#### **DRAFT**

## **Environmental Impact Statement**

# Proposed Barramundi Fish Farm at Channel Island Darwin Harbour, Northern Territory



Prepared by Enesar Consulting Pty Ltd

> for MARINE HARVEST

> > May 2006

(Report No. HO02072/02-Channel Island EIS-version 1)

\_\_\_\_\_

#### **Contents**

Cor	ntents			ii		
For	Foreword					
1	Execu	Executive Summary				
	1.1	Introduction				
	1.2	Description of Proposal				
	1.3	Objectives of the Proposal				
	1.4	Location				
	1.5	Schedule				
	1.6	Layout and Infrastructure				
	1.7	Preferred Design Criteria for the Facility				
	1.8	Services	and Support	5		
		1.8.1	Transport	5		
		1.8.2	Staffing	5		
		1.8.3	Power, Potable Water and Storage	5		
	1.9	1.9 Farm Operation				
		1.9.1	Emissions from the Operation	6		
		1.9.2	Chemicals	6		
		1.9.3	Ongoing Management, Maintenance and			
		Admin	istrative Requirements	6		
	1.10	Decommissioning and Rehabilitation				
	1.11	Legislative Requirements				
	1.12	Alternatives				
	1.13	Existing Environment				
	1.14	Physical and Biological Environment				

	1.15	Port Patte	rson Base	eline Investigation	10
	1.16	Port Hurd	Pilot Farn	n Environmental Monitoring Results	10
	1.17	Paspaley	Pearls Oy	ster Studies	10
	1.18	Risk Asse	ssments		11
	1.19	Environme	ental Man	agement	16
	1.20	Public Inve	olvement	and Consultation	20
	1.21	Conclusio	ns		21
2	Introd	uction			23
	2.1	Backgrour	nd		23
	2.2	Objectives	and Sco	pe of this Report	23
3	Descr	ption of the	Proposal		24
	3.1	Overview			24
	3.2	Objectives	s, Benefits	and Justification for the Project	24
		3.2.1	Backgro	und	24
		3.2.2	Objective	es	26
		3.2.3	Benefits	and Justification	26
	3.3	Location of	of the Proj	ect	27
	3.4	Project Sc	hedule		28
	3.5	Layout an	d Infrastru	icture	29
		3.5.1	Infrastru	cture	29
			3.5.1.1	Land-Based Facility	29
			3.5.1.2	Farm Site	29
	3.6	Preferred	Design Cı	riteria for the Facility	30
		3.6.1	Aims of t	the Design	30
		3.6.2	Site Limi	ting Factors	31
		3.6.3	Fish Net	Design Criteria	31
		3.6.4	Mooring	Design Criteria	32
	3.7	Services a	and Suppo	ort	33
		3.7.1	Transpo	rt and Boat Movements	33
		3.7.2	Staffing	and Servicing Requirements	34
		3.7.3	Power, V	Vater Supply and Storage	35
	3.8	Farm Ope	ration		35
		3.8.1	Fish Cul	tivation	35
		3.8.2	Feeding		36
		3.8.3	Pens Ins	spections and Cleaning	37
		3.8.4		and Counting	37
		3.8.5	•	and Harvesting	38
		3.8.6	Steel Ne	t Construction	38
		3.8.7	Ensiler a	and Domestic Waste Disposal	39
		3.8.8	Emission	·	39
		3.8.9	Chemica	ıls	40
			3.8.9.1	Fuels	41
			3.8.9.2	Solvents and Cleaners	41

			3.8.9.3 Chemicals, Fuels and Hazardous	
			Materials Register	41
		3.8.10	Ongoing Management, Maintenance and	
			istrative Requirements	43
	3.9	Decommi	ssioning and Rehabilitation	43
	3.10	_	e Requirements	44
		3.10.1	Lease Requirements	44
		3.10.2	Native Title	44
		3.10.3	Planning Framework	45
		3.10.4	Compliance with Applicable Standards	45
4	Altern	atives		47
	4.1	Not Proce	eeding with the Proposal	47
	4.2	Alternative	e Locations or Layout for the Whole Proposal	47
	4.3	Alternative	es for Components of the Proposal	48
		4.3.1	Steel Nets	48
		4.3.2	Mooring Devices	48
		4.3.3	Operational Facilities	48
	4.4	Alternative	e Environmental Management Techniques	49
5	Existir	ng Environm	nent	50
	5.1	Regional	Setting	50
		5.1.1	Climatic Zones	50
		5.1.2	Catchment Terrain Type	50
		5.1.3	Marine and Coastal Form and Habitat Structure	50
		5.1.4	Regional Population Centres	51
		5.1.5	Local Industry and Infrastructure	51
		5.1.6	Land and Water Use	51
		5.1.7	Land and Water Sensitivities	52
		5.1.8	Aboriginal Relationships to the Land and Cultural	
		Values	5 52	
		5.1.9	Feedback from Consultation with Larrakia and	
			Aboriginal People	52
	5.2	Physical a	and Biological Environment	53
		5.2.1	Existing Environment	53
			5.2.1.1 Climatic Factors	53
			5.2.1.2 Hydrology and Water Quality	53
			5.2.1.3 Bathymetry	54
			<ul><li>5.2.1.4 Existing Coastal and Marine Flora</li><li>Species 55</li></ul>	
			<ul><li>5.2.1.5 Existing Coastal and Marine Fauna</li><li>Species 56</li></ul>	
		5.2.2	Turtles and Dugongs	61
		5.2.3	Air Quality, Noise, Lighting and Visual Amenity	62
		5.2.4	National Estate and Heritage	62
			5.2.4.1 Channel Island Leprosarium	62
			5.2.4.2 Channel Island Reefs - Corals	63

		5.2.4.3 SS Ellengowan Shipwreck	64		
	5.3	Channel Island Baseline Investigation	64		
		5.3.1 Investigation	64		
		5.3.2 Findings	65		
		5.3.3 Conclusions	68		
6	Poten	tial Impacts from Fin-fish Aquaculture	69		
	6.1	Potential Impacts from Construction of the Farm	69		
	6.2	Potential Impacts of Escaped Fish	69		
	6.3	Potential Impacts from Fish Faeces and Nutrient Loads	69		
	6.4	Potential Impacts from Excess Feed and Feed Quality	70		
	6.5	Potential Impacts from Fish Feeding on Naturally-Occurring Food – Removal of Food from the Food Chain	70		
	6.6	Potential Impacts from Fish Aggregation	70		
	6.7	Potential Impacts from the Introduction of Diseases and Parasites and the Treatment of Fish using Introduced Chemicals	70		
	6.8	Potential Impacts from Waste Generation and Hazardous Materials	71		
	6.9	Potential Impacts from the Loss of Nets	72		
	6.10	Potential Impacts to Hydrodynamics	72		
	6.11	Potential Impacts on and from Predators	72		
	6.12	Potential Impacts on Flora	73		
	6.13	Potential Impacts on Bird, Reptile, Fish and Mammal Habitats	73		
	6.14	Potential Impacts on EPBC Act-listed Threatened and Migratory Species	74		
	6.15	Potential Impacts from Disturbance to Land Surface	74		
	6.16	Potential Impacts to Air Quality, Noise, Lighting and Visual Amenity	74		
	6.17	Potential Impacts on Social and Recreational Values	75		
	6.18	Potential Impacts on Local Infrastructure	75		
	6.19	Potential Impacts on Archaeological, Historical, Cultural and Aboriginal Sites			
	6.20	Potential Impacts on Marine Traffic	76		
	6.21	Potential Impacts on Staff of Pest Insects			
	6.22	Potential Impacts from the Farm on Personnel Emergencies			
	6.23	Potential Impacts on the Barramundi Market	77		
	6.24	Unknown, Unpredictable or Irreversible Impacts	77		
7	Asses	sment of Impacts from the Port Hurd Pilot Farm	78		
	7.1	Port Hurd Environmental Monitoring Results	78		
		7.1.1 Port Hurd Investigations	78		
		7.1.2 Findings	79		
		7.1.2.1 Gullala Inlet Control Site	79		
		7.1.3 Implications and Recommendations	81		
	7.2	Comparison of Channel Island versus Port Hurd Operations	81		
	7.3	Paspaley Pearls Oyster Studies	83		

8	Discus	sion of Poten	tial Impacts and Risk Assessment	84
	8.1	Construction		86
		8.1.1 F	Risk Assessment	86
	8.2	Escaped Fis	sh	86
		•	nterbreeding	87
			Disease and Parasite Transfer	87
		8.2.3	Competition with Wild Populations and Increased	
		Predatio	·	87
		8.2.4 F	Risk Assessment	87
	8.3	Fish Faeces	s and Nutrient Loads	88
		8.3.1 F	Risk Assessment	89
	8.4	Excess Fee	d and Feed Quality	89
		8.4.1 F	Risk Assessment	90
	8.5	Removal of	Fish from the Food Chain	90
	8.6	Fish Aggreg	gation	91
		8.6.1 F	Risk Assessment	91
	8.7	Introduction	of Diseases and Parasites	92
		8.7.1 F	Risk Assessment	93
	8.8	Introduction	of Chemicals from Treatment of Fish Parasites or	
		Diseases		93
		8.8.1 F	Risk Assessment	94
	8.9	Waste Gene	eration and Hazardous Materials	94
		8.9.1 F	Risk Assessment	95
	8.10	Loss of Nets	S	96
		8.10.1	Risk Assessment	96
	8.11	Hydrodynar	nics	96
		8.11.1	Risk Assessment	96
	8.12	Predators		97
		8.12.1	Risk Assessment	97
	8.13	Flora		98
		8.13.1	Risk Assessment	98
	8.14	Corals		98
	8.15	Bird, Reptile	e, Fish and Mammal Habitats	99
		8.15.1	Risk Assessment	100
	8.16	EPBC Act-li	sted Threatened and Migratory Species	100
		8.16.1	Risk Assessment	101
	8.17	Land Surfac	ce	102
		8.17.1	Risk Assessment	103
	8.18	Air Quality,	Noise, Lighting and Visual Amenity	103
		8.18.1	Noise	103
		8.18.2	Lighting	103
		8.18.3	Greenhouse Gases	104
		8.18.4	Risk Assessment	104
	8.19	Social and F	Recreational	104

		8.19.1 Risk Assessment	105
	8.20	Local Infrastructure	105
		8.20.1 Risk Assessment	105
	8.21	Archaeological, Historical, Cultural and Aboriginal Sites	106
		8.21.1 Risk Assessment	106
	8.22	Marine Traffic	106
		8.22.1 Risk Assessment	106
	8.23	Insects Pests	107
		8.23.1 Risk Assessment	107
	8.24	Personnel Emergencies	108
		8.24.1 Risk Assessment	108
	8.25	Risk Assessment Summary	108
9	Propo	sed Mitigation, Management and Monitoring	113
	9.1	Maintenance and Monitoring Manual	113
	9.2	Construction	113
	9.3	Fish Escape	114
	9.4	Disease and Parasite Transfer	115
	9.5	Fish Faeces and Nutrient Loads	117
	9.6	Excess Fish Feed and Feed Quality	117
	9.7	Waste	119
		9.7.1 General Mitigation Measures for Waste	119
		9.7.2 Solid Putrescible Waste	120
		9.7.3 Solid Inert Waste	120
		9.7.4 Prescribed Waste	121
		9.7.5 Dead Farm Fish	121
	9.8	Storage, Handling and Containment of Chemical and	
		Hazardous Substances	122
	9.9	Nets and Moorings	124
	9.10	Hydrodynamics	125
	9.11	Water and Sediment Quality	126
	9.12	Management of Predators	127
	9.13	Bird, Reptile, Fish and Mammal Habitats	128
	9.14	Flora	129
	9.15	Corals	129
	9.16	EPBC Act-listed Threatened and Migratory Species	130
	9.17	Land Surface	131
	9.18	Air Quality, Noise, Lighting and Visual Amenity	132
	9.19	Social and Recreational	133
	9.20	Archaeological, Historical, Cultural and Aboriginal Sites	134
	9.21	Marine Traffic	134
	9.22	Mitigation of Nuisance and Health Risks from Pest Insects	134
	9.23	Personnel Emergencies	135
	9.24	Management and Monitoring of Quality of Farmed	
		Barramundi	135

10	Environmental Management			
	10.1	Company Health Safety Environment and Quality Policy	137	
		10.1.1 Objectives	138	
	10.2	Operational Standards	138	
	10.3	Standard Operational Procedures 139		
	10.4	Monitoring and Reporting Strategies	139	
11	Public Involvement and Consultation			
	11.1	August to September 2005	144	
	11.2	November 2005	145	
	11.3	Future Consultation	145	
12	Conclu	usions	146	
13	Refere	rences		
Limita	tions			
Figure	es			
Apper	ndices			

### **Tables**

Table 3.1:	Coordinates of Lease Area	28
Table 3.2:	Comparison Summary of the Mooring and Net Design Arrangements	33
Table 3.3:	Typical Composition of Fish Feed	36
Table 3.4:	Estimate of Quantities of Liquid and Solid Wastes	40
Table 3.5:	List of Chemicals Likely to be Stored at the Land Base, as per the Port Hurd Pilot Program Chemical Register	41
Table 3.6:	Applicable Environmental and Health Legislation	46
Table 5.1:	List of Threatened and Migratory Species from EPBC Web Site for the Proposed Development Site	57
Table 5.2:	Comparison of Water Quality in Channel Island and Port Hurd	68
Table 7.1:	Comparisons of Channel Island versus Port Hurd Operations	82
Table 8.1:	Marine Harvest Risk Ranking System	85
Table 8.2: Table 8.3:	Maximum Amount of Discharge (kg) per 1000 kg of Fish Produced Summary of Potential Greenhouse Gas Emissions from the Proposed	89
	Port Patterson Barramundi Farm	104
Table 8.4:	Risk Assessments Summary	109
Table 10.1:	Summary of Proposed Monitoring Requirements	140
	Plates	
Plate 1:	Illustration of the Type of 1 <sup>st</sup> Generation Fish-pen Infrastructure Propose the Site	d for
Plate 2:	Diver Carrying Out Repairs on Port Hurd Farm Nets	
	Figures	
Figure 1:	Location Map	
Figure 2:	Location Map – Satellite Image	
Figure 3:	Proposed Lease Area	
Figure 4:	Proposed Lease Area – Details of Features	
Figure 5:	Mooring Arrays	
Figure 6:	Mooring Design Details	
Figure 7:	Substrate Mapping near Channel Island	
Figure 8:	Sampling Investigation Locations for Channel Island Baseline Study	
Figure 9:	Sampling Investigation Locations for Port Hurd Biennial Monitoring	
Figure 10:	Sampling Investigation Locations for Gullala Inlet Control Sites	

#### **Appendices**

- A Environmental Impact Statement Requirement Letter from Northern Territory Natural Resources, Environment and Heritage
- B Environmental Impact Statement Guidelines for Channel Island Proposed Aquaculture Farm
- C Aboriginal Areas Protection Authority, Authority Certificate Copy
- D Channel Island Bathymetry
- E Channel Island Baseline Report by Aquenal Pty Ltd
- F Port Hurd Biennial Report by Aquenal Pty Ltd
- G Paspaley Pearls Oyster Trials at Port Hurd
- H Greenhouse Gases Calculations
- I Fish Feed Residue Monitoring
- J Marine Harvest Port Hurd Standard Operating Procedures
- K Community Consultation Records