Australian Government
Department of the Environment

Referral of proposed action

What is a referral?

The *Environment Protection and Biodiversity Conservation Act 1999* (the EPBC Act) provides for the protection of the environment, especially matters of national environmental significance (NES). Under the EPBC Act, a person must not take an action that has, will have, or is likely to have a significant impact on any of the matters of NES without approval from the Australian Government Environment Minister or the Minister's delegate. (Further references to 'the Minister' in this form include references to the Minister's delegate.) To obtain approval from the Environment Minister, a proposed action should be referred. The purpose of a referral is to obtain a decision on whether your proposed action will need formal assessment and approval under the EPBC Act.

Your referral will be the principal basis for the Minister's decision as to whether approval is necessary and, if so, the type of assessment that will be undertaken. These decisions are made within 20 business days, provided sufficient information is provided in the referral.

Who can make a referral?

Referrals may be made by or on behalf of a person proposing to take an action, the Commonwealth or a Commonwealth agency, a state or territory government, or agency, provided that the relevant government or agency has administrative responsibilities relating to the action.

When do I need to make a referral?

A referral must be made for actions that are likely to have a significant impact on the following matters protected by Part 3 of the EPBC Act:

- World Heritage properties (sections 12 and 15A)
- National Heritage places (sections 15B and 15C)
- Wetlands of international importance (sections 16 and 17B)
- Listed threatened species and communities (sections 18 and 18A)
- Listed migratory species (sections 20 and 20A)
- Protection of the environment from nuclear actions (sections 21 and 22A)
- Commonwealth marine environment (sections 23 and 24A)
- Great Barrier Reef Marine Park (sections 24B and 24C)
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E)
- The environment, if the action involves Commonwealth land (sections 26 and 27A), including:
    - actions that are likely to have a significant impact on the environment of Commonwealth land (even if taken outside Commonwealth land);
    - actions taken on Commonwealth land that may have a significant impact on the environment generally;
- The environment, if the action is taken by the Commonwealth (section 28)
- Commonwealth Heritage places outside the Australian jurisdiction (sections 27B and 27C)

You may still make a referral if you believe your action is not going to have a significant impact, or if you are unsure. This will provide a greater level of certainty that Commonwealth assessment requirements have been met.

To help you decide whether or not your proposed action requires approval (and therefore, if you should make a referral), the following guidance is available from the Department's website:

- the Policy Statement titled Significant Impact Guidelines 1.1 – Matters of National Environmental Significance. Additional sectoral guidelines are also available.
- the Policy Statement titled Significant Impact Guidelines 1.2 - Actions on, or impacting upon, Commonwealth land, and actions by Commonwealth agencies.
- the Policy Statement titled Significant Impact Guidelines: Coal seam gas and large coal mining developments—Impacts on water resources.
- the interactive map tool (enter a location to obtain a report on what matters of NES may occur in that location).

Can I refer part of a larger action?

In certain circumstances, **the Minister may not accept a referral for an action that is a component of a larger action and may request the person proposing to take the action to refer the larger action for consideration under the EPBC Act (Section 74A, EPBC Act).** If you wish to make a referral for a staged or component referral, read 'Fact Sheet 6 Staged Developments/Split Referrals' and contact the Referrals Gateway (1800 803 772).

Do I need a permit?

Some activities may also require a permit under other sections of the EPBC Act or another law of the Commonwealth. Information is available on the Department's web site.

Is your action in the Great Barrier Reef Marine Park?

If your action is in the Great Barrier Reef Marine Park it may require permission under the *Great Barrier Reef Marine Park Act 1975* (GBRMP Act). If a permission is required, referral of the action under the EPBC Act is deemed to be an application under the GBRMP Act (see section 37AB, GBRMP Act). This referral will be forwarded to the Great Barrier Reef Marine Park Authority (the Authority) for the Authority to commence its permit processes as required under the Great Barrier Reef Marine Park Regulations 1983. If a permission is not required under the GBRMP Act, no approval under the EPBC Act is required (see section 43, EPBC Act). The Authority can provide advice on relevant permission requirements applying to activities in the Marine Park.

The Authority is responsible for assessing applications for permissions under the GBRMP Act, GBRMP Regulations and Zoning Plan. Where assessment and approval is also required under the EPBC Act, a single integrated assessment for the purposes of both Acts will apply in most cases. Further information on environmental approval requirements applying to actions in the Great Barrier Reef Marine Park is available from http://www.gbrmpa.gov.au/ or by contacting GBRMPA's Environmental Assessment and Management Section on (07) 4750 0700.

The Authority may require a permit application assessment fee to be paid in relation to the assessment of applications for permissions required under the GBRMP Act, even if the permission is made as a referral under the EPBC Act. Further information on this is available from the Authority:

Great Barrier Reef Marine Park Authority

2-68 Flinders Street PO Box 1379
Townsville QLD 4810
AUSTRALIA

Phone: + 61 7 4750 0700
Fax: + 61 7 4772 6093

www.gbrmpa.gov.au

What information do I need to provide?

Completing all parts of this form will ensure that you submit the required information and will also assist the Department to process your referral efficiently. If a section of the referral document is not applicable to your proposal enter N/A.

You can complete your referral by entering your information into this Word file.

Instructions

Instructions are provided in blue text throughout the form.

Attachments/supporting information

The referral form should contain sufficient information to provide an adequate basis for a decision on the likely impacts of the proposed action. You should also provide supporting documentation, such as environmental reports or surveys, as attachments.

Coloured maps, figures or photographs to help explain the project and its location should also be submitted with your referral. Aerial photographs, in particular, can provide a useful perspective and context. Figures should be good quality as they may be scanned and viewed electronically as black and white documents. Maps should be of a scale that clearly shows the location of the proposed action and any environmental aspects of interest.

Please ensure any attachments are below three megabytes (3mb) as they will be published on the Department's website for public comment. To minimise file size, enclose maps and figures as separate files if necessary. If unsure, contact the Referrals Gateway (email address below) for advice. Attachments larger than three megabytes (3mb) may delay processing of your referral.

Note: the Minister may decide not to publish information that the Minister is satisfied is commercial-in-confidence.

How do I pay for my referral?

From 1 October 2014 the Australian Government commenced cost recovery arrangements for environmental assessments and some strategic assessments under the EPBC Act. If an action is referred on or after 1 October 2014, then cost recovery will apply to both the referral and any assessment activities undertaken. Further information regarding cost recovery can be found on the Department's website.

Payment of the referral fee can be made using one of the following methods:

- **EFT Payments can be made to:**

  BSB: 092-009
  Bank Account No. 115859
  Amount: $7352
  Account Name: Department of the Environment.
  Bank: Reserve Bank of Australia
  Bank Address: 20-22 London Circuit Canberra ACT 2601
  Description: The reference number provided (see note below)

- **Cheque** - Payable to "Department of the Environment". Include the reference number provided (see note below), and if posted, address:

  The Referrals Gateway
  Environment Assessment Branch
  Department of the Environment

GPO Box 787
Canberra ACT 2601

- **Credit Card**

  Please contact the Collector of Public Money (CPM) directly (call (02) 6274 2930 or 6274 20260 and provide the reference number (see note below).

Note: in order to receive a reference number, submit your referral and the Referrals Gateway will email you the reference number.

How do I submit a referral?

Referrals may be submitted by mail or email.

Mail to:

Referrals Gateway
Environment Assessment Branch
Department of Environment
GPO Box 787
CANBERRA ACT 2601

- If submitting via mail, electronic copies of documentation (on CD/DVD or by email) are required.

Email to: epbc.referrals@environment.gov.au

- Clearly mark the email as a 'Referral under the EPBC Act'.
- Attach the referral as a Microsoft Word file and, if possible, a PDF file.
- **Follow up with a mailed hardcopy including copies of any attachments or supporting reports.**

What happens next?

Following receipt of a valid referral (containing all required information) you will be advised of the next steps in the process, and the referral and attachments will be published on the Department's web site for public comment.

The Department will write to you within 20 business days to advise you of the outcome of your referral and whether or not formal assessment and approval under the EPBC Act is required. There are a number of possible decisions regarding your referral:

The proposed action is NOT LIKELY to have a significant impact and does NOT NEED approval

No further consideration is required under the environmental assessment provisions of the EPBC Act and the action can proceed (subject to any other Commonwealth, state or local government requirements).

The proposed action is NOT LIKELY to have a significant impact IF undertaken in a particular manner

The action can proceed if undertaken in a particular manner (subject to any other Commonwealth, state or local government requirements). The particular manner in which you must carry out the action will be identified as part of the final decision. You must report your compliance with the particular manner to the Department.

The proposed action is LIKELY to have a significant impact and does NEED approval

If the action is likely to have a significant impact a decision will be made that it is a *controlled action*. The particular matters upon which the action may have a significant impact (such as World Heritage values or threatened species) are known as the *controlling provisions*.

The controlled action is subject to a public assessment process before a final decision can be made about whether to approve it. The assessment approach will usually be decided at the same time as the controlled action decision. (Further information about the levels of assessment and basis for deciding the approach are available on the Department's web site.)

The proposed action would have UNACCEPTABLE impacts and CANNOT proceed

The Minister may decide, on the basis of the information in the referral, that a referred action would have clearly unacceptable impacts on a protected matter and cannot proceed.

Compliance audits

If a decision is made to approve a project, the Department may audit it at any time to ensure that it is completed in accordance with the approval decision or the information provided in the referral. If the project changes, such that the likelihood of significant impacts could vary, you should write to the Department to advise of the changes. If your project is in the Great Barrier Reef Marine Park and a decision is made to approve it, the Authority may also audit it. (See "*Is your action in the Great Barrier Reef Marine Park,"* p.2, for more details).

For more information

- call the Department of the Environment Community Information Unit on 1800 803 772 or
- visit the web site http://www.environment.gov.au/topics/about-us/legislation/environment-protection-and-biodiversity-conservation-act-1999

All the information you need to make a referral, including documents referenced in this form, can be accessed from the above web site.

Referral of proposed action

Project title: Project Sea Dragon – Core Breeding and Broodstock Maturation Centre

1 Summary of proposed action

NOTE: You must also attach a map/plan(s) and associated geographic information system (GIS) vector (shapefile) dataset showing the location and approximate boundaries of the area in which the project is to occur. Maps in A4 size are preferred. You must also attach a map(s)/plan(s) showing the location and boundaries of the project area in respect to any features identified in 3.1 & 3.2, as well as the extent of any freehold, leasehold or other tenure identified in 3.3(i).

1.1 Short description

Project Sea Dragon Pty Ltd, a wholly owned subsidiary of Seafarms Group Limited (Seafarms) (ASX: SFG), proposes to develop Project Sea Dragon, a large, fully integrated, prawn aquaculture project located in northern Australia.

Project Sea Dragon will be delivered as an integrated production system, providing reliable, long-term, high quality and large scale production of Black Tiger prawns (*Penaeus monodon*). Project Sea Dragon focuses on sustainable land use and integrated design practices to maintain surrounding river and coastal environmental values and to support adjacent agricultural land uses. Project Sea Dragon is a large project with a long development timeline (approximately seven years) between first operations and full scale operations.

It involves a number of facilities located across the Northern Territory (NT) and Western Australia (WA) including quarantine facilities at Exmouth, a breeding program within the Darwin Environs, a grow-out facility at Legune Station, a processing plant in Kununurra and exporting facilities at Wyndham.

This Referral has been specifically prepared for the development of the Core Breeding Centre (CBC), Broodstock Maturation Centre (BMC) and infrastructure associated with these project elements, proposed to be developed at Point Ceylon in the NT (herein referred to as the CBC and BMC, or the project).

The other aspects of the larger project, described above, are not considered part of this application for geographical and operational (timing) reasons. These facilities will be subject to separate environmental approval processes as required, and development application approvals as required.

The Stage 1 Legune Grow-out Facility is currently being assessed at the level of an Environmental Impact Statement (EIS) under the assessment bilateral agreement between the Australian and Northern Territory Governments (EPBC Referral Number 2015/7527).

1.2 Latitude and longitude

The location of the site is described in latitude and longitude in Table 1.

Table 1 Latitude and Longitude

Location	Latitude			Longitude		
	Degrees	Minutes	Seconds	Degrees	Minutes	Seconds
1	-12	43	0.577	130	34	44.468
2	-12	43	43.736	130	34	43.472
3	-12	44	26.231	130	34	9.941
4	-12	44	37.704	130	33	42.526
5	-12	48	29.103	130	33	43.728
6	-12	48	29.425	130	33	4.965
7	-12	46	30.855	130	33	4.24
8	-12	46	31.413	130	31	28.455
9	-12	46	7.238	130	31	28.31
10	-12	45	49.794	130	31	58.7
11	-12	45	49.413	130	33	3.988
12	-12	44	38.424	130	33	3.555
13	-12	44	32.939	130	32	17.002
14	-12	43	29.864	130	31	35.187
15	-12	43	15.282	130	31	35.1
16	-12	43	2.382	130	32	16.331
17	-12	42	14.883	130	32	57.807
18	-12	41	49.237	130	32	51.638
19	-12	41	7.034	130	33	21.48
20	-12	41	13.891	130	33	32.73
21	-12	41	42.814	130	33	16.541
22	-12	42	9.117	130	33	38.896
23	-12	42	59.014	130	33	38.039
24	-12	42	57.515	130	34	38.001

1.3 Locality and property description

Provide a brief physical description of the property on which the proposed action will take place and the project location (eg. proximity to major towns, or for off-shore projects, shortest distance to mainland).

The CBC and BMC are proposed to be located at Point Ceylon, on the southern side of Bynoe Harbour (Figure 1). The project site is approximately 105 km by road from Darwin.

The location of the site is shown in Figure 1 and is described in latitude and longitude in Table 1.

Figure 1 Regional Context

1.4 Size of the development footprint or work area (hectares)

The total development footprint for the CBC, BMC and common facilities at full scale is approximately 132 ha. A breakdown of the total development footprint is provided in Table 2.

Table 2 CBC and BMC Components – Development Footprint

Project Component		**Area of Footprint (ha) (inclusive of marine footprint)**
Broodstock Maturation Centre		39.96
Core Breeding Centre		9.29
Common Facilities	Settlement Ponds	2.70
	Administration and accommodation compound	6.15
	Water storage	3.99
	Intake pipeline	5.53
	Seawater pipeline	11.18
	Discharge channel and/or pipe	13.31
	Biosecurity fence	2.22
	Roads	38.00
Total footprint		132.32

1.5 Street address of the site

Not applicable.

1.6 Lot description

Describe the lot numbers and title description, if known.

The CBC and BMC are proposed to be located on Portion 3192 at Point Ceylon, on the southern side of Bynoe Harbour (Figure 1). The project site is approximately 105 km by road from Darwin. Portion 3192, on which the project site is located, is unregistered crown land owned by the NT Government.

The project will also require the construction of an access road into the site. There are currently two options for the access road into the site. The preferred option is a road that runs north-south from Fog Bay Road. This road will run along an existing road easement between several freehold lots (Portion 2621, 2622, 2608, 2594, 122, 121). The second option is road running east-west from Dundee Road. The road is required to pass through one freehold lot (Portion 2895).

1.7 Local Government Area and Council contact (if known)

If the project is subject to local government planning approval, provide the name of the relevant council contact officer.

The CBC and BMC are located within the Unincorporated Top End Region. The Unincorporated Top End Region contains those areas in the NT that are not part of an incorporated local government council area and therefore no local government consents or licenses are anticipated to be required for the development of the CBC and BMC.

1.8 Time frame

Specify the time frame in which the action will be taken including the estimated start date of construction/operation.

Construction of the CBC and BMC is anticipated to commence in quarter 1 of 2017 with commissioning in quarter 4 of 2017.

1.9	**Alternatives to proposed action** Were any feasible alternatives to taking the proposed action (including not taking the action) considered but are not proposed?	X	No
			Yes, you must also complete section 2.2
1.10	**Alternative time frames etc** Does the proposed action include alternative time frames, locations or activities?	X	No
			Yes, you must also complete Section 2.3. For each alternative, location, time frame, or activity identified, you must also complete details in Sections 1.2-1.9, 2.4-2.7 and 3.3 (where relevant).
1.11	**State assessment** Is the action subject to a state or territory environmental impact assessment?		No
		X	Yes, you must also complete Section 2.5. Unknown – a Notice of Intent has been submitted to the Northern Territory EPA (NT EPA). Project Sea Dragon is currently awaiting a decision from the NT EPA as to whether an Environmental Impact Statement (EIS) under the NT *Environmental Assessment Act* is necessary for the proposed action, or whether the assessment is at an end point and regulation of the proposed activity can proceed through an Environmental Management Plan under the NT *Fisheries Act*.
1.12	**Component of larger action** Is the proposed action a component of a larger action?		No
		X	Yes, you must also complete Section 2.7
1.13	**Related actions/proposals** Is the proposed action related to other actions or proposals in the region (if known)?		No
		X	Yes, provide details. Project Sea Dragon Stage 1 Legune Grow-out Facility (EPBC Act Reference Number: 2015/7527)
1.14	**Australian Government funding** Has the person proposing to take the action received any Australian Government grant funding to undertake this project?	X	No
			Yes, provide details:
1.15	**Great Barrier Reef Marine Park** Is the proposed action inside the Great Barrier Reef Marine Park?	X	No
			Yes, you must also complete Section 3.1 (h), 3.2 (e)

2 Detailed description of proposed action

NOTE: It is important that the description is complete and includes all components and activities associated with the action. If certain related components are not intended to be included within the scope of the referral, this should be clearly explained in section 2.7.

2.1 Description of proposed action

This should be a detailed description outlining all activities and aspects of the proposed action and should reference figures and/or attachments, as appropriate.

2.1.1 Overview

The CBC will be used for the development, production and selection of high performing prawn stock. The top performing individual prawns produced at the CBC will be transferred to the BMC to produce commercial numbers of broodstock for use in the hatchery in the Darwin environs (at a site yet to be determined). Due to different development timeframes and geographical separation from the CBC and the BMC, the hatchery will be subject to a separate referral.

As depicted in Figure 2, the CBC and BMC are located on the same site but are physically separate for biosecurity reasons. The CBC and BMC are intended to be located in the approximate vicinity of the footprints indicated on Figure 2, but as detailed design progresses it is possible that the locations of these facilities may move slightly to work in with local topography. There are also a number of common facilities on site that will support both the CBC and BMC. As outlined in Table 2, the total development footprint for the CBC, BMC and common facilities at full scale will be approximately 132 ha.

While this application is for the full scale development of the CBC, BMC and common facilities, it is important to note that the facilities will be developed initially to support Stage 1 of Project Sea Dragon, which is anticipated to last for two to three years before ramping up to support future stages of the project. Operations and infrastructure will be scaled up over time to support increased demand as described below:

- The CBC will be developed and expanded as the Specific Pathogen Free families become available. This is to accomodate development of the necessary numbers to optimise breeding (i.e. 400 families).
- The BMC will be developed at a rate necessary to support the commercial hatchery operations and the ultimate demand for juveniles from the grow-out facility.
- Significant support infrastructure (known as headworks) will be developed initially to service the CBC and BMC. These headworks will have a capacity greater than that required by the Stage 1 of the project. As such it will not be necessary to duplicate these headworks with every expansion stage. For example, the seawater supply may only require the addition of another pump within the same pump house, using the original intake pipe.

Descriptions of the CBC, BMC and common facilities are provided below. Information is also provided regarding water supply, storage and discharge, workforce details, access and traffic, and bushfire management.

2.1.2 Core Breeding Centre

The CBC will be located to the east of Point Ceylon near Toss Point (Figure 2) and will be used for the genetic development, production and selection of high performing Specific Pathogen Free prawns. The prawns for the CBC will be sourced from the Quarantine and Founder Stock Facility in Exmouth, Western Australia[1]. At the CBC, families of prawns will be raised in separate tanks to avoid unmanaged cross-breeding and maintain genetic lineages. Once the prawns reach a certain size they will be tagged and combined without compromising genetics. The top individual performers within the top families will be used to supply the BMC and produce commercial broodstock. At full scale production, the CBC will have capacity for up to 400 families[2] of unrelated genetic signatures. The CBC will be fully biosecure and managed in accordance with the requirements of the PSD Biosecurity Manual.

[1] The Quarantine and Founder Stock Centre will be a biosecure, segregated and controlled facility which allows production, breeding and disease screening to occur, enabling PSD to develop Specific Pathogen Free founder stock for transfer to the Core Breeding Centre.

[2] A family is a related group of animals with a traceable and controlled pedigree and degree of relatedness.

Figure 2 Development Footprint

The CBC will comprise between 12 and 16 large modules containing hatchery operations, tanks for rearing prawn stock and external covered grow-out raceways (vertical sided "ponds"). Figure 3 illustrates an indicative floor plan of one module and Figure 4 shows the 3D external view of one module. The majority of activities in the CBC will be contained within the buildings, tanks and enclosures of the module.

At full scale the CBC will cover an area of approximately 9 ha and include the following:

- culture facilities including local quarantine, nursery, on-growing, maturation, conditioning, spawning and hatchery facilities
- ponds and tanks for the storage, settlement and treatment of intake and discharge water
- infrastructure for the reticulation of treated seawater through the culture facilities including filters, pipes, valves and fittings pumps, pump house, electrics, monitoring and alarms, lined reservoirs, coverings (poly tunnels), filtration, water treatment (ozonation, activated carbon and UV) and temperature control
- infrastructure for the supply of low pressure air into tanks and aeration of raceways/ponds
- infrastructure for the storage, growing and/or supply of the various food types (algae, artemia, dry pellets and frozen fish) to prawns
- reticulation of power supplied from the common electrical substation
- back-up supply of freshwater for equipment cleaning, domestic and potable water requirements
- discharge channel and/or piping to transport water to the discharge point
- vehicle wash down point
- local laboratory, office and worker amenities probably in the form of transportable units ("dongas").

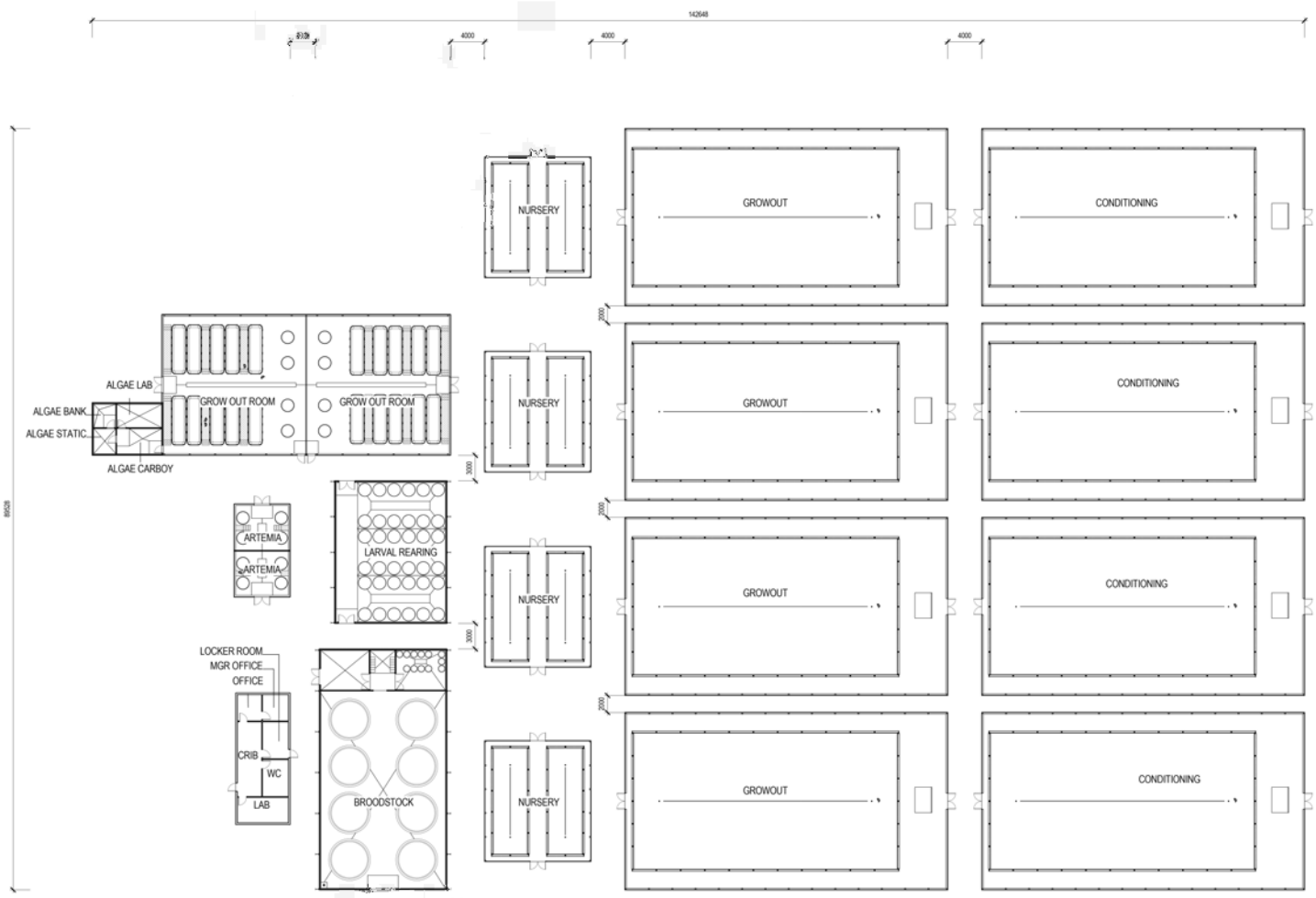
2.1.3 Broodstock Maturation Centre

The BMC will be used to mature the selected post larvae (PLs) and larger broodstock supplied from the CBC. The BMC will be located on high ground to the south of Point Ceylon as illustrated in Figure 2. The young broodstock entering the BMC from the CBC will be Specific Pathogen Free, in good health and brought up to a suitable size and condition for breeding. The BMC will be responsible for the production of commercial numbers of spawners and their mates for the commercial hatchery, which is to be located within the Darwin environs. The BMC will be fully biosecure and managed in accordance with the requirements of the PSD Biosecurity Manual.

The BMC will comprise between 12 and 16 large modules. Figure 5 shows the indicative floor plan of one module and Figure 6 shows the 3D external view of one module. The majority of the activities undertaken at the BMC will be contained in buildings, tanks and enclosures within each module. At full scale the BMC will cover an area of approximately 40 ha and will consist of:

- culture facilities for the maturation, on-growing and conditioning of prawns which will be ponds and raceways typically covered by poly tunnel "houses"
- ponds and tanks for the storage, settlement and treatment of intake and discharge water
- infrastructure for the reticulation of treated seawater through the culture facilities including filters, pipes, valves and fittings pumps, pump house, electrics, monitoring and alarms, lined reservoirs, coverings (poly tunnels), filtration, disinfection treatment (ozonation, activated carbon and UV) and temperature control
- infrastructure for the supply of low pressure air into tanks and aeration of raceways/ponds
- infrastructure for the storage, growing and/or supply of the various food types (algae, *Artemia*, dry pellets and frozen fish) to prawns
- reticulation of power supplied from the common electrical substation
- seawater supply/transfer pipeline to transport water from the intake point and/or settlement ponds
- back-up supply of freshwater for process requirements
- discharge channel and/or piping to transport water to the discharge point
- vehicle wash down point
- local laboratory, office and worker amenities probably in the form of transportable units ("dongas").

Figure 3 Core Breeding Centre Indicative Floor Plan of One Module



GROSS FLOOR AREA SCHEDULE			
NO.	BUILDING NAME	GROSS AREA	TOTAL GROSS AREA
4x	CONDITIONING	793.2 m2	3172.8 m2
4x	GROWOUT	793.2 m2	3172.8 m2
4x	NURSERY	177.8 m2	711.2 m2
1x	ARTEMIA	72 m2	72 m2
1x	ALGAE LAB & GROWOUT	614.24 m2	614.24m2
1x	OFFICE & AMENITIES	99.2 m2	99.2 m2
1x	LARVAL REARING	235.5 m2	235.5 m2
1x	BROODSTOCK	450.3 m2	450.3 m2
		TOTAL GFA	8423.94 m2

1 CBC LAYOUT
SCALE 1 : 250

Core Breeding Centre - Indicative Floor Plan of One Module

NOTE: PRE SITE PLACEMENT LAYOUT

Figure 4 Core Breeding Centre 3D External View of One Module

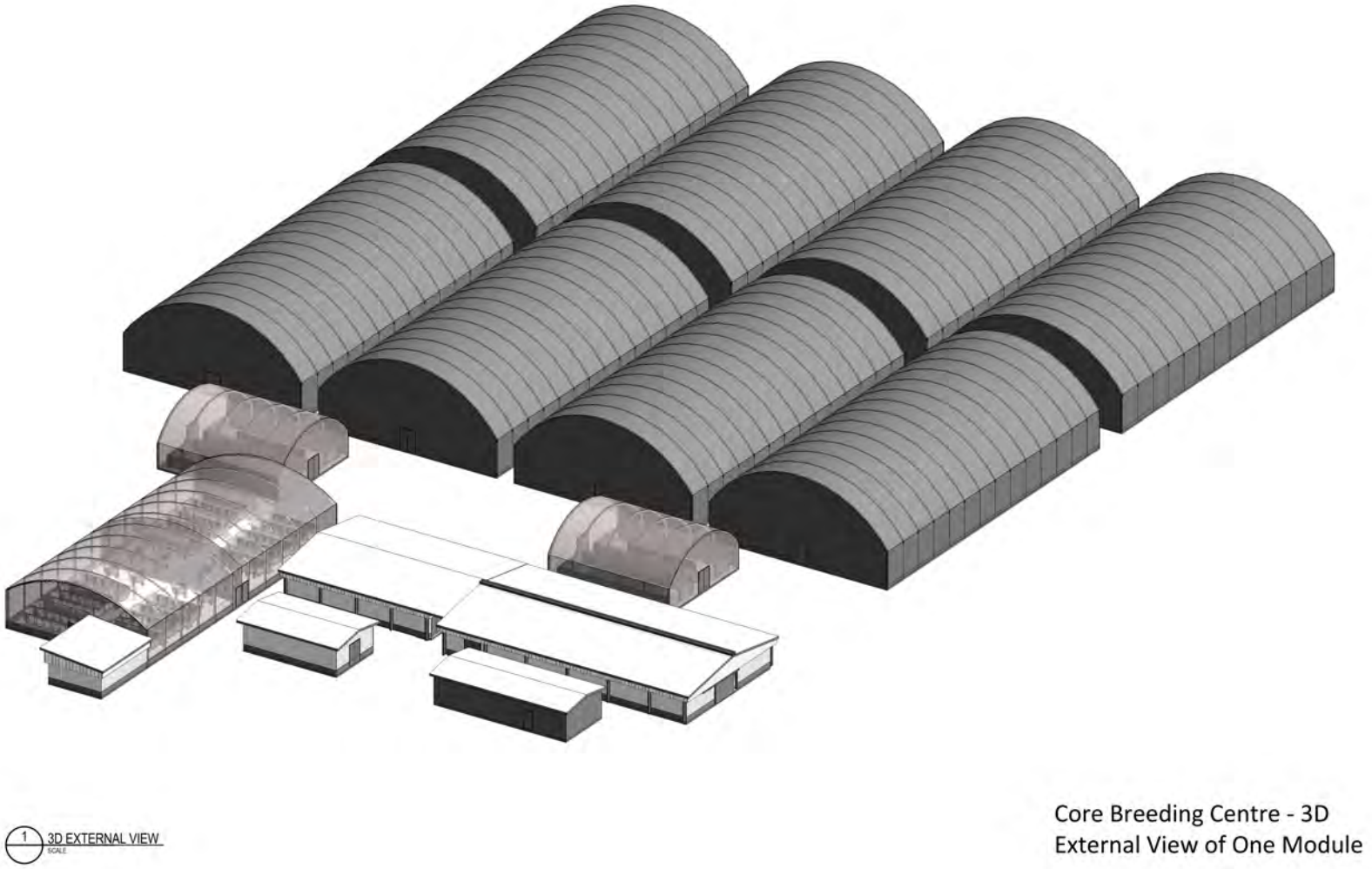


Figure 5 Broodstock Maturation Centre Indicative Floor Plan of One Module

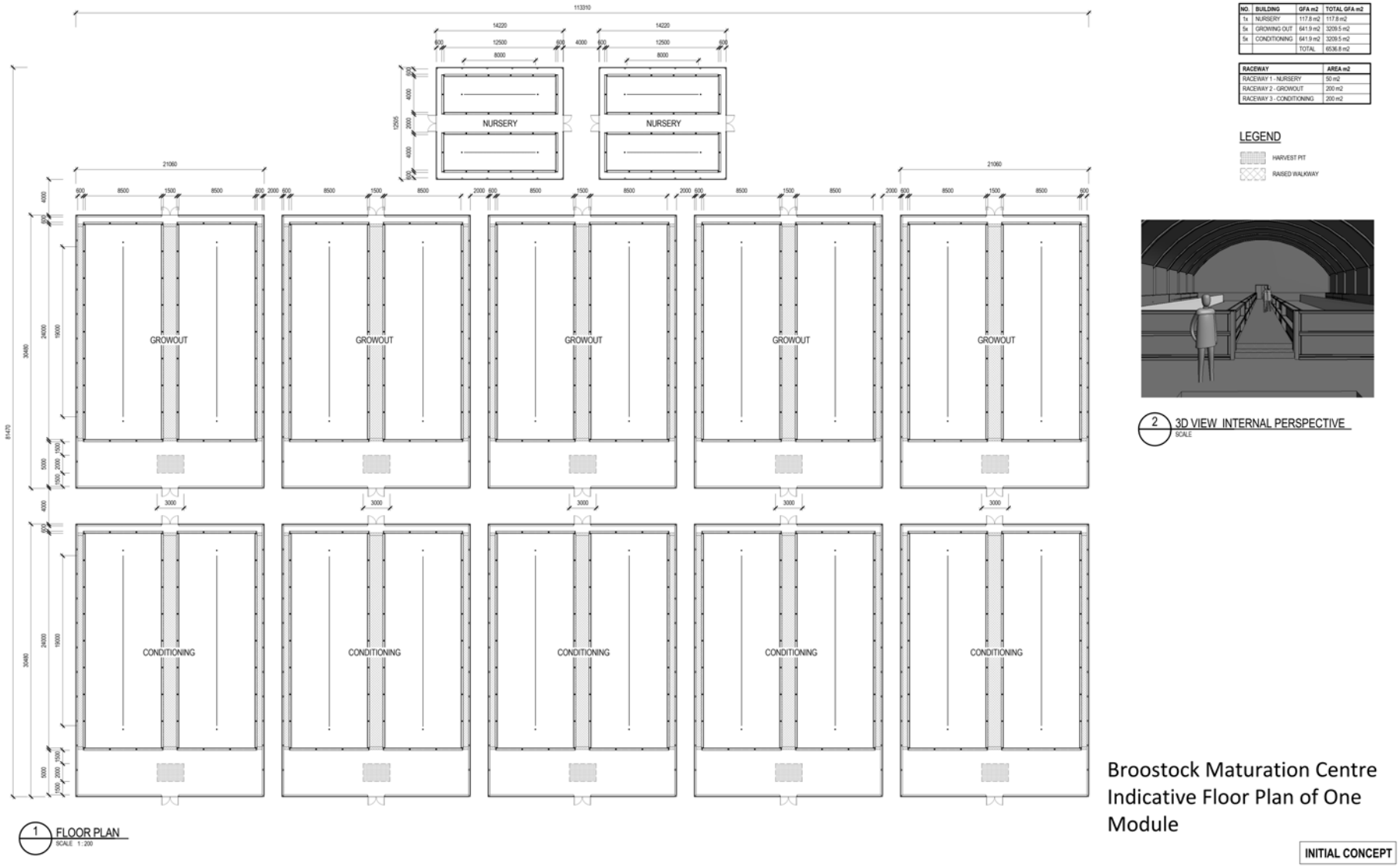
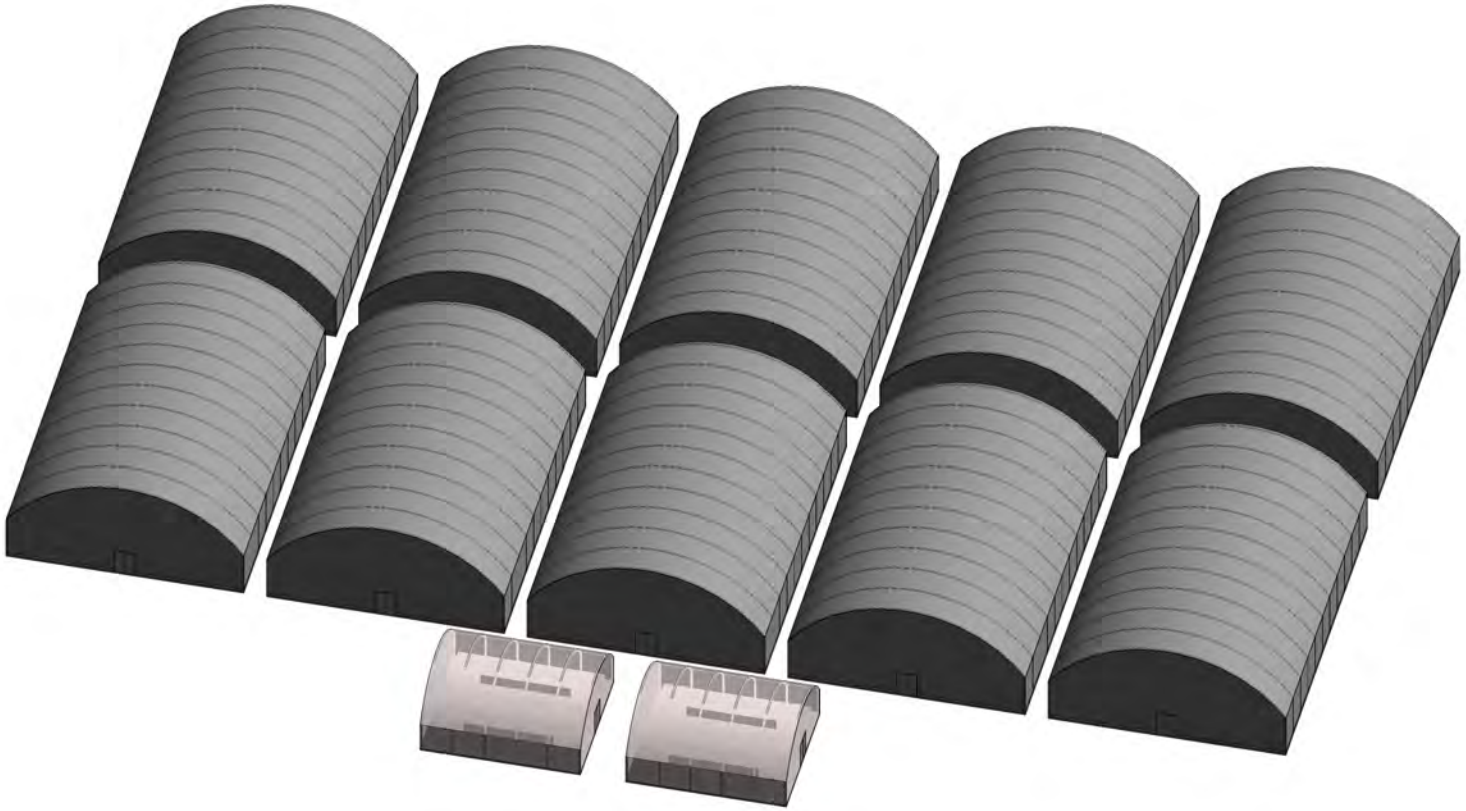


Figure 6 Broodstock Maturation Centre 3D External View of One Module



2.1.4 Common Facilities

Common facilities estimated to cover approximately 83 ha will be shared between the BMC and CBC. These facilities will include:

- biosecurity fence and checkpoint at the entrance of the site
- vehicle wash-downs at the entrance of the site
- water storage tanks and/or desalination plant for potable water supplies
- infrastructure for the supply, storage and discharge of seawater and fresh water (see Sections 2.1.5, 2.1.6 and 2.1.7)
- all weather access roads into the site and connecting the administration and accommodation buildings, the BMC and the CBC, see Section 2.1.9.
- administration and accommodation compound including:
    - a reception, offices, warehouse and workshops
    - an electrical substation (5 megawatts) - electricity will be distributed to the CBC and BMC either via overhead or underground powerline
    - a manager's residence and accommodation for up to six people
    - onsite septic system for human ablutions waste
    - facilities for the collection, sorting and transfer of other solid wastes to the nearest approved waste station.

2.1.5 Water Supply

Seawater

The CBC and BMC will utilise both seawater and freshwater. Seawater will be piped in from a water intake pipeline extending out from Point Ceylon into Bynoe Harbour (Figure 2). The pipeline will extend approximately 2 km from Point Ceylon to approximately the 10 m chart datum to guarantee water intake at any tide. The onshore pumping station will have the capability to function 24 hours per day, 7 days per week, but the pumping operations will be biased to draw in seawater from mid-tide to high tide. The seawater quality treatment process will start with onshore settling ponds which will be sized to provide security of seawater storage for at least 5 days of normal site operations.

The pipeline has been designed to avoid the adjacent oyster leases in Bynoe Harbour. At full scale operations the expected maximum daily seawater intake volume for both the CBC and BMC is approximately 11,000 m^3. At full scale development of the CBC and BMC the intake piping is likely to comprise two 600 mm pipes laid side by side, each with a 1.0 m riser and fixed grille screen at the seaward end.

The design, placement and anchoring of submersed and subterranean pipelines in moving water is a specialised area of civil engineering. The simplest option for underwater pipe placement involves lowering each pipeline to the seabed onto the approved alignment. However, if any cover is required over the top of the pipe, for instance in the wave zone or beach, then guided horizontal drilling or pipe jacking will be employed, to bury the pipes. For this intake at Point Ceylon, the preferred option is to float the assembled pipe into position and sink it in a controlled manner.

The HDPE pipe lengths will be transported by road or seagoing barge to the construction site. The transport lengths are typically 21 to 24 metres if transported by road. Depending on the installation contractor's methodology, the pipeline sections will be either:

- Fusion welded onshore, plugged and floated onto the required alignment with the anchor weights already mounted, then progressively sunk by controlled flooding; or
- Placed from a work barge set up to progressively weld the lengths of pipe together and attach the anchor weights. The assembly will be then lowered as the barge is winched along the alignment.

The local hydrodynamics, seabed and subsurface geotechnology will determine the pipeline anchoring design. The plan is to use either, or both, concrete collar anchor blocks strapped to the pipe or a weighted geotech matting to retain the pipe in its alignment. Piling is considered a last resort for securing the pipe location and is unlikely to be used. The expertise for the design, placement and anchoring of the intake pipe will be provided by contractors engaged by PSD to ensure the longevity and reliability of this infrastructure.

The peak hydrodynamic loads on the pipe will be assessed from local flood, tidal and storm data to determine the optimal anchoring forces required to secure the pipe to that alignment. This anchoring is typically achieved by bolting together two half circles of pre-cast concrete clamped around the pipe at regular intervals to provide ballast to retain the pipe in position by gravity. Alternatively, as mentioned above, whilst unlikely, seabed piling (or screw anchors) may be required on each side of the pipe if the seabed is too soft to restrain the lateral movement of the pipe and anchors under storm and maximum current conditions. Modelling of the local conditions and requirements will determine whether the pipe is placed on the seabed surface or requires partial or full subterranean burial.

Geotechnical investigations (core drilling or seabed probing) along the pipeline alignment will provide the local data to support this engineering design. This is a minimal disturbance activity usually undertaken from a work barge with a small portable drilling rig on-board.

The likely pipe material used for this application will be high density polyethylene (HDPE) because it is impact resistant and inert in seawater (i.e. no corrosion or problematic corrosion products present during its life cycle).

Once the pipe is placed in or on the seabed, no further disturbance of the local environment is necessary. The routine replacement and/or cleaning of the intake screens of biofouling is the only maintenance activity requiring repeated access to the pipe's seaward termination point.

Freshwater

The combined average demand for freshwater for the CBC and BMC is predicted to be 15,800 m^3 p.a. for the full scale development. The demand rate will be an average of 11 m^3/day, over 12 operating hours. Freshwater is expected to be supplied, in order of priority, from:

- rainwater collection on site
- groundwater on the property
- desalination.

It is intended to primarily use rainwater collection. Using the suitable roof areas for the facilities, it will be possible to capture approximately 4,600m^3 of rainwater over a typical wet season (using the last 15 years of rainfall distribution data). This estimate means that Stage 1 freshwater demand of the CBC, BMC and personnel services is able to be met by rainwater supply alone during the wet season.

For the Stage 1 dry season, it is proposed to use either storage of wet season rainfall alone, or a combination of wet season rainfall storage and groundwater use. Storage facilities of 2000 – 2500 m^3 would provide for complete storage for Stage 1 water requirements. In addition, a back-up supply, additional to the Stage 1 requirements, will also be required, as running the facility without any back-up supply is considered too high a risk (for example, in the event of a very dry wet season such as occurred in 2015/16).

PSD will undertake a study to determine whether additional capture of rainwater alone, or use of both rainfall and groundwater, is the better option to provide a back-up supply and fulfil the end of dry season shortfall that currently exists for Stage 1.

The work will occur in August and September 2016 and will include:

- investigating whether the increased duration of rainwater storage would require some form of freshwater treatment
- exploration drilling to ascertain the yield and reliability of the local groundwater source, and that the proposed groundwater source would not impact upon sources used in the Dundee Beach community.

During Stage 1 of the project, further work will of a similar nature will be undertaken to investigate water source options for future stages. For these future stages, a desalination plant solution will also be investigated, as it may not be feasible to service the larger scale project needs with rainwater capture and groundwater alone.

For groundwater, it is not anticipated that a Water Extraction Licence in accordance with the NT *Water Act* will be required as the project:

- will have direct access to the source of water

- will not require pumping of over 15 litres a second, and
- is not located within a Water Control District.

For desalination, at full scale development, freshwater production of up to 2.7l/s would be required. In the worst case scenario, sourcing freshwater from a desalination solution only (which is considered highly unlikely), approximately one l/s of brine flow would result whilst it is operating. This brine waste would be pumped to the process wastewater channel for mixing in the settlement ponds. The process wastewater will flow at an average of 25l/s, thereby offering a 25:1 dilution prior to delivery to the Final Retention Pond. Accordingly, it is anticipated that the desalination brine will have no significant impact on the natural salinity range of Wheatley Creek outside of the initial mixing zone (see Section 2.1.7). A Waste Discharge Licence under the NT *Water Act* will be required for the project and, should a desalination plant prove feasible, the discharge from it, via the settlement ponds, would be assessed under this process, and regulated through the Waste Discharge Licence.

2.1.6 Raw Water (Seawater) Storage

Ponds will be constructed by excavation into the natural soils, resulting in no head pressure on the walls (i.e., negligible risk of wall failure). Each pond will be sealed with an EPDM[3] rubber liner (low saltwater to soil contact).

Surface water runoff will be prevented from entering ponds via a 500 mm high EPDM clad embankment, designed to withstand an Average Recurrence Interval (ARI) event with an ARI of 1:100. See Figure 7 below. Each individual pond will be connected in series to its neighbouring pond, designed to receive any storm overflows, and will have an operating level 500 – 700 mm below the top of the embankment crest (Figure 7). Overflow from ponds will be returned to the estuary via an open unlined earthen channel and a Final Retention (Mixing) Pond.

Ponds will be instrumented for monitoring of required data, including water levels, temperature, conductivity, pH, turbidity and dissolved oxygen.

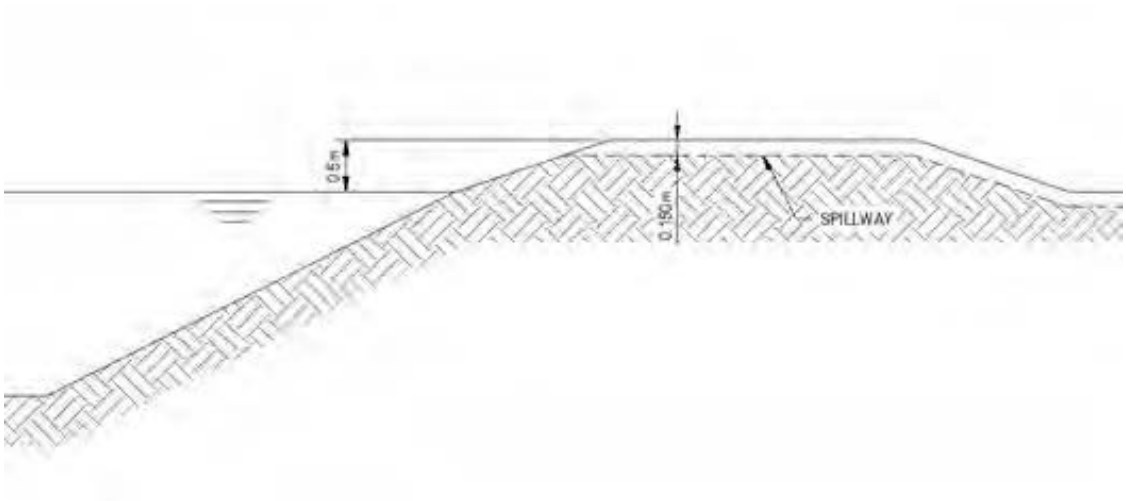


Figure 7 Pond Embankment Design

Raw water storage will be based on 5 days of average demand (assuming 75% of plant in operation at any one time) to allow for not intaking seawater in short periods of low salinity following heavy rainfall.

Given the high loading of suspended solids in the intake water, all seawater will be allowed to settle in storage ponds for approximately 48 hours. Ponds will be constructed north of the BMC near Point Ceylon and will have the capacity to store untreated seawater sufficient for five days use. Removable shade cloth coverings are proposed for the storage ponds to limit temperature increases. These storage ponds will be used in case of short term supply interruptions and variations in salinity levels in Bynoe Harbour following periods of heavy rainfall.

These multiple ponds (nominal 100m x 20m each) are likely to be 2m deep and placed together near the pumping station, sized as described in Table 3.

[3] Ethylene propylene diene monomer (M-class) rubber – this is a commonly used, aquaculture safe rubber

Table 3 Seawater Storage Pond Sizing

	Stage 1	**Full Development**
BMC	18,000 kl	72,000 kl
CBC	15,000 kl	60,000 kl

Any raw seawater storage overflow will be channelled back to the pump station area via an open stormwater drain and returned to the sea.

The raw water ponds will retain the majority of the suspended solids from the incoming seawater, and settle the solids. As multiple ponds will be employed, the accumulated solids will be removed periodically from the ponds in the maintenance periods without interrupting supply. The solids will be predominantly inorganic fine grained sediments. These will be excavated and trucked to a drying pad. Once dry the solids will be used as bulk earth fill.

The drying area will have a bund wall constructed around it and an internal perimeter drain will divert all rainwater that falls in this area to the settlement ponds. This will prevent sediment from the sediment storage area washing into the neighbouring waterways.

There is no capacity for ponds to overflow as the ponds are designed to store up to 700 mm of additional rainfall. To mitigate for an extreme event in which rainfall would exceed that level, the design is such that the overflow from one pond reports to the next, and if required, with final discharge through the final retention pond and discharge structure, in a controlled manner.

Following pumping and storage in tanks at a higher elevation closer to the BMC site, the water will be coarse filtered, disinfected (ozonation, activated carbon and UV), fine and carbon filtered. Exposure to ultraviolet light as a final bacteriological elimination is likely to occur at the point of application. This level of treatment is designed to eliminate incoming bacteria and thus mitigate the risk of bacterial pathogens entering the system. The treated seawater will then be either pumped for use in the BMC or transferred across to the CBC via a pipeline as illustrated in Figure 2.

2.1.7 Water Discharge

Performance Objectives

Seawater used in the facility will be discharged at a rate proportional to the intake. The water to be discharged will have elevated nutrients (most notably nitrogen and phosphorus) as a result of the accumulation of feed residues, faeces and organic matter through the farming process.

For a study of this nature, there is a need to define relevant water quality related performance objectives against which impacts can be assessed. In accordance with National Water Quality Guidelines (ANZECC & ARMCANZ 2000), there is an accepted hierarchy of documentation in this regard. This requires that where there are no locally specific water quality guidelines (which would require comprehensive local data collection typically spanning at least a 1 to 2 year period) that management decisions should default to relevant State based water quality guidelines, and in their absence to National water quality guidelines.

There is currently insufficient data available to comprehensively describe existing water quality conditions within the Bynoe Harbour region to enable locally specific water quality objectives to be developed. Water quality sampling around the site is currently being undertaken on a monthly basis as described in Water Technology, 2016a (see Appendix A). At the time of writing, three rounds of samples had been undertaken.

There are also no whole of Northern Territory water quality guidelines, which would therefore indicate a potential need to defer to the National (ANZECC) guidelines, which by their nature are accepted as being conservative. However, an alternative approach to simply adopting the (conservative) ANZECC guidelines is to draw upon other studies undertaken in comparable climatic regions and to use these studies to derive relevant interim water quality objectives, which can then be used until such time as sufficient data are available for robust locally specific water quality objectives to be derived. Given the close proximity of Darwin Harbour to the current study area, Seafarms are proposing in the interim to utilise the water quality guidelines for Darwin Harbour. Whilst Darwin Harbour could be considered a developed catchment in relation to Bynoe Harbour, the use of the water quality objectives for Darwin Harbour in Bynoe Harbour is considered valid as in accordance with the ANZECC guidelines the data used to set the Darwin Harbour water quality objectives is collected from unimpacted catchments similar to Bynoe Harbour.

Discussion around this approach is provided in Section 3.5.3 of the Water Technology Report (2016a) presented in Appendix A. The proposed interim water quality guidelines are presented in Table 4.

Table 4 Proposed Interim Water Quality Guidelines

Parameter	Mackenzie Arm and Geranium Channel (Mid Estuary)	Wheatley Creek (Upper Estuary)
Total Nitrogen	<0.27 mg/L	<0.3 mg/L
Total Phosphorus	<0.02 mg/L	<0.03 mg/L
Chlorophyll a	<2 µg/L	<4 µg/L

As mentioned above, to date three sampling events have been conducted by Seafarms in Bynoe Harbour to collect data on background/ambient nutrient concentrations. These data collection events will continue until enough data are collected to enable the derivation of site specific water quality objectives to comprehensively describe existing water quality conditions within the Bynoe Harbour region, to then enable locally specific water quality objectives to be developed.

Discharge Quantity

The amount of discharge will be proportional to the intake of seawater, with 11,000 m^3 per day of wastewater being discharged from the project at full scale. The early Stage 1 discharge will be of the order of 2,200 m^3/day and the discharge will ramp up at approximately two to three year intervals in increments of around 20-25%, to the ultimate rate of 11,000 m^3 at full scale.

Discharge Quality and Location

The proposed facility at Point Ceylon will have operating conditions and discharge characteristics that are similar to the existing Seafarms Group prawn farming operations at Cardwell in North Queensland. As such, Seafarms propose to adopt the licence conditions set by the Queensland Department of Environment and Heritage Protection (Qld DEHP) for the Point Ceylon facility.

Table 5 presents the Qld DEHP discharge licence conditions for the Cardwell operations. The long term discharge licence conditions of the Cardwell operations, and those proposed for the Point Ceylon facility, is 2 mg/L for Total Nitrogen (TN) and 0.4 mg/L for Total Phosphorus (TP). These proposed licence quality standards are actually considerably higher than expected from the operation, with data from the Seafarms operations at Cardwell having long-term actual effluent qualities of 1.1 mg/L TN and 0.08 mg/L TP, as shown in Table 6 below, which presents the results of the last 18 months of water quality sampling at two wastewater discharge points at the Seafarms Group Cardwell prawn farm.

Table 5 Cardwell Operation Discharge Water Quality – Licence Conditions

Parameter	Median	80th Percentile	Maximum
Total Nitrogen (mg/L)	2.0	2.5	5.0
Total Phosphorus (mg/L)	0.4	-	0.6

Table 6 Cardwell Operation Discharge Water Quality – Licence Conditions and Actual Performance

Condition	Median	80th Percentile	Maximum
Total Nitrogen (mg/L)			
Licence Conditions	2.0	2.5	5.0
Actual Performance	1.1	1.5	2.8
Total Phosphorus (mg/L)			
Licence Conditions	0.4	-	0.6
Actual Performance	0.08	0.11	0.27

Numerical hydrodynamic modelling of the dilution and dispersion of the discharge water at full scale operations (i.e. 11, 000 m^3 per day) was undertaken to inform the assessment of impacts upon the receiving environment, and to identify the optimum location and timing for water discharge (Water Technology, 2016a – see Appendix A). Despite the likelihood that the actual nutrient concentrations in the discharge water will be considerably less (Table 6), the modelling was conservatively based upon the assumption that discharge concentrations would be at the levels proposed for the licence conditions (i.e. median TN at 2.0 mg/L and median TP at 0.4 mg/L) (Table 5).

Wheatley Creek and Geranium Channel were investigated to assess several potential discharge locations. The results of the investigation indicated that the optimal location for the discharge is on Wheatley Creek, at the site shown on Figure 2.

The numerical modelling revealed that discharging at the proposed licence conditions is anticipated to produce an upper limit long term (or 'far field') increase in nutrient concentrations of 0.06mg/L TN and 0.013mg/L TP. Further to the conservative approach of assuming that the nutrients in the discharge will be at the proposed licence conditions levels, the modelling also assumed no biological uptake or degradation of the nitrogen and phosphorus that will be present in the wastewater discharge. As explained in further advice to that presented in the Water Technology 2016a report, this is a highly conservative assumption (see Water Technology 2016b – Appendix B).

When these conservatively derived upper limit increases are superimposed upon the expected long term background/ambient concentrations for TN and TP of 0.2mg/L and 0.02mg/L (derived at the 80th percentiles of albeit limited (three campaigns) data collected in the vicinity of the site), resultant post operation water quality levels are predicted to be of the order of 0.26mg/L for TN and 0.033mg/L for TP in the upper reaches of Wheatley Creek. These conservative estimates of the ultimate ambient water quality levels are compliant with proposed interim TN water quality guideline value for Wheatley Creek (0.3mg/L) and marginally exceed the proposed interim TP quality guideline value (0.03mg/L) – see 'Performance Objectives' above.

The modelling also assumed a constant discharge. Releasing the discharge only during periods of higher water (for example when water levels are above Mean High Water Neap tides) would further reduce the impact of the discharge on the surrounding water body. These findings have been incorporated into the design and an off stream tidal weir and pool arrangement is now proposed. This will increase initial mixing and minimise impacts on the system. This will be especially significant in reducing peak water quality concentrations that will occur around low water slack.

As noted above, the modelling is conservative in considering the nutrient levels in the discharge to be at the proposed licence conditions, and in not considering biological assimilation of dissolved nutrients, the settling of particulate components in the discharge within the waters of Wheatley Creek and Geranium Channel, nor the controlled timing of the discharge across the proposed tidal pool and weir arrangement. When these additional processes are taken into consideration, the proposed discharge of wastewater into the receiving environment of the Bynoe Harbour region can be expected to have low to negligible impacts on local or regional water quality levels and associated environmental values.

The initial discharge for Stage 1 will be around 2,200 m^3/day, which is considerably smaller than the ultimate flow of 11,000 m^3 per day, which has been assessed herein. This initial stage will provide ample opportunity to better understand background water quality and associated mangrove processes, and also for further investigations of the dilution and decay of materials within the earlier stages of the discharge to Wheatley Creek to confirm the observations and conclusions of these studies.

Around the location of the discharge, there will be a small area (mixing zone) in which there are predicted to be occasional exceedances of the interim water quality objectives. This is discussed further below, with more detailed information contained in Water Technology 2016b (Appendix B).

Mixing Zone

Even when stringent effluent limits are set and the highest standard environmental controls and management practices are in place, discharges to waters may be of poorer quality than the receiving water. In this case, it is accepted practice to apply the concept of a 'mixing zone' - an explicitly defined area around an effluent discharge where initial dilution takes place, and where licence conditions allow long term water quality objectives for ambient waters to be exceeded (ANZECC & ARMCANZ, 2000). Management of mixing zones needs to ensure that the impacts are effectively contained within the zone, that the zone is small, and that water quality objectives, values and uses of the broader ecosystem are not compromised.

Further to the Point Ceylon Coastal Environment and Hydrodynamics Assessment that was undertaken to support this referral (Water Technology, 2016a), Water Technology was commissioned to look further into the expected nature and characteristics of water quality behaviour within the mixing zone that will develop in the vicinity of the proposed outfall (Water Technology 2016b).

The numerical model developed for this study was interrogated at a finer resolution along Wheatley Creek, as opposed to just using the upper estuarine 'Point 1' used in the earlier, 2016a, assessment (Appendix A). The locations at which model results were extracted are shown in Figure 8. As the modelling showed that the worst case in regard to water quality impacts would be the dry season (due to the additional flushing caused by regular catchment run-off in the wet season), model interrogation used the dry season simulation only.

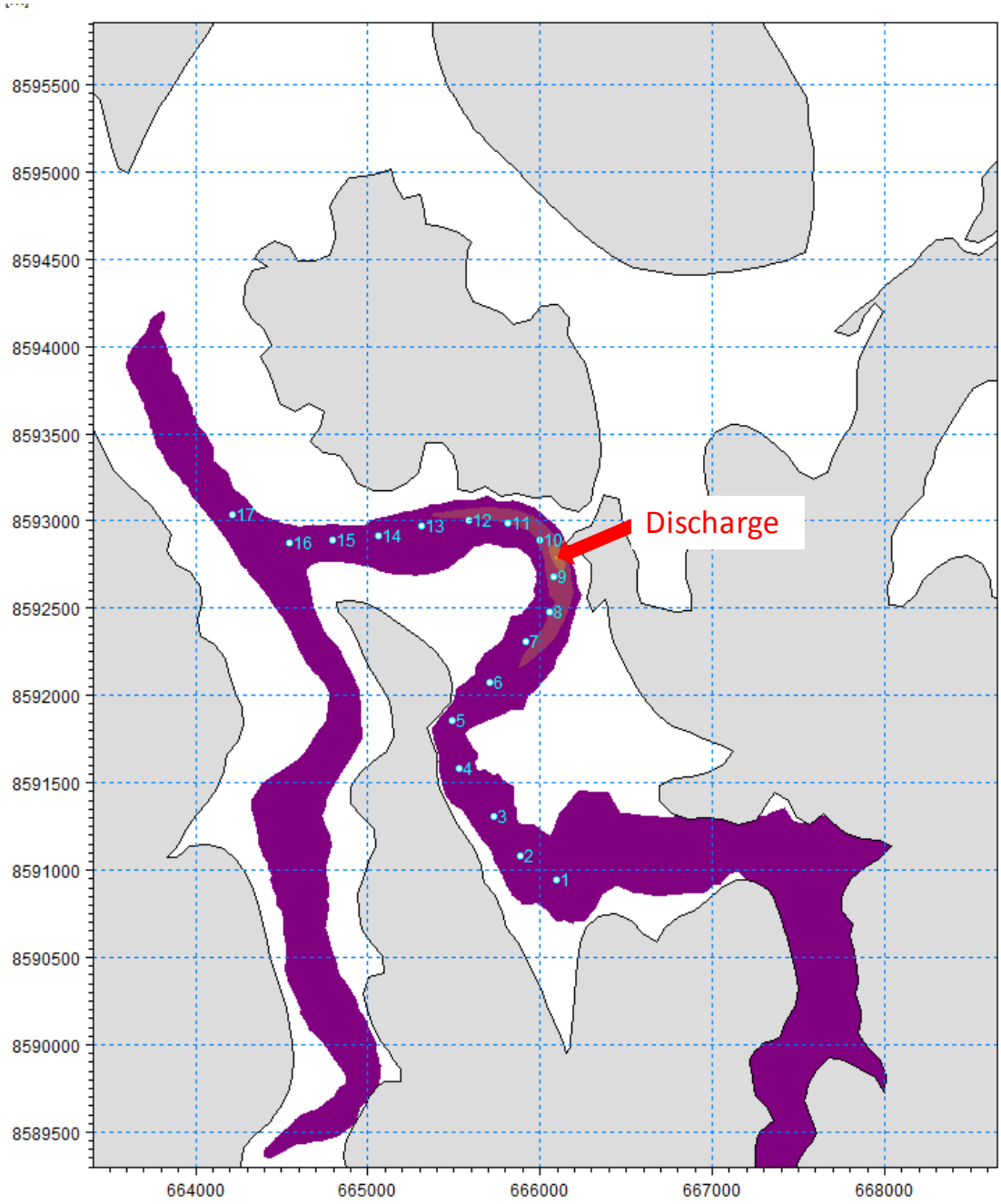


Figure 8 Additional Model Interpretation Locations

'Box and whisker'[4] plots for the dry season case at the Figure 8 sites are shown in Figure 9 and Figure 10, in each case using the proposed (conservative) discharge license concentrations to convert predictions of discharge dilution to predictions of the additional TN and TP which will be present in Wheatley Creek. The upper panel in each of Figure 9 and Figure 10 shows the 'box and whiskers' formulations with outliers, while the lower panel removes the outliers to show what the water quality changes will be for the majority of the time. We have also prepared comparable total TN and TP box and whisker plots, superimposing the additional impacts of the discharge on the anticipated average background water quality data, and also showing the proposed interim water quality objectives. These plots are shown in Figure 11 and Figure 12.

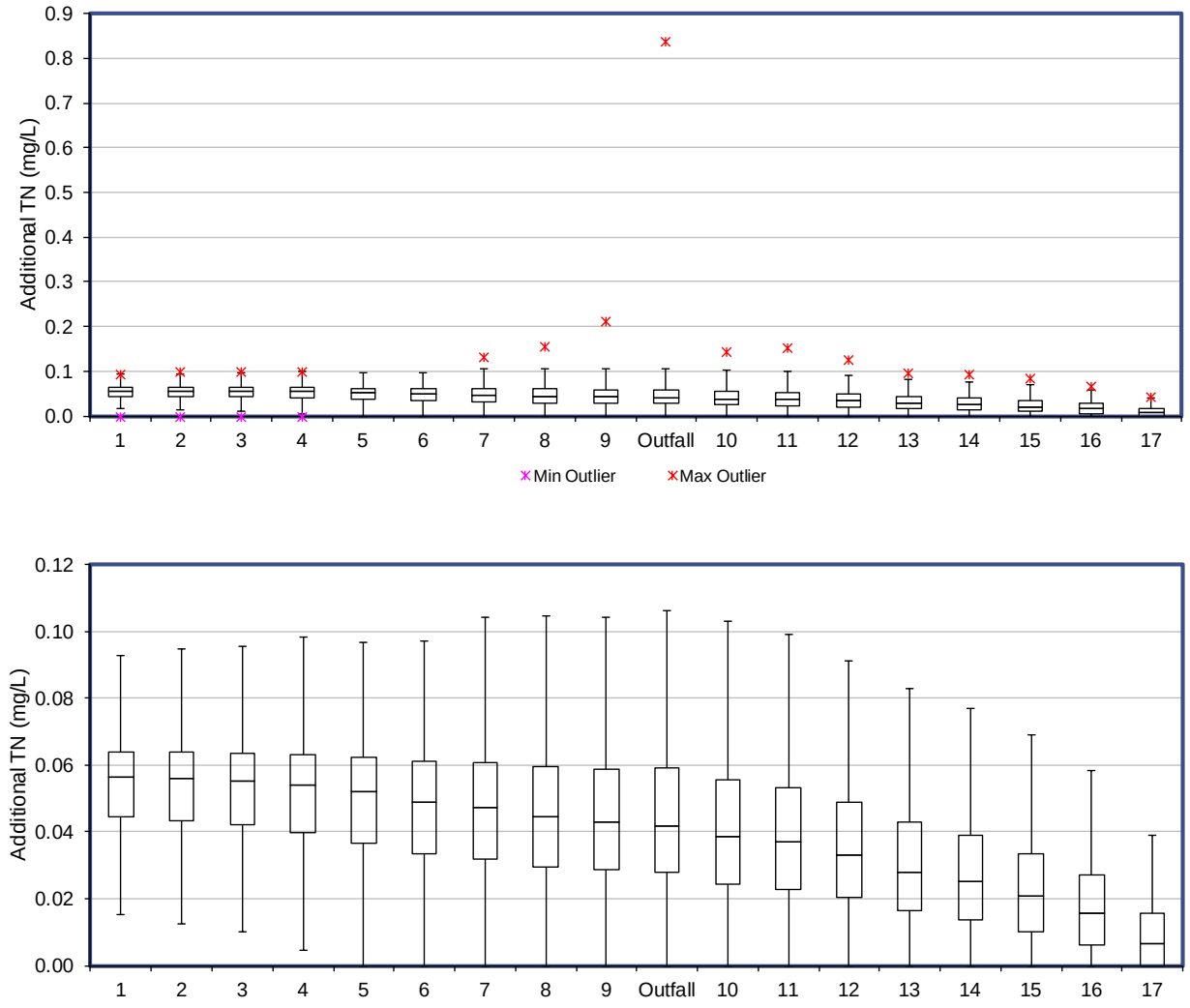


Figure 9 TN Interpretation – Showing the Additional TN Concentrations Due to the Proposed Discharge

[4] a box plot is a convenient way of graphically depicting groups of numerical data through their quartiles. Box plots may also have lines extending vertically from the boxes (whiskers) indicating variability outside the upper and lower quartiles, hence the terms box-and-whisker plot. Outliers may be plotted as individual points. Box plots are non-parametric: they display variation in samples of a statistical population without making any assumptions of the underlying statistical distribution. The spacings between the different parts of the box indicate the degree of dispersion (spread) and skewness in the data, and show outliers.

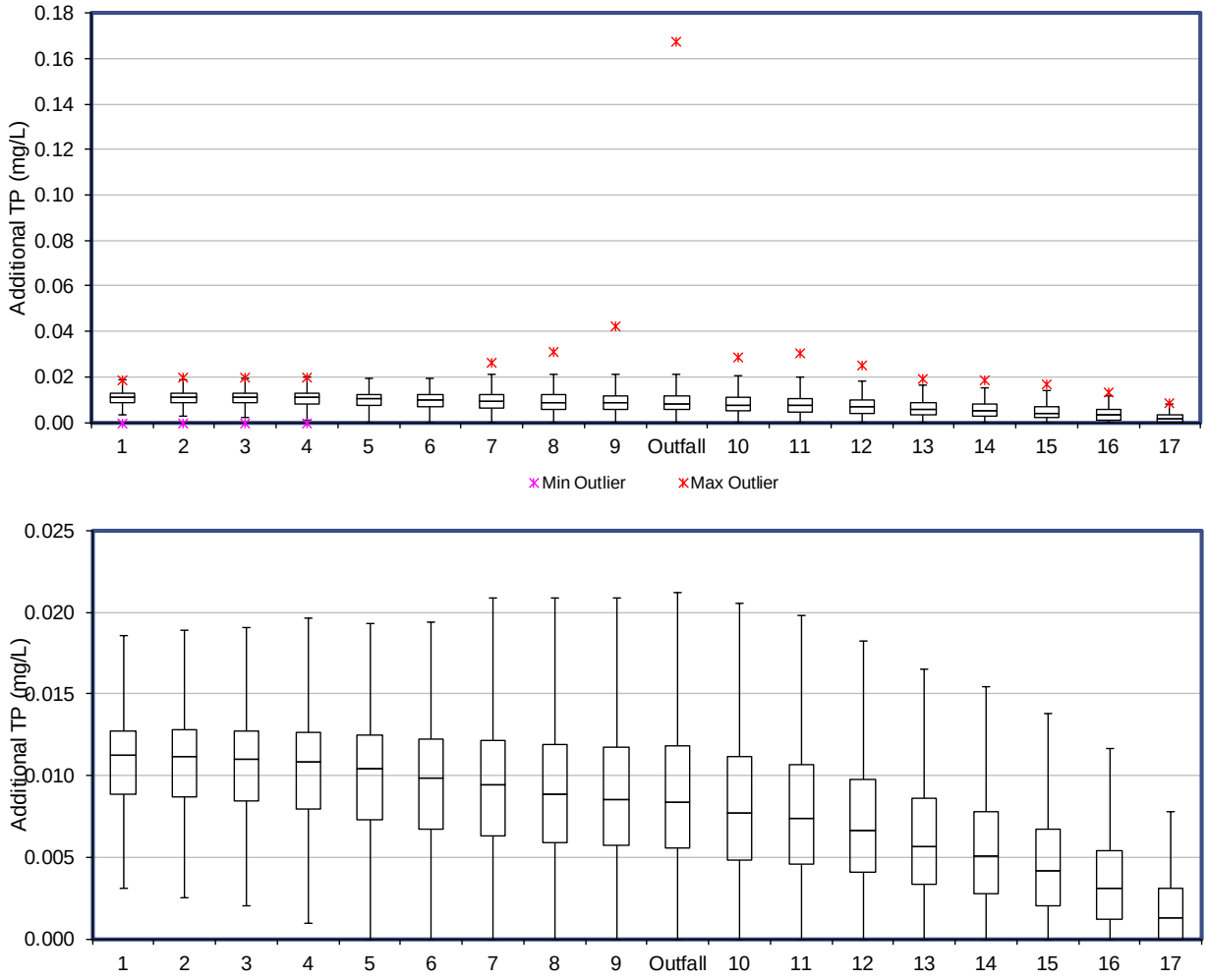


Figure 10 TP interpretation – Showing the Additional TP Concentrations Due to the Proposed Discharge

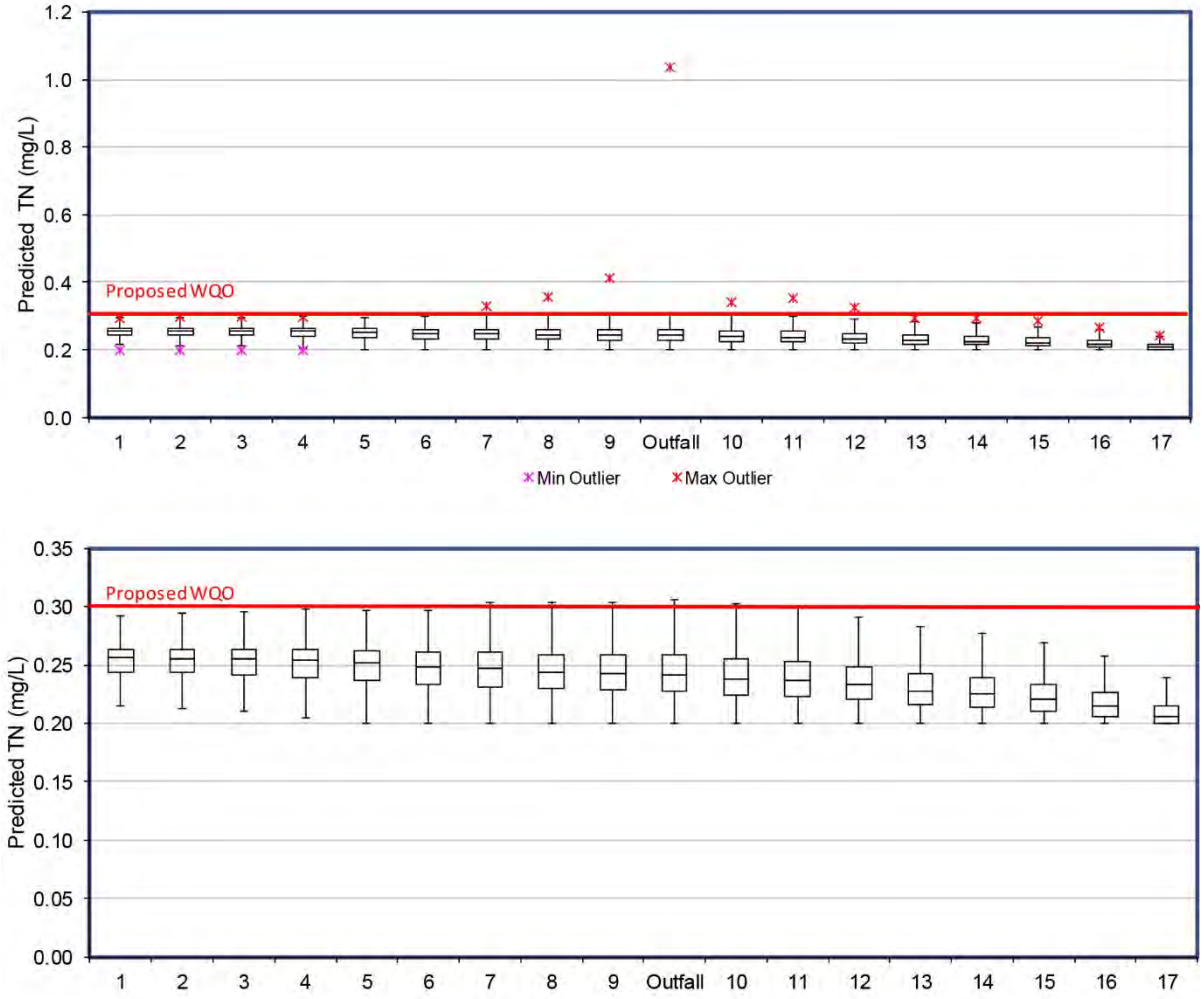


Figure 11 TN interpretation - Superimposing the Influence of the Discharge on Background Water Quality Levels

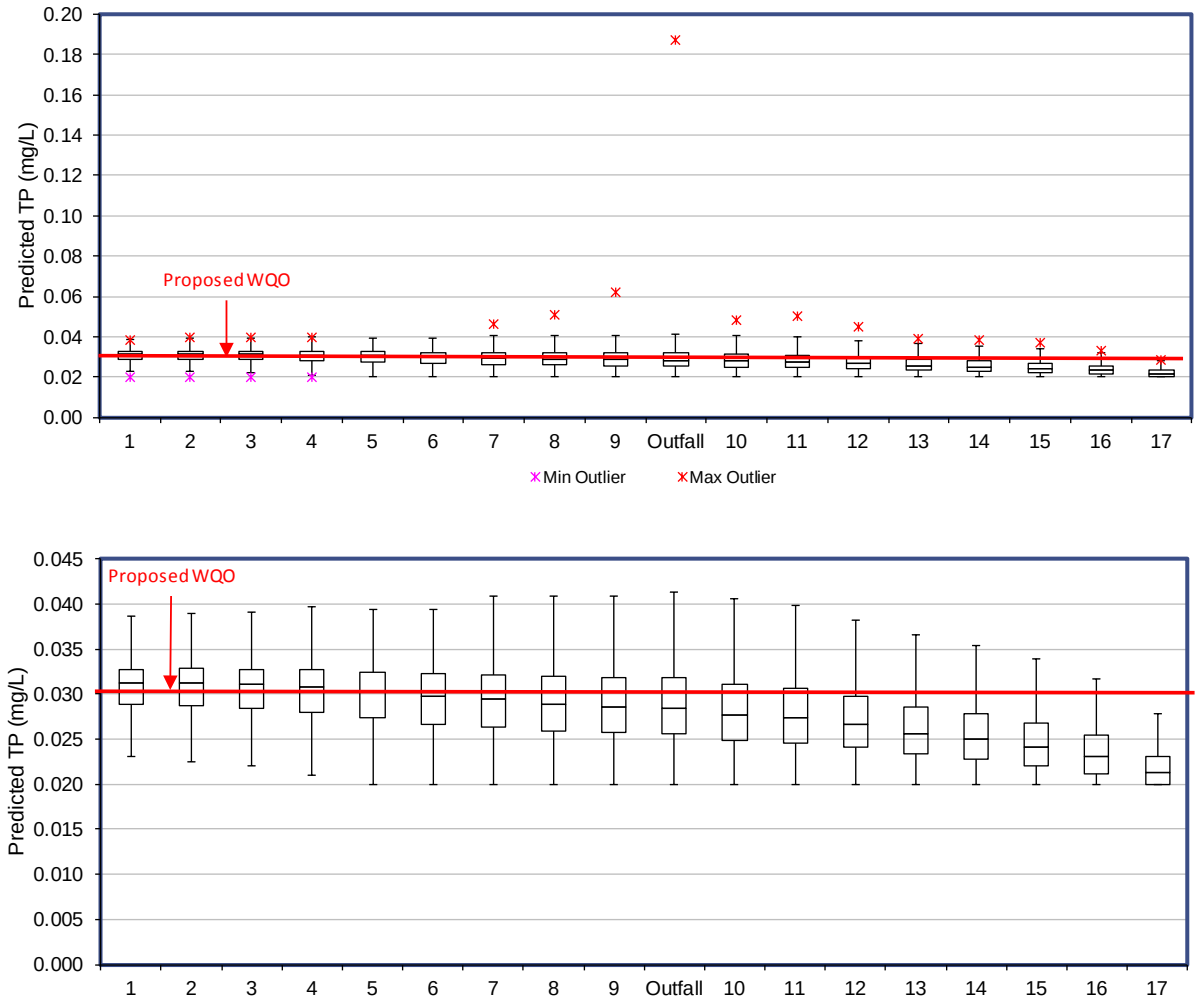


Figure 12 TP Interpretation - Superimposing the Influence of the Discharge on Background Water Quality Levels

These model results show as follows:

- There will be an effective mixing zone extending from approximately location 9 to location 10 in Figure 8, where there will be occasional elevated nutrient levels (outliers), which will occur at and around low water slack and to a far lesser degree (due to the greater volume) high water slack. Outside this mixing zone, water quality changes are predicted to be more temporally consistent. As the proposed interim Water Quality Objectives are based on an annual median, the occasional small and short-lived exceedances outside of locations 9 to 10 will not contribute to an overall annual exceedance of the interim Water Quality Objectives
- Upstream of the proposed discharge, predicted changes in nutrient levels are generally consistent, as could be expected, given there being no additional sources of mixing or dilution in this area; and
- Downstream of the discharge, the predicted changes in nutrient concentrations rapidly reduce in magnitude. By the confluence of Wheatley Creek with the Mackenzie Arm, the predicted changes are typically an order of magnitude, or 10 times, smaller than in the upper reaches of Wheatley Creek, and consistent with the ultimate ambient water quality levels described earlier in this section.

Again, we highlight that these results are conservative as the modelling assumes no decay or biological uptake of the discharged nutrients. To illustrate that in reality this will not be the case, we have reviewed a wide range of salient literature examining how prawn farm waste is assimilated within mangrove/tidal environments, in each case drawing on extensive work which has been undertaken in tropical (Port Douglas and Cardwell) and subtropical environments (Moreton Bay). This work is provided in Appendix B (Water Technology 2016b).

As mentioned earlier, we also note that this modelling is further conservative, as we have assumed that the proposed licence standard will apply, rather than the expected actual results in regard to effluent quality being discharged. Such an assumption effectively doubles the TN predictions and increases the TP predictions by factor of 5.

Within the mixing zone further investigation into the duration and level of exceedances of the proposed interim Water Quality Objectives, revealed that additional TN/TP levels in Wheatley Creek are respectively less than 0.1 mg/L and 0.02 mg/L for more than 95% of the time, and as such are representative of predicted broader water quality changes in Wheatley Creek. This process is illustrated in the model result percentile plot illustrated in Figure 13 below which uses data for the 'outfall' site - in the middle of the mixing zone. More extreme changes in water quality within the mixing zone, for example twice the 95th percentile value, occur for less than 1% of the time. These occasional spikes will typically occur at or around low water slack, when water will accumulate near the discharge for a short period of time, as illustrated in the short duration time series concentration plot shown in Figure 14 below. These localised mixing zone related spikes are of short duration (less than 0.5 hr), are infrequent, and will have no consequence to the overall ecological health of Wheatley Creek. At all other times, the velocities of flow past the outfall and the volumes of water around the outfall are such that there will be no elevated concentrations and the only potential impacts that are of relevance are those of a far field nature reported above (that is which comply with the TN WQO and which marginally exceed the TP WQO in the upper reaches of Wheatley Creek).

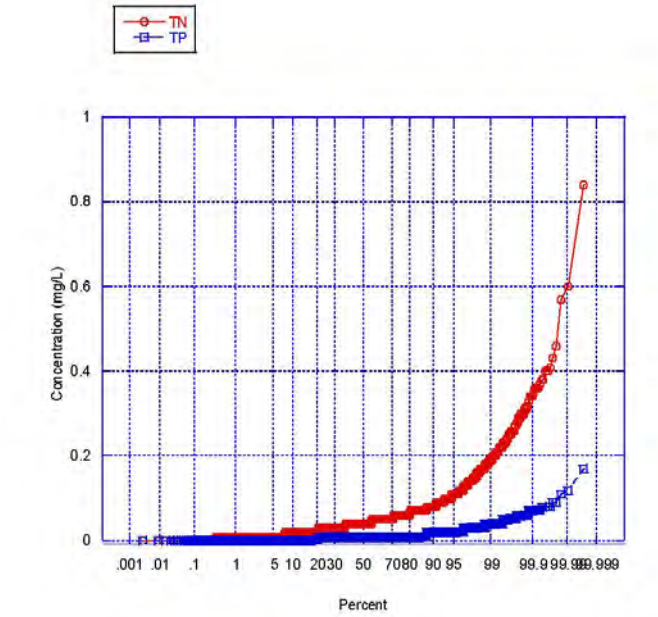


Figure 13 Model Percentile Plot at Discharge Location

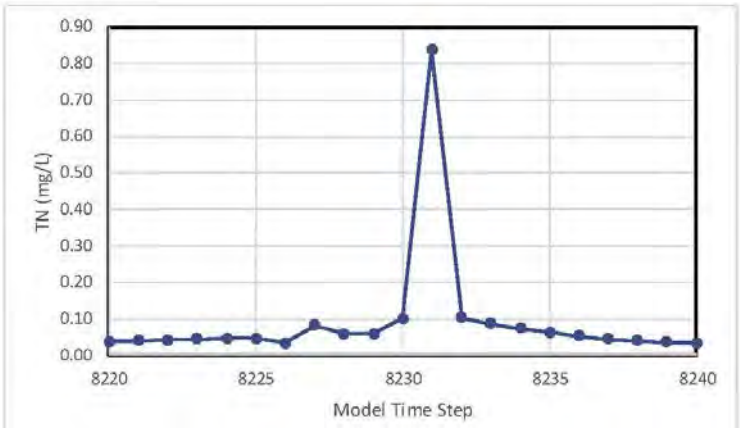


Figure 14 Short Time Period Model Prediction Illustrating the Highly Temporal Nature of Mixing Zone Development

Hence, the proposed discharge, even using conservative modelling assumptions, is not predicted to produce water quality levels which exceed relevant guidelines throughout the majority of Wheatley Creek. The only area where there may be occasional exceedances of guidelines will be in immediate vicinity and for a hundred metres either side of the proposed outfall, which can be referred to as the 'mixing zone'. The exceedances in these areas will be short in duration (less than 0.5 hours), infrequent and will occur primarily under spring tide, low water slack conditions, when there are small volumes in the creek and insignificant tidal flows. As soon as the substantial tides in Wheatley Creek start to flow after low water slack, the 'pooled' discharge waters will rapidly mix and dilute with the incoming tide, restoring the situation which complies with relevant water quality guidelines. As mentioned earlier, mitigation of this will be provided via the provision of the tidal pool and weir arrangement, which has not been factored into the modelling discussed herein. This will increase the initial mixing, which will be especially significant in reducing the peak water quality concentrations that will occur around the low water slack.

The extent of, and water quality criteria within, the mixing zone will be detailed within the Waste Discharge Licence under the Northern Territory *Water Act*.

Further, we note that initial discharge stage will be considerably smaller than the ultimate flow of 11,000 m³ per day, which has been assessed herein. This initial stage will provide ample opportunity to better understand background water quality and associated mangrove processes and also for further investigations of the dilution and decay of materials within the earlier stages of the discharge to Wheatley Creek to confirm the observations and conclusions of these studies.

Discharge Infrastructure, Timing and Location

CBC and BMC Settlement Ponds

The predominant wastewater stream arises from the seawater used on site in the process. The volume of used water will approximate the volume of seawater intake, and will have water quality characteristics as described above. On exit from the CBC and BMC this process water will pass through the Discharge Settlement Ponds to retain the discharge water to settle and separate solid. The discharge settlement ponds will be sized for a minimum of one day of storage prior to final discharge. The water will be chlorinated at the BMC and CBC prior to release to the individual discharge settlement ponds.

At least two discharge settlement ponds will be constructed for each of the CBC and BMC, so that maintenance and sludge removal can be effected on rotation.

Sludge removed from the discharge settlement ponds consists of organic materials. This sediment will be placed in a dedicated sediment storage area in accordance with the Environmental Code of Practice for Australian Prawn Farmers. The sediment will be allowed to sit for approximately six months prior to it being spread as a top dressing. The local vegetation will be encouraged to grow through this top dressing and so avoid loss of the sediment into the general environment through erosion. This area will have a bund wall constructed around it and an internal perimeter drain will divert all rainwater that falls in this area to the settlement ponds. This will prevent nutrients and sediment from the sediment storage area washing into the neighbouring waterways.

The discharge settlement ponds will be earthen, with welded HDPE liners, sized as in Table 7. The pond embankment design will be as for the Seawater Storage Ponds (Figure 7).

Table 7 Discharge Settlement Pond Sizing

	Stage 1 (1m depth)	**Full Scale Development (1m depth)**
BMC	4800kl capacity; 75 m x 75 m	19200 kl capacity; 145m x 145m
CBC	4950 kl capacity; 75 m x 75 m	19800 kl capacity; 145 m x 145 m

The outfall of these discharge settlement ponds will be controlled by an adjustable weir or water box, directing the water into the discharge channel and thereafter to the Final Retention Pond.

Discharge Channel

The discharge channel will be less than one metre deep, and nominally one metre wide. Actual width will be determined in the detailed design phase, and sized to provide for the range of discharge volumes that will occur from time to time, and to cater for all future stages of the project. The channel will be constructed using normal earthmoving equipment, most likely excavator and truck. Any unwanted excavated material will be utilised as bulk fill in other parts of the site.

Some revegetation of the open channel is possible, after a period of operation, and may be desirable for bank stability. An access track will be maintained alongside the channel, to allow for inspection and periodic maintenance, such as clearing of any accumulated sediments or blockage due to possible excess or unwanted revegetation.

Any areas of the channel likely to scour, such as at bends and changes of bed profile, will be protected by lining of the soils. Lining may consist of rip-rap (stone pitching), rock mattresses, shotcrete or proprietary products designed for such applications.

Final Tidal Pond and Discharge Flow Control Structure

At the end of the discharge channel a Final Tidal Pond will receive the settled plant discharge. This pond will be designed to accumulate the discharge and maximise the mixing with the tidal receiving water in Wheatley Creek. The tidal pond will be separated from Wheatley Creek via a flow control structure, such as a broad crested weir.

The flow control structure will be designed with adequate scour protection to prevent undermining of the structure through high tidal flows. The flow control structure will allow for mixing of the discharge water with higher tidal waters to provide further initial dilution, and release of the discharge to the receiving environment to occur only during periods of higher tidal waters (for example when water level is above Mean High Water Neap tides) to further reduce the impact of the discharge on the surrounding water body (see Section 2.1.7).

2.1.8 Workforce

To support the development of 1,080 ha of ponds for the Stage 1 Legune Grow-out Facility, a workforce of 27 will be required to be employed at the CBC and BMC, including managers, a geneticist, various technicians, administrators and aquaculture workers. At full scale production there is estimated to be a workforce of 45. The workforce is expected to come from a mixture of sources, including:

- directly employed staff, self-accommodated in the Dundee Downs areas and/or accommodated nearby
- local contractors, self-accommodated in the Dundee Downs areas and/or accommodated nearby
- local indigenous people
- fly-in/fly out (this option is likely to be the exception but for specialist expertise)
- temporary work skilled visa (sub-class 457) program.

2.1.9 Access and Traffic

Access roads will be constructed between the common facilities, the BMC, CBC and seawater intake. The access roads will be unsealed, all weather roads. It will also be necessary to construct an access road into the site. There are currently two options for accessing the site, as depicted in Figure 2, however, only one road will be required to access the site. The preferred option is a road that runs north-south from Fog Bay Road. This road will run along an existing road easement between several lots (Portion 2621, 2622, 2608, 2594, 122, 121). The second option is road running east-west from Dundee Road. The road is required to pass through one lot (Portion 2895).

Light vehicle movements will be associated with the workforce to and from the site. Heavy vehicle movements to and from the site will be limited to the weekly transport of freight. Initially a medium rigid truck and later a semi-trailer will be used to deliver the broodstock weekly to the Hatchery. Typically several chilled 1,200 litre bins filled with seawater will be strapped to the deck or inside a pantech trailer and a regulated oxygen supply added to each bin to maximize the survival of the PLs or prawns placed in them.

2.1.10 Bushfire Management

As part of the Environment Management Plan, fire risk will be managed in accordance with the *NT Bushfire Act 2009* which establishes the legal framework and responsibilities for bushfire management. This includes management that mitigates risks to property and persons operating the proposed facility, as well as risks

associated with bushfires initiated from the actions of persons or operation of the facility. Management will include vegetation clearing and ongoing hazard reduction activities to maintain a minimum of 4 m cleared firebreaks around shared boundaries, internal fence lines and other facility assets. Subject to more detailed site assessments, additional vegetation clearing may be required to maintain adequate separation distances between hazardous vegetation and Class 1-3 and 10a buildings, subject to calculation of Bushfire Attack Levels (BAL) in accordance with Australian Standard (AS) 3959–2009 – Construction of buildings in bushfire-prone areas. Bushfire risk will also be mitigated through construction of on-site fire-suppression infrastructure, as well as consultation and ongoing liaising with the nearby Dundee Volunteer Bushfire Brigade.

The project area contains suitable habitat for the eastern subspecies of Partridge Pigeon (*Geophaps smithii smithii*) (see Section 3.1(d)). While this species has not been recorded on the project site, it has been recorded from 8 km to the south-west, and the vegetation on the project site is dominated by the vegetation community that the subspecies is primarily known from. This species prefers to feed in recently burnt areas, and fire practices which result in a structurally patchy understorey at a small spatial scale are considered important, and are recommended to maintain habitat quality. As such, formulation of bushfire management practices will also take into account measures recommended to provide optimal habitat and resources for the Partridge Pigeon (eastern subspecies).

2.1.11 Project De-Commissioning

Should the project be abandoned at some time in the future, a two staged approach to decommissioning is proposed. Stage 1 would involve the decommissioning of the site via a care and maintenance program so that the facilities could be offered to other users on a lease or sale basis. If this approach was not successful then a stage 2 removal, demolition and rehabilitation could be employed. These stages are further described below.

Stage 1 Decommissioning, Care and Maintenance

Stage 1 would involve de-stocking the tanks where live food and prawns were grown. Flushing and cleaning would then follow so that the facilities can dry-out and be maintained in a stable, idle condition until required again. This is an extended version of the standard Seafarms operating procedure used between batches of livestock.

Stage 2 Removal, Demolition and Rehabilitation

The majority of the facility is manufactured from long life-cycle products. Depending on the age and condition of the facilities at the time of this decision point, an economics based decision will be made between sale verses scrap value, or a mix of both options on a component by component basis. Structured removal and re-use would be a preferred option.

The remaining open spaces on the site would then be rehabilitated using native vegetation of local provenance, or depending on the conditions applicable at the time, the site could be adopted for another land use.

2.2 Alternatives to taking the proposed action

This should be a detailed description outlining any feasible alternatives to taking the proposed action (including not taking the action) that were considered but are not proposed (note, this is distinct from any proposed alternatives relating to location, time frames, or activities – see section 2.3).

Not applicable.

2.3 Alternative locations, time frames or activities that form part of the referred action

If you have identified that the proposed action includes alternative time frames, locations or activities (in section 1.10) you must complete this section. Describe any alternatives related to the physical location of the action, time frames within which the action is to be taken and alternative methods or activities for undertaking the action. For each alternative location, time frame or activity identified, you must also complete (where relevant) the details in sections 1.2-1.9, 2.4-2.7, 3.3 and 4. Please note, if the action that you propose to take is determined to be a controlled action, any alternative locations, time frames or activities that are identified here may be subject to environmental assessment and a decision on whether to approve the alternative.

Seafarms has spent considerable time investigating suitable sites for the CBC and BMC across northern Australia. A total of 25 sites were short-listed and a formal multi-criteria analysis was applied to assess their suitability as potential locations. Attributes considered in the analysis included land tenure, land area, elevation, access to fresh water and seawater, access to mains power, logistics and workforce, existing infrastructure, surrounding land and

marine uses. One of the more critical attributes for the CBC and the BMC is the access to, and availability of, seawater that maintains a relatively uniform salinity (i.e. has minimal interaction with freshwater inflows). Site selection also considered avoidance of environmentally significant sites including protected areas, those with significant populations of threatened species, and/or sites of archaeological, heritage or Aboriginal significance.

Based on this analysis, the Point Ceylon site was ranked as the most optimal location for the CBC and BMC. The site was previously earmarked for the development of a land based aquaculture facility by Suntay Aquaculture Pty Ltd that was approved for development in 2003 (EcOz, 2003a).

2.4 Context, planning framework and state/local government requirements

Explain the context in which the action is proposed, including any relevant planning framework at the state and/or local government level (e.g. within scope of a management plan, planning initiative or policy framework). Describe any Commonwealth or state legislation or policies under which approvals are required or will be considered against.

The project will be subject to Commonwealth and Northern Territory jurisdiction. Approvals, permits and licenses under Commonwealth and Northern Territory legislation will be required as described below.

Commonwealth Legislative Requirements

Project Sea Dragon has been accorded 'Major Project Facilitation' through the Commonwealth Department of Infrastructure and Regional Development.

Commonwealth legislation which may apply to the CBC and BMC includes:

- *Aboriginal and Torres Strait Islander Heritage Act 1984*
- *Aboriginal Land Rights (Northern Territory) Act 1976*
- *Customs Act 1901*
- *Imported Food Control Act 1992*
- *Migration Act 1958*
- *Native Title Act 1993*
- *Quarantine Act 1908*
- *Export Control Act 1982*

Northern Territory Legislative Requirements

Project Sea Dragon has been accorded 'Major Project Status' through the NT Department of the Chief Minister.

A Notice of Intent (NOI) has been prepared for the NT EPA to assist in determining whether assessment under the NT *Environmental Assessment Act* (EA Act) is required for the CBC and BMC. Relevant Northern Territory government legislation which may also apply includes:

- *Bushfires Act*
- *Control of Roads Act*
- *Heritage Act*
- *Food Act*
- *Parks and Wildlife Conservation Act*
- *Public and Environmental Health Act*
- *Soil Conservation and Land Utilisation Act*
- *Waste Management and Pollution Control Act*
- *Weed Management Act*
- *Work Health and Safety Act*

Northern Territory legislative consents and licenses which may be required to be obtained include:

- an aquaculture licence in accordance with the *Fisheries Act*, Fisheries Regulations and subordinate legislation.
- a sacred sites clearance from the Aboriginal Areas Protection Authority (AAPA) under the *Aboriginal Sacred Sites Act*
- a licence to take or use surface water pursuant to section 45 of the *Water Act*

- a waste discharge licence pursuant to section 74 of the *Water Act*
- an environmental protection licence under the *Waste Management and Pollution Control Act*
- a direct sale application pursuant to the *Crown Land Act*
- a permit to clear native vegetation on Crown Land under the *Planning Act.*

2.5 Environmental impact assessments under Commonwealth, state or territory legislation

If you have identified that the proposed action will be or has been subject to a state or territory environmental impact statement (in section 1.11) you must complete this section. Describe any environmental assessment of the relevant impacts of the project that has been, is being, or will be carried out under state or territory legislation. Specify the type and nature of the assessment, the relevant legislation and the current status of any assessments or approvals. Where possible, provide contact details for the state/territory assessment contact officer.
Describe or summarise any public consultation undertaken, or to be undertaken, during the assessment. Attach copies of relevant assessment documentation and outcomes of public consultations (if available).

As mentioned above, a NOI has been prepared for the NT EPA to assist in determining whether assessment under the NT EA Act is required for the CBC and BMC. This is currently undergoing assessment, and as such, it is unknown at this stage whether an Environmental Impact Statement will be required. Hydrodynamic numerical modelling and a marine fauna impact assessment have been undertaken to support the NOI and this referral (the outcomes of these assessments are described in section 2.1.7 and 3.1 respectively). In addition, community consultation, as described in Section 2.6 below, has been undertaken with the local community at Dundee.

2.6 Public consultation (including with Indigenous stakeholders)

Your referral must include a description of any public consultation that has been, or is being, undertaken. Where Indigenous stakeholders are likely to be affected by your proposed action, your referral should describe any consultations undertaken with Indigenous stakeholders. Identify the relevant stakeholders and the status of consultations at the time of the referral. Where appropriate include copies of documents recording the outcomes of any consultations.

Community consultation has been undertaken within the Dundee area which includes Dundee Beach, Dundee Forest, Dundee Downs and Bynoe Haven. The consultation process identified a number of key stakeholders including residents and landowners, local clubs and associations, local retail businesses and community groups. A total of 67 individuals were reached during the consultation period which included the distribution of information brochures, attendance at two community events and informal communication with local residents. Of those consulted 55 were permanent residents, 11 were weekenders and one was a visitor (Member for Daly, Gary Higgins).

Table 8 presents the key issues identified during the consultation process and Seafarms corresponding responses. Those consulted during this process were overwhelmingly supportive of the project so long as the main concerns were addressed, particularly that fishing and crabbing activities will not be impacted. A consultation report has been prepared, however, as it provides details on individuals, organisations and community groups, it has not been provided due to concerns for the privacy of those involved. However, it will be made privately available to the Department on request, if required.

Based on this analysis, the development of the project will not result in any significant negative social impacts. Conversely, development of the project has the potential to result in positive social impacts, particularly through the generation of economic benefits and employment opportunities.

PSD is committed to ongoing consultation with the community and key stakeholders throughout the development of the project, particularly with regard to access and the development of access roads.