

**Terms of Reference
for an Environmental Impact Statement for the**

Guthalungra Aquaculture Project

June 2002

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1. PREAMBLE

1.1 The Project

Pacific Reef Fisheries (Bowen) Pty Ltd has proposed the development of a site for aquaculture located adjacent to the Elliot River near the small town of Guthalungra, south of Ayr in north Queensland.

Licensing for the pond-based (grow-out) production of the following species will be sought: black tiger prawn (*Penaeus monodon*), brown tiger prawn (*Penaeus esculentus*), banana prawn (*Penaeus merguensis*), Kuruma prawn (*Penaeus japonicus*), mud crab (*Scylla serrata*), barramundi (*Lates calcarifer*). The principal species for production are expected to be Black Tiger, Brown Tiger and Banana prawns.

Licensing will also be sought for other possible pond-based production of species such as mangrove jack, coral trout, Maori wrasse, barramundi cod, and various groupers. Further licenses will be sought for species that may be used in the water treatment system; these species may include mullet, rabbit fish, milk fish, oysters, and macrophytes etc.

Structural elements of the project will include a series of growout ponds, a seafood processing facility and support infrastructure including feed storage, workshops, general storage and accommodation.

The site is estimated to support around 300 hectares of growout ponds producing up to 1750 tonnes of penaeid prawns per year.

1.2 Aims of Study

In preparing the Environment Impact Statement (EIS), the proponent should bear in mind that the overall aim of the EIS is to provide an assessment of the impacts of the project (during the construction and operational stages) on environmental, economic and social environments and stakeholders (including passive users). This is in order to provide a framework in which decision-makers can consider the environmental aspects of the project in parallel with economic, technical and other factors.

1.3 The Process

Under the provisions of the *State Development and Public Works Organisation Act 1971*, the Coordinator-General has declared the Guthalungra Aquaculture project for Pacific Reef Fisheries (Bowen) Pty Ltd to be a significant project for which an EIS is required.

The Commonwealth Minister for the Environment has decided that the proposed action is a “controlled action” under the provisions of the *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act), affecting matters of national environmental significance.

The controlling provisions are:

- sections 12 and 15A (World Heritage);
- sections 18 and 18A (Listed threatened species and communities);
- sections 20 and 20A (Listed migratory species); and
- sections 23 and 24A (Marine Environment).

The term “controlling provision” for a project means a provision of the EPBC Act, chapter 2, part 3, decided by the Commonwealth Environment Minister as a controlling provision for the project under that Act, chapter 4, part 7, division 2.

The EPBC Act allows for assessment of the “relevant impacts” of the proposed action by an accredited assessment process. The term “relevant impacts” has the meaning given by the EPBC Act, section 82.

The Commonwealth Minister for the Environment has decided that the assessment of the “relevant impacts” is to be by an accredited assessment process. The accredited process is an EIS under Part 4 of the SDPWO Act and Part 5 of the SDPWO Regulation 1999.

Part 5 of the State Development and Public Works Organisation Regulation 1999 provides a process for an accredited assessment process where the project has been declared a significant project. Accordingly, the EIS will be carried out in accordance with the provisions of Part 4 of the SDPWO Act and Part of 5 of the SDPWO Regulation to address both State and Commonwealth issues.

The key aspects of the EIS process are outlined below:

- draft terms of reference are prepared and public comment on them is invited over a four week period;
- the terms of reference are finalised to ensure that, in relation to the controlled actions, the assessment:
 - assesses all relevant impacts that the action has, will have or is likely to have;
 - contains enough information about the action and its relevant impacts to allow the Commonwealth Environment Minister to make an informed decision whether or not to approve the action under Part 9 of the EPBC Act;
 - addresses the matters (if any) prescribed in regulations for the purposes of paragraph 102(2) of the EPBC Act relating to the preparation of guidelines for an environmental impact statement under that Act;
- an EIS is prepared and made publicly available for a period of at least 28 days and submissions are invited;
- a Supplementary report is prepared by the proponent summarising any issues raised in the submissions including those relating to the “relevant impacts” of the proposed action and addressing the issues raised during the submission period;
- the Coordinator-General evaluates the EIS and prepares a report on the proposed action in accordance with s.35 of the SDPWO Act. A copy of the report is provided to the proponent and to the Commonwealth Environment Minister, and made publicly available;
- The Commonwealth Environment Minister is required to make a decision as to whether or not to approve the action under Part 9 of the EPBC Act following the completion of the State EIS assessment process.

The term ‘environment’ includes -

- (a) ecosystems and their constituent parts, including people and communities; and
- (b) all natural and physical resources; and
- (c) the qualities and characteristics of locations, places and areas, however large or small, that contribute to their biological diversity and integrity, intrinsic or attributed scientific value or interest, amenity, harmony and sense of community; and
- (d) the social, economic, aesthetic and cultural conditions that affect, or are affected by, things mentioned in paragraphs (a) to (c).

These are the Terms of Reference (TOR) for the assessment of the impacts on the environment of the project.

1.4 Administrative Details

The following terms of reference describe those matters that are to be addressed in the EIS. The document should give priority to the major issues associated with the project. Matters of lesser

concern should be dealt with only to the extent required to demonstrate that they have been considered and adequately addressed.

It is envisaged that the EIS will be based on the results of available research, studies and data, with further studies being conducted where necessary or practicable.

In these terms of reference, the terms “description” and “discussion” should be taken to include both quantitative and qualitative matters as practicable and meaningful. Similarly, adverse and beneficial effects should be presented in quantitative and/or qualitative terms as appropriate.

The main text of the EIS should be written in a clear, concise style that is easily understood by the general reader. Technical jargon should be avoided wherever possible; any acronyms used should be compiled in a glossary. Detailed technical information necessary to support the main text should be included as appendices issued with the EIS, so that the document is complete and self-contained.

The EIS should include references and a list of individuals and organisations consulted during its preparation. Relevant maps and illustrations should also be included.

The EIS must be provided to the Coordinator-General for review prior to its release for public comment to ensure that it adequately addresses the terms of reference.

Once the Coordinator-General has indicated that the EIS adequately addresses the terms of reference, it is the proponent’s responsibility to place public notices advising of the availability of the EIS for public comment and provide copies to local libraries and other locations as specified in the public notice. The Coordinator-General will provide the form and content of the public notices to the proponent. Copies of the EIS are to be provided to the Coordinator-General for distribution to Advisory Bodies (number to be advised).

The cost of the EIS documents must not be more than the actual cost of producing the copy. For ease of access, consideration should be given to making the EIS documents available electronically on the internet or in CD format.

Following receipt of submissions on the EIS, the proponent is required to prepare a supplementary report summarising submissions and the issues raised in submissions including those relating to the “relevant impacts” of the proposed action. The supplementary report must address the issues raised during the submission period.

While every attempt has been made to ensure that these terms of reference address all of the major issues associated with this project, they are not necessarily exhaustive. They should not be interpreted as excluding from consideration matters deemed to be significant but not incorporated in them or matters (currently unforeseen) that emerge as important or significant from environmental studies, or otherwise, during the course of preparation of the EIS.

While the scope of the work entailed in preparation of the EIS is necessarily broad, the level of investigation undertaken on the various impacts should reflect the relative importance of the impacts.

2. CONTENT OF THE EIS

2.1 Executive Summary

The EIS should include an Executive Summary that provides a succinct overview of the purpose and content of the EIS. The Executive Summary will include a description of the project, the findings of the impact assessment, the key environmental impacts, proposed environmental protection measures, safeguards, and on-going management and monitoring.

This section is to be prepared in a format which will allow it to be separated from the body of the main EIS. It should be sufficiently comprehensive so that it can be read as a stand-alone document. The Executive Summary should include material on the following:

- the project's title;
- the proponent's name;
- the designated proponent's full name and postal address;
- a clear outline of the project's objective;
- the location of the project in a State, regional and local setting;
- the background to the project's development;
- how the project relates to any other actions of which the proponent should be reasonably aware that have been, or are being, taken or that have been approved in the area affected by the project;
- the project's current status;
- the consequences of not proceeding with the project;
- a description of the project, its purpose and identification of the study area including:
 - the project's components;
 - the precise location of works to be undertaken, structures to be built or elements of the project that may have relevant impacts;
 - how the works are to be undertaken and design parameters for aspects of the structures or elements of the project that may have relevant impacts; and
 - the project's relevant impacts;
- a description of the existing natural, cultural heritage, social and economic environment of the study area;
- the adverse and beneficial impacts of the project;
- a brief description of the elements of the Environmental Management Plan to manage the impacts of the project and the commitments made by the Proponent to protect the environment;

2.2 Introduction

This section should include details of the proponent **(1.3)**, a clear definition of the objectives **(1.4)**, a brief description of the project **(1.1)** and EIS process **(1.4)** and a project timeline.

The description of the proponent should include information regarding its shareholding, mission, record of and expertise in aquaculture and mariculture activities and references for similar projects it has carried out elsewhere **(1.3)**.

A brief explanation of the scope and legislative basis for the EIS should be provided **(1.5 & 1.6)**

The study area and regional setting for the project should be briefly described with reference to maps locating the project in a State, regional and local setting **(1.9)**.

The introduction should also describe the studies, surveys and/or consultations that have been conducted in developing the project and preparing the EIS **(1.8)**. The complete studies and detailed comments resulting from consultations should be included as appendices if needed.

2.3 Background

The EIS should discuss the background to the project including:

- A summary of aquaculture developments in Queensland and the region **(2.1.1)**, and any strategic directions for the industry **(2.1.2)**;
- legislative requirements to be addressed **(2.2)** and any existing approvals **(2.2.4)** (existing permits and conditions should be attached as an appendix to the EIS)
- any preliminary planning, design and on-site works which have been undertaken **(2.3)**;
- the current status of the project and the approvals required in order for the project to proceed together with sufficient information to enable approval agencies to assess such applications and draft appropriate conditions to provide to the Coordinator General **(2.4)**.

2.4 Need for the project

Provide an explanation of the need and justification for the project including:

- a statement of the specific objectives the project is intended to meet **(3.1)**;
- the need for the project against existing aquaculture developments and any relevant policy framework **(3.2)**;
- expected community, regional, State and / or national economic benefits **(3.3)**; and
- other expected benefits **(3.4)**.

2.5 Description of the Project

All components of the total project should be described in detail from construction activities to long term operations.

Details should be provided of:

- The project's components; **(4.1)**
- the precise location of works to be undertaken, structures to be built or components of the project that may have relevant impacts, including processing works, intake and discharge pipelines and outlets and any associated structures or components;**(4.1, 4.2 and 4.3)**
- how the works are to be undertaken, and design parameters for aspects of the structures or components of the project that may have relevant impacts, including supporting technical information with maps, figures and diagrams as appropriate; **(4.1, 4.2 and 4.3)**
- relevant construction and operation standards (quantified where possible, particularly in relation to seepage etc.) and techniques; ;**(4.1, 4.2 and 4.3)**
- site management arrangements **(4.4.1)**;
- location of bore holes for investigating actual and potential acid sulfate soils, and for groundwater and hydrological investigations;**(4.1)**

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- establishment of the depth of excavation required for all construction elements of this project, detailing depth of excavation relative to 5 metres AHD, and detailing total volume of material to be excavated at or below 5 metres AHD; **(4.3)**
 - establishment of the volume and depth of filling required for all construction elements of this project where natural ground level is at or below 5 metres AHD; **(4.3)**
 - water management and sediment control including:
 - stormwater runoff;
 - recycling and reuse; and
 - wastewater management during construction;**(4.3 and 9)**
 - a detailed description of works for each stage of construction including **(4.3 and 6.5.2)**
 - the schedule, including timing and duration of major construction phases;
 - scale drawings and (for vegetation) maps of the construction phase of the project;
 - the type and source of construction materials to be used;
 - the methods of stabilising the workings;
 - construction of intake and inlet channels, production ponds, settlement ponds and discharge channels;
 - the material and permeability of intended pond linings;
 - installation of erosion controls and sediment traps, showing any areas of land or marine vegetation clearing or disturbance and the species involved;
 - description of treatment options for material requiring treatment, and details of treatment and disposal area locations;
 - the estimated size of the construction workforce and accommodation requirements; and
 - a description of processing, housing and potable water requirements;
 - a description of the methods of construction of each intake option including; **(4.3)**
 - details of any dewatering activities and dewatering areas required for excavated material;
 - requirements for the treatment of this material;
 - a description of how, and indication on a scale diagram where, the excavated material from the basin will be treated and/or disposed; and
 - methods of any backfilling required, source of backfill material, predicted rates of settlement and proposed erosion protection measures for disturbed and backfilled areas;
 - a description of the following for each intake and discharge option: **;(4.1, 4.2 and 4.3)**
 - description of each inlet and discharge structure including depth relative to sea level, fixing and/or anchoring mechanisms, and beach crossings;
 - maintenance access, including details of construction of any road structures;
 - impacts of ASS or low pH environment on pumps, pipes and fittings;
 - proposed security measures for infrastructure located away from the development site;
 - a description of the following for any structure to be located within the Great Barrier Reef Marine Park: **;(4.1 and 6.5)**
 - - the materials to be used in the structure, including any treatment or coatings proposed to be used (e.g. anti-fouling, treated timber);
 - the marine environment in the immediate vicinity of the structure; and
 - identification and location of any *sensitive environments*¹ near the structure/s; **(4.3 and 6.5)**
 - implications of physical site characteristics for construction timetable and design requirements, including wet/dry season influences, cyclones, storm surge and greenhouse induced climate change; **(4.3 and 7.3)**

¹ *Sensitive environments* are areas that contain populations or assemblages of organisms, or habitats that are considered to have significant conservation and/or cultural heritage values. Examples may include dugong protection areas, fish spawning aggregation sites, seagrass beds, breeding areas, and diverse, rare or very old coral assemblages.

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- the operation of the project, including **(4.5)**:
 - specific activities;
 - timing and schedule for operation of project;
 - intake and waste discharge proposals and estimated volumes;
 - expected chemical, biological and physical characteristics of discharge waters;
 - volumes and sources of freshwater and/or groundwater proposed to be used;
 - management of water flows and water quality in/through ponds including seepage control and minimisation of groundwater impacts;
 - water recirculation and reuse opportunities;
 - waste treatment methods and facilities;
 - water quality management and control;
 - the extent of on-site processing, processing methods, structural and material requirements for processing, wastes generated during processing, type of products produced, food safety programs to be implemented, adherence to Food Standards Code²;
 - hygiene management and control;
 - the estimated size of the operational workforce and accommodation requirements; and
 - scale drawings and (for vegetation) maps on the operating phase of the project;
 - the species to be farmed, identifying the principal species for production, other species that may be produced experimentally or commercially and any species that may be produced for use in the water treatment systems **(4.5)**;
 - a description of the following for each species³ **(4.5)**:
 - requirements for the culture and production of each of these species described in detail;
 - the source of stock and the region from which the stock originates;
 - any genetically modified stock which may be used
 - management processes and controls to avoid disease;
 - management processes and controls to avoid escape;
 - how water will be exchanged, if at all, between the different species; and
 - for each of the species used in water treatment processes - details of the bioremediation role of that species;
 - the proposed feed and feeding method(s) for each species⁴ including but not limited to **(4.5)**:
 - amount of feed;
 - source of feed;
 - how feed will be supplied to the farm and how it will be packaged;
 - an indication of expected feed conversion ratios;
 - ingredients (including any additives such as hormones, growth enhancers, antibiotics and chemicals included in the feed or added separately);
 - physical nature of feed (such as grading/size of powder, granules, pellets, etc.);
 - feed quality control including any controls on imported feeds;
 - proposed storage method for feed including protection of feed from pest infestation and strategies to manage such pests;
 - feeding method;
 - feed monitoring;
 - any variations in feeding rates;
 - method of application; and
 - feed wastage rates, etc.;
 - any specific pond management requirements including: **(4.5)**
 - the volume and frequency of water exchanges required for each species; and

² The Food Standards Code that is adopted by the *Food Act 1981*.

³ Descriptions may be provided for groups of species where details for each are identical.

⁴ Descriptions may be provided for groups of species where details for each are identical.

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- the effects the culture of different species may have on variations in the volume and quality characteristics of waste water generated by the project;
 - details of chemicals (including reference to toxicity, breakdown times and mechanisms) or other substances to be used in ponds or to treat discharges, including applicable standards (eg those in the National Water Quality Management Strategy) **(4.5)**;
 - sources and pathways of pollutants and wastes during normal and abnormal operation **(4.5)**;
 - a description of the design and functional aspects of the proposed treatment systems including settlement ponds, bioremediation, and recirculation;**(4.2 and 4.5)**
 - the number and, with reference to a drawing, the location of release points from production ponds to the treatment systems;**(4.1)**
 - a description of the proposed methods used to control salinity levels in production ponds such that water quality is maintained suitable for growth of each proposed species - in particular details are required of the quantities and sources of any freshwater to be used and the proposed average and maximum exchange rates for pond waters;**(4.2 and 4.5)**
 - description of potable water requirements for both processing and workforce usage, and proposed sources, storage facilities, water treatment processes, and monitoring of water quality;**(4.1)**
 - identify if any natural depressions or waterways will be used for water storage or drainage basins and proposed water levels to be maintained in the structures during both the construction and operational phases; **(4.1)**
 - susceptibility of the development to flooding, including storm surge, and any measures proposed to mitigate any impacts;**(4.1)**
 - impacts of the proposed development on local and regional flooding characteristics; **(4.1 and 7.1)**
 - predicted levels of noise (on-site and at nearest residency and noise sensitive place) generated by construction and operation activities, and details of the times when noise is to be generated;**(4.5)**
 - predicted level of light emanating from the site;**(4.5)**
 - predicted volumes and compositions of emissions to air generated by construction and operation activities; **(4.5)**
 - detail existing traffic volumes on the Bruce Highway and turning movements at the intersection with Coventry Road in the township of Guthalungra;**(4.5)**
 - transportation requirements including tonnages of product and inputs to be transported, the period required for haulage and proposed haulage routes, together with the expected traffic generation for both the construction and operational stages; and **(4.5)**
 - any staged or future developments proposed.**(4.1)**

In addition, details of the economic feasibility of the project should be provided, including costs of development and ongoing maintenance, indemnity and public liability insurance, operational and decommissioning costs; the capacity of the proponents to satisfactorily develop the project; the costs of decommissioning the project and rehabilitation of the site; cash-flow projections; estimated market size, location and purchase price; estimated losses in income due to climatic conditions and both natural and human induced hazards; applicable commercial and Government fees; financial assurances and Joint Venture arrangements; and Foreign Investment Review Board issues. If some of this information is considered to be confidential it may be placed in a separate volume for review by the Coordinator-General **(4.5)**.

2.6 Alternatives (5.0)

The EIS should describe any prudent and feasible alternatives to the project or specific elements of the project.

Alternatives should be discussed with relevant administering authorities and results of these discussions should be included in the EIS. These alternatives should be discussed in sufficient detail to make clear the reasons for preferring certain options and rejecting others.

The reasons for choice of the preferred option should be explained, with reference to the adverse and beneficial effects used as the basis for selection as well as compliance with government policy and with the principles and objectives of ecologically sustainable development. Significant short, medium and long term advantages and disadvantages of the options should be considered.

To the extent reasonably practicable, the discussion of any feasible alternatives to the project should include:

- the no project alternative **(5.1)**;
- alternative locations for development of the entire project **(5.2)**;
- alternative locations for elements of the project within the site **(5.3)**;
- alternative locations for intake and discharge structures **(5.4)**;
- alternative locations for structures to minimise the amount of mangroves, marine plants and other vegetation to be cleared **(5.5)**;
- alternative technologies and methods for managing water balance in ponds and treatment of pond effluent, including recycling **(5.6)**;
- alternative options for water treatment including alternative settlement pond designs **(5.7)**;
- the no-discharge alternative **(5.8)**;
- alternative species **(5.9)**;
- alternative pond layouts and/or farming methods to achieve the same objectives **(5.10)**;
- alternative management practices to minimise and mitigate impact on the environment **(5.11)**;
- a comparative description of the impacts of each alternative on the matters protected by the controlling provisions for the project **(5.12)**; and
- alternative power supply including details of fuel type, storage volumes, emergency management, and expected fuel consumption rates (per hour) **(5.13)**.

2.7 Description of the Existing Environment (6.0)

A description should be provided of the present biophysical, social and economic environment in the development area and adjacent lands and waterways to be used for carriage of intake and discharge pipes. This section should include identification of the existing environmental values of the area that may be affected by the project. Environmental values are defined by the *Environmental Protection Act 1994* and Environmental Protection Policies. Environmental values should be described by reference to background information and studies that are included as appendices to the EIS.

Sufficient detail is needed to allow a clear understanding of the likely impacts of the project (both beneficial and adverse) and to assess the effectiveness of any proposed mitigation measures. Baseline information should be used and references included where appropriate as well as any relevant methodological considerations and any caveats.

Relevant maps of the physical environment are to be included where possible.

2.7.1 Biological and Physical Environment

Aspects to be addressed include:

Climate:

- a description of the climate of the site over a 12 month period **(6.2)**;

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- a description of climatic natural hazards including cyclones, flooding and storm surge, sea level rise **(6.2)**;

Topography:

A description of the topography of the site and adjacent lands including elevation details, especially indicating

- land below 5m AHD **(6.1)**;
- the location of the Highest Astronomical Tide (HAT) **(6.1)**; and
- identify and map areas subject to flooding and overland flows during extreme weather events **(6.4)**;

Methods used for determining elevation data should be described **(6.4)**.

Soils:

- identify, map and describe the geology, landform patterns and landform elements, and soil orders of the proposed site and adjacent lands **(6.3)**;
- describe how the development may affect Good Quality Agricultural Land and any implications for the State Planning Policy 1/92: Development and the Conservation of Agricultural Land **(6.8)**;
- identify the location, depth and existing and potential acidity of actual and potential acid sulfate soils (ASS) within the development area and on adjacent lands to be used for carriage of intake and discharge pipes, including proposed treatment of any ASS exposed - an acid sulfate soil investigation must be performed by a suitably qualified person in accordance with current QASSIT⁵ Guidelines⁶. The report of the investigation must include details regarding borehole locations, sampling equipment, sample collection techniques, field testing, and laboratory analysis and be presented in a format that includes a statement of methodology, presentation of raw data, figures, maps, diagrams and tables and a summary of the findings. More detailed sampling will be required for linear excavations (eg. pipelines) such as one borehole per 50-100 metres **(6.3)**;
- describe the presence and location of any contaminants in the soil within the development area such as heavy metals and pesticides, and testing regimes used to identify these; **(6.3)**
- erodability - indicate the suitability of the soil for ponds at the depths of excavation in relation to seepage losses and an indication of the suitability of soil and volumes available for lining; and **(6.3)**
- provide information on soil surveys to identify and quantify for construction purposes any "unsuitable material" identifying the characteristics of the "suitable" and "unsuitable soils". **(6.3)**

Hydrology and Water Quality:

- details of possible licensing requirements under the *Water Act 2000*; **(6.4)**
- identify the current surface water quality and levels within the development area and on adjacent lands to be used for carriage of intake and discharge pipes; **(6.4)**
- identify the current groundwater quality and levels in both regional aquifer and local water tables, including interaction with surface and/or sea/salt water; consideration should be given to establishing baseline monitoring to provide 12 months data prior to commencement of construction, or an alternative means of providing similar information to the satisfaction of the Department of Primary Industries, the Environmental Protection Agency and the Department of Natural Resources and Mines; **(6.4)**

⁵ Queensland Acid Sulfate Soil Investigation Team (QASSIT).

⁶ Ahearn, C.R., Ahearn, M.R. & Powell, B. 1998, *Guidelines for Sampling and Analysis of Lowland Acid Sulphate Soils (ASS) in Queensland 1998*, QASSIT, Department of Natural Resources, Resources Sciences Centre, Indooroopilly, QLD. ISBN 0 7242 7442 1. Available online at <http://www.nrm.qld.gov.au/land/landplan/lp-ass/ass-guidelines.pdf>

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- identify the location of any bores within 3 km radius and indicate if they are used for irrigation or domestic supplies; **(Section 6.4)**
 - detail the existing hydrodynamics of watercourses which may be impacted by the project, including the flow rates during ebb and flood tides at both Spring and Neap tides at both the intake and discharge points, and the volume of the tidal prism; **(6.4)**
 - detail the hydrodynamics of the receiving waters potentially affected by all options for intake and discharge, including those during ebb and flood tides at both Spring and Neap tides at both the intake and discharge points for each proposed option; **(6.4.)**
 - describe the existing rate of sediment supply from the Elliot River to the coast, and the annual average longshore transport rate along the coastline updrift and downdrift of the Elliot River mouth; **(6.4)**
 - describe the marine bathymetry and structures; **(6.4)**
 - describe the natural historical changes that have taken place at the Elliot River mouth and along the beaches to the north; and **(6.4)**
 - provide a detailed description of the water quality: **(6.4)**
 - in the Elliot River and the near-shore marine environment, including waters upstream, downstream and within the “mixing zone” of the proposed discharge and intake points;
 - with measures to include nitrogen, phosphorus, suspended solids, pH, salinity; and
 - under conditions of low rainfall ie dry season flows (July/September inclusive) as well as wet season flows (December/March inclusive).

Conclusions from any baseline tidal hydraulics and water quality sampling program should be addressed in the context of any national/regional standards and compared and contrasted with other regional sites, and with other aquaculture areas.

Terrestrial and Marine Communities:

- indicate the boundaries of the development in relation to any declared Fish Habitat Areas or marine parks; **(6.6)**
- identify the likely presence on the proposed site and adjacent lands and waterways of, species that have local, state, national or international significance such as species listed under the *EPBC Act 1999* and the *Nature Conservation (Wildlife) Regulations 1994* (Queensland) as Rare, Vulnerable or Endangered including cetaceans (dolphins and whales) and species listed by the publication “Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes”⁷, and habitat suitable for them; **(6.5)**
- identify the likely presence of and habitat suitable for migratory species under the China-Australia Migratory Bird Agreement (CAMBA) and Japan-Australia Migratory Bird Agreement (JAMBA) on the proposed site and adjacent lands and waterways, and include an assessment of the significance of such habitat at local, regional, State and National levels; **(6.5)**
- Identify the likely presence of native wildlife or vegetation which could become ‘problem species’ within the context of this proposed aquaculture enterprise; **(Section 6.5)**
- provide details of how the development may be affected by the *Vegetation Management Act 1999*; **(6.5)**
- identify, map and describe vegetation communities of the proposed site and adjacent lands; **(Section 6.5)**
- provide a description and location of marine plant communities at the site and adjacent to the proposed intake and discharge points as required for permits under the *Fisheries Act 1994*; **(6.5)**

⁷ Pogonoski, J.J., Pollard, D.A. & Paxton, J.R. 2002, *Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes*, Environment Australia, Canberra. ACT. ISBN 0 642 54786 6. Available online at <http://www.ea.gov.au/coasts/species/marine-fish/pubs/marine-fish.pdf>

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- identify and map the regional ecosystems present on the proposed site and identify their biodiversity status (see EPA website⁸); **(6.5)**
 - classify and map wetland areas on the proposed site and adjacent lands as per Blackman, Spain and Whiteley, 1992⁹; **(6.5)**
 - identify areas of special ecological significance such as wildlife corridors and refuges on the proposed site and adjacent lands and waterways **(6.5)**; and
 - identify and describe important ecological interactions on and adjacent to the development site including those between seagrass / dugongs / turtles, intertidal areas / migratory birds, seagrass / fisheries resources, and tidal lands / fisheries resources. **(6.5)**

Conservation and Heritage Values:

- identification and discussion of the overall conservation values of the region, site and adjacent areas including **(Section 6.6)**:
 - World Heritage values and attributes; **(Section 6.6)**
 - Great Barrier Reef Marine Park values; **(Section 6.6)**
 - wetlands of international or national importance; **(Section 6.6)**
 - Fish Habitat Areas; **(Section 6.6)**
 - national parks; **(Section 6.6)**
 - places listed on the Register of the National Estate; **(Section 6.6)**
 - other places listed on cultural heritage registers maintained by the Environmental Protection Agency.

To assist in identifying which World Heritage values may potentially be impacted by the project, Section 4 of this document provides a table of the World Heritage criteria against which the Great Barrier Reef was listed. The table contains examples of the World Heritage values for each criterion.

2.7.2 Social and Economic Environment

Aspects to be addressed include:

- a profile of impacted communities: demographic characteristics; current employment and community profile; social well-being; public safety issues; existing community infrastructure including the location and capacity of health facilities; and recreation patterns and opportunities **(6.7)**;
- a profile of existing housing and other temporary and permanent worker accommodation in impacted communities, including the availability of vacant accommodation and a description of its standard **(6.7)**;
- the existence or potential for cultural heritage items and/or places and cultural heritage values at the site or adjacent areas - reference should also be made to the requirements and expectations of the *Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987* and the recommendations of any previous cultural heritage investigations; assessments of indigenous cultural heritage are to be conducted with the prior consent and involvement of indigenous groups or individuals that have a traditional and/or historical affiliation with the study area **(6.7)**;
- a description of past and existing land uses of the site and adjacent areas, including Aboriginal and Torres Strait Islander traditional and contemporary uses **(6.7)**;

⁸ EPA website address is www.epa.qld.gov.au/environment/science/wildlife

⁹ Blackman, J., Spain, A. & Whiteley, L 1992, *Provisional handbook for the classification and field assessment of Queensland's wetlands and deepwater habitats*. Department of Environment and Heritage, Canberra, draft manuscript.

- identification of recreational, commercial or other uses of the local waterways and/or receiving environments, including Aboriginal and Torres Strait Islander traditional and contemporary uses **(6.7)**;
- identification of existing use of groundwater or surface water supplies for agriculture, stock and domestic purposes within a distance of 3 km **(6.7.5)**;
- a description of ambient noise **(6.7.6)**;
- a description of existing industry in the region including commercial fisheries **(6.7.7)**; and
- the location, type and availability of police, fire, ambulance and emergency services **(6.7.8)**.

2.7.3 Land Use and Planning Issues

Aspects to be addressed include:

- statutory and non-statutory planning frameworks including information in the local and regional context, including **(6.8.1)**:
 - the town planning scheme for Bowen Shire;
 - *State Planning Policy 1/92, Development and the Conservation of Agricultural Land* and the relevant planning guidelines¹⁰;
 - *Draft State Planning Policy on the Planning and Management of Acid Sulfate Soils*;
 - the *State Coastal Management Plan - Queensland's Coastal Policy* (State Coastal Plan). The application of relevant principles and policies of the State Coastal Plan should be considered and discussed, particularly with respect to:
 - Policy 2.1.14 Aquaculture
 - Policy 2.2.2 Erosion prone areas
 - Policy 2.3.1 Future need for access
 - Policy 2.3.2 Design of access
 - Policy 2.4.1 Water quality management
 - Policy 2.4.2 Wastewater discharges to coastal waters
 - Policy 2.4.4 Stormwater management
 - Policy 2.4.5 Groundwater quality
 - Policy 2.4.6 Acid sulfate soils
 - Policy 2.4.7 Good Quality Agricultural Land
 - Policy 2.5.2 Involvement of Indigenous Traditional Owners in managing their cultural resources
 - Policy 2.6.2 Cultural heritage
 - Policy 2.8.1 Areas of State significance (natural resources)
 - Policy 2.8.2 Coastal wetlands
 - Policy 2.8.3 Biodiversity
 - The draft Whitsunday, Hinterland and Mackay (WHAM) Regional Plan;
- description of existing and any known proposed aquaculture operations **(6.8.2)**;
- land tenure and any Native Title claims relating to the site, adjacent lands and locality, including proposed access routes and land adjacent to the proposed site over which any easements are proposed including properties on Elliot River, Abbot Bay and Cape Upstart **(6.8.3)**; and
- compliance with the principles of ecologically sustainable development as set out in the National Strategy for Ecologically Sustainable Development **(6.8.4)**;

¹⁰ Planning guidelines are available at <http://www.nrm.qld.gov.au/land/landplan/lp-info/lp-content/public/guide932.pdf>

2.8 Impact Assessment

The EIS should discuss the predicted environmental impacts expected to result from the project. Separate consideration should be given to the effects during the construction phase and the ongoing operation of the project. Generally, the discussion should use the same indicators and descriptions used to describe the existing environment .

Direct and indirect, short-term and long-term, temporary and irreversible, adverse and beneficial effects should be described and, where possible, quantified using valid statistical analysis, or where more appropriate, probability analysis. A statement whether any relevant impacts are likely to be unknown, unpredictable or irreversible is required. The reliability of forecasts and predictions should be indicated as appropriate. Any technical data and other information used or needed to make a detailed assessment of the impacts should be provided and underlying data should be accessible and assumptions used substantiated.

The following illustrates the types of impacts that need to be considered.

2.8.1 Water Management

Water management issues should be addressed in determining any potential impacts both during the construction and operation phases, including consideration of the following:

- effects of natural hazards (cyclones, floods, wave surge, storm/heavy rainfall); **(7.1)**
- describe the impacts of the project upon the hydrology of the proposed site, adjacent areas and receiving waters, including **(7.1 and 9.0)**
 - drainage patterns;
 - potential changes in the quality and levels of the groundwater, both the regional aquifer and local water table;
 - effects on the water quality and levels of the groundwater with different levels of seepage (eg regional aquifers as well as salt-water intrusion, contamination with poor quality pond water and non-tidal watercourses on site), and identifying potential changes in the regional aquifer and local watertable in dry, medium and high rainfall years, detailing any investigations to assess the risk of the project to impacts upon groundwater;
 - tidal regimes;
 - sediment loads and sediment movements;
 - management of stormwater flows;
- detail the impacts of the project upon the receiving waters of Abbot Bay and/or Elliot River and/or Upstart Bay including:**(7.2)**
 - the delineation of the initial mixing zone for discharges;
 - discuss how the proposed location of the discharge structure will maximise mixing and dispersion of effluent; and
 - discuss the effectiveness of the proposed discharge structure compared to alternatives, such as a submerged outfall and diffuser;
- discuss the impact of any structure to be located within the Great Barrier Reef Marine Park on the hydrodynamics of Abbott Bay;
- discuss the impacts of the intake and discharge operations and structures on:
 - water velocities in the Elliot River during normal spring tide and neap tide cycles;
 - water velocities within the Elliot River resulting from the proposed maximum discharge/ intake during normal neap tide and spring tide cycles;
 - bank and bed erosion/stability resulting from operations; and
 - the natural flow rates of the Elliot River as determined in Section 7;
- determine the impact of the tidal prism of the Elliot River during the proposed pumping periods to account for neap and spring tides and during wet season creek flows (December/March inclusive) and dry season flows (July/September inclusive);

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- describe the impact of natural sand movement in the Elliot River mouth on the intake and discharge pipes, and how this impact will be managed;
 - describe what allowance will be made for natural movements of the Elliot River mouth and how the possibility of waves directly impacting on the intake and discharge structures will be managed;
 - identify what impact significant rainfall would have upon (a) the volume of effluent to be discharged from the project in order to restore water quality in the ponds and (b) the associated high flood flows of the Elliot River;
 - modelling of the discharge to the receiving waters is required, and should include the following:
 - changes to tidal velocities for neap and spring tides of Elliot River;
 - estimates of the scouring velocities within the channel of Elliot River;
 - distance downstream for the full mixing and dispersion of the aquaculture effluent from the discharge structure to the point of no detectable change from ambient water quality levels (for Elliot River and/or Abbot Bay). Distances should be reported as the maximum for all occasions and the mean distances downstream;
 - the distances required for the full assimilation of individual contaminants as a minimum to include: total suspended solids, total nitrogen, total phosphorus and chlorophyll a;

The modelling of individual contaminants should be based on a range of concentrations taking account of current industry practice and regulatory discharge requirements;
 - discuss (with reference to diagrams) how the design of any discharge structure will prevent erosion at its junction with and immediately downstream of Elliot River;
 - discuss any potential impacts on the environment from increased flows at the discharge point, such as increased inundation of mangroves in the vicinity etc.;
 - in relation to discharge waters, the basis for expected maximum levels for various parameters should be described with reference to:
 - the hydrological nature and capacity of the receiving waters in considering the hydrology;
 - water quality impacts assessment which have regard to the Australian and New Zealand Environment Conservation Council (ANZECC) 2000 water quality guidelines¹¹;
 - ecological impacts of the project;
 - impacts on native flora and fauna, including rare and endangered species, significant habitats and key ecological interactions;
 - discuss potential cumulative impacts of discharges from the project taking into account any other pollution sources;
 - discuss the effectiveness of controls and structures to measure and regulate the flow of wastewater to the discharge area; consider how the release of wastewater could be managed to coincide with the tidal regime of the discharge area and, if necessary, to confine discharges to periods of ebb tides;
 - discuss the effectiveness of the proposed treatment systems for the treatment of wastewater providing estimates for the removal of contaminants produced by the proposed operation; quantify the ability of the treatment system to remove the total suspended solids, total nitrogen, total phosphorus and chlorophyll a from the pond effluent both during normal operation and during drain harvesting;
 - discuss effects on water quality from leachate due to the disturbance of actual and/or potential acid sulfate soils;

¹¹ Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand 2000, *Australian and New Zealand Guidelines for Fresh and Marine Water Quality*. ANZECC & ARM CANZ, Canberra. ISBN 09578245 0 5 (set). Available online at <http://www.ea.gov.au/water/quality/nwqms/volume1.html>

- describe the maintenance requirements for the intake and discharge pipelines/structures and the wastewater treatment ponds:
 - describe how these facilities will be cleaned;
 - where any contaminants will be treated;
 - the proposed methods for disposal of any contaminants removed from these devices during maintenance;
 - discuss the likely impact of the cleaning of the treatment systems on the concentration of total suspended solids in wastewater proposed to be discharged;
- discuss the measures for minimising the Food Conversion Ratio (FCR) to reduce wastewater contamination; and
- discuss how the risk of erosion of pond walls and embankments will be managed, including:
 - describe how erosion and slumping of channel walls will be prevented if dispersive soils are used in construction;
 - describe what effect the use of dispersive clay soils in the construction of the project will have on the levels of total suspended solids present in wastewater generated by the project; and
 - if revegetation of these areas is proposed, provide a revegetation plan which sets out how this revegetation will be achieved, including a list of what species of grasses may be used, what types and quantities of fertilisers and pesticides are proposed and the freshwater requirements to successfully revegetate these areas following construction.

2.8.2 Flora and Fauna

Undertake an assessment of the project's impact on flora and fauna of the area during construction and operation, including discussion of the following: **(7.3)**

- extent of clearing of native vegetation and effects on native fauna; **(7.3)**
- impacts on native flora and fauna utilising the site and adjacent lands and waterways and their habitat, especially species that have local, state, national or international conservation significance such as species listed under the *EPBC Act 1999* and the *Nature Conservation (Wildlife) Regulations 1994* (Queensland) as Rare, Vulnerable or Endangered; species listed by the publication "Conservation Overview and Action Plan for Australian Threatened and Potentially Threatened Marine and Estuarine Fishes"¹²; migratory species covered under International Conventions (eg. Ramsar Convention, CAMBA and/or JAMBA); impacts in consideration of the Asia-Pacific Migratory Waterbird Conservation Strategy:¹³ 2001 - 2005; endemic species, taxa and other biotic values such as habitats constituting key attributes of the Great Barrier Reef which reflect its World Heritage values; other significant habitats and habitat components (eg. movement corridors); and key ecological interactions; **(7.3)**
- impacts on the regional ecosystems and wetlands present on the proposed site and adjacent lands and waterways; **(7.3)**
- impacts on the conservation values of World Heritage areas, marine parks, wetlands of national and international importance, fish habitat areas, national parks and places listed on the register of the national estate; **(7.3)**
- impacts on areas of special ecological significance on the proposed site and adjacent areas; **(7.3)**
- impacts on the marine environment and important habitats particularly marine plants (including the species and extent of any marine plants proposed to be removed during construction), and intertidal, lagoonal and soft bottomed environments – where appropriate these matters should be

¹² Pogonoski, J.J., Pollard, D.A. & Paxton, J.R. op cit.

¹³ Asia-Pacific Migratory Waterbird Conservation Committee 2001, *Asia-Pacific Migratory Waterbird Conservation Strategy: 2001 – 2005*, Wetlands International – Asia Pacific, Kuala Lumpur, Malaysia. ISBN 983 9663 30 5. Available on-line at <http://www.ea.gov.au/water/wetlands/mwp/2001-2005/>

examined with regard to the Australian and New Zealand Environment Conservation Council (ANZECC) 2000 water quality guidelines of 2000; **(7.3)**

- potential impacts on fisheries stock; **(7.3)**
- discuss the potential for disease outbreak on the farm and risks to the wild stock; **(7.3)**
- discuss the farm design and strategies to prevent escape of any cultured stock at any stage of their life history; **(7.3)**
- impacts due to facility lighting especially on nesting and hatchling turtles; **(7.3)**
- impacts due to the attraction of birds (including migratory birds) and other native species to the ponds and/or prawn trash, and proposed controls and from whom approval will be sought for the implementation of those controls; and **(7.3)**
- the creation or aggravation of mosquito breeding sites and details of any proposed measures to control mosquito-breeding sites. **(7.3)**

2.8.3 World Heritage Values

The following matters are to be considered in relation to the project)

- identification of biotic and non-biotic World Heritage values of the area with the potential to be affected by the project; **(7.2, 7.3 and 7.11)**
- identification and evaluation of potential direct and indirect impacts to these values during construction and operation (including transport and related processes); **(7.2, 7.3 and 7.11)**
- evaluation of risks to these values; and **(7.2, 7.3 and 7.11)**
- application of these analyses to monitoring, impact avoidance, mitigation measures and contingency planning. **(7.2, 7.3, 7.11, 9.0)**

Such values would include, but are not limited to, the biotic values mentioned in Section 2.8.2 and non-biotic values such as processes of erosion and deposition along coastline, river deltas and estuaries.

2.8.4 Noise

The following noise issues should be addressed in determining any potential impacts both during the construction and operation phases:

- consideration of relevant guidelines and standards e.g. *Environmental Protection (Noise) Policy 1997*; *Environmental Noise Guidelines for Construction and Building Sites*; and *AS2436 – 1981 Guide to Noise Control on Construction, Maintenance and Demolition Sites*; **(7.4)**
- an assessment of the noise for this project including predictions for Leq over a 24-hour period and L_{Amax} over a 15 minute selected time period at a time of maximum noise impact; **(7.4)**
- discuss potential noise impacts of this project on nearby protected areas (under State and Commonwealth legislation), in particular if the project will be able to comply within a background noise level plus 10% limit, equal to 33 dB(A) at all times; **(7.4)**
- identify potential noise sources and indicate proposed operating times, in particular the noise level generated by: **(7.4)**
 - the operation of the intake facilities;
 - the operation of aerators and other plant such as generators at the site of the production ponds;
 - the operation of the processing plant; and
 - transportation of materials, plant, product and personnel for the project;

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- assess ambient noise levels at the premises potentially affected by noise from the project, including discussion of the effects of noise from operations performed during non-regular work hours on local residents and noise sensitive places; and **(7.4)**
 - detail any noise control measures to be adopted and their predicted (or measured) effectiveness. **(7.4)**

2.8.5 Air Quality

The following air quality issues should be addressed in determining any potential impacts both during the construction and operation phases:

- options for the disposal of vegetation cleared during construction other than burning; **(7.5)**
- air quality impacts of emissions; **(7.5)**

impacts of the transportation of materials, plant, product and personnel on greenhouse gas emissions and local air quality; and **(7.5)**

- detail any emission control measures to be adopted, and analyse and discuss the anticipated effectiveness of these measures. **(7.5)**

2.8.6 Waste Management / Minimisation

- Detail the methods proposed to manage wastes generated during the construction and operational phases, including: **(4.3 and 7.6)**
- the overall waste management strategy to be adopted (e.g. avoidance, minimisation, reuse, recycling and disposal) including proposed methods for handling chemicals, fuel, feed, processing wastes including liquids, domestic waste from processing plant and accommodation facilities, septic and solid waste etc., opportunities for spillage and measures proposed to prevent any spills. Identify the nature and quantity of any spills that can still occur and assess the impacts of any such spills; **(4.1 and 7.6)**
- amount and characteristics of all waste likely to be generated; **(7.6)**
- solid and liquid waste disposal requirements, proposed methods and locations for reduction, reuse, recycling or disposal; **(4.1, 4.5 and 7.6)**
- assessment of the potential impacts associated with waste handling (e.g. spills and odours); **(7.6)**
- proposed response to any waste management accidents including identification of the entity to act and the action to be taken; **(7.6)**
- discuss how waste packaging from feed will be collected and disposed of and where waste packaging material will be taken for disposal; and **(7.6)**
- impacts of construction, operational, processing and domestic waste disposal. **(4.1, 4.3 and 7.6)**
- Discuss the seafood processing operation for this project and provide information on the packaging requirements for the seafood processing operation including what wastes and quantities of waste will be produced from the processing and packaging of prawns. Explain how packaging waste will be handled and options for the recycling or disposal of this waste. If disposal is proposed, indicate where this waste material will be taken for disposal. **(4.5 and 7.6)**

2.8.7 Construction Methods

Undertake an assessment of the potential impacts of construction methods required to implement the project, including consideration of the following:

- effects and extent of earthworks including those required along proposed pipelines and at intake and discharge points including soil characteristics, potential soil erosion and acid sulfate soils; **(4.3)**
- any construction of the intake and discharge structures occurring at low tide including a description of works proposed in the tidal areas and how these works will comply with this low tide requirement; **(4.2 and 4.3)**
- measures proposed to manage the environmental impacts from construction activities in tidal areas; **(4.2 and 4.3)**
- measures proposed to manage the environmental impacts from construction activities in environmentally sensitive areas eg wetlands; **(4.2 and 4.3)**
- changes to topography as a result of construction, eg. location and details of borrow pits and raised areas; **(4.2 and 4.3)**
- impacts due to machinery access to construct intake and discharge pipelines, including rehabilitation of disturbed areas once construction is complete; **(4.2 and 4.3)**
- effects of natural hazards (including cyclones, floods, storm surge) on construction works; and **(4.2 and 4.3)**
- details on how machinery will be washed to reduce/eliminate contamination from noxious weeds in the district to and from the site, including any safeguards needed to reduce the erosion risk from such washing. **(9.0)**

2.8.8 Traffic and Transportation

Undertake an assessment of the impact of the project on transportation in the region during the construction and operational phases, including

- description of transport methods, frequency of access and impacts on the environment of maintenance access to intake/discharge pipelines and discharge points; **(7.7)**
- the type and number of vehicle trips generated by the project during construction and operation, outlining the potential increase in traffic from employees, visitors and the transport of inputs to the site and product to market; **(7.7)**
- hours of operation and any potential seasonal variations in traffic generation; **(7.7)**
- total projected daily traffic volumes for the Bruce Highway and turning movements at the intersection with Coventry Road (highlighting any peak periods); **(7.7)**
- potential impacts on the Coventry Road intersection with the Bruce Highway and any necessary intersection treatments to address those impacts; **(7.7)**
- potential traffic impacts on the township of Guthalungra and the nearby rest area (in terms of their ability to cope with increased traffic volumes, noise, dust, odours/fumes; and **(7.7)**
- any other roads or access points to the Bruce Highway which may be required during construction and operation of the project, along with necessary actions to address adverse road impacts from any additional access. **(7.7)**

2.8.9 Cultural Heritage

An assessment should be undertaken of any likely effects on sites of archaeological or cultural heritage value, including

- description of the significance (both scientific and to the Aboriginal community) of any landscapes, buildings, shipwrecks, items or places of conservation, or of Aboriginal or European cultural heritage value likely to be affected by the project, and their values at a local, regional and national level; **(7.8)**
- identification of potential impacts on any buildings, shipwrecks, items or places of heritage value; **(7.8)**
- consideration of consultation regarding cultural significance and cultural heritage management with the traditional owners of the area; and **(7.8)**
- recommended means of mitigating any negative impacts on cultural heritage values and enhancing any positive impacts. **(7.8 and 9.0)**
- A cultural heritage survey of the impacts of the development proposal must be conducted by a professional heritage consultant holding a permit under the *Cultural Record (Landscapes Queensland and Queensland Estate) Act 1987*. The survey would involve consultation with Aboriginal people associated with the affected areas, as well as necessary checks of cultural heritage registers maintained by the Environmental Protection Agency, including records held under the Act, and should account for Aboriginal, archaeological and historic sites, items and places. The study should identify any additional sites, items or places of cultural heritage significance that exist in the affected area. **(7.8)**

Aspects of the Cultural Heritage survey report pertaining to the Aboriginal community which are considered by that community to be confidential should be placed in a separate volume for review by the Coordinator-General.

2.8.10 Amenity

Undertake an assessment of the project's impact on amenity of the area during construction and operation, including the following:

- impacts on aesthetic qualities incorporating visual and seen attributes as well as community-held perceptions about the area, including those related to mangroves and terrestrial flora; **(7.9)**
- impact of any structure to be located within the Great Barrier Reef Marine Park on other uses of the Marine Park, e.g. navigation; **(7.9)**
- impact of the transportation of materials, plant, product and personnel for the project; **(7.9)**
- outline proposed signage and lighting elements; and **(7.9)**
- identify the existing visual elements including views in-and-out of the proposed site. **(7.9)**

2.8.11 Social and Economic

Evaluate the impacts of the project on social and economic elements of the region. This evaluation must include a process of consultation with all stakeholders. Impacts to be discussed include: **(7.10)**

- positive and negative socio-economic impacts (both direct and cumulative) including those on demographic, social and cultural, and economic profiles **(7.10.1)**;
- impacts on the current land use and human service delivery, together with impacts of conflicting uses of land and sea **(7.10.2)**;
- the extent to which local and Australian services and goods will be utilised; **(7.10)**;
- industry opportunities that may arise in the region and state as a result of the project; **(7.10)**;

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- information on the revenue value of the project to the local, regional and national economy; **(7.10)**;
 - impacts on the livelihood of other industries, operators and on users of the area (land and sea) including but not limited to impacts on: **(7.10)**;
 - local agricultural crops due to the attraction of birds or other native species;
 - adjacent crops due to increased dust settling on them from increased traffic and construction operations;
 - the livelihood of commercial operators and other industry operators;
 - Aboriginal or Torres Strait Islander traditional and contemporary use of land and sea;
 - recreational users of the land and/or sea including tourism;
 - potential economic and employment impacts on local and state fisheries; and
 - impacts on adjacent industries reliant on groundwater extraction.
 - the number and source of the workforce (including occupational groupings) for both the construction and operational phases of the project, including associated occupational opportunities; **(7.10)**;
 - identified training needs and skills development of the local labour force for construction and operational phases of the project; **(7.10)**;
 - impacts on the demand and supply of appropriate permanent and temporary accommodation sufficient to meet the needs of full time permanent and casual workers, including workers employed on a temporary or seasonal basis; and **(7.10)**;
 - consequential social and economic implications arising from natural hazards affecting the project; **(7.10)**;

2.9 Health and Safety

The EIS must discuss safety management strategies and control measures to be used to minimise the risks of incidents and to minimise the consequences of any incident that occurs during the construction or operational phase of the development. An all hazard risk management approach based on relevant guidelines should be used to determine risks (including natural hazards):

In particular, the following issues should be addressed:

- prevention and handling of fires; **(8.1)**
- maintenance of critical items of equipment; **(8.2)**
- discuss the contingency procedures in the case of equipment failure or other reason causing malfunction and/or failure resulting in the release of contaminants which may cause environmental harm; **(8.3)**
- training of operatives; and **(8.4)**
- emergency procedures including the development of a Counter Disaster Plan or Emergency Action Plan for each of the construction and operational phases of the project, with a description of linkages between the on-site emergency procedures and the Bowen Shire Counter Disaster Plan. **(8.5)**

2.10 Proposed Safeguards, Mitigation Measures, Environmental Management and Monitoring

This section should describe all safeguards proposed to prevent damage to the environment, mitigation measures to manage the impacts of the project and, in the event of unforeseen damage, rehabilitate the damaged environment. It should draw together all relevant information mentioned in the text with a clear statement of specific commitments from the proponent. Any actions required by

others to enable the proponent to meet these commitments should be identified (eg supervision of monitoring, safeguards and environmental management).

2.10.1 Environmental Management Plans

An outline of the environmental management plans for the construction and operational phases should be presented, setting out the framework for continuing management, mitigation and monitoring programs for the project's impacts, including any provision for independent environmental auditing.

The construction environment management plan should incorporate links to relevant construction standards, techniques and reference material confirming their adequacy as environmental safeguards.

Strategies to monitor and mitigate any identified negative impacts should be identified. Monitoring programs designed to ensure safeguards are being effectively applied and to identify and measure any differences between predicted and actual impacts should be described.

Any issues that may adversely impact on public health should be addressed.

2.10.2 Environmental Safeguards and Mitigation Measures (9.1)

Proposed safeguards to avoid and mitigate effects on the environment should be discussed (with reference where appropriate to Environmental Management Plans).

This section must include at least the following:

- a description, and an assessment of the expected or predicted effectiveness, of the mitigation and any necessary rehabilitation measures for dealing with the project's relevant impacts (as defined by the EPBC Act);
- any statutory or policy basis for the mitigation measures;
- the cost of the mitigation measures;
- the name of the entity responsible for endorsing or approving each mitigation measure and monitoring program; and
- a consolidated list of mitigation measures proposed to be undertaken to prevent, minimise or compensate for the project's relevant impacts.

The described mitigation measures should include but are not limited to measures to:

- incorporate environmental protection into the design, siting, layout and landscaping of facilities and associated works;
- control unnecessary soil disturbance;
- control erosion;
- prevent flooding and changes to groundwater;
- mitigate any impacts of flooding on the development;
- identify, mitigate and manage acid sulfate soils and any leachate due to the disturbance of actual and potential acid sulfate soils;
- prevent the passage of any water into the surrounding environment that may contain levels of antibiotics or hormones that may impact upon the local natural environment;
- manage stock feed to ensure no impact from it or any additives on waterway health during normal operations;
- minimise impacts of discharge of pond effluent on the marine environment, including tidal hydrology, marine plants, fisheries and marine mammals and reptiles;
- control aquaculture disease outbreaks including development of a disease management plan referencing material confirming the adequacy of proposed measures;

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- control of organisms such as *Vibrio parahaemolyticus* and other pathogens during production and processing;
 - prevent escape of cultured stock into the wild;
 - control the impact of the project on those native flora and fauna species that could become 'problem species' in the context of this proposed aquaculture enterprise;
 - prevent or minimise the creation of mosquito breeding sites, and/or adequately manage such sites;
 - prevent or minimise impacts on terrestrial fauna and fauna habitat and prevent impacts on terrestrial species listed as Endangered, Vulnerable or Rare in the *EPBC Act 1999* and the *Nature Conservation (Wildlife) Regulations 1994* (Queensland), and on migratory birds of conservation significance such as those listed under International agreements (eg. Ramsar Convention, JAMBA and/or CAMBA);
 - mitigate/rehabilitate areas of marine plant loss resulting from impacts on the marine environment and important habitats particularly marine plants, intertidal, lagoonal and soft bottomed environments;
 - minimise and where necessary remediate vegetation disturbance;
 - prevent or minimise direct and/or indirect impacts on biotic and non-biotic World Heritage values of the area during construction and operation;
 - avoid, (or in the case of damage, rehabilitate) impacts on sites and values of environmental or heritage significance (World Heritage, National Estate etc.);
 - control noise
 - prevent and control spills;
 - prevent pollution from solid and liquid waste including options for reuse and recycling;
 - reduce the potential for contamination of the harvested product by soil contaminants such as heavy metals and pesticides;
 - minimise and mitigate impacts on the existing cultural heritage values of any cultural heritage items and/or places located at the site or adjacent to the site through the preparation of a draft cultural heritage management plan;
 - minimise any deleterious effects on economic, social, recreational, conservation, cultural, and community activities and resources;
 - minimise and mitigate impacts on the community as a consequence of the impact of natural hazards on the project;
 - educate employees and construction managers in relation to their environmental protection obligations (eg. through the incorporation of appropriate clauses in construction contracts);
 - train staff on appropriate operational, water quality and disease management procedures;
 - secure infrastructure, stock and equipment; and
 - restoration of the development site at the end of the operating period of the project or in case of failure of the project.

2.10.3 Monitoring Programs and Procedures (9.2)

Provide details of the monitoring programs to be carried out prior to construction to gather baseline environmental data to enable determination of impacts during the construction and operational phases.

Provide details of reactive monitoring objectives, programs and procedures, including:

- monitoring of water quality - performance indicators regarding water quality should be detailed including guidelines for acceptable:

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- pH levels, this section should also include action for remediation of acid sulfate soils if encountered including neutralisation techniques; and
 - levels of antibiotic and hormones, this section should include action for remediation of passage of water containing unacceptable levels of these to the local natural environment;
 - monitoring of groundwater quality and water levels;
 - monitoring of discharge waters and details of a contingency plan should discharge waters not meet required standards;
 - monitoring of bed and bank stability around the intake and discharge points;
 - methods of identifying problems with remote infrastructure such as fuel/oil leaks, pipeline ruptures, erosion areas etc. and procedures to prevent, minimise and rehabilitate consequential environmental damage;
 - monitoring of the adequacy of the holding capacity of effluent settlement ponds;
 - monitoring of feed consumption and feed conversion ratio;
 - monitoring of potential impacts on mangrove communities adjacent to the discharge point; and
 - proposed monitoring of pathogens during production and processing to prevent food borne diseases.

Proposed locations for monitoring, parameters to be monitored and frequency of monitoring should be clearly indicated, together with any requirement for baseline surveys.

Those responsible for monitoring programs should be identified. There should also be a statement of the procedures that will be put in place for reporting on monitoring programs, and to whom that reporting will be done especially in relation to discharge waters. Contingency measures in the event monitoring objectives are not met should be discussed.

2.11 Studies, Consultation and Public Participation

The results of consultation processes and quantitative data will form the basis of the assessment and need to be clearly linked with the assessment process.

The proponent should identify the groups to be consulted, the consultation timetable, the places and method of consultation and explain how the issues raised will be addressed in the assessment of the impacts of the proposal. **(10.1, 10.2, 10.3 and 10.4)**

Describe any research, investigations or consultations undertaken in the course of evaluating the need, feasibility and design of the project (including baseline studies). **(10.1)**

Describe the consultations undertaken with the Commonwealth/State bodies, local government and the public. Include a statement mentioning any communities that may be affected and describing the issues relevant to the affected community. **(10.5)**

Describe the public information, participation or consultation activities undertaken in project formulation, project planning and in preparing the EIS as well as any proposals for further public consultation in project implementation. Also describe any activities previously undertaken or proposed to be undertaken to promote public awareness of the project. **(10.4 and 10.5)**

- A consultation plan should be prepared prior to consultation commencing.

It is recommended that consultation should include, but not necessarily be limited to, the following stakeholder groups during the preparation of the EIS **(10.5)**

- the relevant Native Title representative body;
- any Traditional Owners of the project site;
- any other Aboriginal and Torres Strait Islander organisations with an interest in the area;
- relevant environment and conservation groups;
- local business, industry and primary producer concerns that may be affected by the project;
- local Landcare Catchment Management groups;
- local progress associations;

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- relevant labour associations; and
 - industry associations;

It is recommended that public consultation be proactive rather than passive. Early consultation is beneficial in helping to ensure that a development will mitigate adverse impacts. In relation to the EIS for this project, the Advisory Bodies listed in Section 3 should be contacted during the preparation of the EIS regarding relevant aspects of the project.

The principles to be followed in the consultation process are:

- discussion should seek to facilitate interest group input into the impact assessment research rather than solely to disseminate information;
- information should be presented in a culturally appropriate manner;
- interest groups should be given sufficient time to respond to any requests from the consultants; and
- any meetings should be structured so as not to raise the expectations of particular interest groups in relation to the project during construction and operation.

A summary of consultations should be provided in the body of the EIS. A detailed consultation report should be included as an Appendix to the EIS and should include: **(10.6 and Appendix T)**

- the consultation plan;
- consultation taken and any documented response to, or result of, the consultation;
- proposed consultation about the project's relevant impacts.

2.12 Environmental Record

The EIS must provide details of any proceedings under a law of the Commonwealth or a State for the protection of the environment or the conservation and sustainable use of natural resources against: **(11.1)**

- the proponent; and
- the applicant for any permit under an environmental law for the project.

If the proponent is a corporation, details of the corporation's environmental policy and planning framework.

2.13 Conclusions and Recommendations

As a result of the findings of the EIS, present a balanced and concise overview of the net impact of the project including any relevant recommendations. This should include the identification of any alterations to the project. It should describe the overall environmental impacts of the proposal, indicating whether the project is likely to cause adverse environmental impacts, whether the level of any negative impacts are likely to be acceptable or whether they can be adequately ameliorated by mitigation actions or alterations to the proposal. **(12.1)**

2.14 References and Information Sources

The information provided in the EIS must be factual and be based on quantitative data assessment. The EIS must state the following about information given in the EIS: **(13.1)**

- the source of the information;
- how recent the information is;
- how the reliability of the information was tested; and
- any uncertainties in the information.

All references consulted should be presented in the EIS in a recognised format.

2.15 Recommended Appendices

2.15.1 A1. Terms of Reference for this EIS

A copy of the final Terms of Reference should be included in the EIS. A summary cross-referencing specific items of the Terms of Reference to the relevant section of the EIS should also be provided.

2.15.2 A2. Development Approvals, Licences, Permits and other Approvals

The EIS should identify any other requirements for, or conditions of, approvals, licences and permits required, or that the proponent reasonably believes are likely be required, to the project.

This should include the following:

- a details of any 'Environmentally Relevant Activities' under the *Environmental Protection Act 1994*;
- b approvals under the *Fisheries Act 1994*;
- c requirements under the *Cultural Record (Landscapes Queensland and the Queensland Estate) Act 1987*;
- d permits under the *Marine Parks Act 1982*;
- e possible licensing requirements under the *Water Act 2000*;
- f requirements under the *Land Protection (Pest and Stock Route Management) Act 2002*;
- g requirements under the *Vegetation Management Act 1999*;
- h possible licensing and registration under the *Food Act 1981*;
- i details of any planning instrument dealing with the project under the *Integrated Planning Act 1997* including the following:
 - what environmental assessment of the project has been, or is being, carried out under the scheme, plan or policy planning instrument; and
 - how the scheme, plan or policy planning instrument provides for preventing, minimising and managing the project's relevant impacts;
- j a description of any approval, other than the Commonwealth approval (under Chapter 4, Part 9 of the EPBC Act), obtained from a State or Commonwealth entity, including any approval conditions applying to the project;
- k a statement identifying any other required approval, other than the Commonwealth approval (under Chapter 4, Part 9 of the EPBC Act); and
- l a description of the monitoring, enforcement and review procedures applying, or proposed to apply, to the project.

2.15.3 A3. Research

Proposals for researching alternative environmental management strategies or for obtaining any further necessary information should be outlined in an appendix.

2.15.4 A4. Consultation Report

A consultation report should be included as an Appendix to the EIS, including:

- the consultation plan;
- list the Commonwealth, state and local government bodies consulted, and the individuals and groups of stakeholders consulted; include information about identifying affected parties (EPBC Act) and interested and/or affected persons (EP Act);

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- identify any affected persons, including a statement mentioning any communities that may be affected and describing the communities' views;
 - describing the methods used in consultation including criteria for identifying stakeholders and the communication methods used;
 - describe the issues raised;
 - discussing measures utilised to address those issues; and
 - any further proposed consultation about the project's relevant impacts.

2.15.5 A5. Study Team

The qualifications and experience of the EIS study team and specialist sub-consultants and expert reviewers should be provided.

2.15.6 A6. Glossary of Terms

A glossary of technical terms and acronyms should be provided.

2.15.7 A7. Specialist Studies

All reports generated on specialist studies undertaken as part of the EIS are to be included as appendices. These may include:

- flora and fauna studies;
- waterway hydrology;
- groundwater;
- geology;
- acid sulfate soils;
- economic studies, cost benefit analyses;
- cultural heritage studies;
- hazard and risk studies; and
- use and land capability studies.

Any limitations in the use of results from other aquaculture projects must be acknowledged when such studies are used in the EIS.

3. LIST OF ADVISORY BODIES

Department of Aboriginal and Torres Strait Islander Policy
Department of Emergency Services
Department of Employment and Training
Department of Families
Department of Health
Department of Housing
Department of Local Government and Planning
Department of Natural Resources and Mines
Department of the Premier and Cabinet
Department of Primary Industries
Department of Transport
Environmental Protection Agency
Environment Australia
Great Barrier Reef Marine Park Authority
Bowen Shire Council

4. GREAT BARRIER REEF WORLD HERITAGE VALUES

The Great Barrier Reef was inscribed on the World Heritage List in 1981. The World Heritage criteria against which the Great Barrier Reef was listed remain the formal criteria for this property. These criteria have been included in the Values Table below. The World Heritage criteria are periodically revised and the criteria against which the property was listed in 1981 are not necessarily identical with the current criteria.

Examples of the World Heritage values for which the Great Barrier Reef was listed are included in the Values Table for each criterion. These examples are illustrative of the World Heritage values of the property, and they do not necessarily constitute a comprehensive list of these values. Other sources including the nomination document and references listed below the Values Table are available and could be consulted for a more detailed understanding of the World Heritage values of the Great Barrier Reef.

Natural criteria against which the Great Barrier Reef was inscribed on the World Heritage List in 1981.	Examples of World Heritage values of the Great Barrier Reef for which the property was inscribed on the World Heritage List in 1981.
<p>Criterion (i) an outstanding example representing a major stage of the earth's evolutionary history.</p>	<p>The Great Barrier Reef is by far the largest single collection of coral reefs in the world. The World Heritage values of the property include:</p> <ul style="list-style-type: none"> • 2904 coral reefs covering approximately 20 055km²; • 300 coral cays and 600 continental islands; • reef morphologies reflecting historical and on-going geomorphic and oceanographic processes; • processes of geological evolution linking islands, cays, reefs and changing sea levels, together with sand barriers, deltaic and associated sand dunes; • record of sea level changes and the complete history of the reef's evolution are recorded in the reef structure; • record of climate history, environmental conditions and processes extending back over several hundred years within old massive corals; • formations such as serpentine rocks of South Percy island, intact and active dune systems, undisturbed tidal sediments and "blue holes"; and • record of sea level changes reflected in distribution of continental island flora and fauna.
<p>Criterion (ii) an outstanding example representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment.</p>	<p>Biologically the Great Barrier Reef supports the most diverse ecosystem known to man and its enormous diversity is thought to reflect the maturity of an ecosystem, which has evolved over millions of years on the northeast Continental Shelf of Australia. The World Heritage values include:</p> <ul style="list-style-type: none"> • the heterogeneity and interconnectivity of the reef assemblage; • size and morphological diversity (elevation ranging from the sea bed to 1142m at Mt. Bowen and a large cross-shelf extent encompass the fullest possible representation of marine environmental processes); • on going processes of accretion and erosion of coral reefs, sand banks and coral cays, erosion and deposition processes along the coastline, river deltas and estuaries and continental islands; • extensive <i>Halimeda</i> beds representing active calcification and sediment accretion for over 10 000 years; • evidence of the dispersion and evolution of hard corals and associated flora and fauna from the "Indo-West Pacific centre of diversity" along the north-south extent of the reef; • inter-connections with the Wet Tropics via the coastal interface and Lord Howe Island via the East Australia current; • indigenous temperate species derived from tropical species; • living coral colonies (including some of the world's oldest); • inshore coral communities of southern reefs; • five floristic regions identified for continental islands and two for coral cays; • the diversity of flora and fauna, including:

Natural criteria against which the Great Barrier Reef was inscribed on the World Heritage List in 1981.	Examples of World Heritage values of the Great Barrier Reef for which the property was inscribed on the World Heritage List in 1981.
<p>Criterion (ii) an outstanding example representing significant ongoing geological processes, biological evolution and man's interaction with his natural environment.</p>	<ul style="list-style-type: none"> - Macroalgae (estimated 400-500 species); - Porifera (estimated 1500 species, some endemic, mostly undescribed); - Cnidaria: Corals - part of the global centre of coral diversity and including: <ul style="list-style-type: none"> - hexacorals (70 genera and 350 species, including 10 endemic species); - octocorals (80 genera, number of species not yet estimated); - Tunicata: Ascidians (at least 330 species); - Bryozoa (an estimated 300-500 species, many undescribed); - Crustacea (at least 1330 species from 3 subclasses); - Worms: <ul style="list-style-type: none"> - Polychaetes (estimated 500 species); - Platyhelminthes: include free-living Tubellaria (number of species not yet estimated), polyclad Tubellaria (up to 300 species) and parasitic helminthes (estimated 1000's of species, most undescribed); - Phytoplankton (a diverse group existing in two broad communities); - Mollusca (between 5000-8000 species); - Echinodermata (estimated 800 extant species, including many rare taxa and type specimens); - fishes (between 1200 and 2000 species from 130 families, with high species diversity and heterogeneity; includes the Whale Shark <i>Rhynchodon typus</i>); - seabirds (between 1.4 and 1.7 million seabirds breeding on islands); - marine reptiles (including 6 sea turtle species, 17 sea snake species, and 1 species of crocodile); - marine mammals (including 1 species of dugong (<i>Dugong dugon</i>), and 26 species of whales and dolphins); - terrestrial flora: see "Habitats: Islands" and; - terrestrial fauna, including: <ul style="list-style-type: none"> - invertebrates (pseudoscorpions, mites, ticks, spiders, centipedes, isopods, phalangids, millipedes, collembolans and 109 families of insects from 20 orders, and large over-wintering aggregations of butterflies); and - vertebrates (including seabirds (see above), reptiles: crocodiles and turtles, 9 snakes and 31 lizards, mammals); • the integrity of the inter-connections between reef and island networks in terms of dispersion, recruitment, and the subsequent gene flow of many taxa; • processes of dispersal, colonisation and establishment of plant communities within the context of island biogeography (e.g. dispersal of seeds by air, sea and vectors such as birds are examples of dispersion, colonisation and succession); • the isolation of certain island populations (e.g. recent speciation evident in two subspecies of the butterfly <i>Tirumala hamata</i> and the evolution of distinct races of the bird <i>Zosterops spp</i>); • remnant vegetation types (hoop pines) and relic species (sponges) on islands. • evidence of morphological and genetic changes in mangrove and seagrass flora across regional scales; and • feeding and/or breeding grounds for international migratory seabirds, cetaceans and sea turtles.
<p>Criterion (iii) contain unique, rare and superlative natural phenomena, formations and</p>	<p>The Great Barrier Reef provides some of the most spectacular scenery on earth and is of exceptional natural beauty. The World Heritage values include:</p> <ul style="list-style-type: none"> • the vast extent of the reef and island systems which produces an unparalleled aerial vista; • islands ranging from towering forested continental islands complete with freshwater streams, to small coral cays with rainforest and unvegetated sand cays; • coastal and adjacent islands with mangrove systems of exceptional beauty;

<p>Natural criteria against which the Great Barrier Reef was inscribed on the World Heritage List in 1981.</p>	<p>Examples of World Heritage values of the Great Barrier Reef for which the property was inscribed on the World Heritage List in 1981.</p>
<p>features and areas of exceptional natural beauty.</p>	<ul style="list-style-type: none"> • the rich variety of landscapes and seascapes including rugged mountains with dense and diverse vegetation and adjacent fringing reefs; • the abundance and diversity of shape, size and colour of marine fauna and flora in the coral reefs; • spectacular breeding colonies of seabirds and great aggregations of over-wintering butterflies; and • migrating whales, dolphins, dugong, whale sharks, sea turtles, seabirds and concentrations of large fish.
<p>Criterion (iv) provide habitats where populations of rare and endangered species of plants and animals still survive.</p>	<p>The Great Barrier Reef contains many outstanding examples of important and significant natural habitats for <i>in situ</i> conservation of species of conservation significance, particularly resulting from the latitudinal and cross-shelf completeness of the region.</p> <p>The World Heritage values include:</p> <ul style="list-style-type: none"> • habitats for species of conservation significance within the 77 broadscale bioregional associations that have been identified for the property and which include: <ul style="list-style-type: none"> - over 2900 coral reefs (covering 20 055km²) which are structurally and ecologically complex; - large numbers of islands, including: <ul style="list-style-type: none"> - 600 continental islands supporting 2195 plant species in 5 distinct floristic regions; - 300 coral cays and sand cays; - seabird and sea turtle rookeries, including breeding populations of green sea turtles and Hawksbill turtles; and - coral cays with 300-350 plant species in 2 distinct floristic regions; - seagrass beds (over 5000km²) comprising 15 species, 2 endemic; - mangroves (over 2070km²) including 37 species; - <i>Halimeda</i> banks in the northern region and the unique deep water bed in the central region; and - large areas of ecologically complex inter-reefal and lagoonal benthos; and • species of plants and animals of conservation significance.

Further information relevant to the World Heritage values of the Great Barrier Reef may be found in the following documents:

Great Barrier Reef Marine Park Authority 1981, *Nomination of The Great Barrier Reef by the Commonwealth of Australia for inclusion in the World Heritage List*, GBRMPA, Townsville.

Lucas, P., Webb, T., Valentine, P. & Marsh, H. 1997, *The Outstanding Universal Value of the Great Barrier Reef World Heritage Area*, Great Barrier Reef Marine Park Authority, Townsville.

Wachenfeld, D.R., Oliver, J.K. and Morrissey, J.I. (eds) 1998 *State of the Great Barrier Reef World Heritage Area 1998*, Great Barrier Reef Marine Park Authority, Townsville.