Middle Arm peninsula, Burns (1994) recorded a total of eleven prehistoric archaeological sites. These included six stratified shell mounds, one of which was associated with a stone artefact scatter and five relatively shallow (<30cm deep) shell middens, one of which was associated with rock engravings. Two of the middens had previously been listed on the Northern Territory Museum archaeological sites register.

All of the shell middens and mounds identified by Burns (1994, 1996) were composed predominantly of the bivalve *Anadara granosa*, specimens of other taxa such as the gastropods *Chicoreus capucinus*, *Nerita sp.*, *Telescopium telescopium*, *Terebralis semistriata* and *Volema cohlidium* occurred in small numbers. These shells derived from either mangrove habitats, or in the case of *Anadara* and *Nerita*, in the sandy/mud substrates of the intertidal zone (Broom 1985). Further archaeological studies are proposed.

Other heritage sites include two World War II facilities, a searchlight battery and a commando training area are located on Wickham Point and several historical ship wrecks are located in the Harbour waters to the north of the Point (Coastal Resources Atlas).

3.3.4 Recreational Use

Darwin Harbour is the major recreation area for residents of Darwin. The city is located on the north east shore of the harbour. The main recreational activities include:

- line and lure fishing from boats;
- scuba diving (mainly during neap tides in the dry season);
- mud-crabbing and prawning on the mud flats;
- sailing and sail boarding;
- charter sightseeing tours; and
- water and jet skiing.

Much of the fishing and diving activity takes place either on coral reefs or artificial reefs within the harbour.

Coral reefs occur on the subtidal portion of rocky shores and are comprised of mainly encrusting turbid water tolerant species. The main diving locations are at channel Island in Middle Arm, and at Weed Reef and Talc Head near the western mouth of the harbour.

Artificial reefs occur throughout the harbour and comprise both the wreckage of ships and aircraft sunk during WWII, and accumulations of unwanted structures which have been specifically established to attract demersal fish.

Darwin is recognised as the city with the greatest proportion of recreational fishermen in Australia, and one which supports a significant industry for fishing tour operators.

3.3.5 Commercial Use

Darwin harbour is closed to commercial trawling and fishing and hence does not support any boat based fisheries. However the harbour supports an important pearl culture industry and some fish and prawn breeding and farming ponds. These activities mainly occur in East and Middle Arm of the harbour.

A number of sight seeing and fishing charter tours operate on the harbour and cater to the growing tourism market.

The harbour is an excellent safe haven for shipping and a number of port facilities are located on its eastern side. The Port of Darwin is currently situated on Fort and Stokes Hills adjacent to the city and comprises three jetties for the handling of general cargo and oil. A new container terminal is currently under construction at East Arm Port. This is a large land reclamation project combined with substantial dredging of a navigation channel and turning basin.

A Naval Patrol boat base is situated at Elliot Point and a general purpose fishing boat harbour is situated on the Frances Bay side of Darwin.

4.0 ENVIRONMENTAL IMPACTS

Construction and operation of the proposed LNG plant on Wickham Point will offer positive socioeconomic benefits and opportunities for regional businesses, the workforce, and general population. As with any industrial development, potential impacts to the surrounding environment must be identified, considered and reasonably eliminated or minimised during the design and construction of the plant. Twenty seven plus years of operating experience of similar facilities by the proponent will also reduce the likelihood of many of the impacts outlined below.

4.1 SOIL AND LAND IMPACTS

Development of the Wickham Point site has the potential for soil erosion and other physical land impacts, which might include erosion of freshly disturbed surfaces, increased siltation and sediment deposition in the nearshore waters, increased turbidity in nearshore waters and siltation in mangroves

adjacent to the proposed access road from Channel Island Road.

Any potential impacts identified during design will be eliminated or minimised through the design of site water control systems for implementation during the construction period. Management practices that may be used include appropriate soil conservation measures such as the use of hay bales and other temporary barriers to reduce water flow during storms, installation of sedimentation basins where necessary, and rehabilitation of areas not required for ongoing use and construction before the onset of the wet season.

4.2 FLORA AND FAUNA IMPACTS

The proposed LNG plant development has the potential to impact terrestrial flora and fauna through such activities as the removal of woodland vegetation and monsoonal vine thicket, disturbance of native wildlife habitat, disturbance of mangroves to enable construction of the tanker access/loading jetty, removal of a 12km corridor of mangrove and terrestrial vegetation to allow for construction of the proposed access road from Channel Island Road, and potential introduction of feral animals, pests and weeds.

Potential impacts will be minimised through the strict enforcement of environmental management guidelines which will be developed during environmental planning and management of the project. Measures will include limiting vegetation clearance to a minimum, revegetation of areas no longer required for construction or operation activities, ensuring that equipment used on site is clean and free of seeds and other plant material, and prohibiting the introduction of pets and plants to the site.

4.3 WATER IMPACTS

Development of the site could potentially have and impact to surface hydrology. However, given the operations of the proposed plant whose primary products are LNG and LPG's, these impacts should be minimal. Areas of potential concern include contamination of creeks, estuaries and harbour by nutrients, heavy metals, BOD and hydrocarbons, contamination of groundwater, spills, and an increase in the volume and channelling of run-off as a result of the proposed plant construction

The risk of contamination arising from accidental spillage or release of chemicals or plant effluent are greatly reduced since the proposed design of the plant does not include any cooling towers or boilers. As such, the amount of chemicals needed for operations related to water treatment is limited to sanitary sewerage and limited process water. Handling of chemicals and effluent treatment will be addressed during preparation of environmental management plans. Surface drainage will be restored in areas surrounding the plant and will be evaluated during design.

4.4 AIR QUALITY AND NOISE IMPACTS

Construction activiites at the site has the potential to generate dust and noise, as well as emissions from vehicles. However, these sources will not cause a permanent decrease in air quality. The

proposed site is remote from residential areas and neighbouring landholders. Dust suppression will be addressed in the design phase and could include water spraying and the imposition of a speed limit.

During operations of the plant, there is the potential for small amounts of natural gas leakage during loading and maintenance operations. This risk will be examined in detail and quantified in the risk analysis (Safety Case) and in developing environmental management plans. Other emissions associated with normal operations of product treatment and gas fired equipment, including emergency flares and CO_2 emissions, will be quantified and evaluated during the design phase of the project. Noise impact is expected to be minimal during operations, but will be addressed during design.

4.5 MARINE ENVIRONMENT IMPACTS

Development and operation of the proposed plant and pipeline installation could potentially impact the marine environment surrounding the proposed plant site. Examples of potential impact could include introduction of foreign pest organisms to the pearl industry from ballast water discharges, metal contamination of sediments and shellfish, and disturbance of sensitive habitats, mangrove forest, grass beds, recreational fishing and WWII heritage sites.

Any potential impacts identified will be eliminated or minimised through the use of good environmental management practices, including proper handling of ballast water, plant effluent and dredging and spoil use.

4.6 VISUAL AMENITY

Evidence of construction of the plant and infrastructure may be visible from the harbour and parts of the city, primarily during earthmoving operations on windy dry season days. However, as noted above, dust suppression measures will be applied as necessary to reduce the incidence of dust. Operation of the plant will be on a 24 hour basis and ships will visible at the jetty during loading operations. The plant will also be visible at night due to lighting and the flares. However, this will be partly attenuated by the retention of natural topography and vegetation where possible.

4.7 SOCIOECONOMIC IMPACTS

The socioeconomic impacts of the project will be largely positive and result in a boost to economics throughout the region. Construction activities associated with the project will result in employment for an estimated 1700 skilled and unskilled workers. Ongoing operation of the LNG plant will provide employment for approximately 75 staff and contractors directly employed at the plant. Other direct and indirect economic gains will also occur in connection with the facility.

5.0 REFEREES

Bayliss (1986). *Factors affecting aerial surveys of marine fauna, and their relationship to a census of dugongs in the coastal waters of NT.* Aust. Wild. Res. 13, 27-37.

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Burns (1996). *Preliminary Site for the Excavations of Shell Midden Sites MA7 and MA10.* A report to the Dept. of Lands, Planning and Environment, Heritage Conservation Branch, April 1996.

Dames & Moore (1990). *Middle Arm Peninsula Industrial Subdivision - PER.* Report for Dept Lands & Housing.

McKean, JL and Martin KC (1986). *An Assessment of the Avian Resources of Darwin Harbour.* Report to the Conservation Commission of the Northern Territory.

Parkinson, G (1986) (Ed). *Atlas of Australian Resources.* Third Series. Volume 4. Climate. Division of National Mapping, Canberra.

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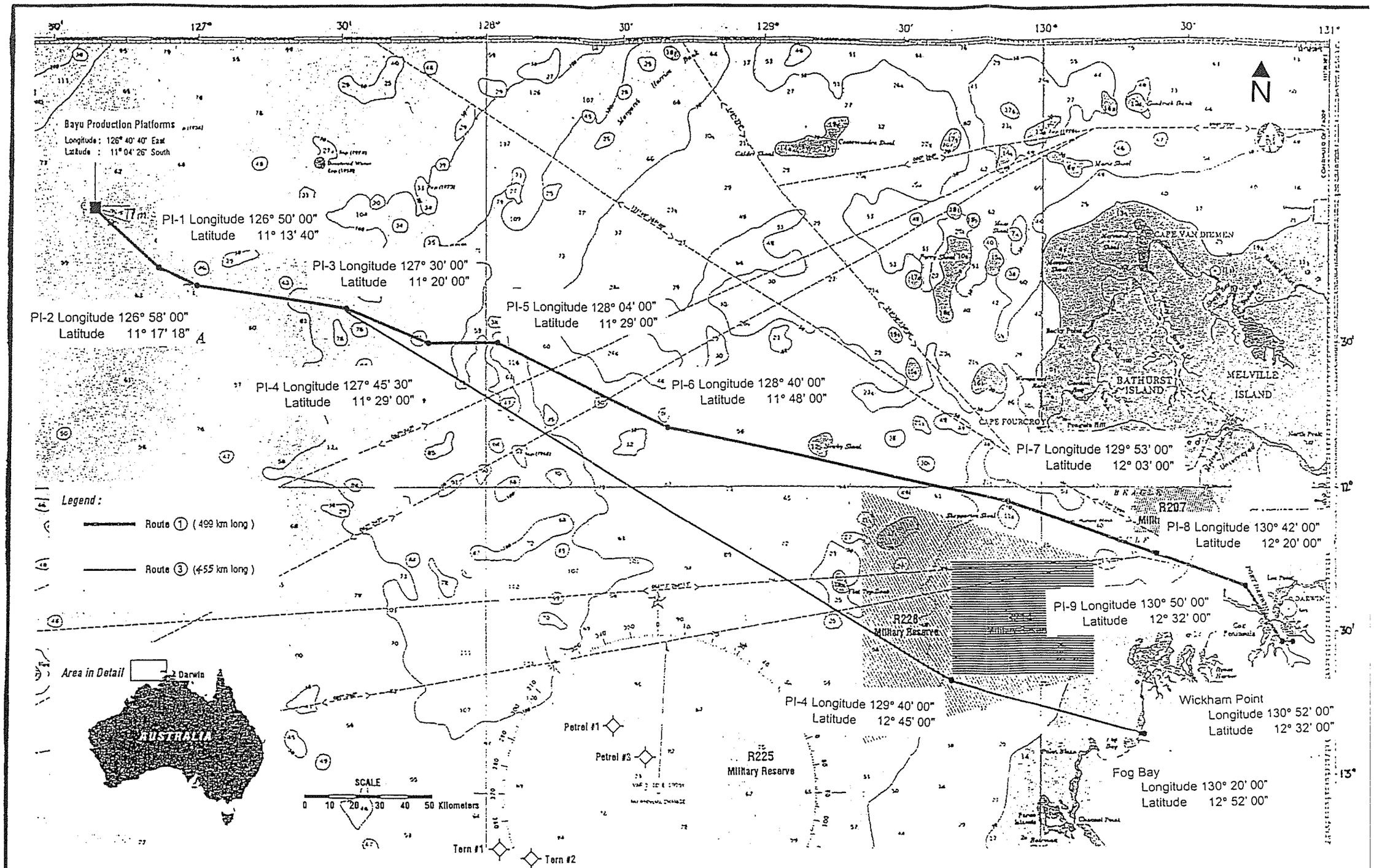

Offshore Pipeline Routes

Figure 1

DAMES & MOORE

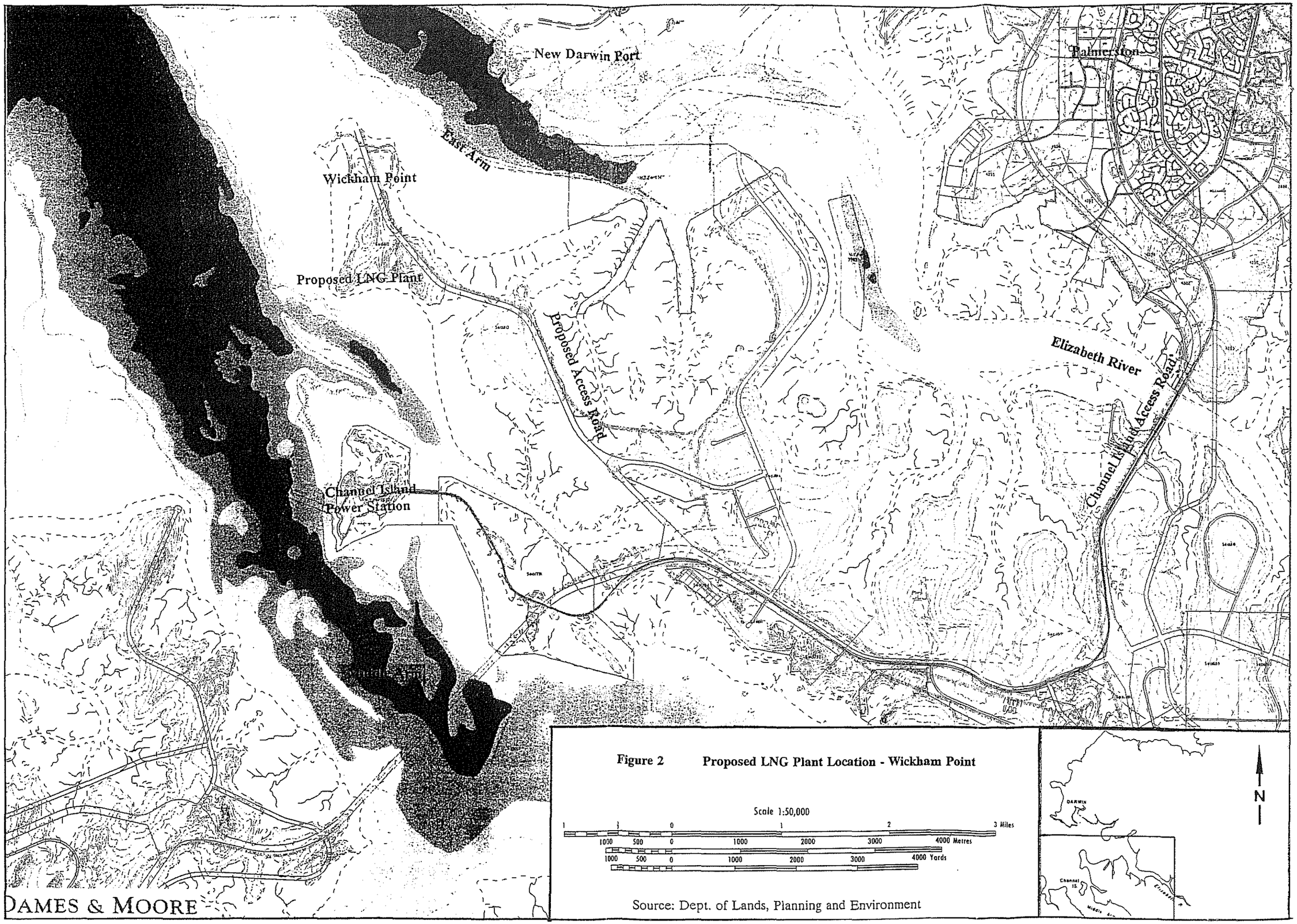

Figure 2 **Proposed LNG Plant Location - Wickham Point**

Source: Dept. of Lands, Planning and Environment

DRAFT GUIDELINES FOR AN ENVIRONMENTAL IMPACT STATEMENT ON THE PROPOSED LIQUEFIED NATURAL GAS PLANT, AND ASSOCIATED PIPELINE FROM THE BAYU PRODUCTION PLATFORM, AT WICKHAM POINT, DARWIN HARBOUR.

DRAFT

INTRODUCTION

A. Background

These Draft Guidelines have been developed to assist Phillips Petroleum Company in preparing a draft Environmental Impact Statement (draft EIS) in accordance with Clause 8 of the Administrative Procedures of the *Environmental Assessment Act (1982)* of the Northern Territory.

The EIS process aims to provide:

- a source of information from which individuals and groups may gain an understanding of the proposal, the need for the proposal, the alternatives, the environment that it would affect, the impacts that may occur and the measures taken to minimise those impacts;
- a basis for public consultation and informed comment on the proposal; and
- a framework against which decision makers can consider the environmental aspects of the proposal, set conditions for approval to ensure environmentally sound development and recommend an environmental management and monitoring programme.

The object of these guidelines is to indicate those matters that should be addressed in the draft EIS. The guidelines are based on the initial outline of the proposal in the Notice of Intent. However, they should not be interpreted as excluding from consideration any matters which are currently unforseen or those which may arise from any changes in the nature of the proposal.

B. Format and Style

The draft EIS should be written in a clear, concise style that is easily understood by the general reader. Text should be supported where appropriate by maps, plans, diagrams or other descriptive material. Detailed technical information should be included as appendices or working papers. A glossary defining technical terms and abbreviations used in the text may be necessary to assist the general reader.

CONTENT OF THE DRAFT EIS

1. SUMMARY

The EIS should include a concise summary of the matters discussed in the main body of the document to allow the reader to quickly obtain a clear understanding of the proposal and its environmental implications. The summary should include:

- the title of the proposal;

- the name, address, telephone numbers and contact officers of the proponent;
- a statement of the objectives of the proposal;
- a brief discussion of the background to, and the need for, the proposal;
- a brief description of the proposal;
- a brief discussion of the alternatives to the proposal and the reasons for selecting the preferred option;
- a brief description of the existing environment;
- an outline of the principle environmental impacts predicted including the results of the risk analysis; and
- a general statement of the types of environmental protection measures, safeguards and monitoring procedures proposed.

2. BACKGROUND

The structure of the document should be briefly explained and the environmental assessment process under the *Environmental Assessment Act* should be described. The role of the EIS in the Government's decision-making processes should be explained.

The EIS should discuss the background to the proposal including:

- initial investigations and feasibility studies;
- relevant government policies;
- relevant Territory legislation;
- secondary proposals that may follow in the future from the development of a LNG plant, pipeline and associated infrastructure; and
- the projected lifetime of the project.

3. OBJECTIVES

The objectives of the proposal should be clearly defined. The relationship of this proposal to the securing of natural gas from other fields (Petrel/Tern and Sunrise/Loxton/Troubadour shoals) should be clarified.

4. NEED FOR THE PROPOSAL

The EIS should discuss:

- the resource implications of utilising natural gas for export rather than domestic consumption;
- the global and Australian market for liquefied natural gas (LNG) and reasons for selection of proposed market;
- current supply of LNG and any inadequacies to meet present and likely future national and international demand;
- the capacity of the proposed LNG plant for meeting this demand; and
- implications of this proposal for global climatic change.

5. ALTERNATIVES

The alternatives should be discussed in sufficient detail to make clear the reasons for preferring certain options and rejecting others.

Alternatives to the overall proposal should include:

- the option of not proceeding with this proposal;
- alternative sites for the facility;
- alternative uses for the product.

Alternative design and technologies for the facility should also be discussed including:

- alternative methods of natural gas liquefication (eg air, water systems);
- *alternative methods for treating heated waste water (eg cooling ponds, direct discharge into sea, cascades, co-generation of electricity);*
- *alternative designs for a water cooling system (eg offshore / onshore pumping stations, intake pipelines / channels, alternate siting for intake and discharge outlets for coolant water);*
- alternative layouts;
- alternative routes for the pipeline; and
- alternative methods of transport of the natural gas from gas field to plant to market.

The reasons justifying the proposal in the manner proposed should have regard to the biophysical, economic and social considerations and the principles of ecologically sustainable development.

For the purpose of this section, "the principles of ecologically sustainable development" are as follows:

- The precautionary principle - namely, that if there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation.
- Inter-generational equity - namely, that the present generation should ensure that the health, diversity and productivity of the environment is maintained or enhanced for the benefit of future generations.
- Conservation of biological diversity and ecological integrity.
- Improved valuation and pricing of environmental resources.

DRAFT

6. PROJECT DESCRIPTION

All components of the proposal should be described in detail from construction to operational stages.

6.1 Design and Construction Criteria / Physical Requirements

6.1.1 LNG Plant

Suitability of site for future expansion.

- expected lifetime of the facility;
- location criteria for the main plant, water intakes and discharge points, access points and routes;
- land requirements, acquisition requirements and reclamation requirements;
- infrastructure requirements (berthing facilities, handling facilities, break waters, roads, drainage, fencing, areas of hard stand, water and power supply, waste treatment and disposal facilities, sewage disposal, equipment buildings, fuel storage, coolant intakes and outfalls, pump stations etc);
- power requirements / sources of supply;
- water requirements in terms of quantity and sources (both marine and fresh) for cooling system, fire fighting, domestic use;
- design criteria for the LNG cooling system (eg. *volume of water required, pump stations, intakes, discharge points*);
- design limitations imposed by site characteristics, storm surge, weather (eg cyclones), possible sea level rises associated with global climatic change etc;
- sources, types and total quantities of major construction materials required including fill material; and
- access requirements (both land and marine).

6.1.2 Pipeline Route Selection

- description of the preferred alignment of the pipeline, illustrated with maps and diagrams to clearly show the pipeline corridor both offshore and onshore.
- the preferred route should be shown with respect to other developments, industry, national and marine parks, sites on the register of the National Estate, World Heritage Areas, historic sites, archaeological/anthropological sites, landforms and other environmental features or constraints.
- land requirements, including a description and justification of easement widths and access requirements along the route;

- description of the location, nature and appearance of all infrastructure requirements associated with the pipeline, including existing access points and roads, markers and warning signs;

- design criteria including pipeline capacity and expected lifetime, options for future extension and joint use with future developments of other gas fields;

- design limitations imposed by site characteristics such as storm surge and cyclones.

6.2 Construction Details

6.2.1 LNG Plant

- construction and siting of proposed infrastructure;

- details of land reclamation (localities, dimensions, methods of fill placement etc);
- localities and methods for extraction of fill (terrestrial and/or marine) and their quantities;

- extent and methods of earthmoving, blasting, trenching;

- construction standards, methods and site management arrangements;

- haulage methods, transport routes and storage locations for major construction materials;

- methods for dredging turning basins, access channel, intake channels etc;

- quantities and proposed disposal of dredge spoil;

- timing of work programme, duration of construction phase;

- time of day during which construction will proceed;

- size and origin of construction workforce, transport to construction sites;

- location and size of construction camps; and

- types and quantities of construction wastes and arrangements for the disposal;

- decommissioning details.

6.2.2 Pipeline

- estimation of timing of the work programme and duration of the pipeline construction;

- description of the pipeline construction and route preparation techniques along with pipeline laying methods (including traversing open water and terrestrial landforms such as steep slopes, wetlands, water courses and stone country). Outline any earthworks and vegetation removal;

- land requirements and location for construction/welding of offshore pipeline;
- if dredging is to occur, estimation of quantities and proposed disposal of dredge spoil;
- transport methods and routes for delivery of pipeline construction materials;
- types and quantities of construction wastes and arrangements for disposal;
- description of the methods used to test the integrity of the pipeline;
- size and origin of construction workforce, transport arrangements and onsite facilities required;
- location and size of construction "camps" and disposal methods of domestic waste;
- description of physical structures above water/ground including permanent route markers;
- description of rehabilitation work after pipeline has been laid, access tracks and camp sites;
- decommissioning details, including the means and extent to which the pipeline would be removed at the end of the project and the methods for rehabilitating the affected area.

6.3 Associated Infrastructure and Services

Detail associated infrastructure and services required and those responsible for its provision (eg housing for workforce, sewage, power, water etc).

6.4 Operation of Facility

Describe in detail the proposed operation of the LNG plant and pipeline including:

- description of the process of gas liquefication;
- characterisation of the natural gas and any other feedstock, the LNG and LPG products which are produced at the facility;
- quantities of LNG and LPG products, such as condensates, generated at the facility;
- storage of LNG, LPG and other hazardous materials at the facility;
- quantities of coolant water used and the quantities, quality and temperature of waste water released;
- methods, routes, timing of LNG haulage including constraints imposed by tides, currents, weather and details of transport including characteristics of haulage vessels, ballast water exchange;

- methods of handling LNG onto haulage containers, handling times etc;
- timing of normal operations of the facility;
- numbers of workforce personnel;
- transport of workforce (routes, modes etc);
- maintenance operations (eg dredging operations in turning basins, dredging of access and intake channels, use of antifouling agents);
- types and quantities of wastes produced (other than cooling water, but including flaring) and methods for their disposal or reuse;
- description of all operational and maintenance inspections or surveillance of offshore and onshore pipeline, including the frequency of such activities over the lifetime of the facility. Reference should be made to safety procedures, including the provisions for the shut-down of the pipeline and/or venting of gas, in the event of leakage of gas; and
- likelihood and requirements for upgrading the pipeline.

7. EXISTING ENVIRONMENT

Describe the existing environment affected by the proposal. The study area should include areas affected by extraction of construction materials (may be off site), construction activities, dredging and operational activities (including the predicted zone of assimilation for heated waste water, areas affected by transport of LNG etc). The matters detailed below should be discussed to the extent necessary to identify environmentally sensitive areas and act as a baseline against which the impacts of the proposal can be assessed. The existing environment of alternatives should be discussed. However, the detail will depend on the extent to which the alternative is capable of meeting the objectives of the proposal. Trends should be discussed and diurnal and seasonal changes should be indicated where appropriate.

7.1 Physical Environment

7.1.1 LNG Plant

- geology, geomorphology, seismic stability;
- characteristics of soils and marine sediments including composition, redox potentials, physical characteristics (eg particle size), contaminants, erosion potential;
- topography;
- hydrology (eg surface drainage, patterns of flooding, ground water resources and recharge, existing uses of surface and ground water resources);

- relevant climatic characteristics including the frequency of catastrophic events such as cyclones and storm surge;
- water quality parameters including pH, turbidity, heavy metal and other pollutants, nutrient levels, dissolved carbon and oxygen, salinity;
- air quality (particulates, dust, odour etc);
- ambient noise levels and frequency of occurrence; and
- ambient light levels.

A model of the hydrodynamics of Darwin Harbour should be generated in order to predict the changes resulting from dredging, land reclamation and disposal of wastewater. The model should incorporate the following aspects:

- marine hydrography, seabed morphology, depth contours;
- sediment regime including accretion and erosion rates, sediment characteristics, sediment sources;
- oceanography including tides, currents, wave action;
- thermal regime; and
- seasonal variations in the above and implications of global climatic change.

7.1.2 Pipeline (marine section)

- geology, geomorphology, seismic stability;
- marine hydrography, seabed morphology, depth contours;
- oceanography including tides, currents, wave action;
- relevant climatic characteristics including the frequency of catastrophic events such as cyclones and storm surge;

7.1.2 Pipeline (land section)

- geology, geomorphology, seismic stability;
- characteristics of soils and marine sediments including composition, redox potentials, physical characteristics (eg particle size), contaminants, erosion potential;
- topography;
- hydrology (eg surface drainage, patterns of flooding, ground water resources and recharge, existing uses of surface and ground water resources);

- relevant climatic characteristics including the frequency of catastrophic events such as cyclones and storm surge;

7.2 Biological Environment

7.2.1 Description of Biota in the Study Area (Wickham Point, Darwin Harbour and pipeline route onshore and offshore)

- Describe and map the major habitats/communities and animal/plant species (both aquatic and terrestrial) which are present in the study area. Any species which are commercially exploited should be indicated; and

- Where relevant discuss the general biology and ecology of the biota identified eg diet, habitat requirements, dispersal abilities, reproductive strategies etc.

7.2.2 Abundance / Conservation Status of Biota Occurring in the Study Area

- Indicate the conservation status of the species and communities/habitats on a local and regional level;

- For biota and communities/habitats identified as being affected by the proposal, indicate how well they are represented and protected within the reserve system;

- Indicate any areas affected by the proposal which are on the Register of the National Estate; and

- Refer to any strategies or management plans relevant to species or communities/habitats affected by the proposal.

7.2.3 Resilience of Species/Communities/habitats to Disturbance

- Describe the impact of previous disturbance to species/communities/habitats in the affected area (eg weeds, feral animals, pollution, human activities such as dredging and offshore oil exploration); and
- Indicate species/communities/ habitats which are potentially sensitive to disturbance either by direct (eg physical changes in habitat) or indirect (eg food chain) effects. If possible indicate any species which may have value as indicators of environmental stress.

7.2.4 Important Ecological Relationships

- Indicate species/communities/habitats of particular importance to ecosystem function eg of high productivity, important in nutrient cycling, in providing breeding areas; and

- Discuss the relationships between vegetation, soil/sediment stability, water quality etc.

7.3 Socio-Economic Environment

The following should be described in relation to the proposal where relevant:

- present land-use, land tenure, zoning of both terrestrial and marine areas;
- proposals for future land use, making reference where applicable to land use structure plans;
- demographic characteristics, social structure, ethnicity;
- local and regional economic structure;
- community services, facilities and infrastructure;
- recreational resources, current and projected levels of use, activities;
- nearby facilities/land uses likely to be sensitive to noise and illumination;
- features of traffic (both land and marine) in the region including current modes of transport, traffic volumes and temporal variation, standards of road construction, present access into the site;
- sites of Heritage significance (archaeological and historic sites) including sites on the Register of the National Estate and their National Estate values;
- sites of significance to Aborigines;
- areas/sites of scientific, educational, or cultural significance;
- landscape/visual qualities;
- existing risk profile (see hazard and risk assessment);

8. ENVIRONMENTAL IMPACTS

This section should clearly identify and quantify where appropriate, the principal environmental impacts expected to result from the development and any feasible alternative. It should thoroughly analyse the potential impacts of the proposal on the natural and social environment in the area during the construction phase and the ongoing operation of the plant and associated facilities. The impacts of all aspects of the proposal; should be discussed including site and pipeline development, transport of materials, provision of associated infrastructure (roads, sewage, power etc), construction camps and facilities etc.

Direct and indirect, short and long term, temporary and irreversible, adverse and beneficial effects should be addressed. Impacts from accidents should be evaluated by a quantitative risk analysis using baseline input as appropriate from the EIS. Separate guidelines are attached for the risk analysis however, the results should form part of the EIS. A table should be prepared which contains a statement about each of the predicted impacts associated with the proposal and the corresponding safeguards, if any, as outlined in Section 9. Appropriate attention to detail in such a table should reduce the need for lengthy discussion in the text. The table should include quantification of impacts and safeguards where possible.

8.1 Extraction of Construction Materials

8.1.1 Biophysical environment

- For onshore sources of rock and land fill discuss whether existing quarries/sand or gravel pits can supply adequate quantities or if new sources need to be opened. If the latter then the impact of extraction should be discussed in terms of:
    - effects of earthmoving, dust, blasting etc;
    - vegetation clearance and impacts on flora and fauna;
    - potential for accelerated soil erosion;
    - significant land forms;
    - changes to hydrology and drainage patterns;
    - potential for the introduction and/or spread of weeds;
- If marine sources of fill are required which are additional to that which could be supplied from dredging during the construction of facilities, the impacts should be discussed in terms of:
    - destruction and disturbance of benthic fauna and flora;
    - changes to hydrodynamics of Darwin Harbour;
    - changes to the sedimentation regime of Darwin Harbour; and
    - changes in water quality including effects of oxidisation of marine muds.

8.1.2 Socio-economic environment

The impact of extraction of construction materials on the socio-economic environment should be discussed including:

- effects of dust, blasting, noise on nearby communities;
- impacts on sites of archaeological/historical significance;
- compliance with Sections 20-22 of the *Aboriginal Sacred Sites Act 1989*
- restriction of access to tourists, scientists, residents, commercial operators etc;
- effects on visual qualities; and
- effects on recreational and commercial fisheries.

8.2 Construction Activities

8.2.1 Biophysical Environment (include both offshore and onshore impacts where relevant)

The impact of construction on the biophysical environment should be discussed including:

- effects of earth moving, dust, blasting, noise, vibration etc from site works;
- vegetation clearance including mangroves;
- seabed disturbance during construction, arising from either positioning of the pipe or ploughing the pipe in, including the anticipated widths of the disturbed zone and the area likely to be affected by any sediment displaced;
- effects of pipeline construction on benthic marine biota; including the impact of trenching through shallow water areas and the intertidal zone;
- effects of fill placement and settlement including potential for subsequent erosion, potential for heavy metal, saline and acidic leachates, potential for differential settlement of marine sediments to affect foundation stability;
- changes to hydrology and drainage patterns, aquifers;
- changes to the oceanographic characteristics (coastal and seabed morphology, sediment regime, currents, wave action, water quality etc) of Darwin Harbour as a result of land reclamation activities, dredging etc.;
- potential for remobilisation of heavy metals in sediments as a result of dredging and disposal of spoil;
- changes in redox potentials, BOD, COD of sediments and resultant effects on recolonisation of dredged areas;
- effects of transportation of fill and construction material;
- effects of construction camps, storage areas for construction materials;
- effects of disposal of construction wastes including dredged materials, mangrove muds etc. on the physical and biological resources of Darwin Harbour and any other site proposed for disposal;
- effects of spills of fuel, oils, hazardous materials on both onshore and offshore environments (see hazard/risk assessment);
- effects of all of the above on species, communities and habitats in the study area, particularly those which are sensitive to disturbance or are rare or endangered;
- effects of the introduction and/or spread of weeds; and
- effect of habitat disturbance (particularly mangrove clearance) on regional conservation planning, making reference where appropriate to government strategies and policies eg Coastal Management Policy.

8.2.2 Socio-economic Environment

The impacts of construction activities on the social environment should be discussed including:

- effects on the local community including employment, local economy, tourism;
- effects of additional workforce including integration/alienation, provision of accommodation and recreational facilities, use and adequacy of existing community facilities;
- effects of dust, noise, vibration, earthmoving etc on the local community;
- visual and aesthetic impacts of construction works;
- restrictions on access to Darwin Harbour and its foreshore;
- effects of construction on sites of historic or archaeological significance (including shipwrecks);
- compliance with Sections 20-22 of the *Aboriginal Sacred Sites Act 1989*
- effects on commercial and recreational fisheries from biophysical disturbance and loss of habitat (an estimate of productivity loss, if any, should be provided);
- impact of supply of fill on other users of these materials; and
- disruption to surface traffic movements (both land and marine) in the area.

8.3 Operational Phase

8.3.1 Biophysical Environment

The impacts of the operation of the completed facility on the biophysical environment should be discussed including:

- dispersal characteristics of the *heated waste water plume* and resultant effects on the salinity / thermal regime of Darwin Harbour (including variations due to tides, currents, seasons). Modelling of dispersion and prediction of assimilation zones is required;
- changes to the oceanographic characteristics (coastal and seabed morphology, sediment regime, currents, wave action, water quality etc) of Darwin Harbour as a result of changed coastal morphology, maintenance dredging, release of waste water etc.;
- effects of chemicals used in routine maintenance or discharged in the operation of the facility and its associated infrastructure, eg antifouling chemicals, additives to coolant water, leakage of hydrocarbons.

The hazard of significant chemical discharges should be examined in terms of environmental exposure (expected environmental concentrations based on chemical fate, transport, volumes released etc), the environmental effects of this exposure based on acute toxicity, chronic effects, bioconcentration etc and the significance of the biota at risk;

- seabed disturbance, including the effect of the pipeline on the seabed due to tidal flows scouring or depositing material against the pipeline, thermal effects of a warm pipeline, if any, and the colonisation of the pipeline exterior by marine biota;
- effects on air quality;
- changes to soil erosion;
- changes to noise levels and patterns;
- changes to ambient light levels and patterns;
- changes to the fire regime;
- effects of discharge of ballast water from haulage vessels;
- potential for introduction and/or spread of exotic species;
- consumption of water and resultant effects on water resources;
- effects of increased run-off from hardstand areas, roads, roofs etc and the disposal of stormwater;
- effects of disposal of wastes including hazardous materials, spoil removed during maintenance dredging, sewage etc;
- impacts of the above on species, communities and habitats in the study area particularly rare and endangered species and those sensitive to disturbance;
- potential effects of propeller wash / fanning from haulage vessels on marine communities;
- potential for aquatic fauna to be killed or otherwise affected at coolant water intake; and
- effects of spills of fuel, oil, hazardous materials etc from either the plant, pipeline or attendant transport tankers (see risk assessment guidelines).

8.3.2 Socioeconomic Environment

- long term effects on the community including local economy, employment, tourism;
- effects of additional operational workforce including integration/alienation, provision of accommodation and recreational facilities, use and adequacy of existing community facilities;

- effects of demands for water, power, sewage disposal, garbage disposal and other infrastructure on current provision of these services and effects on present users;
- examination of energy consumption and management, and atmospheric emissions in relation to global climatic change;
- long term aesthetic effects of the completed facilities, significant viewsheds;
- effects on the recreational users (and uses) of Darwin Harbour;
- land use effects - changes in present and proposed land uses (reference to land use structure plans), changes or curtailment of use or access in areas adjacent to development, changes in access etc;
- effects of changes in surface traffic patterns (both on land and sea) in the region (spatial patterns, frequency, modes of transport, temporal variation etc);
- effects on commercial and recreational fisheries as a result of changes in the biophysical environment (quantify productivity changes if any);
- noise and lighting effects - identify any affected populations and quantify the increases to ambient noise and light levels;
- health impacts including potential for water ponding to create additional breeding sites for disease vectors;
- effects of waste disposal; and
- effects of accidental spills of fuel, oils, other hazardous materials (see risk assessment guidelines).

9. ENVIRONMENTAL SAFEGUARDS, MONITORING PROPOSALS AND THE ENVIRONMENTAL MANAGEMENT PLAN

The proponent is required to achieve the optimal level of environmental management and performance during its pursuit of sound business and financial objectives. The most economically effective environmentally sound technology and procedures should be incorporated into the design of the project. The adoption of such a strategy should ensure optimal management of all emissions, discharges and waste. A similar approach is to be adopted for all procedures involving the management of inputs, outputs and the production process itself.

An environmental management plan should be produced which will:

- detail the proposed measures to minimise adverse impacts and the effectiveness of these safeguards;
- ensure that safeguards are being effectively applied;

- enable remedial action for any impacts which are not originally predicted;
- measure the differences between predicted and actual impacts (monitoring); and
- provide for the periodic review of the management plan itself.

Reference should be made to relevant legislation and standards, and proposed arrangements for necessary approvals and permits should be noted. The bodies responsible for implementing and overseeing the management plan should be identified. Proposed reporting procedures in relation to the implementation of the management plan and reporting of accidents should be outlined.

9.1 Construction Phase

Detail environmental controls, safeguards and design features, and describe proposed management arrangements during the construction phase including:

- safeguards to minimise noise, dust, vibration, air and water pollution, vegetation disturbance, erosion, introduction and/or spread of exotic organisms and diseases, changes to the hydrodynamics of Darwin Harbour;
- measures to protect heritage sites, archaeological sites;
- measures to minimise visual intrusion;
- measures to manage construction wastes and protect against accidental spillage;
- measures to ensure employees and construction managers understand and act upon their environmental protection obligations;
- measures to minimise negative social and environmental effects of accommodating and servicing the construction workforce; and
- measures to rehabilitate disturbed areas.

9.2 Operational Phase

Detail environmental controls, safeguards, design features and proposed management arrangements during the operational phase including:

- safeguards to minimise air and water pollution, thermal pollution, introduction and/or spread of exotic organisms and diseases, soil erosion, noise, changes to the hydrodynamics of Darwin Harbour etc;
- measures to protect identified areas of high biological value;
- an operations maintenance schedule, including the nature and timing of maintenance planned, and an audit, review and revision of the operational phase at regular intervals to ensure the continued safety of the facility (including pipeline) and surrounding areas;

- risk management measures for the containment and transport of hazardous materials;
- a waste management plan placing particular emphasis on waste avoidance, minimisation and recycling, and including procedures for evaluating the most appropriate disposal methodologies;
- an energy management plan including plans for maximising energy efficiency, possibilities for co-generation of electricity using coolant water;
- access and security arrangements and management of buffer zones;
- measures to ensure employees and managers understand and act upon their environmental protection obligations;
- measures to manage natural habitats on-site and rehabilitate disturbed areas;
- provisions for continued consultation / liaison with relevant government authorities and community groups and mechanisms for dealing with complaints from the public; and
- arrangements for the decommissioning of facilities following cessation of operational activities.

9.3 Monitoring

The proposed monitoring programmes, reporting and management arrangements should be outlined

10. INFORMATION SOURCES, PUBLIC INVOLVEMENT AND CONSULTATION

This section should detail any consultations, public input or studies which have contributed to the development of the proposal and the preparation of the draft EIS. Any further or ongoing consultations or studies should also be outlined.

ATTACHMENT TO EIS GUIDELINES

HAZARD AND RISK ASSESSMENT FOR THE PROPOSED LNG PLANT, AND ASSOCIATED PIPELINE, AT WICKHAM POINT

Hazard/Risk to Humans and Facilities

The EIS should include a preliminary hazard analysis and risk assessment for the risks to people and nearby facilities (eg Channel Island Power Station) from potential accidents associated with the operation of the facility, storage, and transport of materials to and from the facility (including pipeline transport and haulage of LNG). The preliminary hazard analysis and risk assessment should outline and take into account emergency plans which detail strategies, procedures and staff responsibilities in the event of an emergency or accident. Contingency plans for dealing with spillages of any hazardous materials should be detailed.

The study should include:

Hazard identification

- identification of the materials involved, quantities and their properties (flammability, toxicity, volatility etc);
- identification of the location, storage, processing and use of hazardous materials;
- identification of transport modes and routes of hazardous materials to and from the proposed facility;
- identification of the human populations at risk, vulnerable areas, hazardous facilities which might be affected by an accident; and
- likely occurrences leading to potentially hazardous events originating both from the operation of the facility and external sources such as cyclones, earthquake, aircraft strike, sabotage etc.

Consequence Analysis

- Estimation of the effects of potential hazards identified above. Eg. explosion; overpressure; fire; predicted concentrations of hazardous materials in air, water or soil; and the resultant effects on nearby populations and facilities/activities.

Frequency Analysis

- Estimation of the likelihood (probability) of hazardous incidents occurring and the likelihood of particular outcomes if those events occur, having regard to all the proposed technical, organisational and operational safety controls.

Quantified Risk Assessment

- The overall risk associated with the proposal should be quantified by combining cumulatively the consequences and probabilities of hazardous events.

The acceptability of predicted risks should be based on established criteria and compared to the existing risk profile in the study area.

Environmental Hazard/Risk

Significant hazards to the environment arising from accidents during the operational phase should also be quantified as follows:

- The hazards identified in the preliminary hazard and risk analysis should be assessed to identify significant potential hazards to the environment which will require further analysis. Assessment should take into account the properties (toxicity, bioaccumulation potential, persistency etc.) of the chemicals, the volumes involved, proposed safeguards, the likely compartment (land, air, sea) which chemicals may be released into, and the sensitivity of the environment potentially affected. For example spillage of LNG, oils, fuels etc. would be expected to require further analysis.

Those hazards identified as being significant should be analysed further as follows:

- The environmental exposure should be examined taking into account chemical fate (degradation, adsorption, solubility etc), transport (using model of the hydrodynamics of Darwin Harbour, plume dispersal models etc as appropriate), volumes released, in order to predict estimated environmental concentrations (EEC's) and the range of biota which are potentially at risk;

- The effect of the EEC's on biota potentially at risk should be examined in terms of acute toxicity, chronic effects, bioconcentration and bioaccumulation potentials, physical effects etc. using dose response relationships; and

- The hazard/risk to biota should be examined in terms of the environmental exposure, environmental effect, and the probability/frequency of occurrence (taking into account proposed safeguards). The acceptability of the predicted hazards/risks should take into account the different sensitivities and conservation values of the biota at risk and be compared to the hazards/risks imposed by natural events.