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OF THE STATE OF
NEW SOUTH WALES

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LEGISLATION

Assents to Acts

ACT OF PARLIAMENT ASSENTED TO

Legislative Assembly Office, Sydney, 26 May 2005

IT is hereby notified, for general information, that Her Excellency the Governor has, in the name and on behalf of Her Majesty, this day assented to the undermentioned Act passed by the Legislative Assembly and Legislative Council of New South Wales in Parliament assembled, viz.:

Act No. 22 2005 - An Act to amend the Dust Diseases Tribunal Act 1989 and the Dust Diseases Tribunal Regulation 2001 to make further provision for the resolution of claims in respect of dust-related conditions and the jurisdiction and practice and procedure of the Dust Diseases Tribunal; and for other purposes. [Dust Diseases Tribunal Amendment (Claims Resolution) Bill]

Russell D. Grove PSM
Clerk of the Legislative Assembly

ACTS OF PARLIAMENT ASSENTED TO

IT is hereby notified, for general information, that Her Excellency the Governor has, in the name and on behalf of Her Majesty, this day assented to the undermentioned Acts passed by the Legislative Assembly and Legislative Council of New South Wales in Parliament assembled, viz.:

LEGISLATIVE ASSEMBLY OFFICE, SYDNEY, 31 MAY 2005

Act No. 23 2005 - An Act to appropriate additional amounts out of the Consolidated Fund for the years 2004-2005 and 2003-2004 for the purpose of giving effect to certain Budget variations required by the exigencies of Government. [Appropriation (Budget Variations) Bill]

Act No. 24 2005 - An Act to amend the Coal Acquisition Act 1981 to make further provision for the payment of compensation under that Act; and for other purposes. **[Coal Acquisition Amendment (Fair Compensation) Bill]**

Act No. 25 2005 - An Act to amend the Criminal Procedure Act 1986 with respect to evidence in criminal proceedings, including evidence given by complainants in sexual offence proceedings; and for other purposes. **[Criminal Procedure Further Amendment (Evidence) Bill]**

Act No. 26 2005 - An Act to amend the Game and Feral Animal Control Act 2002 with respect to the functions of the Game Council and the application of penalties for offences under that Act. **[Game and Feral Animal Control Amendment Bill]**

Act No. 27 2005 - An Act to revoke the reservation under the National Parks and Wildlife Act 1974 of certain areas of land as national park or nature reserve; and for other purposes. **[National Parks and Wildlife (Adjustment of Areas) Bill]**

LEGISLATIVE ASSEMBLY OFFICE, SYDNEY, 1 JUNE 2005

Act No. 28 2005 - An Act with respect to practice and procedure in civil proceedings. **[Civil Procedure Bill]**

Act No. 29 2005 - An Act to amend the Noxious Weeds Act 1993 to make further provision with respect to the declaration, classification and control of noxious weeds; to repeal the Seeds Act 1982; and for other purposes. **[Noxious Weeds Amendment Bill]**

Russell D. Grove PSM,
Clerk of the Legislative Assembly

Regulations

New South Wales

Criminal Procedure Amendment (Penalty Notices) Regulation 2005

under the

Criminal Procedure Act 1986

Her Excellency the Governor, with the advice of the Executive Council, has made the following Regulation under the *Criminal Procedure Act 1986*.

BOB DEBUS, M.P.,
Attorney General

Explanatory note

The object of this Regulation is to extend the operation of Part 3A of the *Criminal Procedure Regulation 2000*, which establishes a trial period for a penalty notice scheme for certain offences under the *Crimes Act 1900* and the *Summary Offences Act 1988*, until 30 June 2006.

This Regulation is made under the *Criminal Procedure Act 1986*, including sections 4 (the general regulation-making power) and 343.

Criminal Procedure Amendment (Penalty Notices) Regulation 2005

under the

Criminal Procedure Act 1986

1 Name of Regulation

This Regulation is the *Criminal Procedure Amendment (Penalty Notices) Regulation 2005*.

2 Amendment of Criminal Procedure Regulation 2000

The *Criminal Procedure Regulation 2000* is amended by omitting the matter "30 June 2005" from clause 11C and inserting instead "30 June 2006".

New South Wales

Liquor Amendment (Sunday Trading) Regulation (No 2) 2005

under the

Liquor Act 1982

Her Excellency the Governor, with the advice of the Executive Council, has made the following Regulation under the *Liquor Act 1982*.

GRANT McBRIDE, M.P.,
Minister for Gaming and Racing

Explanatory note

The object of this Regulation is to prescribe Sunday 12 June 2005 (the day prior to the Queen's birthday public holiday), Sunday 2 October 2005 (the day of the NRL grand final) and Sunday 9 October 2005 (the day of the Australia verses World—Day/Night International cricket match) as the dates on which hotels can stay open until midnight.

This Regulation is made under the *Liquor Act 1982*, including section 24B (Hotel trading hours on Sundays when special events are held).

Liquor Amendment (Sunday Trading) Regulation (No 2) 2005

under the

Liquor Act 1982

1 Name of Regulation

This Regulation is the *Liquor Amendment (Sunday Trading) Regulation (No 2) 2005*.

2 Amendment of Liquor Regulation 1996

Clause 83A (Dates prescribed for special events Sunday hotel trading) of the *Liquor Regulation 1996* is amended by inserting the following dates at the end of the clause:

Sunday 12 June 2005

Sunday 2 October 2005

Sunday 9 October 2005

New South Wales

Public Finance and Audit Amendment (NSW Self Insurance Corporation) Regulation 2005

under the

Public Finance and Audit Act 1983

Her Excellency the Governor, with the advice of the Executive Council, has made the following Regulation under the *Public Finance and Audit Act 1983*.

ANDREW REFSHAUGE, M.P.,
Treasurer

Explanatory note

The object of this Regulation is to prescribe certain persons as officers of the NSW Self Insurance Corporation for the purpose of exercising functions under the *Public Finance and Audit Act 1983* relating to committing or incurring expenditure and authorising payment of accounts. The persons prescribed are those who are authorised under an insurance services contract entered into by the NSW Self Insurance Corporation to exercise the relevant functions.

This Regulation is made under the *Public Finance and Audit Act 1983*, including sections 4 (1) (the definition of an ***officer of an authority***) and 64 (the general regulation-making power).

Public Finance and Audit Amendment (NSW Self Insurance Corporation) Regulation 2005

under the

Public Finance and Audit Act 1983

1 Name of Regulation

This Regulation is the *Public Finance and Audit Amendment (NSW Self Insurance Corporation) Regulation 2005*.

2 Commencement

This Regulation commences on 1 July 2005.

3 Amendment of Public Finance and Audit Regulation 2000

The *Public Finance and Audit Regulation 2000* is amended as set out in Schedule 1.

Schedule 1 Amendment

(Clause 3)

Clause 17 Definitions of "authority" and "officer of an authority"

Insert after clause 17 (14):

(15) For the purposes of the definition of ***officer of an authority*** in section 4 (1) of the Act, a person who is authorised under an insurance services contract to exercise functions for the purposes of sections 12 and 13 of the Act (whether or not the person is a party to that contract) is prescribed in relation to the NSW Self Insurance Corporation, but only for the purposes of exercising those functions that the person is authorised to exercise under the contract.

(16) In subclause (15), ***insurance services contract*** means an agreement or arrangement entered into by the NSW Self Insurance Corporation in accordance with section 8 (b) of the *NSW Self Insurance Corporation Act 2004*.

Orders

New South Wales

Conveyancers Licensing Amendment (Vero Insurance) Order 2005

under the

Conveyancers Licensing Act 1995

I, the Minister for Fair Trading, in pursuance of section 8 of the *Conveyancers Licensing Act 1995*, make the following Order.
Dated, this 2nd day of June 2005.

JOHN HATZISTERGOS, M.L.C.,
Minister for Fair Trading

Explanatory note

The object of this Order is to specify a policy for professional indemnity insurance that is an approved policy for the purposes of the *Conveyancers Licensing Act 1995*.
This Order is made under section 8 of the *Conveyancers Licensing Act 1995*.

Conveyancers Licensing Amendment (Vero Insurance) Order 2005

under the

Conveyancers Licensing Act 1995

1 Name of Order

This Order is the *Conveyancers Licensing Amendment (Vero Insurance) Order 2005*.

2 Amendment of Conveyancers Licensing Order 2000

The *Conveyancers Licensing Order 2000* is amended by inserting after clause 3 (g) the following paragraph:

(h) the master policy of professional indemnity insurance (Number FI304753DF) of Vero Insurance Limited covering the period from 1 July 2005 to 30 June 2006.

New South Wales

Passenger Transport (Accreditation Fees) Order 2005

under the

Passenger Transport Act 1990

I, the Director-General of the Ministry of Transport, in pursuance of section 15 of the *Passenger Transport Act 1990*, make the following Order.
Dated, this 27th day of April 2005.

JOHN LEE,
Director-General of the Ministry of Transport

Explanatory note

The object of this Order is to fix the fees payable for applications for accreditation, and renewals of accreditation, as an operator of a public passenger service that is provided by means of a bus.

This Order is made under section 15 of the *Passenger Transport Act 1990*.

Passenger Transport (Accreditation Fees) Order 2005

under the

Passenger Transport Act 1990

1 Name of Order

This Order is the *Passenger Transport (Accreditation Fees) Order 2005*.

2 Commencement

This Order commences on 1 July 2005.

3 Section 15: Fees for applications for, and renewals of, certain accreditations and authorities

The following fees are fixed for the purposes of section 15 (1) of the *Passenger Transport Act 1990*:

(a) a fee of $355 for an application for an accreditation under that Act to carry on a public passenger service by means of a bus,

(b) a fee of $284 for an application for the renewal of such an accreditation.

New South Wales

Public Sector Employment and Management (Motor Vehicle Repair Industry Authority) Order (No 2) 2005

under the

Public Sector Employment and Management Act 2002

MARIE BASHIR, Governor

I, Professor Marie Bashir AC, Governor of the State of New South Wales, with the advice of the Executive Council, and in pursuance of Chapter 4 of the *Public Sector Employment and Management Act 2002*, make the following Order.

Dated, this 1st day of June 2005.

By Her Excellency's Command,

BOB CARR, M.P.,
Premier

Public Sector Employment and Management (Motor Vehicle Repair Industry Authority) Order (No 2) 2005

under the

Public Sector Employment and Management Act 2002

1 Name of Order

This Order is the *Public Sector Employment and Management (Motor Vehicle Repair Industry Authority) Order (No 2) 2005*.

2 Construction of references to General Manager of Motor Vehicle Repair Industry Authority

A reference in any Act (including in the definition of ***General Manager*** in section 4 of the *Motor Vehicle Repairs Act 1980*) or statutory instrument, or in any other instrument, or in any contract or agreement, to the General Manager of the Motor Vehicle Repair Industry Authority is to be construed as a reference to the Commissioner for Fair Trading, Department of Commerce or, if there is no such position in that Department, to the Director-General of that Department.

OFFICIAL NOTICES

Appointments

FIRE SERVICES JOINT STANDING COMMITTEE ACT 1998

Appointment of Member
Fire Services Joint Standing Committee

I, TONY KELLY, M.L.C., Minister for Emergency Services, in pursuance of section 4(2)(e) of the Fire Services Joint Standing Committee Act 1998, appoint the following person as a Member of the Fire Services Joint Standing Committee:

Craig HARRIS

for the remainder of the three-year period expiring on 5 July 2006.

TONY KELLY, M.L.C.,
Minister for Emergency Services

Department of Infrastructure, Planning and Natural Resources

Infrastructure and Planning

New South Wales

State Environmental Planning Policy No 62—Sustainable Aquaculture (Amendment No 2)

under the

Environmental Planning and Assessment Act 1979

Her Excellency the Governor, with the advice of the Executive Council, has made the following State environmental planning policy under the *Environmental Planning and Assessment Act 1979* in accordance with the recommendation made by the Minister for Infrastructure and Planning. (S04/01140/PC)

CRAIG JOHN KNOWLES, M.P.,
Minister for Infrastructure and Planning

State Environmental Planning Policy No 62—Sustainable Aquaculture (Amendment No 2)

under the

Environmental Planning and Assessment Act 1979

1 Name of Policy

This Policy is *State Environmental Planning Policy No 62—Sustainable Aquaculture (Amendment No 2)*.

2 Aims of Policy

The aims of this Policy are:

(a) to make aquaculture a permissible use in certain areas in the Hunter and Central Coast Region, and

(b) to set out the minimum site location requirements for permissible aquaculture development in those areas, and

(c) to make certain consequential amendments.

3 Land to which Policy applies

This Policy applies to the area of the State comprising the local government areas of Cessnock City, Dungog, Gloucester, Gosford City, Great Lakes, Lake Macquarie, Maitland City, Muswellbrook, Newcastle City, Port Stephens, Singleton, Upper Hunter and Wyong.

4 Amendment of State Environmental Planning Policy No 62—Sustainable Aquaculture

State Environmental Planning Policy No 62—Sustainable Aquaculture is amended as set out in Schedule 1.

Schedule 1 Amendments

(Clause 4)

[1] Clause 4 Definitions

Omit the definition of ***Director-General*** from clause 4 (1). Insert instead:

Department means the Department of Infrastructure, Planning and Natural Resources.

Director-General means the Director-General of the Department.

[2] Clause 5 Where the Policy applies

Insert "clause 1 of" after "described in" in clause 5 (a).

[3] Schedule 1 Pond-based and tank-based aquaculture

Omit clause 1. Insert instead:

1 Regions to which Policy applies

(1) **North Coast Region**

The area of the State comprising the local government areas of Ballina, Bellingen, Byron, Clarence Valley, Coffs Harbour City, Greater Taree City, Hastings, Kempsey, Kyogle, Lismore City, Nambucca, Richmond Valley and Tweed.

(2) **Hunter and Central Coast Region**

The area of the State comprising the local government areas of Cessnock City, Dungog, Gloucester, Gosford City, Great Lakes, Lake Macquarie, Maitland City, Muswellbrook, Newcastle City, Port Stephens, Singleton, Upper Hunter and Wyong.

[4] Schedule 1, Part 2

Omit the heading to Division 1. Insert instead:

Division 1 Site location requirements—North Coast Region

1A Application of Division

Despite clause 5 (a) of this Policy, this Division applies only to those areas of the State described in clause 1 (1) of this Schedule.

[5] Schedule 1, clause 3

Omit "of Planning".

[6] Schedule 1, Part 2

Insert after Division 1:

Division 1A Site location requirements—Hunter and Central Coast Region

7A Application of Division

Despite clause 5 (a) of this Policy, this Division applies only to those areas of the State described in clause 1 (2) of this Schedule.

7B Acceptable areas for estuarine pond-based aquaculture

Within an area coloured green on either of the following maps, deposited in the head office of the Department:

(a) Estuarine Aquaculture Map 11, Port Stephens Estuary (dated 25 May 2003), or

(b) Estuarine Aquaculture Map 12, Hunter River Estuary (dated 25 May 2003).

7C Zoning under environmental planning instrument in the Hunter and Central Coast Region

(1) Pond-based aquaculture—for land to which an environmental planning instrument listed in Column 1 of the table to this clause applies, in the zones listed in Column 2 opposite the name of that instrument.

(2) Tank-based aquaculture—for land to which an environmental planning instrument listed in Column 1 of the table to this clause applies, in the zones listed in Column 3 opposite the name of that instrument.

Table

Column 1	Column 2	Column 3
Environmental planning instrument	**Pond-based aquaculture**	**Tank-based aquaculture**
Cessnock Local Environmental Plan 1989	1 (a) Rural "A"	1 (a) Rural "A" 1 (a1) Rural "A1" 4 (a) Industrial 4 (b) Light Industrial

State Environmental Planning Policy No 62—Sustainable Aquaculture (Amendment No 2)

Amendments Schedule 1

Column 1	Column 2	Column 3
Environmental planning instrument	**Pond-based aquaculture**	**Tank-based aquaculture**
Dungog Local Environmental Plan 1990	1 (b) General Rural 1 (d) Rural Farmlets	1 (b) General Rural 1 (d) Rural Farmlets 4 (a) General Industrial 4 (b) Light Industrial
Gloucester Local Environmental Plan 2000	1 (a) Rural 7 (d) Environment Protection (Scenic)	1 (a) Rural 4 (a) Industrial 7 (d) Environment Protection (Scenic)
Interim Development Order No 122—Gosford	1 (a) Rural (Agriculture) 1 (b) Rural (Highway Protection) 7 (b) Conservation and Scenic Protection (Scenic Protection)	1 (a) Rural (Agriculture) 1 (b) Rural (Highway Protection) 4 Industrial (Extractive)
Gosford Planning Scheme Ordinance		4 (a) Industrial (General) 4 (b) Industrial (Light)
Great Lakes Local Environmental Plan 1996	1 (a) Rural	1 (a) Rural 3 (d) Special Business Waterfront 4 (a) General Industrial
Lake Macquarie Local Environmental Plan 2004	1 (1) Rural (Production) 9 Natural Resources	1 (1) Rural (Production) 1 (2) Rural (Living) 4 (1) Industrial (Core) 4 (2) Industrial (General) 9 Natural Resources

State Environmental Planning Policy No 62—Sustainable Aquaculture (Amendment No 2)

Schedule 1 Amendments

Column 1	Column 2	Column 3
Environmental planning instrument	**Pond-based aquaculture**	**Tank-based aquaculture**
Maitland Local Environmental Plan 1993	1 (a) Prime Rural Land 1 (b) Secondary Rural Land	1 (a) Prime Rural Land 1 (b) Secondary Rural Land 4 (a) General Industrial 4 (b) Light Industrial
Merriwa Local Environment Plan 1992	1 (a) General Rural	1 (a) General Rural 4 (a) Industrial
Murrurundi Local Environmental Plan 1993	1 (a) Rural "A"	1 (a) Rural "A"
Muswellbrook Local Environmental Plan 1985	1 (a) Rural "A" 5 (a) Special Use (Power Station)	1 (a) Rural "A" 4 (a) General Industrial 4 (b) Light Industrial 5 (a) Special Use (Power Station) 7 (L1) Environment Protection General (L1) (Alluvial Areas)
Newcastle Local Environmental Plan 1987		1 (a) Rural 4 (a) Light Industrial 4 (b) General Industrial 4 (c) Eco-industrial
Newcastle Local Environmental Plan 2003	7 (a) Conservation	4 (a) Urban Services 4 (b) Port and Industry 4 (c) Steel River

State Environmental Planning Policy No 62—Sustainable Aquaculture (Amendment No 2)

Amendments Schedule 1

Column 1	Column 2	Column 3
Environmental planning instrument	**Pond-based aquaculture**	**Tank-based aquaculture**
Port Stephens Local Environmental Plan 2000	1 (a) Rural Agriculture "A" 1 (c1) Rural Small Holdings "C1" 6 (a) General Recreation "A" 6 (c) Special Recreation "C" 7 (a) Environment Protection "A" 7 (f1) Environment Protection "F1" (Coastal Lands)	1 (a) Rural Agriculture "A" 1 (c1) Rural Small Holdings "C1" 1 (c2) Rural Small Holdings Zone "C2" 4 (a) Industrial General "A" 6 (a) General Recreation "A" 6 (c) Special Recreation "C" 7 (f1) Environment Protection "F1" (Coastal Lands)
Scone Local Environmental Plan 1986	1 (d) Rural Holdings 1 (e) General Agricultural 1 (i) Intensive Agricultural 1 (s) Small Farm	1 (d) Rural Holdings 1 (e) General Agricultural 1 (i) Intensive Agricultural 1 (s) Small Farm 4 (a) General Industrial
Singleton Local Environmental Plan 1996	1 (a) Rural	1 (a) Rural 4 Industrial
Wyong Local Environmental Plan 1991	1 (a) Rural 7 (b) Scenic Protection	1 (a) Rural 4 (a) General Industrial 4 (b) Light Industrial 4 (e) Regional Industrial and Employment Development 7 (b) Scenic Protection

State Environmental Planning Policy No 62—Sustainable Aquaculture (Amendment No 2)

Schedule 1 Amendments

7D Conservation exclusion zones

Not within:

(a) areas dedicated or reserved under the *National Parks and Wildlife Act 1974*, or

(b) marine parks or aquatic reserves (other than areas designated as general use zones), or

(c) vacant Crown land (other than areas used only for access to water provided under a licence).

[7] Schedule 1, Part 2, Division 2

Omit the heading. Insert instead:

Division 2 Operational requirements—all regions

[8] Schedule 1, clause 11

Insert "(except tanks and raceways)" after "farm".

Aquaculture Industry Development Plan

Hunter and Central Coast Sustainable Aquaculture Strategy
Land Based Aquaculture

A NSW Government Initiative

Note:
The following Aquaculture Industry Development Plan and Project Profile Analysis form part of a Hunter & Central Coast Sustainable Aquaculture Strategy from which they have been extracted. Therefore, the page numbers shown within this gazette reflect the page locations within the Strategy.

Hunter and Central Coast Sustainable Aquaculture Strategy

A NSW Government initiative of Department of Primary Industries, Department of State and Regional Development, Department of Environment and Conservation, Department of Lands, Department of Infrastructure, Planning and Natural Resources and NSW Premiers Department to encourage sustainable aquaculture in New South Wales.

Aquaculture Industry Development Plan

Table of Contents

1. Objectives of the AIDP

The Aquaculture Industry Development Plan (AIDP) has been developed under the provisions of the *Fisheries Management Act 1994*. The Minister for Primary Industries has determined the Aquaculture Industry Development Plan (AIDP) in accordance with section 143 of the *Fisheries Management Act 1994*. The AIDP's purpose is to promote economically and environmentally sustainable land-based aquaculture by providing guidance for responsible aquaculture practices.

The Objectives of the Aquaculture Industry Development Plan

1. To provide the basis for the attraction of investment and employment in sustainable aquaculture to the region and the recognition of the region for its sustainable aquaculture industry.

2. To facilitate sustainable aquaculture in the region through:
   a) reinforcing within the aquaculture industry the need for a commitment to environmental sustainable practices and a duty of care for the environment in which the industry is located;
   b) ensuring environmental factors are considered in site selection for the optimum siting of new aquaculture enterprises;
   c) ensuring environmental factors are considered in the planning, design and operation of all aquaculture enterprises.

3. To provide the technical basis for the efficient and effective regulation of the industry with up-front certainty to applicants, the community and decisions makers as to the appropriate environmental performance of aquaculture.

The AIDP provides the best practice environmental management component of the Sustainable Aquaculture Strategy with a clear signal to the existing aquaculture industry as well as new investors as to the environmental performance objectives expected. The AIDP includes the following:

- **Business Planning,**
- **Species Selection,**
- **Site Selection,**
- **Planning and Design,**
- **Operating the Farm.**

It is recognised that the industry is in a dynamic phase, with research and development leading to a better understanding of what constitutes best practice from a commercial production as well as an environmental performance standpoint. However, the provisions put forward in the AIDP represent what is considered current best practice and provide a minimum performance benchmark. Industry is encouraged to make improvements on the environmental performance set out in the AIDP. When there are significant advances in best practice, the AIDP will be reviewed to reflect those advances. This Strategy is promoting continuous improvement in performance.

2. Land Based AIDP

The AIDP applies only to land based aquaculture that includes ponds, dams, raceways and tank culture. While it is recognised that there is significant potential for aquaculture in public waterways (including estuaries and the ocean), these forms of aquaculture will be dealt with in another strategy focusing specifically on the environmental and technical issues relating to those sectors.

The AIDP focuses on "intensive" aquaculture which is defined as aquaculture involving supplementary feed in purpose-built pond, raceway or tank based systems using saline or fresh water for the commercial production of fish or marine vegetation. Table 1 provides examples of extensive and intensive aquaculture in land based and in natural water bodies.

Tanks systems include hatcheries but do not include pet shop activities, aquariums for exhibition only or personal scientific collections. The pond systems do not include dams or other systems where there is no supplementary feeding of stock (eg. stocking of farm dams where the fish or yabbies are reliant on the natural ecosystem in the dam for food).

Table 1. Aquaculture covered by the Land Based AIDP

The shaded part of this table shows the types of aquaculture covered by this AIDP.

Location	**Intensive** some form of supplementary feeding	**Extensive** no supplementary feeding
On land above the top of the bank or the mean high water mark	hatcheries culture of • fin fish • yabbies & other crustacea • abalone, scallops, oysters, mussels & other mollusca • aquarium species bred for sale to pet shops • fishouts	culture of • fin fish • yabbies • fishouts
In natural waterbodies below the top of the bank or the mean high water mark	Culture of • fin fish • scallops, abalone & other mollusca	culture of • mussels • oysters • scallops

Land based aquaculture facilities for ponds, tanks, hatcheries, raceways, and fishouts may include facilities for

- holding, breeding, harvesting and pre-market conditioning (purging) of stock;
- associated facilities for the preparation or storage of feed;
- processing, manufacturing, packaging or distribution of products;
- administration, laboratory, storage and maintenance facilities;
- waste management;
- water extraction, storage, reticulation and recirculation systems;
- transport facilities including access;
- any related tourist or fishout activities.

3. The Hunter and Central Coast AIDP for Land Based Aquaculture

3.1 Extent of the application of the Hunter and Central Coast AIDP

The Hunter and Central Coast Aquaculture Industry Development Plan only applies to land based aquaculture on the Hunter and Central Coast of NSW including the Hunter River catchment and extends from south of the Manning River catchment to the Hawkesbury River catchment. It includes the following local government areas:

Cessnock, Dungog, Gloucester, Gosford, Great Lakes, Lake Macquarie, Maitland, Muswellbrook, Newcastle, Port Stephens, Singleton, Upper Hunter (incorporates Merriwa, Murrurundi & Scone) and Wyong.

The AIDP covers a range of environmental, technical and commercial issues to be considered in establishing and operating an aquaculture enterprise on the NSW Hunter and Central Coast Region. As guidance, an Estuarine Aquaculture Land Suitability Map and a Non Estuarine Aquaculture Land Suitability Map have been developed for Port Stephens and surroundings to assist in identifying land that is potentially suitable for pond and tank aquaculture. Land identified in these maps meet some of the broad landscape requirements for pond and tank aquaculture. These maps provide a first step in potential site selection with further site specific assessment required to confirm the suitability of a specific site for aquaculture.

The Hunter and Central Coast of NSW is a region with significant potential for the development of land based aquaculture with an emerging industry as demonstrated in Table 2. It is a region with broad river valleys, healthy river catchments, developed infrastructure and a readily available labour force.

Table 2. Aquaculture in the Hunter and Central Coast Region 2005

Local Government Area	Fisheries Permit Class			Species		
	D	F	H	Marine Fish	Fresh water Fish	Yabbies
Cessnock	2	1	0	1	2	0
Dungog	2	0	0	0	1	1
Gloucester	7	1	2	1	7	0
Gosford	2	1	3	1	1	1
Great Lakes	5	0	1	4	5	4
Lake Macquarie	1	0	0	1	0	0
Maitland	1	0	1	1	1	0
Muswellbrook	1	0	1	0	1	0
Newcastle	0	0	0	0	0	0
Port Stephens	3	0	1	2	3	2
Singleton	1	0	0	0	1	0
Upper Hunter						
Former Merriwa	0	0	0	0	0	0
Former Murrurundi	1	1	0	1	1	0
Former Scone	1	1	0	0	1	1
Wyong	0	0	0	0	0	0
TOTAL	**29**	**5**	**8**	**12**	**26**	**10**

Permit Class D = Intensive land based aquaculture
Permit Class F = Fishout permit;
Permit Class H = Hatchery permit

There is now good information of surface and subsurface water resources and a depth of knowledge on the location and management of acid sulfate soils in coastal areas. In addition to the favourable climate, the Hunter and Central Coast Region offers distinct advantages in relation to the accessibility to domestic markets in Sydney and Newcastle and to overseas markets for both live, chilled and frozen shellfish and fish.

3.2 Review of the Hunter and Central Coast AIDP

Under the Fisheries Management Act performance indicators must be established within an AIDP to determine if the objectives set out in the plan are being achieved. The plan must also specify at what point a review of the development plan is required if these performance indicators are not being met. The indicators in Table 3 relate to performance and cumulative issues and will provide the trigger that will initiate a review of the plan by the Minister.

Table 3. Triggers for review of the Hunter and Central Coast Land Based AIDP
Note: indicators need to be reviewed in as the AIDP develops

Indicator	Measure	Trigger for Review of AIDP
1. Number of new or expanded aquaculture permits per annum	Reflect effectiveness of objective (1) to encourage aquaculture industry	<5 per annum See Table 2.
2. Percentage of aquaculture farms providing Department of Primary Industries with "acceptable" compliance reports on time per annum	Reflect effectiveness of the industries acceptance of responsibility for environmental performance in accordance with objective (2a & c)	<90% per annum
3. Surface area of estuary pond farms per estuary compared with area suitable for estuarine pond farms in estuary	*Potential cumulative water quality issues in accordance with objective (2b)*	*See Table 4 below for trigger for specific estuaries*
4. Percentage of designated development proposals	Reflect the effectiveness of objective (3) to encourage lower risk projects	>30% designated development
5. Number of years since review (if not triggered for other reasons)	Potential to become out-of–date with advice no longer reflecting the most sustainable approach	> 5 years

While the focus of this plan is on facilitating high quality performance on individual aquaculture farms, it is recognised that cumulative issues could become a concern when a series of aquaculture enterprises are established within a catchment or subcatchment. The principle issues of concern relate to water quality and flows.

Except for species approved for flow through systems (eg. Salmonoids) the Hunter and Central Coast AIDP does not permit discharge from freshwater aquaculture facilities. The areas suitable for flow through production in the Hunter and Central Coast Region are very limited. Therefore, the potential for cumulative water quality impacts from this sector of the industry is low.

However as saline pond, raceway and tank systems are permitted to discharge treated water back into the estuary, the review of the strategy focuses on the potential for cumulative impacts in estuary catchments and sub-catchments. Water quality triggers for review of the AIDP in relation to estuarine aquaculture systems have been based on the total farm water surface area (as a surrogate for the quantity and quality of water discharged) compared to the total area suitable for ponds identified in key estuaries considered in the AIDP. Exceedence of these areas (set out in the Table 4 below) will require a review of the AIDP for that catchment.

Table 4. Cumulative indicators for estuary pond farms

Hunter and Central Coast Rivers or Lake Catchment	**Gross Area** identified as suitable for estuary pond farms in *Potential Suitable Land Map* (ha)	**Trigger for review AIDP** Ponds with Water Surface Area of greater than the threshold below (ha)
Wallis Lake	NIL	N/A
Port Stephens	5,496	10
Hunter	10,431	100
Lake Macquarie Catchment	NIL	N/A
Lake Tuggerah Catchment	NIL	N/A
Brisbane Waters Catchment	NIL	N/A
Hawkesbury Catchment	NIL	N/A

Business Planning

Hunter and Central Coast Sustainable Aquaculture Strategy
Land Based Aquaculture

A NSW Government Initiative

Hunter and Central Coast Sustainable Aquaculture Strategy

A NSW Government initiative of Department of Primary Industries, Department of State and Regional Development, Department of Environment and Conservation, Department of Lands, Department of Infrastructure, Planning and Natural Resources and NSW Premiers Department to encourage sustainable aquaculture in New South Wales.

Business Planning

Table of Contents

1. Sound Business Planning is the *Key* to Success

Land based intensive aquaculture in its various forms requires a fair degree of technical skill as well as prudent business planning and management. It is often said *most people do not plan to fail, they simply fail to plan*. Sound planning is the key to the success of an aquaculture business. A business plan provides for a rigorous evaluation of the business idea and a blue print for the future operation and growth of an aquaculture business. A business plan may be the only tangible aspect of a business in its early stages of development.

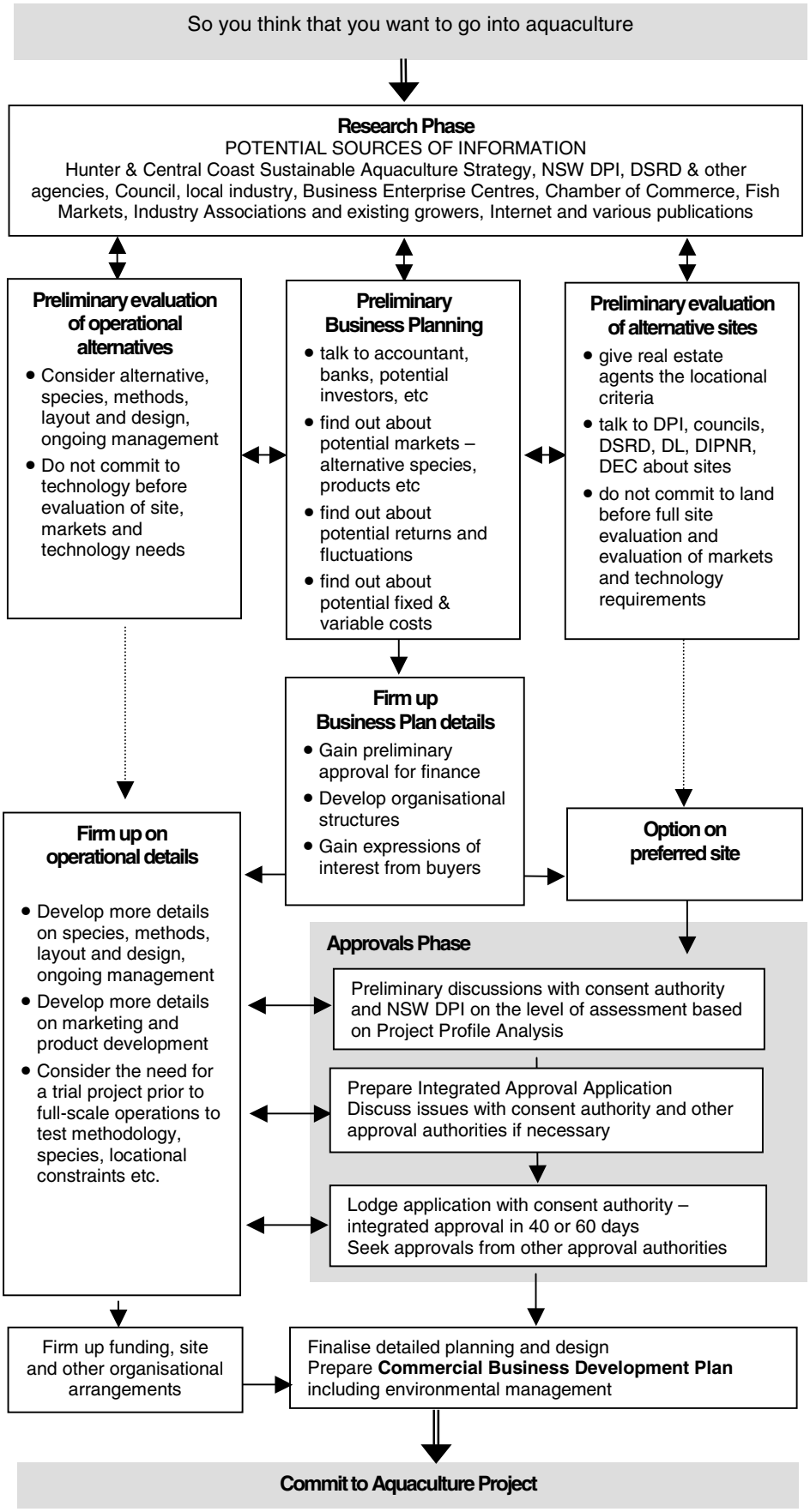
It is recommended that a business plan be prepared before making any financial commitments in terms of land, plant or equipment. The plan will identify the potential profitability of the enterprise. The business plan should establish the objectives for the business and provide performance targets that can be measured.

A written plan provides the means to think through all aspects of a new business and to examine the consequences of a range of alternative management, marketing, finance and human resource strategies. A business plan will help prevent mistakes being made which could be anticipated and solved on paper.

In addition to identifying the expectations of the business owners in terms of goals, the business plan provides the information needed by potential lenders or investors to evaluate the venture when seeking external financing or a business loan. This is most important as many investors or financial institutions are not familiar with aquaculture. The business plan needs to demonstrate the solid reasoning behind the venture and the justification for financial support. A thorough business plan automatically becomes part of a financial proposal that will meet the requirements of most lenders and investors.

An action plan for implementing the business plan should then be drawn up with detailed staging and schedules for tracking the steps to implement the plan. A number of useful project management software packages are available for undertaking this task. They provide an important and useful means of storing, documenting, reporting and monitoring the implementation of the project.

Figure 1. Business and Project Planning



2. Business Structure

Aquaculture is a business and like other businesses, potential investors should evaluate the pros and cons of various business structures and select a structure that offers them the most advantages.

Factors in the choice of business structure for an aquaculture enterprise include access to resources, management issues, long term plans, interrelationships, liability and taxation issues. While currently sole proprietorship is the most common organisational structure for aquaculture enterprises, there is likely to be an increase in other structures in the future.

Advice should be sought from a business planner, accountant or legal advisor regarding the business structure that best meets the needs of the aquaculture enterprise at its particular phase of development.

Common Business Structures

Sole Proprietor
The principal advantage of a sole proprietor structure is that it provides total management control and is probably the simplest in terms of start-up and record keeping. However resources are often limited and personal assets are often put at risk. Farm efficiency will vary with the abilities (and often health and well being) of the sole proprietor.

Partnerships
Partnerships involve more than one individual and while still having many of the characteristics of sole proprietorship, have the added advantage of additional resources in terms of assets and additional personnel. The structure of the partnership (limited or general) will affect factors such as liability, management responsibilities and ease of exiting the partnership. As a structure, it offers little advantage for estate planning or continuity of operation over the sole proprietorship.

Corporation
The primary advantage of a corporation is access to resources, limited liability of participants and continuity of operation. Depending on the structure of the corporation, there can also be tax advantages. However there is likely to be increased complexities in decisions making as control is shared between shareholders, the board and management (depending on the structure). There can be a significant increase in complexity in accounting and record keeping. Incorporation of a farm business can however help to provide for the transfer of shares to new owners and can simplify estate planning.

3. Outline of a Business Plan

The business plan should contain marketing, production and financial strategies for the establishment and operation of the business with a program to monitor the implementation of these strategies to achieve the business performance targets.

The business plan should outline what will be produced, where it will be sold and how profitable the activity is likely to be. This may include the production of existing product lines in existing markets or new product lines and new markets. The big questions to be addressed in business planning are:

Market feasibility:	What product is to be produced? Who will buy it and for how much?
Production feasibility:	How much will it cost to produce and sell?
Financial feasibility:	Will the profit exceed the costs?

There are a number of different formats for business plans depending on the type and source of funding sought. The following format includes the key issues that would normally need to be addressed.

OUTLINE OF A BUSINESS PLAN

Executive Summary

- Objectives of Business
- Current Analysis
- Profit Projections
- Capital Funding Requirements
- Key Factors

The Business

- Resume of Owner(s)/Proprietor
- Business Structure: Partnership, Company, etc.
- Main Activities/Unique Features
- The Business Objectives
- An outline of all aspects of the business
- Development schedule
- Strengths and Weaknesses - Past experience - Current Performance
- Opportunities and Constraints – markets, locations, relationships etc.
- People: Customers; Staff; Suppliers; Contractors/Services

Market Feasibility

1. *Industry Analysis*
   - Overview of the Industry
   - Industry Characteristics
   - Economic Trends
   - Consumer Trends
   - Social and/or Political Considerations
   - Price Sensitivity of Industry

2. *Product Range/Service*
   - Product Description
   - Strengths/Weaknesses
   - Opportunities/Threats
   - Future Development

3. *Marketing*
   - Marketing Strategy
   - Target Market/Customer Profile
   - Market Size/Market Share/Market Potential
   - Competition/Pricing Policy
   - Key Factors Influencing Market/Research and Analysis
   - Advertising and Promotion
   - Sales and Distribution

Production Feasibility

4. *Production/Harvesting/Processing*
   - Quality Control
   - Strengths/Limitations
   - Expansion/Capacity/Scheduling
   - Equipment Requirements
   - Material Requirements

5. *Management and Staffing Strategy*
   - Key Management
   - Staffing Requirements – full time/part time/peak activities
   - Training and Skills
   - Duties and Responsibilities

Financial Feasibility

6. *Financial Information*
   - Current Position
   - Income and Expenditure Projections/Profit Budget/Balance Sheet/Cash Flow Forecast/Break Even Analysis
   - Start-up Capital/Operational Capital Requirements
   - Sources of Finance
   - Timing and Stages of Finance
   - Fixed Asset Requirements
   - Tax issues

7. *Supporting Documents and Miscellaneous*
   - Business Advisers, Accountant, Solicitor, Banker
   - Legal Documents/Leases or Contracts
   - Letter(s) of Intent
   - Research Documents/Patents or Trademarks

4. Market Feasibility

A marketing strategy is often the hardest part of an aquaculture business plan but it will fundamentally influence its profitability. Issues that need to be addressed in a market feasibility analysis include:

- Should the farm concentrate on a single species and a single product or a number of species and a number of products?
- Should the farm concentrate on high value/low volume products or high volume/low value throughput?
- Should the products be sold directly to the customers or through retailers, wholesalers or the Fish Markets? What is the implication for market size and return per unit?
- How should the farm interact with other aquaculture businesses with regard to marketing? Should the farm try to differentiate its products from others in the market place and how?
- How should the farm interact with the tourism/recreational market?

The market analysis should demonstrate that there are enough customers for the proposed product and that there is potential for growth or diversification in the market. This analysis should influence the choice of species to be grown and may influence the site selection (See *Species and Site Selection section).*

4.1 Potential customers

Potential customers need to be identified within the "market" area. These include wholesalers, restaurants, seafood stores, supermarkets, institutional buyers, and individuals. In addition to markets for food consumption, supplementary market niches for fishing bait or pet food particularly in relation to waste minimisation could also be considered. The short term and also longer term potential customers should be identified. Regional Development Boards, Department of State and Regional Development, Chambers of Commerce or the Yellow Pages are some of the potential sources of information of business and consumer data that can help to identify the numbers and location of potential customers. In addition the Sydney Fish Market is a key source of important information on market trends and opportunities and updated sales figures can be accessed on the Internet daily.

The market for crustacean, fin fish and shellfish can be particularly variable (*See Species section*). Each market segment can have its own pattern that can affect quantities and types of product purchased, price and demand for "value-added" products. It is critical that potential customers are consulted about their likely needs and how these could change during the year or in response to other factors. For example, the sizes of the product required, whether they want them live, fresh or frozen or whether they want them whole or headed and gutted. In addition the likely demand for value-added products such as smoked, special fillets or other processing should be identified. Consideration should be given to whether certain species are in short supply at certain times of the year. Can these species be grown and harvested to meet these periods of short supply? Can the harvest cycle be managed so that it does not coincide with periods of oversupply or when there are plentiful substitutes? The likely price differentials and sensitivities should be identified.

4.2 Positioning the product

It is important to identify where the competition is likely to come from in terms of other aquaculture producers, products caught in the wild, imports and substitute products. Many fish products command high prices as luxury food items that are characteristically in short supply. Since demand is limited, increased production could result in reduced product returns unless new "luxury" markets are identified. Other fish products command lower prices and compete with substitutes such as chicken, beef and pork as well as cheap overseas imports. As the quantity of fish consumed per person remains relatively low, growth in this "bulk" market is likely to be very competitive.

In some cases, the product can be "positioned" to maximise returns by creating or taking over a high return boutique market. Market advantages should be recognised and used. For example, for some products there is a perception that farm-raised fish or prawns are fresher, healthier and of higher quality than wild-caught species. The positioning of the product may require innovative packaging, pricing or promotion to achieve and maintain that position. In some cases, this can be achieved by individual producers, by a group of producers in a region (e.g. Hunter Valley) or by an industry sector as a whole (e.g. the NSW Silver Perch Growers Association Inc.). Emphasis on careful handling, cleaning, processing, packaging, transport and reliable quality service is important to develop, maintain or expand the market.

4.3 Promotion

Promotion of products creates customers. One of the best forms of promotion is the product itself, where the reputation of a high quality product within the market place serves as the promotion of the product. In addition however, time and resources should be set aside to promote the product. This promotion may dovetail with the promotion of the Hunter Valley Region or the industry as a whole (e.g. silver perch industry). However, for small scale operations, personal promotion with regular contact with the customers is probably more effective, particularly as it provides opportunity for feedback from the customers. In addition, some on-site promotion can help to emphasize the non-price attributes of the product and provide customers with a better understanding of aquaculture. Either approach could be reinforced by promotional tools such as recipes or other forms of industry wide promotion such as flyers and posters.

4.4 Distribution

Another very practical issue in determining the size and type of market is the issue of market access and how the products reach the customers. It is important to determine what delivery options are currently available (using agents, distribution companies or own staff). Determine the area which can/could be reached using these options or combinations of these options. With a small operation, allocating staff for sales and deliveries will impact upon other production activities. Direct deliveries to speciality markets often have the greatest potential for the highest return per kilogram but the full costs in terms of staff time and transport costs should be considered. A budget should be developed, keeping in mind that it is usually more expensive to establish a new market than to service an existing market.

4.5 Factoring in tourism

Another issue is the potential for additional returns from the interaction with the tourist industry. In addition to the potential for sale of product at the door, there is the potential to charge access to tour groups. However it is important that the full costs of additional facilities (e.g. customer amenities, sales display area and equipment, additional staff costs) and the costs associated with disruption to the daily operations of the farm are fully considered. The other potential fringe activity for fin fish farms is the stocking of fishout ponds for recreational fishing activities (*see Planning and Design section*).

5. Production Feasibility

Having determined that there is a market for the potential product, it must then be determined that production is feasible and that the product can be produced reliably, efficiently and economically.

A production feasibility analysis needs to consider the fixed and variable costs associated with factors such as the site, species to be produced, production methods, infrastructure requirements, human resources and quality controls. Feed and costs associated with feeding are often the most important variable cost and the profitability of the enterprise will depend on the feed costs and feeding efficiency. In the production feasibility analysis, consideration should be given to changing feed costs to test the sensitivity of the production viability with these changing costs. (See *Planning and Design* and *Operating the Farm* sections)

Start up costs will depend on the extent to which land, plant and equipment are available or have to be purchased for the aquaculture enterprise. As the land costs are a significant start up cost, site selection is a key business planning issue. The availability of a large enough block of land which meets the “preferred” selection criteria will vary within the region, as will the cost. In addition, a range of variables in terms of temperature, rainfall, access and cost of water, distance to markets and sources of fry will also affect start up and operational costs. These factors should be considered in the selection of sites (see *Site Selection* section). Choice in terms of capital investment will also affect variable and fixed costs – say in relation to plant and equipment and construction of dams, ponds, sheds and other facilities.

The production feasibility should also consider the management of the enterprise and the ability of management to make decisions and take actions for the reliable production of product. Issues include the availability of suitably experienced and skilled staff or advisers and/or access to appropriate training and instruction so that the enterprise can be run smoothly.

6. Financial Feasibility

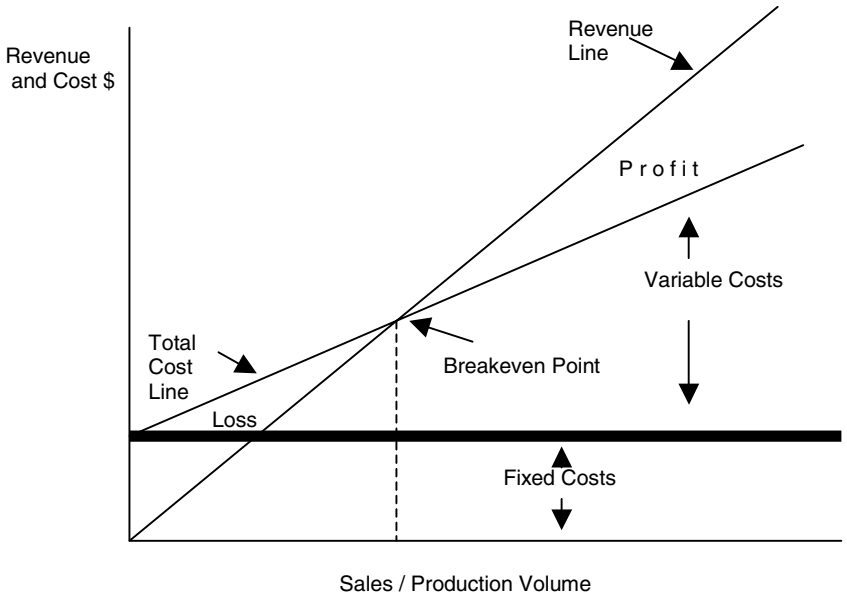
A cash flow projection is one of the most important of the financial documents included in a business plan. It forecasts cash inflows and outflows and ensures that money is available when needed. The cash flow statement should show how much money is required, when it is required, and when it will be available. This is particularly critical for those enterprises where there will be a single harvest per year while the expenses will be spread out over the year.

The cash flow statement will help predict if there is likely to be a cash deficit. It should also include timing of capital investments and managing of borrowings, particularly if future expansion of the operation is proposed in the business plan. A cash flow projection plan should include monthly budgets for at least the first 18 months, but preferably for 3 years or until the operation is likely to be 'in the black'. In many operations, expenditure occurs in spurts, with a high level of costs at stocking and harvest times and a lull in between.

The business plan should distinguish between fixed and variable costs.

- Fixed costs are associated with those costs that do not change as production volume changes such as full time employee salaries, overheads, insurance and depreciation (on ponds/tanks, plant and equipment).
- Variable costs change with production levels and include costs of juveniles, feed, chemicals, water, electricity and casual labour.

Figure 2. Considering fixed and variable costs



On the revenue side, there can be difficulties in predicting variability in prices and quantities likely to be harvested. In developing the plan, the assumptions used to arrive at the predictions should be included. Advice should be sought from Department of Primary Industries if necessary. The sensitivity and risk analysis should consider variations in sale price for various products in various markets as well as variations in costs including feed, water and transport. The risk analysis should also consider the short

and longer term viability of the enterprise if various scenarios should occur such as disease outbreaks, constraints on water supply because of droughts, extreme flood events, variable interest rates or domestic or overseas market constraints.
One of the most common reasons for business failure is the failure to recognise and plan for expenses such as professional fees and taxes. It is recommended that advice be sought from the accountant/business adviser on estimates to cover legal, accounting, insurance and taxes that may be incurred by the business.

Economic model: Yabby Farms

An economic model developed by the Department of Primary Industries and Resources South Australia indicates that the cost of establishing a yabby farm with 3.3ha of ponds (semi-intensive farming) is $34,312. This does not take into account the cost of land and assumes that much of the machinery and excavation equipment is already owned by the farmer, but does take into account the construction of 3.3ha of drainable ponds. The model also takes into account the opportunity cost of using the land for yabby farming based on a value of $500/ha, at 6ha of land used for the farm.

At a stocking density of 4 yabbies per m^2, a yield of 650kg/ha can be achieved, with a grow-out time of 3-11 months (>50g animals). Cost of production per kg of yabbies in this model is $8.19/kg, split as follows:

Feed	9.8%
Labour	58.6%
Fertilisers	0.7%
Power	12.2%
Repairs and Maintenance	3.7%
Administration	5.7%
Capital	9.3%

Based on a sale price of $9/kg with an annual production of 2,145kg, this gives the farm a gross income of $19,303 p/a. This returns the farm only a modest profit of $1,741 per annum, although included in the production costs are wages paid to the owner/operator at a rate of $20/hr for 8 hours per week. This means that the owner is receiving an annual income from the farm of $10,080. The payback period for the farm is 12 years, and based on the above figures gives an internal rate of return of 7% per annum. This would increase substantially with an increase in market price.

The farm used in this example is based on an actual farm operating in South Australia, and is a diversification of existing primary production on the property. Other economic analysis have indicated that an intensive farm with a minimum size of 4ha of pond would be required. It is difficult to nominate an optimum sized farm however, and current trends in NSW for the production of yabbies are based on small scale extensive farming in farm dams and constructed ponds, with often much lower production rates than above (<300kg/ha).

It is believed the future of yabby production in Australia is in intensive production, with research currently underway into hybridisation and mono-sexing. Market analysis for yabbies in Australia have indicated that supply is currently much lower than demand. As a consequence prices have remained strong with the 2000/2001 NSW production period estimating the average price of farmed yabbies at $13.14/kg. Some farms are receiving up to $20/kg for larger animals >120g.

7. Planning for Continued Success

Business planning doesn't stop once the business has been established. The Business Plan needs to be checked from time to time to ensure the marketing, production and financial strategies remain internally consistent and supportive of each other. The implementation of the plan should be monitored using production, sales, cost and other information to keep track of how the business is progressing and whether the goals are being met.

7.1 Potential threats to long term success

A number of studies have been undertaken in the USA to identify why some aquaculture enterprises succeed and others do not. While the situation in the USA is not the same as NSW, the results of the studies are of interest.

The most important factors identified for continued successful operation of aquaculture farms include the recognition that:

(a) aquaculture requires continued and constant commitment;
(b) fish are living animals that need to be "nurtured" like other animals;
(c) good reliable workers and managers with business skills are critical;
(d) it is better to start small while learning or when changing species/technology/equipment (e.g. pilot stage to test new approaches);
(e) it is better to grow a high value product than to deal in the high volume market;
(f) reliable good quality service is key;
(g) marketing is where the money is made; and
(h) it is critical to always manage the enterprise recognising that aquaculture can be a risky business.

The key causes of failures include:

1. For family operations, the death of the key person (who understood how to operate the farm) or marital/divorce problems or attempting to support too many family members, especially during start up times;
2. Natural disasters such as flood, hurricane, extreme heat or cold;
3. Speculation without proper research to identify realistic returns and /or tax minimisation driven investment decisions;
4. Over-dependence on collateral (especially when interest fluctuates) or inappropriate loan structure;
5. Poor production management;
6. Poor management of the marketing/lack of flexible marketing program to deal with changing markets;
7. Poor monitoring or record keeping of the production, financial and/or marketing aspects;
8. Appropriate/adequate information not used for decision making;
9. Poor money and time management with extensive effort spent on non-productive and non-profitable activities at the expense of profitable, productive activities. (80 – 20 rule); and
10. Poor "business" skills (Note: the failure rate for aquaculture farms is similar to non-farm businesses where 60% fail in the first 5 years).

7.2 Insurance

An essential consideration in any business venture (including aquaculture) is that of insurance. Some insurance policies are compulsory by law while others are essential to mitigate potential risks to the business. Aside from those required by law a good starting point would be to assess the extent to which the business is at risk from potential hazards.

Examples of insurances that aquaculture business operators should consider include:

- Workers Compensation;
- Sickness and Accident;
- Key Person;
- Product Liability;
- Public Liability;
- Loss of Profits;
- Fire;
- Burglary; and
- Machinery Breakdown.

You should discuss your insurance requirements with an insurance broker, insurance company, accountant or legal advisor prior to commencing business. Insurance cover should be reviewed on a regular basis. Under insurance as well as lack of insurance could endanger your business.

7.3 Ongoing business planning

The business plan should be a living document, which is revisited and updated especially when major events or changes occur. It is good practice to formally review the plan on a regular cycle. Issues that need consideration in the review include the following:

Review past performance

The production yields and cost, quality and any other defined performance variables should be reviewed. The same applies to marketing and financial performance measures. It is then possible to compare actual with planned performance and make any necessary adjustments to the strategies.

Analyse strengths and weaknesses

In reviewing the past performance, it is wise not only to monitor the performance of the farm, but also be aware of what other growers are doing and how they are performing. Comparing the performance of the enterprise with others (quantity as well as quality and costs of production) will give some indication as to how the farm is performing relatively – a benchmarking approach. Department of Primary Industries information may be valuable in this exercise.

Look for opportunities and threats

It is important to be aware of changes in markets and the potential for competition from within the region as well as interstate and overseas. Other changes in value adding, harvest size, transport, technology, species, species management, interest rates, etc. may offer opportunities as well as threats.

Adjust the plan as necessary

There is nothing wrong with making changes to a business plan as threats appear and opportunities evolve. Business planning is an attempt to be systematic about guiding the direction of the business. It also provides the basis upon which to recognise and make the most of opportunities that may not have been envisaged in the original business plan.

8. Information Sources

There are many publications available to assist with preparing a business plan. Assistance can be accessed from Department of Primary Industries, Department of State and Regional Development, Economic Development groups, industry associations, chambers of commerce, Business Enterprise Centres, business advisers or accountants. In addition the Internet is a useful source of overseas and interstate information on aquaculture management and business planning in general.

Department of Primary Industries

The Fisheries Management branch at the Port Stephens and Grafton Department of Primary Industries Research Stations are key sources of the latest information on aquaculture species and management techniques – critical input in the business plan. In addition, useful information regarding the latest research and publications which may be found on the DPI website http://www.dpi.nsw.gov.au/.

Fisheries Management Branch Agriculture & Fisheries Division Department of Primary Industries Port Stephens Fisheries Research Centre Private Bag 1, Nelson Bay 2315 Ph: 02 4982 1232	Fisheries Management Branch Agriculture & Fisheries Division Department of Primary Industries Grafton Fisheries Research Centre PMB 3 Grafton 2460 Ph: 02 6644 7633

NSW Food Authority

NSW Food Authority is the first point of contact for information and advice on required food safety programs. Information on the latest developments can be sourced from www.foodauthority.nsw.gov.au .

NSW Department of State and Regional Development (DSRD)

DSRD is the first point of contact within Government for companies wishing to establish or expand their operations in New South Wales.

With its head office in Sydney, eighteen offices in the State's major regional centres, including the Hunter and Central Coast regions and an international network including offices in London and Tokyo, DSRD is committed to working with potential aquaculture investors by

- assisting with site location, project feasibility and other investigations;
- coordinating the necessary regulatory and approvals processes;
- facilitating discussions with suppliers of key services such as electricity, water and transport;
- providing introductions to business and financial partners;
- helping companies to develop new domestic and export markets;
- providing advice and assistance in such areas as business planning, marketing, exporting and quality assurance; and

- providing tailored financial assistance packages for particular investment projects.

Contact: **Hunter Regional Office**
NSW Department of State and Regional Development
Level 3, 251 Wharf Road
NEWCASTLE NSW 2300

Ph: 4908 7333
Fax: 4929 7096

Central Coast Office
PO Box 7096
KARIONG NSW 2250

Ph: 4340 8700
Fax: 4340 1005
http://www.business.nsw.gov.au/
http://www.smallbiz.nsw.gov.au/

Sydney Fish Market

The Sydney Fish Market holds the largest seafood auction in Australia every weekday morning from 5.30am selling 1000 crates every hour and 65 tonnes of fresh catch daily. The Market sells on behalf of fishermen, aquaculture growers and seafood suppliers. While the majority of produce is sold through the Dutch Clock Auction, a traditional voice auction is used for live crustaceans. The Sydney Fish Market provides details of the daily market price on its web site http://www.sydneyfishmarket.com.au/. The Sydney Fish Market is developing an Internet sales facility, specifically to meet the needs of aquaculture farmers who are interested in trialling the concept. The Fish Market considers that advantages for the aquaculturist would include listing products on the Sydney Fish Market's Internet sales web site and using the Sydney Fish Market as a Sydney delivery depot with payment guaranteed by Sydney Fish Market on the Friday following the week of sale.

Seafood Services Australia

A recent joint national industry/government initiative has been the formation of Seafood Services Australia. This organisation combines all the services previously provided by the Australian Seafood Extension & Advisory Service (AUSEAS), the National Seafood Centre (NSC) and Seaqual Australia under the one ‘umbrella’ name and in one location. As a result, Seafood Services Australia now provides three core services to the Australian seafood industry:

- Information and advice on technical issues;
- Guidance on food safety, quality management and standards;
- Assistance with adding value to your business through developing new products and processes.

One of the aims of Seafood Services Australia is to support commercially focussed, value-adding projects that can stimulate industry development and subsequent production activities. The priority is to add value to fish and fish products through:

- Planning, funding and managing short-term market-focussed applied research and development with the potential for high return; and
- Keeping the Australian seafood industry aware of opportunities and technical developments through promotion of research and development results and fostering collaboration between industry and R&D agencies.

The Australian Seafood Industry Quality Assurance (QA) Project has produced easy-to-follow best practice manuals for five seafood sectors: farmed prawns, wild-caught prawns, mullet, spanner crabs and reef fish. The ISO Best Practice Manuals, developed under the Australian Seafood Industry Quality Assurance Project can assist in achieving the internationally recognised ISO Quality Standards. The manuals are designed to assist in implementing a Hazard Analysis Critical Control Point (HACCP) based quality assurance system for business, a necessary prerequisite to having the QA system certified to an international standard such as ISO9002.

For further information contact:	Seafood Services Australia, PO Box 2188, Ascot, Qld 4007 Phone: 1300 130 321 Fax: 07 3633 6776 Email:- ssa@seafoodservices.com.au Web Site: http://www.seafoodservices.com.au/

Aquafin CRC

The Aquafin CRC is a collaborative venture bringing together researchers from universities, CSIRO, state governments and industry to undertake research into the development and management of aquaculture. The Aquafin CRC has been focusing on issues such as genetics, breeding, rearing, feeding, disease, product quality and water quality issues and has developed a computer program *Pondman 2* which can be used to manage individual prawn ponds as well as the whole prawn farm including stocking, feeding and harvest scheduling.

For further information contact:	Aquafin CRC Director, Phone: 02 9514 1385 CSIRO Marine Science 233 Middle St, Cleveland, Qld 4163 Phone: 07 3826 7200.

Your local council

Contact the Economic Development Manager with your local council for advice on site selection and planning issues.

Your local tourist authority

Your local tourist authority may be able to provide advice on the tourism potential of a site, particularly if establishing a fishout or public sale outlet and how it may be linked with other regional tourism facilities.

Your local Business Enterprise Centre (BECs)

BECs are able to assist with business start up and business planning issues.

Hunter Business Enterprise Centre
265 King Street
NEWCASTLE NSW 2300
Ph: 4925 2566
http://www.businesscentre.com.au/

Lower Hunter Business Enterprise Centre
Cnr Barton and Methyr Street
KURRI KURRI NSW 2327
Ph: 4936 2557

Business Central Coast
PO Box 240
OURIMBAH NSW 2258
Ph: 4349 4949

Queensland Department of Primary Industries

An Aquaculture Market Monitor is located on the Department of Primary Industries (DPI) web site http://www.dpi.qld.gov.au/and includes market prices, conditions and commentary of aquaculture products in Sydney and at the Sydney Fish market auction. The DPI has also developed two economic models for the guidance of barramundi or redclaw farmers. Titled "*Barraprofit*" and "*Redclawprofit",* the CD-ROMs are available from DPI. 'Barraprofit' is an interactive CD Rom package for potential investors and existing producers in barramundi farming. 'Barraprofit' aims to provide an economic based decision tool package to help potential investors in barramundi aquaculture understand the economic requirements, such as capital investment and operating costs, and the risks involved in farming barramundi, such as the impacts of disease, water quality, feed conversion and markets. It will aid existing farmers to develop their own farm model and apply it to the farm's operation. Farmers can observe the impact on profitability of price changes for inputs such as feed, fingerlings, electricity, packaging and transport. It can also be used to evaluate improvements in genetics and other methods of stock improvement, evaluate future development of farms, such as the addition of ponds, or change in production style. The whole farm model incorporates information on services offered by the Australian Barramundi Farmers Association (ABFA) and supports the growth of the industry in Australia.

Fisheries Victoria

Generic software packages such as *AQUAFarmer* produced by Fisheries Victoria provides a useful framework for financial feasibility assessment. Of particular use in financial assessment is a robust methodology for determining capital and operating costs (including relevant depreciation) and sensitivity analysis associated with variable growth rates and economies of scale. The Fisheries Victoria have other useful information at http://www.dpi.vic.gov.au/

National Fishing Industry Education Centre

The National Fishing Industry Education Centre (NFIEC) located in Grafton provides a number of tools which may be of assistance in establishing aquaculture enterprises. The NFIEC is an alliance between TAFE NSW and the Australian Fishing Industry. The Australian Fishing Industry has recognised the need for more systematic training for its workforce including those involved in the growing, processing and marketing of aquatic plants and animals. The NFIEC is committed to providing relevant, credible and accessible vocational education and training by face to face and flexible delivery, focusing of learners' needs. The Centre's courses include modules on farm design and construction, feeding, stocking and sampling, health management and water quality management.

National Fishing Industry Education Centre
Locked Bag 5
Grafton, NSW 2460
Phone: 02 6641 4400 Fax: 02 6644 7767
Web site: http://www.natfish.tafensw.edu.au/
Email:- natfish@tafensw.edu.au

Hunter Institute of Technology

The Hunter Institute of Technology provides courses in aquaculture and seafood industry.

Kurri Kurri TAFE
PO Box 135 KURRI KURRI NSW 2327
Phone: 02 4936 0300 Fax: 02 4936 0360.

Central Coast TAFE
PO Box 127 OURIMBAH NSW 2327
Phone: 02 4349 4529 Fax: 02 4349 4785.

HGT Australia NSW Centre for Seafood, Fisheries & Maritime Studies

Level I 148 Lampton Road Broadmeadow NSW 2292
Phone: 02 4903 3444 Fax: 02 4952 8070.

Professional and trade sources

Equipment suppliers can also be a useful source of information on the latest in technology. Professional associations will also have helpful general information on the planning and operating a successful aquaculture enterprise.

NSW AQUACULTURE ASSOCIATIONS

Industry associations can be a very useful source information on the aquaculture industry in Australia. By becoming an active member of these associations, growers benefit from the shared experience of other members and information disseminated by them.

Table 5. NSW Aquaculture Associations

Association	Contact Details	Function / Mission Statement
Australian Prawn Farmers Association PO Box 3128 SOUTH BRISBANE Qld 4101	Nick Moore, President Martin Breen, Exec Officer Phone: (07) 3255 1070 Fax: (07) 3844 7307 Mobile: 0417 006 639 info@apfa.com.au *www.apfa.com.au*	To represent the interests of the Australian prawn farming industry.
NSW Aquaculture Association Inc PO Box 3 KARUAH NSW 2324	Brian Leader, President Steve Barker, Vice President Rob McCormack, Secretary Phone: (02) 4997 3002 Fax: (02) 9688 4645 *nswaqua@hotkey.net.au*	To promote, develop and improve freshwater aquaculture in NSW and Australia.
Gilgandra Aquaculture Association Inc "Havilah" GILGANDRA NSW 2827	Ken Bardon, President Phone: (02) 6848 3526 Fax: (02) 6848 3555	To develop aquaculture in the Gilgandra and surrounding regions.
Jervis Bay Mariculture Association Inc 83 Attunga Ave KIAMA HEIGHTS NSW 2533	Barrie Bamford, Secretary Phone/ Fax: (02) 4233 1988	Lobby for the development and establishment of shellfish farming in Jervis Bay, NSW.

Association	Contact Details	Function / Mission Statement
NSW Cultured Mussel Growers Association PO Box 365 PAMBULA NSW 2549	Erick Hyland, President Phone/Fax: (02) 6496 3485 Mr Chris Boyton, Secretary Ph: (02) 6495 6998 or 0429 956 988 email: boyton@netspeed.com.au	To promote sustainable mussel farming, and lobby government for a viable mussel industry in NSW.
NSW Farmers Association (Oyster Section) GPO Box 1068 SYDNEY NSW 1041	Mark Bully, President Rachel King, Exec Officer Phone: (02) 8251 1856 Fax: (02) 8251 1752 kingr@nswfarmers.org.au	To represent the NSW oyster farming industry.
Oyster Farmers Association of NSW Ltd PO Box 254 TURRAMURRA NSW 2074	Roger Clarke, President Andrew Phillips, Deputy President. Lesley Spencer, Manager Phone: (02) 9487 3566 Fax: (02) 9487 1849 *oyster@oysterfarmers.asn.au* *http://www.oysterfarmers.asn.au*	To represent the interests of the NSW oyster farmers.
NSW Silver Perch Growers Association Inc	Ian Charles - President Noel Penfold, Secretary Phone: (02) 69229447 Fax: (02) 69229448 mdfish@ozemail.com.au	Network with government and industry bodies on behalf of members to gain information, technical expertise, training, funding and infrastructure; provide an initial point of contact for intending growers; increase public awareness of silver perch.
Native Fish Growers Co-op Ltd PO Box 244 GLOUCESTER NSW 2422	Lindsay Fraser - President Marcia Thompson - Secretary Phone/Fax: (02) 6558 8321 marsia@bigpond.com	To facilitate the collection of information; to share ideas and labour for on-farm operations; and coordinate the development of a viable, sustainable industry in the local area.
Central Coast Aquaculture Foundation Building 50 Mt Penang Gardens KARIONG NSW 2250	Soo Man Heng – Chairman Tim Shaw – Vice-Chairman tsem@ozemail.com.au	Community group dedicated to the development of the aquaculture industry on the Central NSW Coast in an ecologically responsible manner.
Pet Industry Association of Australia PO Box 7108 BAULKHAM HILLS Business Centre NSW 2153	Peter Nobbs Phone: (02) 96595811 Fax: (02) 96595822 info@piaa.net.au	To create an environment that grows the commercial pet industry by fostering responsible supply, care, sale and ownership of companion animals (representativeness includes the aquarium sector of the aquaculture industry). Specifically, to achieve a strong positive public perception; speak influentially and credibly for the industry; promote high standards within the industry; build and maintain a strong financial base; protect industry; communicate effectively.

Reference Sources

Hyde K (1997) The New Rural Industries, A handbook for Farmers and Investors, Rural Industries Research & Development Corporation, Canberra, Australia

NOFARIC 1995 Marketing Silver Perch (Bidyanus bidyanus). Prepared by Ruello & Associates, NOFARIC, Sydney, Australia.

NOFARIC 1995 A Model of a Feasibility Study and Business Plan for Aquaculture. Prepared by the Pacific Seafood Management Consulting Group Pty. Ltd., NOFARIC, Sydney, Australia.

NOFARIC 1995 Potential for Commercial Marine Fish Farming for NSW. Prepared by the Pacific Seafood Management Consulting Group Pty. Ltd. NOFARIC, Sydney, Australia.

NSW Fisheries 1999 Silver Perch Market Assessment. Prepared by Ruello & Associates. Sydney, Australia.

DSRD Small Business Website (www.smallbiz.nsw.gov.au)

- Guide to Business Planning
- Guide to Business Review
- Export Market Planning
- Winning Exports Workbook

Species Selection

Hunter and Central Coast Sustainable
Aquaculture Strategy
Land Based Aquaculture

A NSW Government Initiative

Hunter and Central Coast Sustainable Aquaculture Strategy

A NSW Government initiative of Department of Primary Industries, Department of State and Regional Development, Department of Environment and Conservation, Department of Lands, Department of Infrastructure, Planning and Natural Resources and NSW Premiers Department to encourage sustainable aquaculture in New South Wales.

Species Selection

Table of Contents

1. Selecting the Species

The species selected for cultivation will affect the selection of a site and the design of the facility as well as the viability of the aquaculture business *(see also Site Selection and Planning & Design sections)*. More than one species may be cultivated at a facility. In designing the facility, a certain amount of flexibility should be built into the design and layout so that the species can be switched later to meet opportunities created by changing markets.

In selecting species, the Translocation Policy to protect NSW's native fish populations must be considered. The selection of the species will also affect the level of assessment and type of approvals required.

Factors in the selection of species include:

- translocation policy;
- genetic factors, availability of seed stock (reliability, quality, quantity, season) and documented performance of the species in the aquaculture system proposed;
- market factors and potential profitability;
- site specific attributes (eg market distance, scale required, flood liability, temperature and water requirements (quality/quantity);
- feed and other management factors issues;
- disease factors.

In some situations, "polyculture" (i.e. more than one species within the one pond or in ponds in sequence) could provide opportunities for maximising returns and minimising environmental risk. In many circumstances, these types of multi-tiered systems can lead to more economical use of water, feed and energy, for example mullet grown in the prawn recirculation ponds.

2. Translocation Issues

One of the potential risks of aquaculture is the inadvertent introduction of species into waterways beyond their natural range or to areas within their natural range that have genetic stocks or populations that are distinct from the aquaculture stock. This is called translocation. Translocation of non-indigenous species can be sanctioned in some catchments, for example as a result of trout stocking for recreational fishing. In other circumstances, it may occur accidentally or deliberately but illegally.

Translocation of aquatic organisms has a number of inherent risks for the receiving aquatic habitats as well as for endemic organisms including:

- Predation;
- Introduction of disease or parasites;
- Competition, directly or indirectly for food and space;
- Adverse impacts on habitat and the native aquatic ecology; and
- Hybridisation with native fish that can affect genetic integrity.

The National Translocation Policy Guidelines has been developed to meet the needs of Australia's aquaculture and aquarium industries for the translocation of species within jurisdictions and across jurisdictional boundaries. These guidelines set out a risk assessment process for considering translocation issues. All proposals must be assessed according to the Translocation Policy.

Department of Primary Industries is currently refining the NSW Translocation Policy in the context of the National Translocation Policy Guidelines. However, for the purposes of this AIDP the principles in Table 6 and 7 also apply.

A number of the freshwater species considered in the AIDP are not indigenous to the region or the state and have therefore been assessed as a high risk species for the Hunter and Central Coast Region of NSW. High security species will have stricter requirements in terms of site selection, design and operational parameters. (*See Site Selection, Planning and Design and Operating the Farm sections).*

Table 6. Key Translocation Principles in the Coastal Region

1. Non-endemic species to NSW are not permitted to be translocated into estuarine pond systems.
2. Non-endemic species to NSW must meet prescribed health testing protocols for stock to be translocated from interstate.
3. Non-endemic species to NSW with high security status such as barramundi are permitted only in tank systems. Imported stocks must be disease free and discharge water treatment and disposal must meet the relevant AIDP performance criteria.
4. Non-endemic species to the Region with a high security status such as Murray Cod, Trout Cod, Barcoo Grunter and Sleepy Cod are only permitted if site selection, design and operational components meet the relevant AIDP performance criteria. Murray Cod and Trout Cod are not permitted in the Clarence and Richmond Catchments but may be cultured in other catchments.
5. Other species non-endemic to the Region such as Silver, Golden and Macquarie Perch are permitted in freshwater pond systems that meet the relevant AIDP performance criteria.
6. The threatened species Eastern Freshwater Cod may be permitted for culture in the Clarence and Richmond Catchments if sourced from accredited hatcheries that comply with Threatened Species Protocols.
7. Threatened species may be permitted for culture in their natural Catchments provided they are sourced from accredited hatcheries that comply with Threatened Species Protocols.

The generic risks associated with the culture of a particular species have been assessed and listed in Table 7 (*Species Table*).

The categorisation of each species was determined according to an assessment of the risks associated with translocation of disease and pathogens, and the risks associated with the survival and establishment of the species should it escape an aquaculture facility. The species are categorised into either a High or Low category as shown in Column 2 and Column 3 of Table 7. These categorisations are applied to set standards for facility design in the Project Profile Analysis under the heading Stock Security.

The Species Table also applies risk management measures that are specific to each species. Culture methods and locations that are considered too risky are prohibited in the Species Table.

Table 7. Species Table

Species	Disease/ Pathogen Security Status	Likely chance of Survival & risk of Establishing feral or invasive populations following escapement	Permissible culture methods[1]				Specific Operational and Locational Constraints
			Tanks and Raceways	Ponds Below PMF in the eastern drainage or below 1:100 year flood level in western drainage.	Ponds Above PMF in the eastern drainage or above 1:100 year flood level in western drainage.	Flow Through	
Any hybrid fish OR Any species not otherwise listed in this table	Assessment must be done on a case by case basis according to the National Policy on the Translocation of Live Aquatic Organisms						
Freshwater aquarium species							
Exotic freshwater aquarium species listed on Schedule 6 of the EPBC Act.	High	High	Yes	No	Yes	No	
Flat - headed gudgeon (Philypnodon grandiceps)	Natives:Low within endemic area - high outside	Natives:Low within endemic area - high outside/ domesticated natives: High	Yes	Yes	Yes	No	
Climbing galaxias (Galaxias brevipinnis)	As above	As above	Yes	Yes	Yes	No	
Common jollytail (Galaxias maculatus)	As above	As above	Yes	Yes	Yes	No	
Dwarf galaxies (Gallaxiella pusilla)	As above	As above	Yes	Yes	Yes	No	
Empire gudgeon (Hypseleotris compressa)	As above	As above	Yes	Yes	Yes	No	
Firetail gudgeon (Hypseleotris galii)	As above	As above	Yes	Yes	Yes	No	
Goldfish (Carassius auratus)	High	High	Yes	No	Yes	No	Prohibited in Catchments free of Carp
Koi carp (Cyprinus carpio)	High	High	Yes	No	Yes	No	Prohibited in Catchments free of Carp
Cox's gudgeon (Gobiomorphus coxii)	Natives:Low within endemic area - high outside	Natives:Low within endemic area - high outside/ domesticated natives: High	Yes	Yes	Yes	No	
Purple spotted gudgeon (Mogurnda adspersa)	As above	As above	Yes	Yes	Yes	No	
Murray cray (Euastacus armatus)	As above	As above	Yes	Yes	Yes	No	
Pacific blue eye (Pseudomugil signifer)	As above	As above	Yes	Yes	Yes	No	
Rainbow fish (Melanotaenia sp.)	As above	As above	Yes	Yes	Yes	No	
Striped gudgeon (Gobiomorphus australis)	As above	As above	Yes	Yes	Yes	No	
Sydney crayfish (Euastacus spinifer)	As above	As above	Yes	Yes	Yes	No	
Western carp gudgeon (Hypseleotris klunzingeri)	As above	As above	Yes	Yes	Yes	No	
Bullrout (Notesthes robusta)	As above	As above	Yes	Yes	Yes	No	
Freshwater mussels	As above	As above	Yes	Yes	Yes	No	
River blackfish (Gadopsis marmoratus)	As above	As above	Yes	Yes	Yes	No	
Marine aquarium species							
Barramundi cod (Cromileptes altivelis)	Low in east high in West	Low	Yes	No	No	No	

[1] For any **culture methods** not otherwise listed in this table an Assessment must be done on a case by case basis according to the National Policy on the Translocation of Live Aquatic Organisms.

Species	Disease/ Pathogen Security Status	Likely chance of Survival & risk of Establishing feral or invasive populations following escapement	Permissible culture methods[1]				Specific Operational and Locational Constraints
			Tanks and Raceways	Ponds Below PMF in the eastern drainage or below 1:100 year flood level in western drainage.	Ponds Above PMF in the eastern drainage or above 1:100 year flood level in western drainage.	Flow Through	
Seahorse (Hippocampus kuda)	As above	As above	Yes	No	No	No	
Seahorse (Hippocampus procerus)	As above	As above	Yes	No	No	No	
Seahorse (Hippocampus trimaculatus)	As above	As above	Yes	No	No	No	
Seahorse (Hippocampus tristis)	As above	As above	Yes	No	No	No	
Seahorse (Hippocampus whitei)	As above	As above	Yes	No	No	No	
Wrasse (Labroides bicolor)	As above	As above	Yes	No	No	No	
Wrasse (Labroides dimidiatus)	As above	As above	Yes	No	No	No	
Wrasse (Labroides pectoralus)	As above	As above	Yes	No	No	No	
Species non endemic to NSW							
Atlantic salmon (Salmo salar)	High	Low within present distribution or High elsewhere	Yes	Yes	Yes	Yes	Consistent with the EHNV zoning policy
Brook trout (Salvelinus fontinalis)	High	Low within present distribution or High elsewhere	Yes	Yes	Yes	Yes	Consistent with the EHNV zoning policy
Brown trout (Salmo trutta)	High	Low within present distribution or High elsewhere	Yes	Yes	Yes	Yes	Consistent with the EHNV zoning policy
Carp (Cyprinus carpio)	High eastern / low western	High	Yes	Yes	Yes	No	Prohibited in Catchments free of Carp
Rainbow trout (Oncorhynchus mykiss)	High	Low within present distribution or High elsewhere	Yes	Yes	Yes	Yes	Consistent with the EHNV zoning policy.
Redfin (Perca fluviatilis)	High	High	Yes	Yes	Yes	Yes for catchments where they are present	Consistent with the EHNV zoning policy, for EHNV sentinel only Prohibited in Catchments free of Redfin
Barramundi (Lates calcarifer)	High	low	Yes	No	No	No	Farms are to be above the PMF in the eastern drainage or above 1:100 year flood level in western drainage. No discharge of any waters to natural water bodies permitted.
Marron (Cherax tenuimanus)	high	High	Yes	No	Yes	No	Special Fencing requirements
Redclaw (Cherax quadricarinatus)	High	High	Yes	No	Yes	No	Special Fencing requirements
Sleepy cod (Oxyeleotris lineolatus)	High	High	Yes	No	No	No	
Brine shrimp (Artemia sp.)	High	High	Yes	Yes	Yes	No	
Freshwater species							
Australian bass (Macquaria novemaculeata)	High in Western drainage Low in Eastern Drainage	High in Western drainage Low in Eastern Drainage	Yes	Yes	Yes	No	Eastern drainage sites - Broodstock must match DPI stocking zones

Species	Disease/ Pathogen Security Status	Likely chance of Survival & risk of Establishing feral or invasive populations following escapement	Permissible culture methods[1]				Specific Operational and Locational Constraints
			Tanks and Raceways	Ponds Below PMF in the eastern drainage or below 1:100 year flood level in western drainage.	Ponds Above PMF in the eastern drainage or above 1:100 year flood level in western drainage.	Flow Through	
Eastern freshwater cod (Maccullochella ikei)	Low in Richmond and Clarence Drainage or High elsewhere	Low in Richmond and Clarence Drainage or High elsewhere	Yes	Yes	Yes	No	Prohibited outside of Richmond and Clarence Catchments.
Eel tailed catfish - Eastern Form (Tandanus tandanus)	High in Western drainage Low in Eastern Drainage	High	Yes	Yes	Yes	no	Stock to be sourced from approved Genetic Broodfish
Eel-long finned (Anguilla reinhardtii)	High in Western drainage Low in Eastern Drainage	High in Western drainage Low in Eastern Drainage	Yes	Yes	Yes	No	Pond design criteria
Eel-short finned (Anguilla australis)	High in Western drainage Low in Eastern Drainage	High in Western drainage Low in Eastern Drainage	Yes	Yes	Yes	No	Pond design criteria
Freshwater mullet (Myxus petardi)	High in Western drainage Low in Eastern Drainage	High in Western drainage & South of Shoalhaven - Low in remaining Eastern Drainage	Yes	Yes	Yes	No	
Cusped crayfish (Cherax cuspidatus)	High outside natural range / low within natural range	Low North Coast / High otherwise	Yes	Yes	Yes	No	Special Fencing required outside natural range
Rotund crayfish (Cherax rotundus)	High outside natural range / low within natural range	High outside natural range / low within natural range	Yes	Yes	Yes	No	Special Fencing required outside natural range
Strong crayfish (Euastacus valentulus)	High outside natural range / low within natural range	High outside natural range / low within natural range	Yes	Yes	Yes	No	Special Fencing required outside natural range
Freshwater prawn (Macrobrachium sp.)	High outside natural range / low within natural range	High	Yes	Yes	Yes	Yes	Broodstock must be sourced from local catchment
Freshwater shrimp (Atyidae sp.)	High outside natural range / low within natural range	High	Yes	Yes	Yes	Yes	Broodstock must be sourced from local catchment
Mussels (freshwater) (Velesunio ambiguus)	High outside natural range / low within natural range	High outside natural range / low within natural range	Yes	Yes	Yes	Yes	Broodstock must be sourced from local catchment
Barcoo grunter (Scortum barcoo)	High	High	Yes	No	No	No	
Bony bream (Nematalosa erebi)	High in Eastern drainage Low in Western Drainage	High in Eastern drainage Low in Western Drainage	Yes	Yes	Yes	No	
Eel tailed catfish - western form (Tandanus tandanus)	High in Eastern drainage Low in Western Drainage	High	Yes	Yes	Yes	No	Stock to be sourced from approved Genetic Broodfish
Golden perch (Macquaria ambigua)	High in Eastern drainage Low in Western Drainage	high (high genetic variation)	Yes	Yes	Yes		
Murray cod (Maccullochella peelii)	Low	Low	Yes	No in Eastern Drainage	Yes	No	Prohibited in Richmond and Clarence Catchments.
Silver perch (Bidyanus bidyanus)	High	high	Yes	Yes	Yes	No	
Spangled perch (Leiopotherapon unicolor)	High in Eastern drainage Low in Western Drainage	High in Eastern drainage Low in Western Drainage	Yes	Yes	Yes	No	
Welchs grunter (Bidyanus welchi)	High	High	Yes	No	No	No	
Yabby (Cherax destructor)	High in Eastern drainage Low in Western Drainage	High in Eastern drainage Low in Western Drainage	Yes	Yes	Yes	No	Special Fencing requirements in East
Marine / estuary species							
Balmain bugs (Ibacus peronii)	High in Western drainage Low in Eastern Drainage	low	Yes	Yes	Yes	Yes	
Banana prawn (Fenneropenaeus merguiensis)	As Above	As Above	Yes	Yes	Yes	Yes	

Species	Disease/ Pathogen Security Status	Likely chance of Survival & risk of Establishing feral or invasive populations following escapement	Permissible culture methods[1]				Specific Operational and Locational Constraints
			Tanks and Raceways	Ponds Below PMF in the eastern drainage or below 1:100 year flood level in western drainage.	Ponds Above PMF in the eastern drainage or above 1:100 year flood level in western drainage.	Flow Through	
Banded coral shrimp (Stenopus hispidus)	As Above	As Above	Yes	Yes	Yes	Yes	
Beachworm (Australonuphis parateres)	As Above	As Above	Yes	Yes	Yes	Yes	
Beachworm (Australonuphis teres)	As Above	As Above	Yes	Yes	Yes	Yes	
Beachworm (Hirsutonumphis mariahirsuta)	As Above	As Above	Yes	Yes	Yes	Yes	
Black tiger prawn (Penaeus monodon)	As Above	As Above	Yes	Yes	Yes	Yes	
Blacklip abalone (Haliotis rubra)	As Above	As Above	Yes	Yes	Yes	Yes	
Bloodworms (Marphysa sanguinea)	As Above	As Above	Yes	Yes	Yes	Yes	
Blue mussel (Mytilus gallo provincialis)	As Above	As Above	Yes	Yes	Yes	Yes	
Brown tiger prawn (Penaeus esculentus)	As Above	As Above	Yes	Yes	Yes	Yes	
Clam (Tapes dorsatus)	As Above	As Above	Yes	Yes	Yes	Yes	
Cobia (Rachycetron canadum)	As Above	As Above	Yes	Yes	Yes	Yes	
Coral trout (Plectropomus leopardus)	As Above	As Above	Yes	Yes	Yes	Yes	
Dusky flathead (Platycephalus fuscus)	As Above	As Above	Yes	Yes	Yes	Yes	
Eastern king prawn (Melicertus plebejus)	As Above	As Above	Yes	Yes	Yes	Yes	
Eastern lobster (Jasus verrauxi)	As Above	As Above	Yes	Yes	Yes	Yes	
Estuarine clam (Katelysia rhytiphora)	As Above	As Above	Yes	Yes	Yes	Yes	
Estuarine clam (Tapes dorsatus)	As Above	As Above	Yes	Yes	Yes	Yes	
Estuary cod (Epinephelus coioides)	As Above	As Above	Yes	Yes	Yes	Yes	
Estuary perch (Macquaria colonorum)	As Above	As Above	Yes	Yes	Yes	Yes	
Fingermark bream (Lutjanus johni)	As Above	As Above	Yes	No	No	No	
Flat (mud) oysters (Ostrea angasi)	As Above	As Above	Yes	Yes	Yes	Yes	
Flowery cod (Epinephelus fuscoguttatus)	As Above	As Above	Yes	Yes	Yes	Yes	
Greasyback prawn (Metapenaeus bennettae)	As Above	As Above	Yes	Yes	Yes	Yes	
Greenback flounder (Rhombosolea tapirina)	As Above	As Above	Yes	Yes	Yes	Yes	
Kingfish (Seriola lalandi)	As Above	As Above	Yes	Yes	Yes	Yes	
Kuruma prawn (Marsupenaeus japonicus)	As Above	As Above	Yes	Yes	Yes	Yes	
Mahi mahi (Coryphaena hippurus)	As Above	As Above	Yes	Yes	Yes	Yes	
Mangrove Jack (Lutjanus argentimaculatus)	As Above	As Above	Yes	Yes	Yes	Yes	

Species	Disease/ Pathogen Security Status	Likely chance of Survival & risk of Establishing feral or invasive populations following escapement	Permissible culture methods[1]				Specific Operational and Locational Constraints
			Tanks and Raceways	Ponds Below PMF in the eastern drainage or below 1:100 year flood level in western drainage.	Ponds Above PMF in the eastern drainage or above 1:100 year flood level in western drainage.	Flow Through	
Mud crab (Scylla serrata)	As Above	As Above	Yes	Yes	Yes	Yes	
Mullet (Mugil cephalus)	As Above	As Above	Yes	Yes	Yes	Yes	
Mulloway (Argyrosomus japonicus)	As Above	As Above	Yes	Yes	Yes	Yes	
Offshore greasyback prawn (M. ensis)	As Above	As Above	Yes	Yes	Yes	Yes	
Pacific oysters (Crassostrea gigas)	As Above	As Above	Yes	Yes	Yes	No	Noxious species in all estuaries except Port Stephens.
Queensland groper (Epinephelus lancedatus)	As Above	As Above	Yes	Yes	Yes	Yes	
Red emperor (Lutjanus sebae)	As Above	As Above	Yes	Yes	Yes	Yes	
Sand whiting (Sillago ciliata)	As Above	As Above	Yes	Yes	Yes	Yes	
School prawn (Metapenaeus macleayi)	As Above	As Above	Yes	Yes	Yes	Yes	
Silver bream (Acanthopagrus australis)	As Above	As Above	Yes	Yes	Yes	Yes	
Silver trevally (Pseudocaranx dentex)	As Above	As Above	Yes	Yes	Yes	Yes	
Snapper (Pagrus auratus)	As Above	As Above	Yes	Yes	Yes	Yes	
Southern bream (Acanthopagrus butcheri)	As Above	As Above	Yes	Yes	Yes	Yes	
Sydney rock oysters (Saccostrea glomerata)	As Above	As Above	Yes	Yes	Yes	Yes	
Tubeworms (Diopatra aciculata)	As Above	As Above	Yes	Yes	Yes	Yes	
Tubeworms (Diopatra dentata)	As Above	As Above	Yes	Yes	Yes	Yes	
Yellow eye mullet (Aldrichetta forteri)	As Above	As Above	Yes	Yes	Yes	Yes	
Small mouth nannygai (Lutjanus erythropterus)	As Above	As Above	Yes	Yes	Yes	Yes	

3. Hatchery and Genetic Factors

3.1 Quality of Hatchery Progeny

Hatchery-reared juveniles can be used by the producers; sold to other aquaculture enterprises or the aquarium industry; or used for stocking into farm dams or for a Department of Primary Industries approved stock enhancement program in a natural waterway. It is the hatchery operators responsibility to ensure that:

- the juveniles are healthy before sale (it is illegal to sell diseased fish);
- the stock is not tainted with exotic invertebrates and vertebrates.

It is the hatchery's responsibility to ensure that the unintentional escape of cultured stock is minimised to prevent potential contamination of the genetic diversity of any endemic stocks and possible environmental impacts. Decisions relating to species and hatchery management will affect the planning and design of a facility and its operation (See *Hatchery section* in *Planning and Design*).

3.2 Broodstock Management

The efficient production by hatchery facilities of quality, healthy juveniles in sufficient quantities to meet the increasing demands is dependent on the availability of adequate numbers of quality broodstock. The appropriate number of broodstock is determined by the number of eggs needed to produce the required number of juveniles, with normal losses taken into account. Other factors include the lifecycle of species, when broodstock are retired, genetic lines of broodstock and whether demand for juveniles is seasonal or continuous.

The assessment of the quality of broodstock usually focuses on factors such as:

- broodstock reproduction rates;
- performance and survival of broodstock under hatchery conditions;
- genetic characteristics; and
- progeny characteristics.

In the future as translocation issues and stock enhancement of wild fisheries becomes more important, hatchery breeding programs will be called upon to meet an increasing demands from the aquaculture industry as well as from specific stock enhancement programs or other fishery programs with more emphasis being placed on broodstock genetics.

3.3 Acquisition and Maintenance of Broodstock

Broodstock can be collected from the wild under the provisions of a permit, grown and maintained in a hatchery or purchased from a commercial supplier. Currently, broodstock of Australian Bass are mostly captured in the wild prior to spawning, whereas broodstock of Silver and Golden Perch, Murray Cod, Snapper and Mulloway are maintained at the hatchery or in farm dams.

The reliability of spawning and quality of eggs from wild-caught broodstock varies with species. Reliance on the capture of wild broodstock limits the availability of eggs to the natural spawning period each year. Wild-caught broodstock are often used only once for spawning and then returned to the wild. Maintenance of broodstock in tanks with controls over day length and temperature can provide more flexibility in the supply of eggs and broodstock. For example, for many

species, the period of spawning can be extended from several months to year round.

Proper care of broodstock is essential for good production of eggs, larvae and juveniles. Methods differ with species, but the hatchery operators must provide optimum conditions for maturation and spawning. Factors for consideration include pond management, water quality and temperature, disease control, food supply, broodstock age, density and sex ratios.

3.4 Broodstock Genetic Management

The characteristics of fish as with domesticated plants and animals can be improved by implementing breeding programs. For example, long-term breeding programs for chickens have resulted in significant improvements in productivity.

In any hatchery breeding program, a comprehensive record keeping system is necessary to track and evaluate progress of the program and to ensure weaknesses are not being introduced as a result of inbreeding.

Selective Breeding Program to Improve Stock

Fish stocks may be improved by selective breeding, hybridisation and crossbreeding. For example, selective breeding of trout has resulted in improved strains in relation to growth rates, spawning time and the age of maturation. Broodstock may be selected on a range of criteria such as size, colour, shape, growth, feed conversion rates, time of spawning, age at maturity, reproductive capacity and past survival rates. These criteria may vary with different hatcheries.

Selective Breeding Program to Avoid Inbreeding

Selective breeding involves selected mating of fish of a single strain and species and results in a reduction in the genetic variability in the population. Broodstock managers must be aware of the potential for inbreeding and manage the breeding program to minimise the risks of inbreeding problems arising. Inbreeding can occur when mates selected from a population of hatchery broodstock are closely related. The proportion of genes that fish parents have in common determines the degree to which a particular fish has been inbred. Problems that can occur after only one generation of brother-sister mating include reduced growth rates, lower survival, lower food conversion rates, increased numbers of deformed fry and increased susceptibility to disease. A system for selective breeding of trout has been developed to reduce the likelihood of inbreeding. The method involves maintaining three or more distinct breeding lines in a rotational line-crossing system. The number of fish required for the program can be set at any level necessary to satisfy the egg production requirements of a particular hatchery. Groups of fish can be held in separate tanks or combined, provided fish are individually tagged.

Hybridisation and Cross Breeding Programs

Hybridisation between species of fish and crossbreeding between strains of the same species can result in significant increases in growth, better food conversion, increased disease resistance and tolerance to environmental stressors. Hybrid vigour is responsible for the stock improvements; however this may not be achieved in all crosses.

Special Program Management for Stock Enhancement

If hatchery-reared progeny are destined for a stock enhancement program, rather than aquaculture facility, maintenance of genetic diversity is extremely important. Broodstock should be obtained from the wild and mated pairs should be randomly selected from the population.

4. Market and Pricing Factors

4.1 There must be a market

In addition to a species being biologically suitable for aquaculture production, it must have market acceptance. The aim of commercial aquaculture is to make a profit. The farm must produce fish that are marketable in sufficient quantities at acceptable prices. All too often, a decision is made to farm a species based on biological factors with little consideration given to its market acceptance. These factors must be taken into consideration in the preparation of the Business Plan (*see Business Plan section).*

Domestic market

The live fish market in Australia is still developing, particularly for native freshwater species. There is still significant potential for expansion. However, once this market niche that returns very attractive prices has been filled, alternative higher volume markets are likely to return lower prices. In some cases, these prices may not be sufficient to cover production costs. If a number of farmers independently decide to target the live fish and other boutique markets at the same time, this may saturate the market leading to price wars and lower returns to farmers. It is important that farmers network with each other to ensure that a steady and reliable supply of quality product is supplied to meet market specifications and requirements. This approach will assist in increasing demand and help to smooth out periods of glut and short supply, thereby leading to more reliable prices for the farmed products. In addition, industry groups are better placed to develop and promote markets for new aquaculture products than individual producers.

A most important segment in the domestic market is Asian restauranteurs and fish retailers. By contrast the non-Asian retail trade is relatively small and more price sensitive. It is considered that this segment is capable of substantial growth with market promotion to improve consumer awareness.

In the longer term, it is considered that significant growth in the aquaculture fish “fillets” market will occur to meet the demand of the Australian consumers preference in the home and restaurant trade for skinless boneless fillets.

Export markets

There is excellent potential to promote the *clean green* image of Australian aquaculture products. In addition, it is anticipated that there will be great potential for Australian producers to step in and replace some of the shortfall in supply that may arise overseas. Australia, and in particular NSW are fortunate to have avoided most of the problems experienced by other countries associated with waterway pollution and disease. This *clean green* image is increasingly important because of growing concerns associated with the spread of disease and pest species with importing of fish especially live fish. As a result the development and implementation of best practice in production and quality assurance programs to guarantee the quality of the product is increasingly important for the expansion of the export market.

4.2 Factors affecting market value and price

There are many factors likely to affect the price achieved in the market place ranging from global economic issues (eg. value of the A$ and the buoyancy of the Asian economy) to supply and demand factors (eg. competition from other fish products, consumer preference, the season and fads in eating). The price gained for a product will also vary with the market sector and its geographic location. For example there can be significant difference in price achieve in the local market and the Sydney, Brisbane and Melbourne markets and between wholesalers or overseas distributors, retailers (super markets and fishmongers), restauranteurs and the take-away-food sector.

It is important that the farmer becomes well informed about options and the implications in relation to the costs in getting the product to a particular market and the likely differentials in returns. For example:

- Where is the product to be positioned in the market place – economy or luxury?
- What are competitors offering and what prices are they achieving?
- What is the price range of potential customers and for what volume?
- Is there a potential for repeat business?

The lowest acceptable price should be equal to the cost per kilogram to produce the product, taking into consideration both fixed and variable costs. The highest price may be what is achievable by selling the best of the stock into a niche market. The base price is generally somewhere between the two.

Table 8. Indicative prices from selected fish sales 2002
(Ruello & Assoc pers comm)

Fish/product whole or gilled and gutted (GG)	Wholesale or auction price approximate $/kg	Median Sydney Retail price approximate $/kg
Golden perch GG wild	13.50	20.00
Barramundi whole farm	8.50	14.00
Snapper GG wild	10.00	16.00
Silver perch whole farm	8.80	13.00
Silver bream whole wild	8.50	13.50
Rainbow trout GG farm	6.50	11.50

MARKET FACTORS

Prawns

The Australian aquaculture production of prawns is estimated at about 2,700 t/year. Much is exported. Farm-gate prices vary around an average of $15/kg for black tiger prawns, and up to as much as $70/kg for live kuruma prawns sold on the Tokyo markets.

Crayfish

The size of the market for the three freshwater crayfish species grown in NSW is unknown. Redclaw have a meat yield (meat to body weight ratio) of 22 to 25 per cent; the meat yield is comparable in marron but slightly lower in the yabby. Yabbies have been marketed in small quantities from the wild fishery for years (up to $8 kg). Much higher prices (up to $35/kg) have been obtained for all three species by supplying live crayfish of a particular size to restaurants. These prices are for very small quantities, however prices in the range of $8 to $15 can be expected as supply increases. Crayfish are likely to feature in the highly competitive "entree" market (along with such delicacies as prawns, oysters and smoked salmon), and this may make it difficult to permanently establish a market niche. The size of any export

market is impossible to evaluate until supply can be maintained. There is certainly a market for crayfish in Europe, as crayfish are regarded as a delicacy and local stocks have been largely wiped out by the "crayfish plague". However, the market in some European countries (for example, Sweden) is highly seasonal. Trial shipments have suggested that Cherax species would be accepted in the marketplace.

Silver Perch

Most of the silver perch currently produced has been targeted for the live fish trade in Sydney's Asian restaurants. The live fish market requires fish to be 600-800g in weight and have a good physical appearance (no marks or blemishes on skin, fins intact, good colour etc). Silver perch has been readily accepted into this market, with farmers receiving strong prices ($9-10/kg live) at the farm gate. It is expected that this price will drop in time as more producers enter the industry. Some live product is sold at the Brisbane and Melbourne Fish Markets, with small amounts sold regionally. Fish not suitable for the live trade is usually sold whole chilled on the Sydney Fish Market auction floor with a small quantity sold in the Brisbane and Melbourne Fish Markets.

In a recent report by Ruello Associates Pty. Ltd entitled "*Silver Perch Market Assessment*", it was considered that the market for whole silver perch is near saturated, and is only capable of growth of about 20-30% over the next few years. The report concluded that the long-term future for fish farming lies with fillets. The Australian consumer's preference is overwhelmingly for a skinless boneless fillet rather than a fish with its head and bones.

Local markets for fillets appear to be relatively unfulfilled with the potential domestic markets not yet fully explored with some researchers predicting that silver perch industry was capable of supplying over 10,000 tonnes/annum. There may also be future potential to supplement some of the $500 million worth of fish imported into Australia every year, predominantly in the form of cheap, processed/frozen, white flesh fillets eg. hoki and hake. Export markets for silver perch are still relatively unexplored.

Like most freshwater fish, silver perch has a tendency to develop a muddy flavour. This occurs as a result of fatty tissues in the fish absorbing compounds released by blue green algae in the culture ponds. The only way to remove the *off-flavour* is by purging in clean water for 3-21 days, depending on the extent of tainting. Purging the fish in clean water expels the compounds that cause the taste, and the fish is then ready for market. The presence of off-flavours in marketed product has the potential to impact the industry. In order to encourage quality assurance and to assist maintain product standards, it is recommended that all silver perch are purged to reduce the potential for off-flavoured fish entering the markets. It is essential that the industry as a whole implement best management quality assurance practices so a high quality product is consistently available to the consumer.

Barramundi

One advantage to barramundi farmers is that the species has been commercially fished for a number of years, and as such has a well-established "elite" position in the market place. There are a number of options available to producers, including the live fish trade, plate size whole (300-500g) trade, and fillet or larger whole fish (2kg) trade. The reputation of barramundi as well as its premium edible properties (white, firm, mild tasting) also provides a good marketing platform for new producers. barramundi (cultured and wild-caught) is sold in most major fish market or retail outlets, with aquaculture barramundi usually in the form of the whole plate size product. Live fish are also sold, targeted at the Asian restaurant trade. Farmers receive an average price of around $9-10/kg at the farm gate for Barramundi, with higher prices for value-added products eg fillets. The average price used to be higher, but has been driven down by the number of new producers entering the industry, as well as cheap imports from places such as Vietnam. Due to the higher production costs associated with barramundi culture compared to overseas producers, there is probably only limited potential to create export markets for this species.

Murray Cod

Murray Cod has generated much interest in the live fish trade, due to its appearance and premium quality flesh and taste. Murray Cod sold as a live product has been very well received, and is perceived by some chefs to be one of the best tasting freshwater fish in the world. This is reflected in the average price paid for live Murray Cod; around $25-30/kg at the farm gate. There is also good potential for a gilled/gutted product fetching prices of $18-22/kg regularly on the Sydney Fish Markets auction floor. While most of the product is sold domestically, there may be potential for export trade of cod when production is increased. Overseas traders have expressed interest in the product. Most live product is purchased by Asian restaurants, indicating its acceptance within the Asian community. Although it is expected that average prices for live product will drop as more producers come on line, the almost legendary status of the cod, its excellent flavour and excellent appearance should ensure its place in the top range of the market.

Snapper

While marine fish are more usually grown in cages in estuaries, bays or the ocean, pond-rearing trials have also produced a high quality product. Snapper are relatively easy to market. The majority of the existing demand is for plate-size fish (400g), which are sold and served whole. Two ways to expand the market for Australian snapper have been identified. The first is to export live and sashimi-quality snapper to Japan based on technology developed in New Zealand to export live wild snapper. The second is to develop a local market for live and sashimi snapper.

Mulloway

Marketing mulloway is a different proposition to snapper. Large mulloway (more than 2.5kg) currently fetch the best price. Wild-caught smaller mulloway (soapies) have poorer consumer acceptance, however informal taste tests of 1kg mulloway grown in seacages were very favourable, and pond rearing trials have also produced a high quality product. Little is known of the export potential for mulloway.

Eels

More than 130,000 tonnes/yr of eels is produced worldwide, with the main producers being China, Japan and Taiwan. Over 70% of this product is produced for the Japanese 'Kabayaki' market. Kabayaki is a style of serving eels, where eels of around 150-200g are butterflied, placed on skewers, basted in a thick soy based sauce, and steamed or grilled. More than 90% of eels consumed in Japan are served this way, with eel being the most widely consumed freshwater fish in Japan. The Australian shortfin eel (Anguilla australis) is very similar in appearance to the species of eel favoured by the Japanese market (A. japonica). As such, the shortfin eel is well accepted in Japan and attracts similar prices to A. Japonica, averaging around $10-15kg at the farm gate (live). There is good potential for Australian producers to export shortfin eels to Japan for this market. The long fin eel (A. reinhardtii) is different in appearance to the A. japonica species, and as such is not well accepted in Japan, leading to lower prices.

However, the long fin eel is similar to the species favoured in China (Anguilla mamorata), and as such there is some potential to export this species there. For eels, it is hard to evaluate the size of any potential markets for Australian producers. Certainly the export markets are present and active; however the very nature of eel farming (i.e. reliance on glass eels for seedstock, seasonal nature of glass eel collection, limited technical know-how etc.) can to some extent prohibit its development. Declining eels stocks overseas may work to the advantage of Australian producers. Furthermore, as Australia's multicultural population increases, there may be opportunity for a small domestic market for eels to develop.

Trout

Trout have high meat yields and sell well. Fresh trout has become cheaper than other prime fish such as snapper, mulloway and barramundi. They command medium prices for quality fish (rainbow trout retails for approximately $8 per kg fresh and $10 smoked; with approximately $4-6 at the Sydney Market). At present, a few large producers dominate the market and control the maximum price. Value-added products (e.g. smoked trout) demand higher prices. New marketing techniques (e.g. fillets and cutlets in supermarkets) are being developed.

4.3 Product specification and adding-value

Like other primary industries, if the aquaculture industry is to be sustainable, it must constantly adapt to changing preferences and expectations of consumers, and to changing market conditions. To do this, the industry needs to focus on meeting the market and where possible value-adding. The following outlines marketing options:

- Live fish, prawns or other species (to remain alive for 5 days),
- Chilled whole fish (shelf life for 1 week at 5°C) (eg. GU=Gutted, GH=Headed/Gutted, GG=Gilled/Gutted),
- Cooked prawns and yabbies - whole or peeled – frozen or chilled,
- Skinless and boneless chilled or frozen fillets (FI=Fillets) – chunks, steaks, fillets, nuggets etc.
- Smoked (hot or cold smoking), pickled or other processed products.

The size of the fish can also be a key factor in market returns and consideration should be given to the grading specifications at the Sydney Markets which may change from time to time.

Table 9. Current Grading Specifications at the Sydney Markets

Aquaculture species	***Extra small***	***Small***	***Medium***	***Large***	***Extra large***
Barramundi *gms*		< 450	450 - 600	600 - 800	800 +
Silver Perch *gms*		300 - 450	450 - 550	> 550	
Black Tiger Prawns (P.monodon) *Number/kg*	>66	56 – 66	45 - 56	22 - 44	<21

Market sectors exhibit a preference for certain sized fish – for example for silver perch (Ruello & Assoc):

- Large whole fresh or live fish for the Asian “shared plate” dining range typically from 500gms – 1kg and up to over 2kg at times. There is likely to be greater demand for this size at holiday periods.
- Chilled whole fish for non-Asian cuisine ranging from 400gms – 1kg.
- Chilled plate-sized for Asian and non-Asian cuisine sold mostly whole or some gutted ranging from 350 - 500gms.
- Fillets mostly for non-Asian cuisine – 100 – 200gms fillets from fish 300 – 800gms.

Packaging and presentation of products into the retailing market is an issue that requires more consideration. Bulk fish packaging is usually in clean styrene cases with a polyethylene liner bag in 10kg or 15 - 18kg lots. Cooked king prawn supply is a mix of plastic tubs (20 - 25kg) and styrene cases (10kg and 16 - 18kg type).

Positioning speciality products through the use of well-designed packaging can add value and increase returns. The key to success with value-added products is a good quality assurance program to ensure that consistently high quality products reach the consumer. All products should meet the National Food Standards (See *Operating the Farm section* and Australian Seafood Industry Quality Assurance Project by Seafood Services Australia *www.dpi.qld.gov.au/cft/ssaust).*

5. Temperature Factors in Selecting Species

Water temperature profoundly affects the growth rates and health of fish. Most species of finfish that are farmed successfully reach minimum market sizes (40-500gms) in 12 -18 months. Prawns will typically reach market size in 3-6 months. To enable maximum growth, the temperature range of the selected site should match with the optimum temperature growing regime for the selected species. Regions where lethal temperatures are reached, or even approached, are unsuitable for pond or raceway culture of the particular species. Consideration of the site/system design in terms of likely water temperature ranges/growing season is essential for the species under consideration. Below is a table of optimal temperatures for various species under consideration that should be considered during site selection (See *Site Selection section*).

Table 10. Temperature range for breeding and grow-out

Species	Ideal Temperature	
	Hatcheries	Grow-out facilities
Abalone	15 - 18°C	12 - 20°C
Prawn - Black Tiger	28 - 32°C	25 - 32°C
Prawns - Kuruma	25 - 30°C	20 - 28°C
Prawns - School	-	2l - 27°C
Crustacea - Redclaw	27 - 30°C	27 - 32°C
Crustacea - Yabbies	15 - 20°C	23 - 25°C
Barramundi	27 - 30°C	26 - 30°C
Eels	-	23 - 28°C
Kingfish	21 - 24°C	15 - 25°C
Mahe-Mahe	25 - 30°C	25 - 30°C
Mulloway	21 - 26°C	14 - 30°C
Murray Cod	19 - 21°C	23 - 26°C
Silver Perch	20 - 25°C	23 - 28°C
Snapper	21 - 24°C	17 - 30°C
Trout Brown	*6 - 10°C	4 - 19°C
Trout Rainbow	*9 - 14°C	10 - 22°C

**for spawning and egg production*

6. Feed Factors

Intensive fish culture is based on the use of medium to high stocking densities, prepared feeds (usually specially formulated dry pellets) and, with some species, fertilisation of pond water. Very high production rates can only be achieved with species that accept prepared feed. Not all species readily accept pellet rations (e.g. Australian bass and golden perch) and consequently there has been limited progress with intensive cultivation of these species.

Species vary in their optimal protein and nutrient intake. Generally, more carnivorous species such as snapper and kuruma prawns require a higher animal protein component, whereas species with lower protein requirements such as silver perch and abalone are often more amenable to diets with inclusion of plant protein sources. For aquaculture to continue to expand significantly, fish meal based diets must be replaced with other protein sources.

The food conversion ratio (FCR) is the ratio of dry weight of food, to the wet weight gain of fish. The lower the ratio, the more efficiently food has been converted to fish flesh. Feed costs often constitute 40-55% of total production costs, so it is essential to use species that convert food efficiently. Modern diets enable food conversion ratios of 2:1 or better in freshwater species such as trout. Species that have high meat to total body weight ratio are desirable because of their more efficient conversion of feed into edible flesh. This is particularly important if the end product is to be processed.

7. Disease factors

Although all species are susceptible to disease under culture conditions, the interactions that cause disease outbreaks relate to three components referred to as the epidemiological triad namely:

- the disease agent;
- the host; and
- environmental factors.

These factors are usually inter-dependent so that rather than a chain of causes, there is usually a causal web. These inter-relationships should be considered when selecting a species for aquaculture, choosing a site and designing grow-out facilities and management practices.

Avoid stress

Appropriate growing conditions that do not stress the fish are essential for successful culture. While species can tolerate sub-optimal conditions for short periods (e.g. for prawns, short periods of low temperature, dissolved oxygen levels or salinity levels), they will become stressed with reduced FCRs and greater susceptibly to disease than species better suited to those conditions.

Many of the potential disease parasites, viruses and bacteria occur naturally in the environments and may be present in the ponds or tanks. The natural defence systems of healthy fish will ward off infection. However, once a fish becomes stressed, opportunity for the disease to cause infection increases via the lowering of the immune systems. The stress may also occur during handling (e.g. grading, harvesting, transferring between ponds, transport to market), heavy predation from predators (such as cormorants), drug treatments, poor water quality, undernourishment or overcrowding.

Prevention of stress is fundamental to maintaining disease free stock. Good husbandry techniques for disease prevention include:

- maintenance of appropriate water quality standards;
- maintenance of optimum stocking rates to prevent overcrowding;
- quarantine management for new stock before introduction into the ponds;
- development of feeding regimes to maintain water quality;
- regular inspection of fish should be undertaken to monitor health and implement of disease management protocols if necessary.

Disease management protocols

Some diseases are not naturally occurring and every effort should be taken to ensure that these are not introduced onto the farm from hatcheries, other farms or the wider environment. Measures should include stock protocols, worker protocols and in some circumstances exclusion of birds. A useful website on this subject is www.dah.csiro.gov.au. Many of the disease outbreaks (if caught early) are easily treatable, with little or no effect on the productivity of the crop. However, some fish diseases are difficult to treat and cause widespread mortality in the aquaculture facilities as well as in the wild. Disease in hatcheries can be a particular problem, both in terms of losses in the hatcheries and also through putting at risk customer farms or native fish stocks (through restocking programs).

Good practice for disease management should include:

- At the first signs of disease outbreak specimens should be removed and analysed for disease symptoms and water quality should be checked. If no obvious manageable causes are found then a qualified veterinarian should be consulted immediately.
- Appropriate training for all staff in health management and disease recognition but in particular key personnel who should have specialised training in the recognition and diagnosis of common fish diseases. These personnel should be made aware of the importance of keeping up-to-date with the latest disease identification and management.
- Appropriate equipment on site to assist in the accurate diagnosis of diseases including a microscope and testing kits.
- Appropriate protocols to prevent the inadvertent introduction of disease onto the farm from stock movement, employees, visitors or equipment.
- Appropriate protocols to deal with disease notification and management should an outbreak occur.

DISEASE PROFILES

Abalone

Abalone appears to have one major disease known as Perkinsus which naturally occurs predominantly from Jervis Bay and north along the coastline. It can cause devastating losses to stock and is linked to high summer water temperatures and is not treatable.

Abalone are also susceptible to Mud worm and Vibrio bacterial infections.

Prawns

To protect native prawn species and reduce the risk of disease introduction, no live penaeids are allowed into Australia. So far, this appears to have prevented the introduction of major penaeid viral diseases such as infectious hypodermal-haematopoietic necrosis virus disease (IHHNV), yellow-head and white spot virus, which has caused very serious problems in countries that have allowed importations. Other viral diseases have occurred in Australia (for example Baculovirus), although this only appears to be a problem in hatcheries cultured prawns under sub-optimum conditions. Although bacterial, fungal and protozoan infections have been recorded in Australian prawn hatcheries and ponds, very few have caused serious problems.

Freshwater Crayfish

Australian freshwater crayfish appear to have only one major disease, the so-called porcelain or white tail disease, caused by a microsporidian. The disease appears to be transmitted through cannibalism of dead individuals. The disease cannot be treated, but can be managed in aquaculture if stocks are periodically examined, and diseased animals removed. Microsporidians have been found in all three Cherax species.

Silver and Golden Perch

Infection with disease and parasites is a response by perch to stressors occurring in their environment. The most common of these would be deterioration of water quality. Most pathogens and parasites occur naturally in ponds and natural aquatic environments, however the natural defence systems of healthy fish will help ward off infection. Once fish become stressed with a lowering of its immunity defences, opportunity for the disease to infect increases. Infection may also occur when fish are handled e.g. grading, harvesting, moving between ponds, or stress caused by heavy presence of predators such as cormorants, or from inappropriately high stocking densities.

Prevention is the best cure, and a combination of good husbandry and management techniques will ensure that stock remains relatively disease free. General husbandry should include quarantine of all new stock to the site, with regular salt baths of new batches at a concentration of 5-10ppt for at least 1 hour before placement into any of the nursery ponds. Optimum water quality should be maintained to relieve stress on the fish, and regular inspections to monitor health. At the first signs of a disease outbreak a sample of fish should be removed and analysed for obvious disease

symptoms, and water quality should be checked. If a source of infection or disease cannot be identified, a qualified fish veterinarian should be consulted. Most fungal and parasitic infections can be treated with a combination of salt bathes and formalin.

Trout

Trout are vulnerable to disease if stressed. Temperature stress is the most common problem in NSW, then overcrowding and low oxygen. Common parasites include Ichthyophthirius ('Ich' or 'whitespot') and Trichodina, both protozoans. Poor hygiene is also a common cause of bacterial disease in hatcheries, where any disease can spread rapidly if not identified and treated. Introduced trout diseases in the river stocks are a source of concern. In particular, outbreaks of trout EHN virus have resulted in new quarantine regulations.

Murray Cod

Like any fish, Murray Cod can be susceptible to various pathogens and diseases. Disease outbreaks are often in response to stressors being placed on the stock, which in most cases could be avoided. Prevention is the best cure, and a combination of good husbandry and management techniques will ensure that stock remains relatively disease free. General husbandry should include quarantine of all new stocks to the site, with regular salt baths of new batches at a concentration of 5-10ppt for at least 1-hour before placement into any of the grow-out tanks. Water quality should be maintained to relieve stress on the fish, and regular inspection of fish should be undertaken to monitor health. Upon the first signs of a disease outbreak a sample of fish should be inspected for obvious disease symptoms, and water quality should be checked. If a source of infection or disease cannot be identified, a qualified fish veterinarian should be consulted.

Barramundi

Barramundi are naturally susceptible to most bacterial, fungal and parasitic infections, particularly at times of stress. This is can usually be avoided by appropriately quarantining new stock before release into culture tanks, maintaining water quality and a stress free environment, and regular disease monitoring of stock. In the event of disease outbreak, stock can sometimes be effectively treated by salt or freshwater bathes, or via veterinarian prescripted medicines. The barramundi is known to be a potential carrier of the barramundi Encephalitis Virus (BEV) which has potential to affect a number of species native to NSW. As such Department of Primary Industries has imposed tight restrictions on the culture of barramundi in this State. To address these concerns Department of Primary Industries have included provision within the Barramundi Farming Policy for the sterilisation of all effluent to be removed, as well as a specific protocol for the importation of barramundi fingerlings from out of state. This includes the testing of fingerlings for presence of the BEV as well as other diseases and virus. This policy will not only reduce the chance of translocating the virus to NSW, but also ensures that the farmer has a guarantee of healthy good quality seedstock.

Eels

Because glass eels are sourced from the wild, they may already be infested with various parasites or diseases, or alternatively act as disease carriers. However, the acclimatisation to freshwater that usually occurs after capture eliminates most parasitic infections through osmotic forces. Bacterial and fungal infections on eels raised in freshwater can usually be treated by simple salt baths at a rate of around 10ppt. Eels, like most fish, are particularly susceptible to infection at times of high stress, for example when water quality has deteriorated, there is constant presence of predators in ponds, or at times of harvesting and handling. While eels are generally quite tough, they still need to be handled with care. As in most forms of aquaculture, the best cure is prevention and a combination of good husbandry and management techniques will ensure that stock remains relatively disease free. The maintenance of disease free stock involves the quarantining of all new eels to the site, and regular salt bathing of eels in quarantine facilities. Water quality should be maintained to relieve stress, and regular inspection of eels or elvers should be undertaken to monitor health and condition. At the first signs of a disease outbreak a sample of eels should be inspected for obvious disease symptoms, and water quality should be monitored. If a source of infection or disease cannot be identified, a professional fish veterinarian should be consulted.

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Site Selection

Hunter and Central Coast Sustainable Aquaculture Strategy
Land Based Aquaculture

A NSW Government Initiative

Hunter and Central Coast Sustainable Aquaculture Strategy

A NSW Government initiative of Department of Primary Industries, Department of State and Regional Development, Department of Environment and Conservation, Department of Lands, Department of Infrastructure, Planning and Natural Resources and NSW Premiers Department to encourage sustainable aquaculture in New South Wales.

Site Selection

Table of Contents

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1. Importance of Site Selection

1.1 The most critical step

For the long-term sustainability of an aquaculture enterprise, it is good investment sense to select an environmentally sound, low risk site at the outset. Site selection is the first and generally most critical step in establishing a sustainable aquaculture facility. Poor site selection can lead to failure. With pond culture, factors such as water supply quality and reliability, soil characteristics and topography can influence all further construction and operational decisions. It must be emphasised that a site that has access to an abundant supply of good quality water is key to a successful aquaculture enterprise.

Sound principles for the selection of aquaculture sites include:

- aquaculture must be permissible within the landuse zones;
- environmentally sensitive areas should be avoided;
- aquaculture should be compatible with nearby land uses;
- site specific investigations should indicate that the site is fundamentally suitable for an aquaculture operation.

The appropriate location of an aquaculture facility is one of the most effective environmental management tools available to an applicant. While operational and market considerations are important factors, a high priority must be given to environmental characteristics of the location. Appropriate site selection can avoid or reduce many problems inherent to aquaculture, and:

- reduce the need for technically based environmental mitigation measures and costly ongoing management and monitoring measures;
- result in substantial savings in establishment and operation;
- reduce levels of public scrutiny and community concerns;
- streamline the approval processes.

Information on the availability of potential sites can be obtained from real estate and stock and station agents. In addition, advice should be sought from Department of Primary Industries (DPI) and the Department of State and Regional Development (DSRD) as to whether they are aware of any potential sites. These agencies can also give advice on the general advantages and disadvantages of locating in particular regions or catchments.

1.2 A tiered approach to site evaluation

A systematic and rigorous approach to site selection based on the “locational principles” in the **Project Profile Analysis** is recommended.

At the time of site selection, the community as well as environmental factors should be considered. Potential conflicts with neighbours should be avoided. Options for reducing or preventing conflicts should be considered at the outset including the adequacy of separation distances between the ponds and other facilities and nearby houses. The surrounding, existing or likely future land uses should be compatible with aquaculture. For example, it is important to consider early in the process whether a potential site is likely to be adversely affected by near-by agricultural pesticide use or if the aquaculture farm and the 24 hour operation of its pumps and other machinery is likely to adversely affect adjacent residents.

In undertaking an evaluation of various locations for aquaculture development, all relevant legislation, plans and government policies should be considered in

the selection of preferred sites e.g. in relation to river and estuary flow regimes, water allocation, floodplain management, vegetation management, zoning, heritage strategies, biodiversity protection.

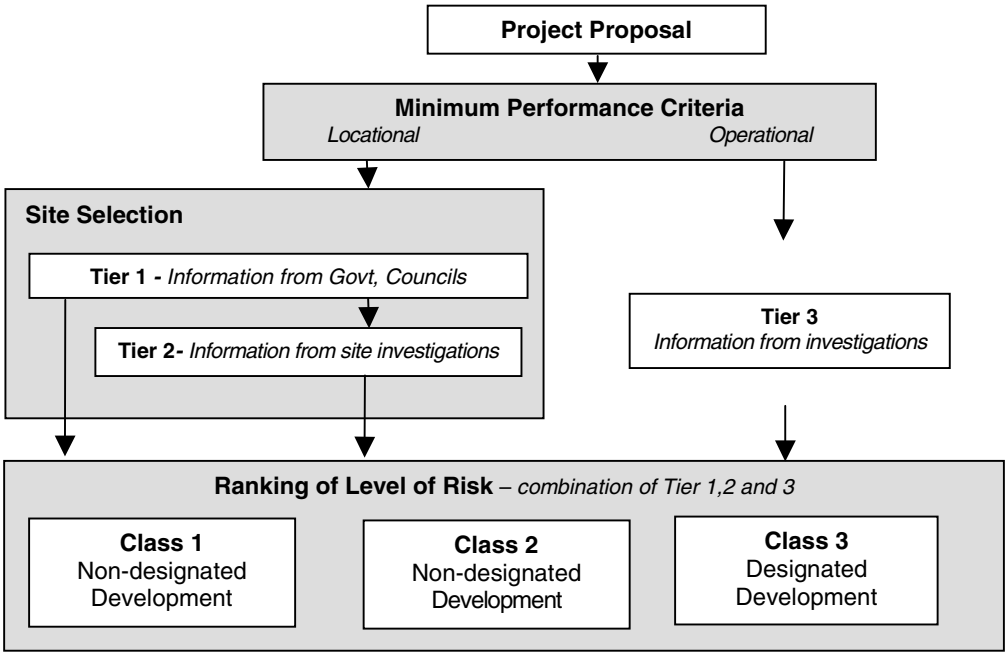
In general, the selection of a site should be based on a thorough knowledge of local and regional hydrology, geology, topography, ecology, climate and weather. While recognising that environmental factors are not the only factor in selecting a site, it is critical that when assessing alternative sites, environmental constraints and the long term costs (associated with environmental management and monitoring) are weighted with other factors such as land and construction costs.

To aid in this process, an assessment framework based on a series of "sieves" has been established to provide a mechanism for determining the likely level of environmental risk associated with any particular site. It includes three locational "sieves":

- The **Minimum Performance Criteria** provides the first environmental sieve for selecting sites and project characteristics. These must be met in order for the project to proceed.
- The **Tier 1** and **Tier 2** Site Selection Criteria in the Project Profile Analysis provides the next two environmental sieves to determine the acceptability of risks.

The Minimum Performance Criteria and Tier 1 criteria are based on information readily available in maps and other sources held by government agencies and accessible usually via a visit or a telephone call. Tier 2 criteria are dependent on information that will result from site investigations necessary to determine the suitability of the site for aquaculture. This assessment is intended firstly for the use for potential investors when considering alternative sites and secondly by approval authorities when deciding the level of risk associated with a project on the site and for determining the level of assessment.

Figure 3. Locational "Sieves" in Project Profile Analysis



The Tier 1 and Tier 2 criteria and other issues that will need to be assessed on their merits are discussed in this section of the strategy. The Tier 1 and Tier 2 criteria are used to rank the level of risk associated with locating an aquaculture enterprise in a particular area and to establish the level of assessment (See *Project Profile Analysis*).

1.3 Minimum Performance Criteria

The Minimum Performance Criteria include locational criteria that land based aquaculture proposals must meet to be permissible development within the Hunter and Central Coast Region.

Minimum Site Location Requirements

	Zoning under local environmental planning instrument
1.	Pond based aquaculture - Within zones listed in Column 2 of Zoning Table.
2.	Tank based aquaculture - Within zones listed in Column 3 of Zoning Table.
3.	Estuarine pond based aquaculture must be located within the green areas on the Estuarine Aquaculture map for the particular estuary.
4.	Conservation exclusion zones Not within: (a) Areas dedicated or reserved under the National Parks and Wildlife Act 1974; or (b) Aquatic reserves or marine parks (other than areas designated as general use zones); or (c) Vacant Crown Land (other than areas used only for access to water provided under a licence).

2. Water Issues

2.1 Water quality objectives

The NSW Government through its Water Reform Program is committed to ensuring the long-term health of the NSW Waterways. This program includes the introduction of a better balance in the sharing of water between users and the environment and reducing the stress on rivers and aquifer systems. Improved water quality and flow regimes are prime objectives for healthier waterways.

The Government has developed a two part complementary process for setting environmental objectives for individual catchments. One part involves an independent inquiry by the Healthy Rivers Commission in individual catchments to recommend longer-term environmental objectives and management strategies. This has occurred in the Williams River and the Hawkesbury Nepean catchments. The other involves the development of interim environmental objectives to guide river management planning with the involvement of Water Management Committees for each catchment.

For each of the Lower North Coast, Hunter and Central Coast catchments, water quality objectives and river flow objectives have been developed. The most relevant of these areas for aquaculture are the estuarine and uncontrolled stream areas. Interim water quality and river flow environmental objectives were released in October 1999 for all catchments within the strategy area. For each catchment a printed booklet is available setting out the interim environmental objectives and associated information. The title of each of the booklets is *Guidelines for Water Quality and River Flow Interim Environmental Objectives, ... Catchment.* The catchment names are listed below. You can order a printed booklet for a specific catchment by telephoning Pollution Line on **131 555** or access the documents on the EPA's website at www.epa.nsw.gov.au/ieo.

- Gosford and Northern Beaches Lagoons Catchments
- Hunter River Catchment
- Karuah River and Great Lakes Catchments
- Lake Macquarie and Tuggerah Lakes Catchments

More localised numerical targets for nutrients and turbidity have not been refined for many water bodies of the State. Until this is achieved, more generic objectives will need to be employed. It is recommenced that general "trigger" values that have been derived for particular water body types in NSW be used. These are values that can be used as an indication of the levels above which adverse effects might be expected. In the absence of rigorously derived and agreed local objectives, these can be used as a proxy for in-stream water quality objectives (see Table 12).

Table 11. Water quality trigger values for water body types in NSW

Water body type	TP	TN	FRP	NH4 -N	NOx-N
	(ug/L)	(ug/L)	(ug/L)	(ug/L)	(ug/L)
Upland River	20	250	15	13	15
Lowland River	50	500	20	20	40
Estuary	30	300	5	15	15

Land based aquaculture facilities such as trout farms have the potential to contribute significant nutrient loads to waterways. It is important that aquaculture facilities are designed and managed to minimise pollutant concentrations and loads in all discharges so that water quality objectives can be met and maintained in receiving waters. In some areas, high nutrient loads might lead to unacceptable deterioration in water quality. In these cases alternative sites should be pursued.

Water quality objectives for estuaries

For all estuaries the water quality objectives included protection of aquatic ecosystems, visual amenity, recreation (primary/secondary contact) and aquatic food (cooked) and commercial shellfish production. The river flow objectives included maintaining wetland and floodplain inundation, manage groundwater for ecosystems, minimise effects of weirs and other structures, maintain or rehabilitate estuarine processes and habitats and maintain natural flow variability.

Ongoing water quality problems occur in estuaries from the nutrients and other contaminants in stormwater and sewage outflows as well as release of highly acidic waters from acid sulfate soils areas. In particular dredging and drainage works on the floodplain continue to result in disturbance of acid sulfate soils with resultant water quality problems. The Shellfish Quality Assurance Program conducts regular monitoring of estuarine water quality as part of actions to support commercial shellfish production.

Water quality objectives for uncontrolled streams

The water quality objectives for uncontrolled streams included the protection of aquatic ecosystems; visual amenity; recreation – primary and secondary contact; water supply – livestock, irrigation, homestead, domestic drinking water and aquatic food (cooked). The river flow objectives included:

- Protection of natural low flows and ponds in dry times;
- Protection of important rises in water levels;
- Maintain wetland and flood plain inundation;
- Mimic natural drying in temporary waterways;
- Maintain natural flow variability;
- Manage groundwater for ecosystems;
- Minimise effects of weirs and other structures.

2.2 Water supply issues

An abundant supply of good quality water available on a permanent basis is essential for land based aquaculture. In evaluating a potential water supply, seasonal changes in quantity and quality must be considered. The cost of purchasing water as well as supplying it to the site may be a major limiting factor to the economic feasibility of a particular site. Pumping costs can be high and should be minimised. Options for gravity flow on a site should be maximised, as it is efficient and cheap. This should be kept in mind when evaluating a site and assessing layout options.

a) Water quality suitable for aquaculture

In evaluating the acceptability of a water supply, consideration could be given to whether the supply is reliable and:

- Free of organic, agricultural or industrial pollution (pesticides, heavy metals)
- Free of suspended particles - need to check particulates - composition (organic and inorganic), size, concentration, likely seasonal variation
- Relatively constant temperature - need to check temperature range (daily and seasonal variations)
- For estuarine farms, relatively constant salinity range - need to check tidal and seasonal salinity, pH and alkalinity variation
- Free of pathogens, trash fish and other undesirable aquatic organisms.

For the production of healthy fish and the maintenance of good water quality on the farm, the source water to be used in the ponds should meet the criteria set down in the ANZECC Water Quality Guidelines (2000 Version soon to be released by the Commonwealth) for protection of aquatic ecosystems and the protection of human consumers of fish and other aquatic organisms. The guidelines give levels of physico-chemical parameters that would be required to maintain a viable natural aquatic community. The ANZECC Guidelines[1] also provide guidance relating to levels of organic contaminants that may cause tainting of the products.

Table 12. Water Quality Indicators for Aquatic Ecosystem

Based on EPA's Guidelines for River, Groundwater and Water Management Committees (1999)

Water quality indicator	Criteria	Comment
Total phosphorus	Rivers and estuaries : 10-100ug/L Lakes & reservoirs: 5-50 ug/L EPA recommendation interim level for estuaries and coastal lakes: 10-20ug/L	Understanding the different forms of P (eg the proportion of P in water that is available for plant growth) is important in managing unfavourable plant/algae response.
Total Nitrogen	Rivers and estuaries : 100-750ug/L Lakes & reservoirs: 100-500 ug/L Current range for estuaries and coastal lakes: 150-300ug/L	Understanding the different forms of N is important in managing of different situations.
Chlorophyll-a	Bays and estuaries : 1-10ug/L Lakes & reservoirs: 2-10 ug/L	
Turbidity	Estuaries and coastal lakes <5 NTU Increase in suspended solids should be limited. <10% change in seasonal mean NTU EPA notes that 5-20 NTU typical in fresh water	Common water quality descriptors < 5 NTU – low turbidity & high clarity 5-25 NTU medium turbidity 25-50 NTU high turbidity >50 NTU very high turbidity
Clarity	For waters deeper than 50% of the euphotic depth, the euphotic depth should not change by more than 10% for an established seasonal norm.	For water shallower than 50% of the euphotic depth, the maximum reduction in light at the sediment bed should be < 20%
Salinity (EC)	Freshwater: < 1500 uS/cm Non-degradation of current levels	
Dissolved oxygen	> 6mg/L or 80-90% saturation, being determined over at least 24 hours (or few days) to establish the diurnal range in concentration)	
pH	Fresh water: 6.5-9.0 Marine waters: < 0.2 pH unit change	Change of more than 0.5 pH units from the natural seasonal maximum or minimum should be investigated
Temperature	< 2°C change in natural temperature levels	
Chemical contaminants	See ANZECC (1992) Guidelines [3]	Waters should be free of pollutants in amounts or combinations that are toxic to humans, animals, plants and other organisms.

If the water supply does not meet these criteria, then an assessment should be made of the potential effect of non-compliance with the parameters is likely to have on the selected species at all stages of the life cycle, e.g. an animal may be able to live and grow in pH of 6.0, but the eggs and larvae may not survive.

In some waterways, the water quality may meet the criteria for protection of the aquatic communities, but not meet the guidelines for human health eg. arsenic may be found at levels of 50ug/l for protection of aquatic communities, but only 0.2ug/l for human health. The reason behind the different standards is the

[1] *Australian Water Quality Guidelines for Fresh and Marine Waters*, National Water Quality Management Strategy, Australian and New Zealand Environment and Conservation Council, Canberra

potential bioaccumulation of some of the contaminants in the organisms. This can potentially increase low levels of contaminant to levels that can cause health concerns in people consuming the product.

Table 13. Metal Contaminant Indicators

Indicator	Aquatic Community		Human Health	Potable
	Fresh water	Marine water		
Arsenic	50.0	50.0	0.02	50.0
Beryllium	4.0	NR	0.1	
Nickel	15-150	15	100	100

b) Estuarine water supply

Tidal exchange

The *Aquaculture Land Suitability Maps* identify sites adjacent to waterways that tend to have water quality satisfactory for an estuarine water supply source. Careful consideration needs to be given to the potential for high levels of freshwater runoff likely to affect salinity, sediment levels, pH, alkalinity and other water quality characteristics. More detailed investigations should be undertaken to determine if there is good tidal exchange and circulation and if the water quality is able to recover quickly to consistent good water quality following rain events.

Preferred location: Tidal flushing time of < 15 days

Tidal amplitude

Water intake sites should be in an area of good water ventilation. Channels which have an exchange due to tidal action of greater than 30 days are considered to have poor exchange. Poorly ventilated areas may be adversely and significantly impacted by adjoining floodgates and land runoff. An indirect measure of ventilation is tidal amplitude. Tidal amplitude is defined as:

MHWN - MLWN

where MWHN = Mean High Water Neap, and
MLWN = Mean Low Water Neap.

This attribute uses tidal plane analysis sheets derived from recording stations situated on the river systems. The data is administered by Manly Hydraulic Laboratories in Sydney. Generally tidal amplitude will diminish further up river systems and where restriction to tidal movement occurs such as narrow / shallow channels and sand bars. Sites with a tidal amplitude of less than 100mm should undergo a full assessment prior to making a decision that the site is suitable in the long term.

Preferred location: Tidal amplitude > 300 mm

Access

The site selection process requires consideration of whether the potential inlet sites will require a change to the estuary channel eg require sump or deepening or other disturbance of the bed of the estuary.

Preferred location: Require no deepening of the estuary for pumping station

Adjacent land and water uses

Sites down stream of land uses likely to result in poor water quality should be avoided, e.g. downstream of sewage treatment works, town storm water overflows, near heavy agricultural pesticide use or high levels of recreational boating activities.

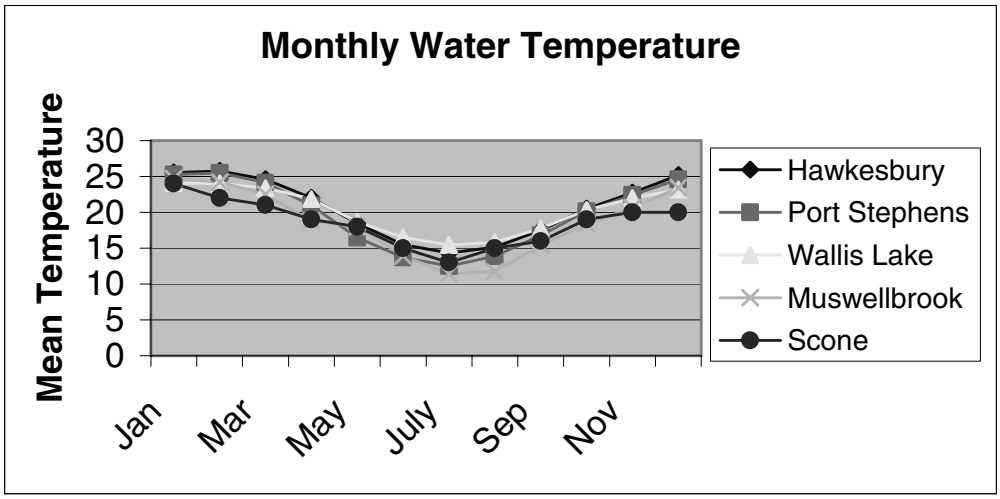
Consideration should also be given to whether the location of inlet and outlet sites are likely to affect the water quality or flows of other water users, in particular whether any changes in water quality are likely to affect oyster growers, aquatic ecosystems and recreational users up stream and down stream of any discharge site.

Preferred location: Not affected by poor water quality or likely to affect other users with poor water quality

c) Water temperature

Water temperature is a key limiting factor in the selection of species and the location of aquaculture facilities.

Figure 4. Average Monthly Water Temperature



d) Pond/tank freshwater supply

Water for freshwater fish farms can be drawn from sources such as streams, on-site dams, underground bore water or town supply providing the relevant permit/entitlement can be obtained. Most streams are now under an embargo, which means that water entitlement in most catchments must be purchased from another water user usually an irrigator. For advice on the availability of entitlements, contact the local stock and station agents or consult www.w*aterexchange.com* on the likely availability of water in the catchment.

In some areas, while access to groundwater is generally embargoed, there are some groundwater aquifers that are not yet under an embargo. In these areas the current level of water usage is relatively small and the environment is not degraded. For these water resources, water licences may be obtained from the Department of Infrastructure, Planning and Natural Resources by application.

Preferred location: Irrigation licence approved or available for water extraction.

It is essential that the stream water quality be evaluated for reliability of flow, demands of other competing users, cost of access, salinity, and other water quality parameters. With ground water supply, reliability of flow, demands of other competing users, vulnerability, salinity, depth and cost of access and quality should be evaluated. Reliability of supply in dry periods is a critical issue in assessing alternative sites. In some systems, water may only available during high flows (when water quality may carry high levels of sediment). For projects with restricted access, an on-site storage and settlement system should be considered.

Preferred location: No access restrictions based on flows in normal conditions.

In addition it is preferable for water pumps to be located in stretches of rivers where modifications are not required to the rivers bed or banks in order to install a pump system which will have reliable access to water.

Preferred location: Require no deepening of the river for pumping station.

It should be noted that a water licence is required to install a pump, construct a levee, divert the river flow or install a bore or piezometer. A licence must also be obtained for the containment of more than 10% of overland flows across a site. However, because of rainfall variability, any venture using rain run-off as the major supply (i.e. catchment and storage in a reservoir on the farm) should seriously estimate the water budget and storage requirements and consider establishing a contingency back-up water supply in the case of extended dry conditions. Under the new Water Act, a licence may be required for a change of use from irrigation to aquaculture.

e) Potable water for processing and other purposes

As well as having a reliable supply of quality water for the pond/tanks, it is also essential that there is a reliable supply of potable water for processing, purging and employee uses. The quantity required will depend on the nature of the operation. The water must meet “potable” drinking water standards set out in the National Drinking Water Standards.

Preferred location: Existing reliable potable water or access to mains water.

f) Multiple use of recycled freshwater pond/tank or processing water

When selecting a site, the potential for multiple use of the water on the farm or by a neighbouring water user should be considered. There could be significant economic and environmental benefits, if a multiple use approach is taken. While water should be recycled and re-used a number of times in ponds/tanks within the farm, it is recommended that other water uses (such as hydroponics, horticulture or irrigated agriculture) be integrated with the operation to allow for regular exchange of water. In some cases it may be possible to on-sell/transfer the recycled water to neighbouring water users. Any irrigation schemes associated with aquaculture should be seen as a substitute for “raw” water and not as wastewater disposal schemes.

g) Avoid drinking water catchment

Sites within an identified drinking water catchment area (e.g. land mapped or nominated as “special or protected areas” by the County Council or water supply authorities) should be avoided.

Preferred location: Site not within a prescribed drinking water catchment

SURFACE WATER ACCESS RULES

Riparian Rights

Riparian Rights only apply to landholders with river frontage. Currently water can only be extracted without a licence for stock and solely for domestic uses. This water is not available for commercial aquaculture production. It is a subsistence right. If the product using this water is to be sold, a water licence should be obtained. This right has been reviewed as part of the new Water Act review and is to be limited to small volumes generally less than 2 megalitres equating to normal house and stock drinking use.

On-Farm Dams

The Dams Policy applies to all landholders who have a right to harvest up to 10% of runoff from their properties without a water licence, metering or charging. Water under the policy can be used for any purpose including aquaculture. The policy applies to dams constructed on hillsides and 1st and 2nd order streams, but not on permanent flowing streams. The 1st and 2nd order streams are defined by the blue lines on the 1:25,000 topographic maps. The amount of runoff varies with rainfall and maps are available from DIPNR for the various regions. Using a self-assessment kit, landholders simply take the harvestable right contour line near their property and multiply it by the area of their property to calculate dam capacities.

Extraction Licences from rivers

All catchments in the Hunter - Central Coast area currently have surface water licence embargoes. No increase in licensed entitlements are available under Sections 10, 13A, 18F, 20B, 20CA or 20L of the Water Act. Much of the aquaculture development is occurring through diversification of existing water licences. Water Management Plans, currently being prepared by Water Management Committees, will establish rules for access to water. Any new application to use water from river extraction can only occur where the volume has been purchased on the water trading market.

2.3 Groundwater

The *NSW State Groundwater Protection Policy (1998)* should be consulted on the principles and issues to be considered relating to groundwater, for example:

- Groundwater quality and vulnerability,
- Threats and protecting the resource, and
- Conservation of water resources.

GROUNDWATER WATER ACCESS RULES

Under Section 116 of the Water Act, anyone using a bore or well must have a groundwater licence. Currently, the alluvial aquifers in the Hunter Catchment, with the exception of Wollombi Brook, are embargoed, and therefore no new water licence applications can be made. The Tomago-Tomaree-Stockton sandbed aquifer system has been nominated for an embargo, with the endorsement of the Tomago-Tomaree Groundwater Management Committee.

Any proposed use of groundwaters in areas possessing acid sulfate soils will need considerable environmental assessment to convince the DIPNR that such extraction will not lower groundwater tables leading to an acid sulfate water issue. The department will generally require a full assessment of any proposed works affecting land mapped as having either vulnerable groundwaters, or significant potential for acid sulfate soils.

Table 14. Assessment regime for groundwater

Situation	Site Selection Assessment required
In areas where groundwater is not vulnerable because of the depth, overlying geology and where there are no obvious sources of contaminants and no ASS present (as indicated in DIPNR Maps)	**No assessment** necessary
In areas which have groundwater of "low" value which may be vulnerable and where there are no obvious sources of contaminants	**A Professional Opinion** is required in relation to the nature of the groundwater resource and the risk the development places on the resource
In areas where there may be a potential risk to groundwater or the environment	**A Desk Study** is required showing the nature of groundwater resource, pollution risk, effect of any barriers to pollution flow, either natural or engineered. Calculations showing level of environmental risks based on existing knowledge of the site
In areas where the desk study indicate that there are potential risks to the environment.	**Limited Site Studies** are required with soil and water testing to establish a baseline and to confirm the characteristics of the resource and to determine the likely effectiveness of barriers or other possible measures (natural or engineered) to protect the resource.
In areas where there are significant risks to quality groundwater as indicated by the desk study or the limited site studies	**Extensive Site Studies** are required with soil and water testing and modelling of the groundwater flows and quality to predict the likely effectiveness of the barriers and other design and planning options to prevent degradation of the resource.

a) Groundwater vulnerability

The quality of the underlying groundwater should not be put at risk by the pond management, in particular where the saline ponds are underlain by fresh water aquifers. Groundwater that may be used for drinking or irrigation supply must be protected from contamination. Of particular concern is the potential contamination of groundwater by nitrogen compounds, salts, chemical contaminants and microorganisms.

The DIPNR has published groundwater vulnerability maps for the Hunter Valley and the Tomago-Tomaree aquifers. No vulnerability maps cover the aquifers of the Central Coast. These groundwater vulnerability maps identify areas where areas could be considered to be high risk in terms of location of ponds.

Technical advice from recognised consultants or the DIPNR should be sought on the suitability of sites and potential impacts on groundwater.

Preferred location: No underlying potable or high quality fresh groundwater within 3 metres.

Where there are risks to groundwater from saline ponds because of the proximity or the vulnerability, the site evaluation should be based on the principles set out in National Water Quality Management Strategy: Guidelines for Groundwater Protection in Australia (ARMCANZ & ANZECC 1995). During the site selection process, baseline groundwater chemistry may need to be established so that monitoring can determine if future deterioration of groundwater quality is occurring as a result of the project.

b) Groundwater and ASS

In areas where there is acid sulfate soils, the management of groundwater is critical in minimising the generation and export of acid into the ponds or neighbouring environment. Preferably the project should lead to no increases in the generation of acid either from the disturbance of acid sulfate soils or the lowering of the groundwater levels. It is critical that there is a clear understanding of the likely implications to any change to the groundwater in terms of acid generation and appropriate measures built into the project to mange the acid generated.

Preferred location: No lowering of the groundwater levels in ASS areas.

c) Groundwater and pond security

In addition to the potential for aquaculture ponds seepage putting the groundwater at risk, the groundwater could also put the successful operation of the aquaculture ponds at risk. Sites with high groundwater are high risk for pond construction and management. It can be difficult to build the ponds and maintain the integrity of the walls where there is high or rising groundwater. If ponds are built in these areas, they may not be able to be adequately drained and dried, steps which are necessary for efficient pond management.

Preferred location: Not located in areas of high groundwater.

2.4 Surface hydrology issues

(a) Tidal issues

When assessing potential sites, the potential increase in the tidal flow and subsequently the tidal prisms in the estuaries and creeks from the inlet/outlet flows should be considered. In addition, consideration should be given to whether the construction and operation of the aquaculture ponds is likely to result in changes in the tidal inundation patterns on nearby land or wetlands.

(b) Flooding issues

Sites that are flood prone should be avoided. If unavoidable, then a detailed risk assessment should be undertaken. As well as the risk to the investment from flooding of ponds, tanks, plant and equipment and the loss of stock, these sites pose a potential risk to the environment if there is an escape of non-indigenous fish species, disease or nutrient enriched waters.

Preferred design: So ponds/raceways/tanks not flood liable
– Freshwater above PMF
– Estuarine above 1:100

In addition the construction of banks, levees or above ground ponds which are likely to affect flood flows patterns can pose an increased risk to neighbours and possibly the catchment flood mitigation controls. Prior to the selection of a flood prone site, an analysis of the catchment flooding implications should be undertaken and discussed with DIPNR and Local Council.

Preferred location: No potential for flood management measures to effect passage of flood waters or neighbouring properties

(c) Stormwater issues

In addition to flooding impacts, consideration should be given to the effect on local stormwater issues. The sites within a stormwater drainage passage can result in problems for management and maintenance of the facilities as well as local flooding problems for neighbouring properties. It is preferable that there is no major stormwater drainage across to the site. If unavoidable, there should be sufficient space to design measures to manage the flows so as not to affect neighbouring properties or ecosystems.

Preferred location: Not located on a local stormwater drainage channel

(d) Waterway protection

The site should provide for adequate setback or separation between the facility and any natural waterbodies so as to avoid disturbance of riparian vegetation, to allow for natural hydrological processes and to avoid accidental contamination during storm events if there is an incident. It should be noted that areas adjacent to creeklines and waterways often have a high potential to contain Aboriginal sites. With indigenous species, there should be capacity to have at least 50 metres distance between the ponds/tanks and the waterways. With barramundi the set back is required for both grow-out and effluent culture units.

Preferred location: All ponds > 50 metres from the top of the high bank.

3. Elevation and Topography

a) Elevation

For estuarine ponds, the height above sea level of land is a good indicator of a number of important factors such as:

- Land above 2m AHD is less likely to contain acid sulfate soils and land below 1m AHD is likely to have significant acid sulfate soils issues
- Ponds on land located higher than 10m AHD will involve expensive pumping costs
- Tidal and flooding inundation is likely to occur on land below 1m AHD
- Ponds on land below 1m AHD are likely to have problems with draining and drying and ASS.

Preferred location: Estuarine ponds must be on land located within the green areas on the Estuarine Aquaculture Maps.

b) Landform

Preferably, the land should be relatively flat with few undulations or sloping gently. The slope of the land will influence the most economical dimensions for the ponds and the drainage system. It is preferable that the site will allow for the location of a water recycling dam below the growing ponds for ease of drainage and treatment and should be constructed so as not to cause scouring.

Greater emphasis need to be placed on the topography of the site for high security species with translocation concerns.

Preferred location: Slope should be : less than 2% (estuarine);or
less than 5% (freshwater).

The topography can also be an important factor if pond discharge water is to be used on site for irrigated crops. Attached is a table of characteristics to be considered in assessing site. NSW Agriculture Advisory Bulletin No. 14 *Landform and soil requirements for biosolids and effluent reuse* (NSW Agriculture, 1998) contains further information on landform assessment and requirements for effluent reuse.

Table 15. Landform Requirements for Irrigation Systems

	Limitation			Restrictive Feature
	Slight	Moderate	Severe	
Slope for				Excess runoff and erosion risk
• surface or underground	<1	1-3	>3	
• sprinkler	<6	6-12	>12	
• trickle/microspray	<10	10-20	>20	
Flooding	None or rare	occasional	frequent	
Land form characteristics	Crests, convex slopes and plains	Concave slopes and footslopes	Drainage lines and incised channels	Erosion and seasonal water logging risks

4. Soil Characteristics

4.1 Selecting sites for ponds or dams

a) Soil characteristics

The soil characteristics of the site will influence construction costs as well as long-term maintenance and management costs. The availability of suitable soils will determine the type of embankment to be constructed and the construction methods. Advice on the suitability of soils for pond construction should be sought from appropriate authorities such as the soil specialists at the Department of Infrastructure, Planning and Natural Resources (DIPNR). In many cases, DIPNR may have available relevant soil survey information or maps to provide detailed information on the soil characteristics of particular sites. In other cases, some soil survey work may need to be undertaken to provide adequate Tier 2 evaluation information.

With high security species, particularly those with translocation concerns, the assessment of the suitability of the soil for pond or dam construction is essential.

Preferred location: Soil clayey (soil/sand mix) with low erosion potential.

As ponds and water storage/recycling dams should be constructed of impervious soils to eliminate or reduce the loss of water by seepage, sites with clay or clay loam soil characteristics are ideal. Ponds can be constructed in sandy or other porous soils but the cost of lining the bottom and sides with clay will add a significant extra cost to construction. It is preferable that at the Project Profile Analysis Tier 2 evaluation phase, sufficient site data should be available to determine if there are likely to be any gravel or sand layers, rock strata and other soils characteristics that may interfere with water-holding qualities and hence add to the costs of construction.

When evaluating the site for saline pond culture in areas with highly permeable soil, the risks of infiltration of saline water into any underlying groundwater should be considered at the Tier 2 assessment. In areas where the underlying groundwater is fresh, the site should be considered to be high risk.

For sites with highly dispersive or flocculative soils, additional erosion controls and other measures to prevent dam wall failure through "tunnelling" will need to be factored into the costs. Dam liners are recommended.

b) Soil contamination

The previous land use is also a risk factor that should be considered. If the land was previously used for crops, the soil should be tested for accumulated pesticide residues. Soil contaminated with agricultural chemicals organophosphate, carbamates and synthetic pyrethroids should be avoided. Pesticide use in the Hunter and Central Coast catchments is likely with beef and dairy (dips), vines, fruit trees, horticulture crops, maize, potato, soy bean and weed control.

Preferred location:	No soil contamination from previous land uses or remediated so suitable for residential or animal occupation.

c) Acid sulfate soils

In estuary areas, high-risk acid sulfate soils (ASS) should be avoided on two counts. Firstly, the disturbance of the sulphidic material could result in the production of acid damaging to the aquaculture operations as well as to the surrounding environment. Secondly, sulphidic muds have poor load bearing characteristics and could subside under load once ponds are filled. In addition, the effect of "loading" and "unloading" of these types of muds can lead to pond wall instability and leakages.

The ASS Risks Maps provide details on the likely risks that acid sulfate soils are present given the broad range of soil characteristics. In addition these maps provide information on elevation and soil/landscape characteristics. The risk approach in the ASS Maps provides a useful tool for identifying areas where aquaculture ponds could be high risk, where the risks are more easily managed and areas where there is nil risk. Any likely sites on ASS soils should be evaluate using methods in the ASS Manual (ASSMAC).

Preferred location:	Where there are no acid sulfate soils, or ASS Landform Process Class A with Landform Element class b, l, t, p, y or w

4.2 Soils for irrigating recycled water

If irrigation of recycled pond water or processing wastewater is proposed the suitability of the soil for crops or tree plantations should be considered. Factors such as fertility, permeability and slope should be taken into account in the context of the method of irrigation and the type of crop. All relevant soil characteristics should be fully established when designing an irrigation system. In some areas, site and soil characteristics will be unsuitable for receiving irrigation water from aquaculture facilities. In these cases alternative sites and/or approaches might need to be pursued. NSW Agriculture Advisory Bulletin No. 14 *Landform and soil requirements for biosolids and effluent reuse* (NSW Agriculture, 1998) contains further information on landform assessment and requirements for effluent reuse.

Preferred location: For freshwater recycle systems, soil suitable for irrigated agriculture.

Table 16. Soil requirements for irrigation systems

Property	Limitation			Restrictive Feature
	Slight	Moderate	Severe	
Exchangeable sodium percentage (ESP, 0-40 cm)	< 5	5 - 10	> 10	Structural degradation and waterlogging
Depth to top of seasonal high water table (m)	> 3	0.5 - 3	< 0.5	Wetness, risk to groundwater
Depth to bedrock or hardpan (m)	> 1	0.5 - 1	< 0.5	Restricts plant growth, excess runoff, waterlogging
Excessive drainage	highly structured soils, sandy loams, other soils		fine to coarse sands	Risk to groundwater from nutrients
Poor drainage	poorly structured clay loams, other soils		Hardpans, poorly structured clays	Potential for restricted plant growth and runoff

SOIL SUITABILITY FOR IRRIGATION

Soil salinity

Soil salinity refers to the amount of dissolved salts in the soil solution. Soil salinity levels are usually determined by measuring the electrical conductivity (EC) of a soil suspension, which estimates the concentration of soluble salts in the soil. High concentrations of soluble salt in soil are not desirable for most plants and also affect land use and increase potential for soil erosion.

Soil sodicity

Soil sodicity refers to the amount of exchangeable sodium cations in the soil and is expressed in terms of exchangeable sodium (Na) percentage (ESP) or Sodium adsorption ratio (SAR). Dispersion is associated with sodicity levels. For practical purposes, soil or water sodicity is the measurement of sodium ions in soil or water relative to calcium and magnesium ions.

Cation exchange capacity

The cation exchange capacity (CEC) of a soil is the total number of cations it can retain on its adsorption complex at a given pH. CEC is a major factor controlling soil structure, nutrient availability for plant growth, soil pH and the soil's reactions to fertilisers, contaminants and other soil ameliorants. Soils with a low CEC may be improved by the addition of organic matter.

Exchangeable cations

The principle exchangeable cations in soil include Ca2+, Mg2+, K+, Na+ (exchangeable bases), and H+ and Al3+ (exchangeable acidity). It is common practice to measure the concentration of these five most abundant cations and express them individually as a percentage of the CEC.

Desirable levels of major soil cations for many plants

Cations	% of CEC
Calcium	65-80
Magnesium	10-15
Potassium	1-5
Sodium	0-1
Aluminium	<5

Source: NSW Agriculture and Fisheries (1989)

Soil nutrients

Soil nutrient concentrations should be determined before establishing an irrigation scheme, since they can influence the amount of additional nutrients that can safely be applied in the discharge or waste water. The composition of nutrients taken up by the crop may also be determined at key stages of crop growth to ensure that nutrient balance is maintained.

Soil phosphorus

Most unfertilised Australian soils contain less than 0.02% phosphorus. Much of it is immobilised in forms not readily available to plants such as organically bound P and insoluble mineral P. There are three main sinks for phosphorus within an irrigation area: soil adsorption, organic matter and plant uptake. Soil minerals can adsorb inorganic orthophosphate ions. The amount of P adsorbed at a given P concentration over a fixed period of time is known as phosphorus sorption capacity (PSC). The soil's capacity to immobilise available P depends on the concentration of hydrous oxides of iron and aluminium, and calcium carbonate and their relative surface areas. Soils high in such oxides tend to have high adsorption strength.

Soil nitrogen

Nitrogen is the nutrient required in the largest amounts by a crop. The addition of N to soils in excess of the agronomic rate of N uptake at a crop site results in the potential for NO_3-N contamination because NO_3-N is not easily adsorbed by the soil particles and will move downward as water percolates downward through the soil profile.

Organic matter

Organic matter has an important effect on soil fertility. Considered the "life blood" of productive soil, it is both living (microorganisms) and decaying matter. It plays a crucial role in improving soil structure, recycling and storing plant nutrients, holding water and buffering changes in acidity and alkalinity. The organic matter content in soil may range from 1-10% by weight, depending on the soil type, soil moisture content and type of vegetation grown. When land is cleared and cultivated, the organic matter content of the soil becomes depleted. Over time, fertility will become exhausted unless this organic matter is replenished. Around 75% of Australia's surface soils have less than 1% organic matter.

5. Local Climate and Air Quality

The local climate can be an important factor in site selection.

Growing cycle

The seasonal variation in air and water temperature can have a significant impact on the growing cycle of many aquaculture species and should be considered in evaluating alternative sites within the Hunter and Central Coast region. (See *Water Temperature*)

Design and construction issues

The prevailing wind direction and air movement patterns along with the local topography should be considered as consistent air circulation assists in the aeration of the ponds. In evaluating sites, rainfall patterns including storm intensity, timing and frequency need to be considered in terms of their impacts on the design of ponds, dams, stormwater drains and flood management facilities. Seasonal climatic patterns including severe storm events should be considered in construction timetables as they could add significantly to the construction costs and environmental management measures for some sites.

Effect on environmental performance

Noise and odour impacts are likely to be more of an issue in areas that experience local temperature inversions, particularly where there are existing odour or noise issues from other industries. The existence of other industries with the potential for cumulative impacts in the air catchment should be considered at the site selection stage.

Effect on irrigation schemes performance

Temperature, humidity and wind patterns will affect plant growth, evapotranspiration or crop water use and hence will have a bearing on the design of irrigation schemes to use the discharged pond water. Ideally, a location where monthly evapotranspiration consistently exceeds net monthly rainfall provides the best climatic regime for effective irrigation schemes. High rainfall areas are acceptable, provided adequate storage is available.

6. Ecological Factors

6.1 Terrestrial ecology

The existing land use and vegetation on the site is an important factor in evaluating potential sites. Sites should be selected so as to minimise the need to clear native vegetation including native grasses. If more than 2ha of native vegetation is to be cleared, generally a consent will be required from DIPNR.

Recent vegetation mapping undertaken for the Lower Hunter and Central Coast Regional Environment Management Strategy provides information to assist in identifying important vegetation communities. Regional Vegetation Management Committees are currently being established to prepare Regional Vegetation Management Plans for the Hunter and Central Coast. These plans, when prepared, will outline requirements with regard to the regulation, management and conservation of native vegetation. The vegetation mapping and the Regional Vegetation Management Plans (once prepared) will assist in identifying vegetation communities of importance.

Preferred location: No native vegetation present on the site or if present, no disturbance of the native vegetation is required.

6.2 Aquatic ecology

The risks to native species within the catchment from the escape of stock or disease from the water exchange (estuarine only) or from flooding should be considered when selecting a location. These issues are considered in the Species Selection section. However they are also listed here as a site selection factor as the preferred species may have locational constraints.

Preferred location: Species indigenous to the catchment and if not, then consistent with the Department of Primary Industries Translocation Policy.

With estuarine sites, consideration should also be given to the likely risks to native aquatic species from the location of intake and outlet systems or from overtopping during flooding which could result in the escape of stock or release of disease. This could be a particular constraint if the site is near oyster farms or important fish nurseries or habitats.

Preferred location: No likely disturbance of mangroves or aquatic habitat.

6.3 Predators

The feeding, breeding, roosting or migratory activities of birds in the vicinity of potential sites should be evaluated for the potential for conflict with the management of the ponds. Sites near areas where predator birds congregate should be avoided as the long-term costs in terms of loss of fish or in mitigation measures can be very significant. (See *Planning and Design* section for a more detailed discussion on avoidance of predator problems and predator management). Water rats can also be nuisance predator.

Preferred location: Not adjacent to wetlands or other likely habitats of predator species.

6.4 Threatened species

In the *Threatened Species Conservation Act 1995* and the *Fisheries Management Act 1994* include lists of threatened species, population and ecological communities and critical habitats that are protected under these Acts. The DEC maintains a GIS database of information on the flora and fauna of NSW - *Atlas listing of Fauna and Flora Records in NSW* (Contact: Data Licensing Officer (02) 9585 6684).A search of the *Atlas of NSW Wildlife* (which only contains species and not populations or communities) may be undertaken for the study areas to provide an early warning of the occurrence of threatened wildlife species, on or near the site. The *Atlas of NSW Wildlife* does not, however, represent a comprehensive list of threatened species in an area and there may be unrecorded threatened species present. Councils may also have lists of species, population and ecological communities occurring in their local government areas as a result of studies undertaken in the preparation of local environment plans or other strategies. In addition Council may be aware of 8 Part Tests or Species Impact Statement (SIS) prepared by other applicants on nearby land which could provide useful data.

As with terrestrial ecology, consideration should be given to whether threatened aquatic species, populations or communities and their habitats are likely to be affected. Department of Primary Industries should be contacted to determine if any threatened species, populations or communities have been recorded occurring in the particular estuary or river.

At the site selection stage, it may not be necessary to undertake a full 8 Part Test (necessary prior to lodging a Development Application to decide if a SIS is required), but the general issues in the 8 Part Test should be considered when evaluating different sites.

Preferred location: No impact on threatened species, populations or ecological communities or their habitats or critical habitat listed under the Threatened Species Conservation Act or the Fisheries Management Act.

THE 8 PART TEST

The following factors must be taken into account in deciding whether there is likely to be a significant effect on threatened species, populations or ecological communities, or their habitat:

a) in the case of a threatened species, whether the life cycle of the species is likely to be disrupted such that a viable local population of the species is likely to be placed at risk of extinction;
b) in the case of an endangered population, whether the life cycle of the species that constitutes the endangered population is likely to be disrupted such that the viability of the population is likely to be significantly compromised;
c) in relation to the regional distribution of the habitat of a threatened species, population or ecological community, whether a significant area of known habitat is to be modified or removed;
d) whether an area of known habitat is likely to become isolated from currently interconnecting or proximate areas of habitat for a threatened species, population or ecological community;
e) whether critical habitat will be affected;
f) whether a threatened species, population or ecological community, or their habitats, are adequately represented in conservation reserves (or other similar protected areas) in the region;
g) whether the development or activity proposed is of a class of development or activity that is recognised as a threatening process;
h) whether any threatened species, population or ecological community is at the limit of its known distribution.

6.5 Conservation sites

Impacts on sites of high conservation value should be avoided. Conservation sites include:

- ***Coastal Rainforest*** especially SEPP 26 – Littoral Rainforest and ***Wetlands*** especially SEPP 14 – Coastal Wetlands and any RAMSAR wetlands, riparian vegetation, mangroves, seagrass beds. Currently Myall Lakes National Park (including Corrie Island and Little Broughton Island Nature Reserves) and Kooragang Nature Reserve are the only listed Ramsar Wetlands in the Hunter and Central Coast Region. However it should be noted that **Important Wetlands In Australia** (Briggs) list Barrington Tops Swamps, Myall Lakes, Port Stephens Estuary, Wallis Lakes and adjacent estuarine islands and Shortland Wetlands Centre. Your local council should be consulted as it may have also identified wetlands within its area that are considered to be of high local conservation value.
- ***Habitat of Migratory Species*** protected under CAMBA and JAMBA international agreements. The full list of species can be seen on the Internet. They include CAMBA species such as Cattle Egret Bubulcus ibis (Ardeola ibis), Great Egret (Egretta alba), Eastern Reef Egret (Egretta sacra), Glossy Ibis (Plegadis falcinellus), White-bellied Sea-eagle (Haliaeetus leucogaster) and Sarus Crane (Grus antigone) and JAMBA species such as Red-faced Cormorant (Phalacrocorax urile), Oriental White Stork (Ciconia ciconia

boyciana), Japanese Crested Ibis (Nipponia nippon), White-tailed Sea Eagle (Haliaeetus albicilla albicilla), Steller's Sea Eagle (Haliaeetus pelagicus pelagicus), Goshawk (Accipiter gentilis fugiyamae) and Japanese Crane (Grus japonensis).

- ***Critical Habitat*** declared under Part 3 of the *Threatened Species Conservation Act 1995*.
- ***Protected areas*** which include all lands managed by the DEC and protected under the *National Parks and Wildlife Act 1994* such as National Parks (including marine park extensions e.g. Bouddi National Park), Nature Reserves, Historic Sites, Aboriginal Areas, Karst Conservation Areas, State Recreation Areas and Regional Parks.
- ***Wilderness Areas*** declared under the *Wilderness Act 1987*.
- ***World Heritage Area*** of the Barrington Tops National Park which is part of the Central Eastern Rainforest Reserves World Heritage Area. This World Heritage property includes all major protected areas of rainforest in north east NSW and south east Queensland. Please note that a project does not need to be in or adjacent to a World Heritage Area to have an impact e.g. development in a catchment of World Heritage Area could significantly alter water quality and quantity in the World Heritage Area.
- ***Marine Parks***: At present there are no marine parks in the Hunter and Central Coast region. A marine park in the Port Stephens area is under investigation by the Marine Parks Authority. The zoning of marine parks permits aquaculture where it can be demonstrated that the activity is environmentally sustainable and does not impact adversely on the marine park environment or its flora and fauna. The zoning plan for each park, and the consultation process involved in its development, will determine where and when aquaculture (and any other similar activities) will be permitted.
- ***Aquatic Reserves:*** Fly Point – Halifax Park Aquatic Reserve, Port Stephens (approximately 80 ha) is the only aquatic reserve in the Hunter and Central Coast Region. This popular diving and snorkelling site includes seagrass, kelp, sand and rocky reef habitats on the ledges at Fly Point and the bomboras at Halifax Park which contain overhangs and crevices inhabited by many different fish. It provides protection for important sensitive fish habitat as well as providing unspoilt natural sites for recreation, eduction and research. Line fishing is permitted in the reserve though disturbance of marine vegetation or habitat is prohibited.

Preferred location: Not located adjacent to or with the potential to impact on conservation sites

7. Native Title Issues

An aquaculture proposal relating to Crown Lands subject to a Commonwealth Native Title Claim/NSW Aboriginal Land Claim Applications can not proceed until the claims are resolved. The Native Title Claims can take long periods to resolve.

Most vacant Crown Land on the Hunter and Central Coast is now under one claim or more. Generally, claims under the NSW Land Rights Act are granted unless an essential public use of the lands can be proven. Department of Lands (DL) can provide information on those areas that are presently under claim.

Aquaculture applications that need to cross Crown Land (subject to either of these claims) to gain access to water supply, should be avoided unless agreements can be made with the claimants. However, unless the works are likely to adversely affect the estuary, it could be expected that the claims would be unlikely to stop access across Crown Land to waterways.

8. Heritage Issues

If the land was previously cleared and used for agriculture it is less likely that heritage items will be located on the site. The heritage significance of any built and non-built items on the site should be considered at the site selection stage to reduce delays later associated with gaining approvals to change the heritage significance of an area. Generally a 2-step process should be followed if heritage items are suspected of occurring on the site:

Step 1: collate information from the following sources:

i) consult relevant heritage or historical research on the area

ii) consult with the local council, the Aboriginal community (DEC can provide relevant contacts) and local historical societies

iii) inspect existing heritage registers, databases or lists including :

- in LEPs and REPs for relevant heritage issues
- in Heritage Studies prepared by a local council
- on State Heritage Register for items protected under the Heritage Act or subject to Interim Heritage Orders or s.136 Orders.
- on the National Trust Register
- on DEC Aboriginal Heritage Information Management System,
- in Shipwrecks Atlas (if affecting an estuary or its banks),
- on Register of the National Estate (Australian Heritage Commission).

Note: The Heritage Office maintains a computerised *State Heritage Inventory* with listings of items protected under the Heritage Act and LEPs and REPs that can be searched on www.heritage.nsw.gov.au.

Step 2: survey the area likely to be affected, to identify any items of potential heritage significance.

- Reference should be made to the *Aboriginal Cultural Heritage Standards and Guideline Kit* for guidance on methodology for surveying, identifying and assessing the importance any Aboriginal sites
- Reference should be made to the *NSW Heritage Manual* 1996 for guidance on methodology for surveying, identifying and assessing the importance of any non-Aboriginals sites.

8.1 Aboriginal heritage

Aboriginal sites or items have been recorded across the landscape in the Hunter and Central Coast area. Other cultural values may also be associated with this landscape, such as traditional uses of an area, eg. a ceremonial area, a historic event or place, and/or contemporary values such as access to wild resources. Areas that are adjacent to creeklines and waterways often have a high potential to contain Aboriginal sites. A search should be undertaken of the DEC Aboriginal Heritage Information Management System (AHIMS) to determine whether any Aboriginal sites have been recorded on or adjacent to the proposed land. If the search of the AHIMS yields no sites, it does not necessarily mean that there are no sites present. The AHIMS is, nevertheless, an important first step. The State Heritage Inventory should also be checked as Aboriginal sites may also be protected under the Heritage Act. Early consultation with the local Aboriginal community and/or Land Council could also provide valuable information on the area and the likely occurrence of Aboriginal sites.

The DEC charges a fee for each search of the AHIMS (Contact: 02 9585 6471). All search requests should clearly identify the land and state the reason for the request, i.e., to accompany an aquaculture application in accordance with the Hunter and Central Coast Sustainable Aquaculture Strategy. The results of the search will be forwarded along with advice on the level of Aboriginal heritage assessment required. In determining the appropriate level of assessment, the DEC considers a range of factors including:

- the results of the DEC Aboriginal Heritage Information Management System search;
- reference to general archaeological models relating to Aboriginal site locations within a given area; and
- the views of the local Aboriginal community.

Applicants should at the time of making a request with the DEC Aboriginal Heritage Information Management System also forward a letter of notification to the Aboriginal groups in the area. The DEC can advise of the relevant Aboriginal groups. This letter should include a copy of the relevant 1:25,000 topographic map clearly illustrating the area of the proposal and a brief description of works proposed. The letter should request notification of the presence of any Aboriginal sites on the property and further discussions with the group should Aboriginal sites be present which require active management.

Under the Integrated Development Approvals (IDA) process the DEC can require up to an additional 46 days to consult with Aboriginal communities, organisations or Land Councils after the development application has been lodged prior to issuing general terms of approval, if it is considered by DEC that a relic or Aboriginal place is likely to be disturbed. As a result it is wise to consult the relevant Aboriginal communities early in the site selection and evaluation process to determine if there are any major constraints on the site relating to Aboriginal heritage issues.

A survey may need to be undertaken by an appropriately qualified and experienced heritage person in consultation with the relevant Aboriginal community group/s to identify and record any sites, places of cultural significance or other values that the place has to the Aboriginal community. The significance of any places or values that are recorded should be assessed, and appropriate management options developed. Places of high significance should be conserved in-situ wherever possible.

Preferred location: Site does not contain any recorded Aboriginal sites, places or values of significance to the Aboriginal community and if Aboriginal sites, places or values are present the project will not impact on these.

8.2 Non-Aboriginal heritage

For non-Aboriginal heritage, if there are any potentially historic or cultural items on the site, the LEP and REP should be check along with the State Heritage Inventory and Heritage Commission lists (Commonwealth) and the National Trust register to determine if the item is already listed for protection.

If not, the heritage significance should be considered. It may be appropriate to engage an appropriately qualified and experienced heritage expert. If in doubt, council officers and/or the NSW Heritage Office should be contacted regarding the appropriate provisions for the identification, assessment and conservation of heritage items.

Preferred location: Site does not contain any heritage items identified in LEP Maps and if present the project will not affect the significance of these items

9. Amenity Issues

Conflicts commonly arises when there is a perception that the amenity of residents or recreational users is likely to be threatened by impacts such as poor water quality, highly visible industrial structures, odour from the management of sludges or dead fish or disturbance from noisy pumps or other activities.

In the evaluation of sites, the compatibility of aquaculture activities with surrounding existing or future land and water uses should be considered. For example in some areas

- there may be concerns that if aquaculture was located on a particular site, there could be risks to the heritage significance of the adjacent properties, buildings or sites.
- there could be concerns that the amenity of the area could be compromised from noise, air and water emissions.
- there could be concerns that the visibility of the sheds, ponds and other plant on the site could affect the visual quality of the landscape of the area.

Preferred location: Site not overlooked by neighbours or from a prominent vantage point (e.g. major highway).

These issues should be considered in the evaluation of sites. Potential site options for reducing or preventing conflicts should be considered, in particular, the range of management options to prevent off-site impacts.

Preferred location: No residences within 400 metres of the ponds or pumps or 200 metres of tanks (if not in an industrial zone)

If there is likely to be conflict, consideration should be given to acquiring sufficient land to provide adequate on-site separation from nearby houses as it can help maintain good relationships with the neighbours in the longer term and will provide sufficient land for flexibility in management of the facility in the long term.

10. Strategic Landuse Planning Issues

It is essential that discussions be held early with local council and Department of Lands (if Crown Land may be involved in or adjacent a proposal) to understand the future strategic land use direction of the area. Sites in “stable” agricultural areas (or industrial areas for tank production) are preferable.

Preferred location: Neighbouring land uses compatible with aquaculture

10.1 Future residential areas

Areas in transition from agriculture to rural residential or urban areas carry long term risks. For example, the long term viability of aquaculture should be questioned in relation to sites in areas where council has indicated that they are proposing an adjacent or overlooking residential land release area or adjacent to land where the land owner has or is applying to rezone the land for rural residential.

In these circumstances, careful consideration should be given to whether future conflicts could occur which could result in costly additional mitigation measures being required or pressure being brought to bear to encourage the aquaculture enterprise to move. It is preferable that the Council’s long-term land use

strategy be consistent with the long-term aspirations of the aquaculture enterprise on the preferred site.

10.2 Agricultural land issues

Aquaculture is recognised as an increasingly important food production industry with potential to provide diversification for farmers on the Hunter and Central Coast. However because prime agricultural lands (i.e. class 1,2, 3 agricultural lands) are a limited resource, the use of these lands for aquaculture should be carefully assessed on its merits, taking into consideration the full implications given the socio-economic and environmental factors.

In the majority of circumstances, potential sites for pond culture (and some tank culture) will be currently under agricultural use. In evaluating these sites, consideration should be given to:

- The previous land use and the potential for soil contamination leaching into the ponds. If there were pesticides, fungicides, nemocides or herbicides used on the site or adjacent land, appropriate soil analysis should be undertaken early in the site evaluation process, as sites with significant soil contamination should be eliminated from further consideration.
- The compatibility with surrounding land use and potential for chemical contamination from the use of chemicals sprays. If there is to be regular chemical use especially involving aerial spraying or fogging adjacent or near a potential site, the site should be avoided. Reliance on neighbouring land to provide a buffer is not acceptable, as the neighbouring land use may change and result in incompatible adjacent landuses in the future. It should be noted that aerial pesticide spray drift can be detected up to between 1 and 5km from the target crops under prevailing winds.
- If prime agricultural land (e.g. class 1, 2 or 3), alternative use for agricultural production taking into consideration economic factors. It should be noted that for fresh water aquaculture, it is an advantage to have nearby potential users of discharge water e.g. for hydroponics, horticulture, orchards, vineyards or lucerne.
- The likelihood of the land being returned to agriculture or other viable land uses should the aquaculture enterprise fail. If the land is prime agriculture land then the practicality of returning the land to agriculture if aquaculture should fail or not be continued should be considered at the outset.

Preferred location: No pesticide spraying within 1km

10.3 Oyster growers and other water users

Good water quality is of great importance to all aquaculture enterprises, particularly those located in the waterway such as oyster farms or caged fin fish culture. These enterprises must be considered in the selecting of sites and the location of inlet and outlet facilities associated estuarine aquaculture.

Preferred location: No inlet or outlet facilities so as to affect the water quality of other water users especially oyster growers.

10.4 Potential cumulative impacts

If similar industries cluster in a catchment, there is a likelihood of cumulative impacts arising. For example, if a number of industries or activities discharge water with nutrients into a waterway, though the impacts of individual activities may not be significant, their combined impacts could be. Aquaculture like other industries will contribute to cumulative impacts. The likelihood of cumulative impacts occurring in sub-catchments or catchments should be anticipated and avoided.

Table 17. Potential Contributing industries/activities to cumulative impacts

Potential cumulative impact	Examples of Contributing industries/activities to cumulative impacts
Water quality - sedimentation	agriculture, urban development, storm water, forestry, estuarine aquaculture, road works
Surface water quality - nutrients	agriculture, sewage treatment & stormwater, manufacturing, estuarine aquaculture
Sub-surface water quality	agriculture, manufacturing, aquaculture, sewage treatment and the disturbance of ASS soils.
Water supply usage	agriculture, urban development, aquaculture, manufacturing industry
Disturbance of ASS	agriculture, urban development, estuarine aquaculture, road works, manufacturing industry
Aquatic diseases	aquaculture, fishery activities, stress from poor water quality especially ASS discharge
Land clearing – loss of vegetation & habitats	agriculture, urban development, forestry, aquaculture, road works
Noise & odour	agriculture, urban development, aquaculture, sewage treatment

11. Practical Locational Issues

11.1 Size of the site

Small sites can result in management problems that can ultimately put the sustainability of the aquaculture enterprise at risk. For a site to be acceptable for a fish farm, it should be large enough for current production needs plus for future expansion. Depending on the type of facility there should be adequate space for the following facilities to be laid out so that there can be efficient movement on the site:

- growing facilities: ponds and/or tanks
- spawning and/or hatchery facilities/laboratory complex
- cold storage and packing and possibly processing sheds
- water storage tanks/dams
- pond/tank water recycling and reuse facilities including storage dams
- waste management facilities – dead fish, sludges, processing waste water, sewage, etc.
- management and staff facilities
- roadways, loading docks, carparks
- tourist facilities if relevant.

The site should be large enough to provide adequate distance between noise and odour generating activities such as pumps, ponds and waste storage areas, and any neighbouring residential or community areas. This should provide for the level of odour, dust or noise beyond the site boundary to be kept to an acceptable level. In some prominent locations, it may be desirable for allowance of sufficient space for landscaping along the boundary fence as a visual barrier.

11.2 Availability of services and other practical matters

Other important practical factors that must be considered include:

- Availability of electricity (3 phase in sufficient quantity and price) and its proximity to the site.
- Availability of vehicle access to the site and transport networks. Does the site provide for safe truck entry and exit?
- Proximity of markets – are there local niche markets; are there efficient transport options to Sydney, Newcastle or Brisbane?
- Availability of a reliable source of stock, feeds, and other supplies. Is the site well located in terms of hatcheries?
- Availability of suitable labour to operate the farm. Is the local TAFE offering training courses to increase the skill base?
- Ability to secure the site against poaching and sabotage?
- Proximity to processors?

Preferred location:	Access and services available or readily connected to the site.

11.3 Access and location for tourists

If an aquaculture facility is to be developed as a tourist attraction then site aspects such as ease of access, prominent location and integration with other tourist facilities or routes need to be considered. Local tourist authorities may be able to assist in identifying the tourism potential of a site.

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Planning and Design

Hunter and Central Coast Sustainable Aquaculture Strategy
Land Based Aquaculture

A NSW Government Initiative

Hunter and Central Coast Sustainable Aquaculture Strategy

A NSW Government initiative of Department of Primary Industries, Department of State and Regional Development, Department of Environment and Conservation, Department of Lands, Department of Infrastructure, Planning and Natural Resources and NSW Premiers Department to encourage sustainable aquaculture in New South Wales.

Planning and Design

Table of Contents

1. Good planning and design are *Key* elements

Land-based aquaculture accounts for over 95% of world aquaculture fish production. Earth ponds are used for the production of fish in many regions of the world. They provide a practical, reliable and viable means of producing fish on a large scale provided attention is paid to selection of site and design. In addition to growing interest in pond culture, there is also increasing interest in the use of super-intensive tank recirculation systems. Evolving technology continues to improve reliability, performance and viability of these systems in certain production applications. Design and to a lesser extent selection of site are also important considerations in these tank systems.

Careful consideration of these issues can ensure sustainable economic production and environmentally friendly methods of producing a product that is a valuable commodity in the market place in Australia and abroad. The area of land selected for a fish farm should be large enough to include:

- the maximum number of ponds/tanks required plus holding ponds/tanks,
- reconditioning ponds/tanks (possibly 20+% of the total pond area),
- laboratory complex (and hatchery, if appropriate),
- packing and handling sheds, and
- administration, maintenance, storage, waste management facilities.

For freshwater complexes, on-site use of the reconditioned water may also need to be accommodated. In addition, it is preferable if there is sufficient capacity for future expansion.

There is no doubt that new and exciting advances in the design and operation of facilities will occur in the aquaculture industry during the next few decades. This reflects the dynamic and evolving nature of aquaculture in Australia. However, caution needs to prevail and the experience and knowledge already gained both in Australia and abroad should be utilised to best advantage. Too often effort and opportunities are wasted because of the lack of reference to available and relevant scientific and engineering information.

It cannot be over-emphasised that site planning and design are critical steps to the successful culture of farmed species. Sound planning and design will minimise the costs associated with the construction and management of ponds and associated environmental protection measures. These principles can equally be applied when building a new facility or expanding an existing aquaculture farm.

It should be noted that the construction of the pond/recirculation/ reconditioning system constitutes one of the major capital investments in pond fish culture and is also an important factor in the depreciation (most frequently over 10% of the operating costs). As a result, careful consideration should be given to design and layout options, as these factors will significantly affect the cost of fish production and environmental viability of the farm.

Once a site has been selected, a comprehensive feasibility study should be conducted on various layout, systems and management options to assess their strengths and weakness in terms of reliability of economic and environmental performance prior to finalising the design for the facility.

2. General site layout and design issues

Once a suitable site and species to be grown have been identified, the next important step is the physical site planning and design. Topography, site conditions and water availability are not the only factors influencing the design and layout of ponds. Available capital, costing, management factors such as stocking rates and the intended function of the pond (e.g. broodstock, nursery, wintering, grow-out) must also be taken into consideration.

The design and construction of an aquaculture facility must be carefully planned. Advice and assistance from professionals such as aquaculturists, water and soil chemists, engineers, irrigation and agricultural scientists, accountants and relevant Government Departments should be sought and used. Consideration should be given to whether a qualified consultant is needed to help in planning and also designing the enterprise taking into consideration environmental and other technical operational factors. In addition, the consultant may assist in preparing the documentation for the necessary approvals.

A detailed survey of the site should be undertaken so that facilities can be most efficiently located, to minimise construction costs and provide for the most efficient running of the operation. A plan detailing the farm layout, water supply, circulation and drainage lines, electricity lines, buildings, visual barriers etc. should be drawn up and pond specifications documented. Make a checklist and consult with Department of Primary Industries as to available information sources and what approvals may be required given the risk profile (see *Site Selection* and *Project Profile Analysis* Sections of this Manual).

2.1 Setback from any natural waterbody

As a general principle, all ponds, dams and internal drains should be set back at least 50 metres from a natural waterbody or wetlands.

There should be sufficient buffer so that if any pond water should overtop or be released, it will not drain directly into the natural waterbody. This separation distance also provides protection for the riparian vegetation and allows for natural hydrological processes such as bank erosion without putting the ponds at risk. The buffer areas should be vegetated so as to prevent erosion and minimise flow into the waterbody.

Preferred design:	Pond/dam setback of at least 50 metres from the bank of a natural waterbody or wetlands.

In addition, a vegetated buffer zone of not less than 20-40 metres should be maintained between any irrigated areas and the high bank of any adjoining watercourse. This vegetated buffer should be maintained so as to protect any existing native plant species.

It should be noted that a setback of more than 40 metres would avoid the need for a permit from DIPNR under the *Rivers and Foreshore Improvement Act 1948*. In addition, as Aboriginal sites commonly occur in the vicinity of waterways, a set back may reduce the likelihood of disturbance to Aboriginal sites.

2.2 Native vegetation

(a) Disturbance of native vegetation

Areas of significant vegetation on the site should be retained wherever possible.

The site layout for the ponds, dams, water intake, outlet and circulation system and operational facilities should be designed so as to minimise the destruction or disturbance of native terrestrial as well as aquatic vegetation or the habitat of native fauna.

Preferred design: No native vegetation/habitat should be disturbed

The clearing of more than 2 hectares of native trees, shrubs or grasses will usually require an approval under the *Native Vegetation Conservation Act.* Reference should be made to any Regional Vegetation Plan prepared for the catchment. If the vegetation is within 40 metres of the bank of a waterway or wetland, an approval could also be required under the *Rivers and Foreshore Improvement Act (or new Water Act)*.

The water inlets and outlets should not be in the immediate vicinity of important seagrass beds or other aquatic vegetation communities. Any channels, drains, pipes or pumping equipment should be installed in such a manner so as to minimise disturbance of foreshore or aquatic vegetation communities (in particular mangrove communities).

If mangroves, seagrass or foreshore vegetation is to be disturbed by the inlet and outlet pipes or drains, an approval may be required under the *Fisheries Management Act* and *Rivers and Foreshore Improvement Act*.

Preferred design: No disturbance of riparian vegetation, mangroves or aquatic habitat

(b) Threatened species issues

If terrestrial or aquatic threatened species, populations or ecological communities or their habitats occur on the site or in the area of impact, an 8 Part Test (S5A of the EP&A Act) must be undertaken. The 8 Part Test sets out the factors to be considered in determining whether there is likely to be a significant impact on threatened species, populations or ecological communities, or their habitats. If there is likely to be a significant impact on threatened terrestrial species or marine mammal or reptile species, populations or ecological communities, or their habitats, a species impact statement (SIS) must be prepared in accordance with the requirements of the *Threatened Species Conservation Act 1995*. The proponent must contact the DEC to obtain these requirements. The DEC maintains a register of critical habitat. If there is likely to be a significant impact on any threatened aquatic species, populations or communities or their habitats, a species impact statement will be required under the *Fisheries Management Act.*

The 8 Part Test should be referred to the consent authority prior to lodging the Development Application (DA) for it to decide if a SIS is required. For a more efficient process, the 8 Part Test (if necessary) could be referred to the consent authority at the same time as the Project Profile Analysis is referred, to determine the appropriate level of assessment for the proposal.

Preferred design:	No impact on threatened species, populations or ecological communities or their habitats

2.3 Landscaping issues

Where vegetation is to be cleared or lopped, the material should be mulched and used on the site to minimise erosion and to encourage revegetation of disturbed areas. Where areas are to be disturbed during the pond construction or other site works, the disturbed area should be revegetated as soon as possible using native species including grasses and herbaceous covers. Propagation material should be collected and available in a suitable form for use in the revegetation of disturbed areas, prior to disturbance occurring.

If none exist, native vegetation endemic to the area should be established as visual buffers especially for tank culture or sheds. Species should be carefully selected so that the trees are not likely to become habitat for predator species.

Preferred design:	3 metre wide vegetated buffer on the street alignment or around sheds

2.4 Heritage considerations

At the site selection stage, Aboriginal and non-Aboriginal heritage should have been considered. This preliminary assessment should have identified the more obvious heritage items such as heritage buildings, landforms, scar trees or middens and established their significance. At the planning and design stage, more detail survey work may need to be undertaken, especially in areas where minimal disturbance by agriculture or other previous land uses have occurred. As with site selection, information may need to be sourced from the DEC and the local Aboriginal community. In some cases, a detail archaeological survey (on land and/or under water) will be necessary.

If heritage items are present on the site, the project should be designed, whenever possible to ensure that there is no disturbance or impact on their significance, curtilage or setting. In areas where there has been minimal disturbance, heritage items may not be noticed or evident until appropriate assessments have been undertaken. With non-Aboriginal heritage, studies and archaeological zoning plans may provide guidance and information. With Aboriginal heritage, the DEC Aboriginal Heritage Information Management Systems and the local Aboriginal community may provide information. If items are discovered during construction or operation, works should cease immediately and the DEC contacted if Aboriginal sites are discovered, or the Heritage Office for other items. Prior to further disturbance occurring to Aboriginal sites, an approval is required from the DEC. Under s.140 of the Heritage Act, works involving the disturbance of other archaeological relics (land or under water) require a Heritage Council approval.

Preferred design:	If heritage items are present on the site, no disturbance or impact on their significance.

2.5 Noise issues

In the design and layout, every opportunity should be taken to minimise the impacts of the operation of the aquaculture facility on the neighbours and the broader community. Reference should be made to the DEC's Industrial Noise Policy (replaces the Environmental Noise Control Manual). Wherever possible noisy activities eg. truck loading areas or plant/equipment (pumps) should be located remote from neighbouring houses or in a location where there is an existing barrier between the noisy activity and the receiver. Where there is the potential for noise to become a nuisance, options to reduce noise impacts should be considered including

- quieter, insulated plant/equipment,
- enclosing the noisy activities in a building, or
- building of noise barriers.

The use of scare devices to manage predator birds can have significant noise nuisance implications. If there are residences within a kilometre, their use should not be considered to be the first line of defence in a suite of predator management options. When there are near-by neighbours, it is preferable that noisy devices only be used as a back-up. Prior to serious consideration of noise predator options, it is recommended that discussions be held with neighbours and the council to determine if acceptable protocols can be developed with neighbours regarding the use of noisy scar devices. It is critical that neighbours understand at the outset the likely frequency of use of the devices, the times of the day and year of their use, the loudness and likely affect on the birds. If neighbours do not understand what is happening, they are more likely to complain, especially if they think that birds are being killed.

2.6 Drainage and flooding controls

It is preferable for freshwater aquaculture ponds to be constructed above the probable maximum flood (PMF) level and estuarine ponds above the 1:100 year flood level. However a case by case evaluation can be considered for estuarine aquaculture farms with species that are indigenous to NSW.

Preferred design:	so ponds/tanks not flood liable – Freshwater above PMF – Estuarine above 1:100

The construction of banks, levees or above ground ponds which are likely to affect flood flows and levels can pose an increased risk to neighbours and possibly the catchment flood mitigation controls. Prior to the design of a flood prone site, an analysis of the flooding implications should be undertaken and discussed with Local Council. All flood works are to be constructed and installed so as not to obstruct the reasonable passage of floodwaters flowing in, to or from a river. These should be designed in consultation with DIPNR. The plans for levees or other floodworks should:

- specify the location and nature of the works,
- specify the level of the crest of the works, and
- analysis to indicate that flooding will not be increased on nearby land.

Preferred design	so flood management will not effect passage of flood waters

In addition to considering the impacts of the project on flooding, the affect of the proposed layout and on-site drainage management on local stormwater management should be considered. The blockage of stormwater drainage passage across the site by ponds, drains, roads or other structures can result in problems for management and maintenance of the facilities as well as local flooding problems for neighbouring properties. It is preferable that there is no catchment stormwater drainage across to the site and if present, measures to manage the flows are available so as not to affect neighbouring properties or the environment.

Preferred design:	so as not to affect stormwater drainage

2.7 Waste management

The aquaculture farm should be designed from the outset so as to minimise waste and reuse and recycle materials at every opportunity. This includes:

- pond water,
- processing water,
- pond sludge and filter materials,
- processing wastes and dead fish, and
- packaging material.

The section *Operating the Farm* outlines classification of material which are not to be reused/recycled and are classified as wastes. Adequate facilities should be included in the design for the safe and efficient management of all wastes, especially organic material. The short-term storage of waste on site or its permanent disposal can lead to odour and vermin issues which can become evolve into amenity and health issues. The site should be laid out so as to not locate any short-term organic waste storage or composting facilities adjacent neighbouring houses or public areas.

Preferred design:	so that there can be daily disposal of organic wastes or the material held so that it does not generate odour or other issues.

Any proposal which includes the on-site disposal of waste, in particular organic waste must give consideration to the potential to generate impacts on any nearby residences or for contamination of surface or ground water.

Preferred design:	so that waste can be disposed of off-site or on-site so as not to affect groundwater or the neighbour's amenity.

The major issue for aquaculture is water management that is covered in section 4 and 5 of this guideline. The location of any irrigation scheme should take into consideration factors such as soil characteristics, slope, drainage as well as proximity to neighbours (*See Site Selection).*

Preferred design:	slope should be < 5% for irrigation areas.

2.8 Energy

The access to a power supply to the site is an issue in the design and layout of the facility as well as in the site selection. Early discussion should be held with the appropriate power transmission authority with regard to capacity and access issues.

The consideration of energy efficiency in the layout and design of the facility is critical in relation to the ongoing management costs. The facility should be designed to minimise energy use and maximise opportunities for the use of alternative energy sources.

Water pumping costs can put a significant burden on operational budgets. Where possible gravity should be used in the water recirculation system. Buildings should be well designed to minimise lighting and heating/cooling costs. Options could also exist for the use of solar or wind power in heating of tanks or in the powering of remote facilities. The NSW Sustainable Energy Development Authority and the Australian Greenhouse Office (in Canberra) should be contacted about energy saving approaches in the design and management of a business.

2.9 Accommodating operational facilities

The buildings are essential components of an aquaculture facility and their design and location should be planned so that space, labour and equipment are used efficiently and economically. The layout should meet the relevant local council's Development Control Plan or the development controls below.

Preferred design:	Buildings should be set back > 5 metres from the boundary Buildings should be < 7.2 metres high Buildings should have a floor space ratio of <1:1 Buildings should comply with the Building Code of Australia

2.10 Road access

The road access to the site should provide for safe entry to and exit from the site. The entry and exit from the site should provide for adequate traffic sight lines in both directions. The design standard should take into consideration the traffic flow in the road adjacent to the site and the likely level of vehicle movements particularly during peak flows. If the public road has high flows, Council or RTA (as the responsible authority under the s138 of the Roads Act) may require turning and acceleration lanes in accordance with the RTA Road Design Guide. Adequate off-street parking spaces should be provided for trucks and cars (particularly if tourist or fishout facilities are part of the aquaculture enterprise). Carparking layout should take into consideration the provisions of AS 2890.1-1993.

Preferred design:	Complies with the approval requirements of the Local Government Act.

2.11 Crown lands and road reserves

Any structure that is built on Crown land or crosses it or is attached to the estuary bottom, will need a licence under the Crown Lands Act 1989. The bed of all estuaries (the bottom) below the high tide mark are considered to be Crown Lands. The estuary extent varies depending on the river system. Some river beds are also Crown land but they may also be private property. The status of estuary and riverbanks will vary and a title search will be needed. Title searches should be undertaken to determine the exact land status of the proposed development site.

There are numerous unconstructed “unopened” council controlled (and dealt with by council) or Crown roads (and dealt with by Department of Lands) roads for which a reserve has been created under the Roads Act. Some of these roads have been incorporated into the management of abutting freehold properties for a number of years. Before any aquaculture works are built on these roads they should be formally closed if not required for access. If access is required, alternative access should be arranged or the road opened. Opening and closure can take months as advertising has to occur and neighbours concurrence obtained. Sometimes alternative access may be provided, but it is preferable if aquaculture ponds or other structures are not located on road reserves.

3. General water supply issues

The most critical constraint for the successful management of an aquaculture business is the water supply – both in terms of reliable quantities and quality. As a general rule a reliable supply of 40ML/ha/annum of good quality water is recommended as a minimum water budget for non salmonoid intensive aquaculture culture, intensive salmonoid aquaculture culture may require up to 40ML/day. The Stressed Rivers Reports published by DIPNR covers all sub-catchment on the Hunter and Central Coast and provides preliminary data on water availability, numbers of licences, and water quality indicators. Also, water management plans have or are being prepared for the Hunter and Central Coast river systems outlining water access and environmental flow requirements. Water sharing plans detail yearly and daily extraction limits that apply to a given water source. Assessment of the available water (based on eg. embargo provisions, flow rules etc.) should be undertaken to determine if adequate water is accessible for development. Consideration of transfer rules will also be required. These documents and DIPNR should be consulted to ascertain current and future management regimes for river systems.

Table 18. River stress categories for the Hunter catchment (does not include estuarine areas)

Subcatchment	Hydrological stress	Environmental stress
Allyn	High	Medium
Baerami	High	Medium
Black	High	High
Bow	Low	Medium
Bylong	High	High
Dart	High	High
Glenbawn	Low	Medium
Glennies residual	Low	High
Goulburn and residual	High	High
Halls	High	High
Hunter estuary	Low	High
Hunter residual	High	High
Karuah	High	Low
Krui	High	Medium
Lake St Clair	Low	Low
Lostock	Low	Low
Martindale	High	Medium
Merriwa	High	Medium
Munmurra	Low	Medium
Myall	High	Medium
Pages (includes Isis)	High	High
Rouchel	Medium	Low
Wallis Lake	High	Medium
Williams	High	Medium
Widden	Medium	Medium
Wollar	Low	Medium
Wollombi	High	High
Wybong	High	High

Table 19. River stress categories for the Central Coast catchment

Subcatchment	Hydrological stress	Environmental stress
Brisbane Water	Low	Medium
Jilliby Jilliby	High	High
Lake Macquarie	High	Medium
Lower Wyong	High	Low
Ourimbah	High	Medium
Tuggerah	Low	Low
Upper Wyong	Medium	Low

DIPNR Classification for hydrological or environmental stress
Hydrological stress was derived for each catchment by proportioning estimated water extraction to the estimated streamflow. The classifications being, low (0 to 30% extraction of flow), medium (40 to 60% extraction of flow) and high (70 to 100% extraction of flow). For those catchments that fell between these parameters additional local information was used to classify into which stress level they were placed. Environmental stress was determined utilising the following eight indicators, riparian vegetation, bank condition, bed condition, barriers to fish, turbidity, electrical conductivity, phosphorus and pH. If two thirds of the indicators scored high a high stress rating was assigned, however, if two thirds were scored low the a low stress rating was assigned and all other catchments were assigned a medium stress rating.

Trading of water on the Hunter and Central Coast is developing. With the new Water Act, there are likely to be changes in water transfer patterns with water rights being separated from the land and being transferable within catchments. Water sharing plans detail specific transfer rules for each water source. Water users will also be able to buy futures in water. The other changes are likely to result from the deregulation of the dairy industry. Organisations such as stock and station agents (eg Elders), NSW Farmers or water trading sites on the Internet (*www.waterexchange.com*) can provide information on how to access water rights.

A key issue in planning and design is the consideration of risks associated with the water supply and planning to ensure the farm can deal with various contingencies. For example for fresh water aquaculture enterprises, on-farm water storage or supplementary groundwater supplies should be considered, to provide a back up supply during droughts or when there is poor water quality in the river (eg. during low or high flows).

Another critical issue is the use of water resource. It is important that the aquaculture farm is planned and designed in such a manner to prevent wastage of water. This includes minimisation of seepage or leakage from channels, dams and ponds, the treatment and recycling of water and (for freshwater) the use as a substitute for raw water in agriculture or other purposes. All water related works should be constructed, maintained and operated so as to ensure public safety and prevent possible damage to any private or public property.

3.1 River and estuary extraction

Preferably the site chosen for extraction of water from the river or an estuary should provide sufficient depth for the pumping head during low flows without the need to excavate the bed to deepen the pumping hole. In addition, the water extraction site should offer a bank location so that the pump can be located so that it is not likely to be damaged during high or flood flows.

The existing profile of the channel or bank must not be disturbed any more than is necessary to install the pumping facility. Any disturbance should be restored as soon as possible to prevent erosion. If the bank or the bed of the river requires substantial disturbance (especially of aquatic or bank vegetation) a permit will be required under the *Rivers and Foreshores Improvement Act*. If mangroves are likely to be disturbed, a permit may also be required under the *Fisheries Management Act*.

Where water is extracted from a river or estuary, a suitable device should be installed to accurately measure the quantity of water extracted. Provisions should be made for this equipment to be adequately maintained. For freshwater extraction (and possibly estuarine under the new Water Act), DIPNR will require the quantity of water to be recorded and reported under the water licence provisions. The annual return of information to DIPNR (or more regularly if required) should include hours pumped, monthly extraction rate and use of water. DIPNR may limit the extraction from a river from time to time to ensure an adequate flow remains for other water users and the environment.

3.2 Dams

The implications of the Dams Policy should be considered with the option to "capture" and use 10% of the average yearly regional runoff from the property without needing a licence. If an aquaculture enterprise is located on a large property, this quantity could be significant and could provide a primary or supplementary source of quality water. The guideline *Rural Production and Water Sharing* (DLWC 1999) covers dams policy and how to calculate harvestable rights. The farm dams and stressed rivers policy is on the DIPNR web site. Reference to relevant water sharing plans in regard to provisions for dams and storages should also be undertaken.

In areas where the river or estuary water quality is poor during low and high river flows, the feasibility of off-river storage should be discussed with DIPNR so that water reserves can be extracted from the river when the water quality is good and held for later use. This form of off-river water storage dam could if feasible, increase the reliability of supply in some areas.

Dam safety can be a major issue depending on the stability of the geology/soils, the size of the dam and the size and characteristics of the dam's catchment. Any guidance on the location, design and construction of the dams provided by DIPNR and DL should be followed. Factors to be considered include:

- the location of the dam in relation to local water flows,
- the dam construction – wall design, heights, method of construction, etc
- volume of water and extent of the land inundated when the dam is at capacity,
- the relative height and dimensions of the by-wash to control the dam's capacity or the provisions to ensure that inundation of land does not

exceed the specified extent,
- provision to provide for passing flows.

Once approved, the dam design or location should not be altered without the agreement of DIPNR and DL. The Dam Safety Committee should be contacted for technical advice on the safety of large-scale water storage dams.

3.3 Groundwater

All piezometers or bores must be licensed by DIPNR.

A bores must be at least
- 40 metres from the nearest bank of any river or creek,
- 500 metres from any town water supply bore,
- 400 metres from any irrigation bore on an adjoining property,
- 100 metres from a property boundary, and
- 400 metres from a DIPNR observation bores. Note that distance criteria may change dependent on the relevant water sharing plan.

DIPNR must be notified within 2 months of sinking a bore if a useable water supply has been obtained, the location, pumping tests, depth, water analysis and other relevant details. The bore must be of an approved diameter, lined and capped to the standards required by DIPNR.

CURRENT WATER POLICY WHICH APPLIES TO AQUACULTURE

Works that need a license

All naturally occurring water (both surface and sub-surface) in the State of NSW that is capable of being used for irrigation or for watering stock is regulated by the provisions of the Water Act. Any "work" (which includes any dam, pump, weir, regulator, race, channel, cutting, well, excavation etc) which affects the quantity of water flowing in, to or from, or contained in a river, stream or lake comes within the provisions of the Water Act. Licenses are issued to authorise (construct/install and use) such works. In relation to groundwater, the construction of any bore (which includes any bore, spear point or excavation) requires authorisation under the Water Act.

Embargoes

Throughout the Hunter, the demand for water for commercial purposes exceeds the available supply (on a sustainable basis). This situation has led to the imposition of embargoes, which effectively place a limit on the volume of water which may be extracted from rivers, and on the construction of dams to intercept flows in streams. A water management plan, showing all sources of water to a development, must be developed to determine if a water licence will be required. Prior to making any application for a water licence, a determination of licensing requirements, and the possible direction to purchase and transfer existing active water entitlements may be required.

Restricted groundwater areas in the Hunter Region include the Tomago-Tomaree-Stockton sandbeds and coastal sandbeds on the coastal lakes systems of the Myall and Wallis catchments, and further entitlements may not be available.

Transfers

A water transfer scheme (for surface water) is in place for all catchments. This permits (subject to certain statutory licensing requirements) the transfer of water use entitlements from one property to another within a sub-catchment. The scheme

operates as a market, subject to supply and demand and other relevant market forces. The DIPNR is not involved in brokering these arrangements (see stock agents or waterexchange.com). All applications for transfers are subject to interim guidelines that include:

- no movement upstream
- no transfer into stressed sub catchments
- no transfer of sleeper licenses

Transfer rules may be amended as part of the water management committee planning process.

Stressed Rivers Assessment

The level of stress in the State's rivers and streams has been assessed on a sub-catchment basis using criteria related to hydrologic stress (water extraction) and environmental stress (general river health including water quality and status of the riparian zone). A special category of high conservation value also applies to a restricted number of sub catchments. These assessments will be used to determine further water management planning relating to current embargoes, transfers, prioritising of the preparation of river management plans and volumes available for extraction. Any application for licenses for aquaculture purposes would be assessed in light of the classification determined under the stressed stream determination.

Access rules

All current and any new licenses will be subject to conditions requiring the maintenance of low flows in the streams from which water is extracted. To ensure security of supply in periods of low flow (when extraction will not be permitted), users will need to construct off-stream water storage facilities. A license classification system is soon to be introduced which will specify the flow regime from which water may be extracted. The system will be based upon "A", "B" and "C" class licenses. "A" class license will have access to the low flow regime, "B" to medium flows and "C" to high flows only. In the case of aquaculture, it is anticipated that most licenses will be issued as category "C" due to current commitments in the low flow regime in most streams.

Water Management Committees (WMC)

WMC's have been established for all catchments throughout the State. Each committee has an independent chair with members representing relevant water user groups, conservation groups, local government, aboriginal representatives, special interest groups as required and government agencies with involvement in natural resource management. Each committee is required (amongst other things) to produce management plans to advise government on what actions are needed to achieve environmental objectives relevant to their area. There may be a need for the aquaculture industry to make representation to the WMC's for appropriate consideration.

Volumetric allocation

All licences for industrial (aquaculture) purposes will be allocated an annual entitlement. Unless proponents obtain additional water entitlements through the transfer market, no new licences in a high stressed river system or embargoed catchment will be given an allocation. The system of volumetric allocation requires both regulators and users to manage the available water resource in a sustainable manner. It will be necessary for metering of water supply to any regulated water use.

Harvestable rights

On 1st January 1999 the NSW Government introduced a new policy which allows all landholders to harvest a basic volume of water (10% of run-off) and store and use that water for any purpose without the need to obtain a license under the Water Act. The policy has a number of exceptions, exemptions and location variations and reference to the full policy document is recommended.

Charges

Fees are payable for licenses for most purposes and are currently issued for a period of 5 years. In addition an annual management charge applies to these licenses. Charges are fixed by the Independent Pricing and Regulatory Tribunal of NSW

(IPART).

COAG

The above initiatives are all part of the NSW Government's Water Reform Package which demonstrate its commitment to the water policy framework announced by The Council of Australian Governments (COAG) in 1994. That framework aims to achieve an efficient and sustainable resource management. It covers the five broad areas of cost recovery and pricing, institutional reform, allocation and trading of water entitlements, environment and water quality and public consultation and education.

4. Ponds and related facilities

Ponds are structures that are constructed by excavating earth and reshaping it to create a structure that has the capacity to hold water and may be earthen or lined.

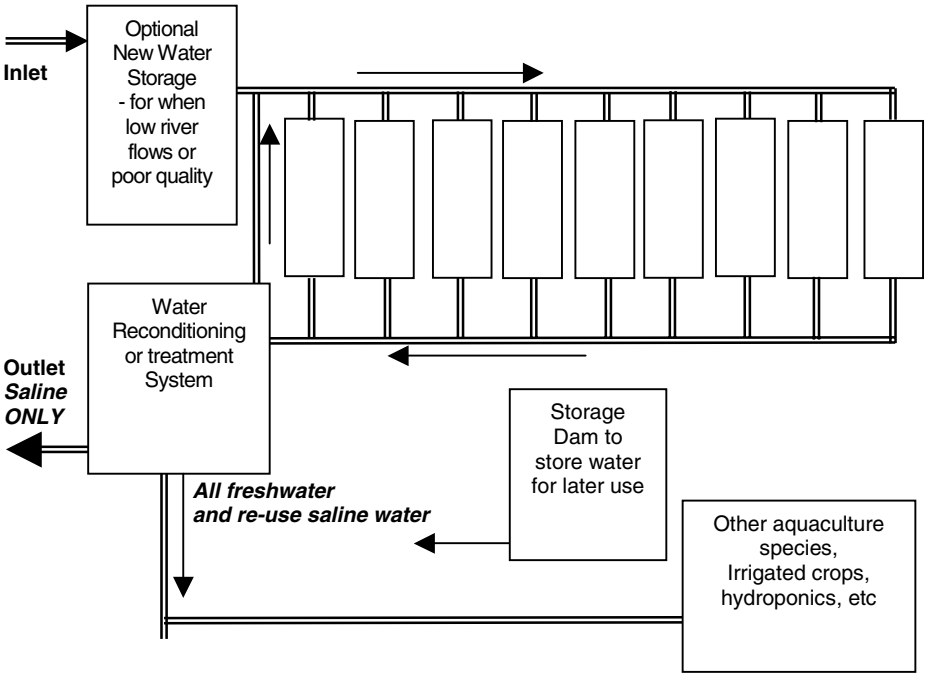
4.1 Layout

(a) Efficient circulation and drainage system

Ponds should be orientated so as to allow for an efficient water circulation through water supply access facilities, storage dams, growing ponds, reconditioning ponds and drainage lines.

Reticulation systems should be designed so that pond discharge water can be retained in reconditioning ponds (for an appropriate time to reduce suspended solids and to allow for appropriate treatment if necessary) and have the capacity to recirculate the water on the farm or release/reuse the water in an appropriate manner.

Figure 5. Water Recirculation and Reconditioning System



Site planning should include drainage layout

- to protect the farm and ponds from excessive run-on drainage from surrounding land during storms or flooding, and
- to protect surrounding areas from run-off water from the farm.

For estuarine and marine water farms, the site layout should ensure that the discharge points are located so as to maximise the dispersion of the discharge water and minimise disturbance on marine vegetation or any oyster leases in an estuary.

For freshwater farms, site planning for efficient use of reconditioned water resources following pond use is essential. In some areas, relationships may be able to be established with nearby irrigated agriculture, hydroponic or other water users. In these cases, the piping and pumping of water will need to be considered including the costs, capacities and storages. If the pipes are to cross public road, permission will be required from RTA, Local Council or Department of Lands. If on-site irrigation is proposed, the layout of irrigated land should consider slope, soils type, distance from natural creeks or drainage lines, location of pumping systems, irrigation reticulation systems and catch drains (if relevant). See Section 4.2 in the Site Selection Chapter for further information on site and soil assessment for proposed irrigation areas.

(b) Designing for climatic effects

An open site is advantageous because it allows wind to aerate water in the ponds. In wind exposed areas, consideration may need to be given to the direction of the prevailing of wind to reduce wave setup and associated bank erosion. In areas where there are likely to be temperature inversions, it is critical that any noisy or odour generating activities are not located near residents or in areas where still area or air flows are likely to amplify impacts on neighbours.

(c) Acid sulfate soils

For estuarine ponds in areas where there is a risk of acid sulfate soils (ASS) being present, the layout of the ponds and drains should be designed so as to minimise the disturbance of ASS. As ASS is not necessarily evenly distributed across a site, some soil survey work will be required to identify the depth to the ASS and any likely “hot spot” areas. Reference should be made to the ASS Manual for sampling and assessment regimes.

Preferred design:	Where there is no acid sulfate soils, or ASS Landform Class A with Landform Element class b, l, t, p, y or w

In addition to issues with regard to the potential to generate acid in the ponds and the drains, issues relating to the structural characteristics of ASS in subsoil layers may need to be considered. As some potential acid sulfate soil clays have the consistency of a gel with up to 70% water content, they have low load bearing capacity resulting in lateral movement or considerable subsidence under load. For dams and ponds on these types of soils, geotechnical data should be analysed to consider the extent of possible movement of the sulfidic material under load and appropriate management strategies developed.

Preloading of the site may need to be considered. If preloading of the site is to be undertaken, hydrological analysis should also be undertaken to consider the effects of compaction on groundwater levels and the potential for discharge of acid. The material used for preload should be non-ASS and if it is to be removed in the future, it should be separated by some geotech fabric to allow final removal without ASS contamination.

(d) Fencing ponds and/or the farm

In addition to screening of water outlets to prevent accidental release of aquaculture stock, ponds that are used in the culture of crayfish, yabbies and eels should be laid out so that they can be fenced (an unbroken fence 60 cm in height) to prevent escape and/or entry of wild stocks. In addition fencing of ponds can prevent loss from water rats, predation by eels and people wandering onto the farm.

4.2 Pond design

Ponds commonly refer to those structures that are purpose built constructed earthen dams where fish are intensively farmed and are usually situated either wholly or partly below ground level.

(a) Pond shape

Intensive aquaculture ponds must be purpose-designed earthen dams for efficient filling, cleaning, draining and water circulation and for efficient stocking, feeding and harvesting of fish. The shape of a pond affects:

- the cost of construction,
- the inlet and outlet options and water circulation in the pond (with subsequent effects on management of plankton, sediments and reconditioned water),
- the harvesting and feeding methods, and
- pond banks and bottom maintenance including erosion risks.

The topography and site characteristics will affect the pond size and shape. Square and rectangle ponds make the most efficient use of available land. Rectangular ponds tend to be easier to manage than square ponds and offer good water circulation provided they are not too narrow. This shape is relatively cheap to build and offers practical advantages in feeding and harvesting.

Excessive water depth may result in stratification of the pond waterbody (e.g. of oxygen, temperature, organic load and sulfides) and unintentional destratification (eg. sudden winds or rains) can have disastrous effects. On the other hand, very shallow water promotes excessively low or high temperatures and weed growth. Preferably each pond should be designed to have a deep section (at least 2 metres) and a shallow section (about 1 metre). The actual depths will vary with the species and the locality but generally having a deep section provides a buffer against extremes of temperature, reduces evaporation during summer, facilitates harvesting, reduces the growth of macrophytes and increases production.

(b) Pond size

There is a large variation in the optimum size of ponds for aquaculture. Freshwater fingerling and grow-out ponds for silver perch may be 0.2 ha up to 1.0 ha in surface area to provide a balance between management and economies of scale.

A number of factors affect what is the most efficient pond size for each farm including species, management techniques and stocking densities, cost of land, topography, capital and equipment available for construction and proposed production capacity. While larger ponds tend to be lower in cost per unit to construct and maintain than smaller ponds, larger ponds present a number of disadvantages such as size of harvest - handling and marketing; water quality management problems; disease monitoring and control difficulties; algal bloom control. Harvest management in larger ponds is often more difficult to manage so as to not stress the catch. While overseas large ponds from 10 – 40 ha are known, it is generally considered that ponds less than 2 ha represent the optimum pond size for intensive aquaculture on the Hunter and Central Coast with the current methods.

(c) Pond banks

Pond banks if earthen should be constructed of suitable material and designed with optimal batter angles to prevent slump or erosion. Banks should be wide enough to ensure strength, stability and vehicular access. This is extremely important, and enables efficient management of ponds.

In general, the dimensions of pond embankments should:

- crest approximately at 3m; with batter minimum
  - 2.5:1 on the inside and 2:1 on the outside for embankments less than 3m high,
  - 2.5:1 for embankments greater than 3m but less than 6m,
  - 3:1 for embankments greater than 6m (rare); and
- have freeboard minimum of 0.5m (where wave action fetch is less than 100m); and
- have cut-off trench minimum 300mm into good clay.

Ponds constructed of manufactured products such as plastic/rubber liners and reinforced embankments utilising concrete/tyres etc., may have steeper gradients however care must be taken so that the steepness does not create access and maintenance issues.

Walkways to the drainage outlet structures enable efficient control of the boards, screens and valves, as well as being ideal sites for observing and sampling water and observing, sampling and feeding of fish.

If there is no other alternative, the ASS Manual must be consulted to ensure acid sulfate soils are managed so that the long-term use of the ponds is not jeopardised. It should be noted that the use of acid sulfate soils in the construction would constitute a “high risk” option, requiring a high level of assessment and approval. It is preferable that acid sulfate soils are not used for backfill or in pond bank construction

The earthen pond banks and batters backfill should be lined with topsoil and planted with endemic grasses to ensure stability and prevent erosion. In some circumstances (highly erodable soils, or with some water circulation/aeration systems), a pond bank liner should be used to cut down on bank erosion and reduce the sediment in the water (and hence improve the water quality). Any embankment at the water inlet should be fortified to protect from erosion. It is preferable that the grass is mowed when necessary and animals are not used to keep the grass down. Animals (such as cattle and to a lesser extent sheep and goats) can lead to bank degradation and may enter the water and increase turbidity and nutrients.

(d) Pond water inlet

Water inlets from the natural environment should be screened prior to entering the circulation system to prevent the entry of trash fish and other undesirable aquatic fauna. Where there is likely to be poor water quality or restricted access to water supply because of seasonal variations in flows, it is good practice for the farm to include a “new water supply” reservoir to ensure that there is good quality water available to supplement the pond water recirculation system when required.

Each pond should have separate water inlets and outlets. Water supply and drainage pipes should be at least 15 cm in diameter. Water supply pumps may include axial pumps used in areas of low pumping head through to deepwater bore pumps typically used in the Coleambally irrigation area of

the Riverina (NOFARIC, 1995c). The water in the supply reservoirs should be aerated and subsequently piped by gravity or circulation pumps to the individual ponds and buildings.

Preferred design: so largest pond can be filled in 24 hours or less

(e) Pond water outlets

Ponds should be designed so that they can be drained individually, completely and rapidly. This will enable the removal of all stock during harvesting and facilitate efficient management, particularly when water quality and disease problems occur. Complete drainage can be achieved by a raceway or well in the deepest section of the pond. The bottom of the pond should be level and slope gradually towards this area.

Preferred design: no pumping required to drain pond completely

The water outlet (also called a monk, tower, penstock, gate or standpipe) is the most important feature used in regulating the water levels and in draining the pond. The outlet should be designed so that water can be withdrawn from the surface and excess water can overflow through a screen and escape. The water outlet should also be structured so that water can be drained from the bottom so that "dead" water (low or deficient in oxygen) can be removed. Water outlets should be screened to prevent the inadvertent loss of stock from ponds.

The width of a pond monk is typically between 300 and 500 mm. There must be adequate space between the rear board and back wall of the monk to avoid restricting the drainage capacity of the pipeline. If the fish are to be channelled through the outlet pipe for harvesting, the pipes must have a minimum diameter of 300 mm.

It is essential that the bottom of the monk must be the deepest point of the pond and designed so that the last 10 cm of pond water can be drained in less than 1 hour. The drainage pipeline (made usually of concrete, HDPE pipe or PVC) traverses the embankment and discharges in the main drainage line. The incline of the pipeline should be between 0.5 and 1.5%.

PVC standpipes of 150-200 mm can also be used in smaller ponds as outlets but are less robust, more prone to mishaps and blockage of screens and are relatively difficult to operate efficiently.

The pond bottom should slope evenly towards a centre drain system or sump, standpipe or monk gate and be designed so that the pond is completely drainable. Ditches in the pond bottom inclining towards the outlet may be dug to improve the water drainage from the pond and enable complete drying out of the pond following harvest. It is extremely important in earthen ponds that suitable soil material is used in the installation of the water control outlet for ponds with careful attention to compaction to prevent pond levee failure.

4.3 Pond water reticulation system

(a) Water management as a resource

Reconditioning and recycling of pond water should be part of standard environmental management practice for all aquaculture farms. Any new or expanding existing aquaculture farms should incorporate, as standard

practice, a suitably designed reconditioning pond and/or treatment systems as part of the water circulation system so that water is reused within the aquaculture farm

- For estuarine farms, the water circulation system should include pre-treatment ponds and appropriate reconditioning ponds before reticulation and eventual discharge to the estuary.
- For freshwater aquaculture farms, the water circulation system should include appropriate reconditioning ponds before recirculation or re-use so that there is no discharge of water from the fish farm to the natural waterway. Re-use options may include agriculture or other purposes on the farm or by arrangement with other water users as a substitute for raw water.
- The use of water on freshwater aquaculture enterprises is conditioned on "no discharge" into public or Crown roads, Crown land, neighbouring land, rivers, creeks or natural wetlands, groundwater aquifers or native vegetation.

(b) Reconditioning system

The capacity to recirculate water within a farm system relies on the capacity to recondition water from the aquaculture ponds. The technology for doing this is under intensive research both in Australia and abroad and is currently being reported in a range of journals and industry forums. Undoubtedly, there will be significant developments in this area over the next decade.

However, for the purposes of this AIDP, provisions must be made in the farm reticulation system (both for fresh and estuarine water) for reconditioning of pond water. This must include reconditioning ponds equivalent to at least twice (x 2) the volume of the largest rearing pond for non salmonoid production.

In addition, in estuarine pond systems where discharge is permitted under license, the reconditioning system must be a minimum of 10% of the total net-growing area of the farm and discharge water must be retained for a minimum of 1 day prior to discharge. However it is considered good low risk practice for the reconditioning ponds to be 20% of the total net-growing area of the farm and for the water to be retained 6 days prior to discharge or strategies which produce an equivalent to better outcome.

Preferred design:	reconditioning storage capacity of > 2 times the size of the largest growing pond.

The following design guidelines must be considered:

- The sediment condition (dispersive/prone to erosion) must be an important consideration in the design features of the reconditioning system; Minimisation of sediment entrainment (eg through use of levee liners) in the reticulation/pond system should be a design priority.
- The design criteria for the reconditioning unit must consider allowable benthic shear maxima in the settlement process to maximise the potential for settlement of solids prior to exit from the reconditioning unit.
- The farm design must include the capacity to manage complete drain down of aquaculture ponds at the end of the season without discharging sediments to estuary or waterway system. Depending on the management approach, reconditioning pond and overall

reticulation system may also be completely drained down or maintained to encourage the natural ecosystem in the reconditioning ponds to maintain the biofilter systems.

- The reticulation system should include provisions for the management of accumulated sediment that may be removed after a production run or when maintenance is undertaken on the reconditioning pond.
- Provisions should be made for the management of sediments so that there are no adverse environmental impacts (for example drying, storage and/or composting areas prior to its use on the farm or by another landowners or removal to a landfill).

Preferred design:	For estuarine pond systems, retention of longer than 6 days prior to reuse or discharge or surface of reconditions ponds of > 20% of total water surface of growing ponds.

(c) Use of reconditioned freshwater

There is an obligation on all water licence holders to use water efficiently. This includes the use of water that is no longer to be recycled in the pond or raceway system, eg. as a result of a constant daily exchange with fresh water or at the end of a growing season when the ponds are to be cleaned out.

Consideration should be given to establishing an integrated aquaculture/ agriculture system. Reconditioned water could be used by hydroponics or agricultural crops in the system to utilise any existing nutrients in the system. Preferably the reconditioned water should be a substitute for raw water for productive use rather than a disposal scheme. In many cases, a relationship may be able to be formed with a neighbouring water user so that any reconditioned water can be passed on – or on sold to them. The high volumes associated with salmonoid production may limit the opportunity to pass on or on sell water utilised on the salmonoid farm.

With any irrigation scheme, there should be adequate provisions for the storage of water during wet weather until there are opportunities for irrigation. Depending on where the water is to be used (on farm or by a near-by water user) adequate provisions must be made in the wet weather storage dam for extended wet periods.

(d) Use of reconditioned saline water

In some saline water aquaculture systems overseas, the water may be used by a number of species such as fish, then filter-feeding organisms, and then seaweed prior to the water passing through mangroves or wetlands into the natural system. While this approach is in its infancy in Australia, there may be opportunities for the multiple use of the reconditioned water in the future.

4.4 Pre-Market conditioning facilities

For some species, to enhance the quality of taste, it is essential to place fish in pre-market conditioning (purging) facilities prior to marketing (for 2 days to possibly 2 weeks). It is preferable if the conditioning tanks are fibreglass or plastic and are self-cleaning with a water supply free of algae and off flavour compounds (eg. underground (bore or spring), rainwater or domestic (dechlorinated aeration system). Preferably the conditioning tanks should be in an enclosed sheds.

4.5 Predator management

(a) Bird predators

Predator birds can be a serious problem in many areas leading to significant losses. In many cases, the exact extent of losses is circumstantial and more research is needed to better understand the threats particular species pose and the best methods of control.

SUMMARY OF POTENTIAL THREATS

Based on Llewellyn Report *Cormorants and their Control at Fish Farms in NSW 1999*

Great Cormorant

The Great Cormorant (*Phalacrocorax carbo)* occurs in most areas of NSW, breeding along rivers and lakes in the Murray Darling and some coastal rivers including in the Hunter and Central Coast. They congregate in considerable numbers at breeding locations but at the end of the breeding season, will disperse moving considerable distances in search of suitable feeding habitats. The estuaries can support numbers of cormorants year round. These numbers can be boosted significantly during droughts when inland birds are forced to more permanent coast waters. Breeding is usually in colonies but occasionally in dispersed pairs, in autumn and spring.

Cormorants are sociable feeding birds, usually take 1 or 2 trips to the feeding ground per day, diving several metres deep to take fish. Their diet is mainly freshwater fish supplemented by crustacean, salt-water fish, frogs and insects. Though they principally feed in daylight hours they have been observed feeding at night. They are capable of taking fish up to 1kg with a daily intake of a breeding bird of around 750 gm. They have been recorded with as many as 63 small fish (2-4.3 cm in size) in their stomach at one time. The extent to which they impinge on native fish stocks is not known, but once they detected the presence of aquaculture ponds, they can make significant impacts on the stock in a fairly short period if unchecked.

Threat: Most serious because of their gregarious nature and ability to take large numbers of large fish from grow out ponds both during the day and night.

Little Black Cormorant

The Little Black Cormorant (*Phalacrocorax sulcirostris)* has a distribution similar to the Great Cormorant. They are abundant in most ares in NSW where there is available water including the Hunter and Central Coast. During summer and autumn they tend to congregate in colonies of up to 100 birds in breeding localities such as swamps, lakes and along rivers but tend to disperse during other times. Drought will increase the numbers in coastal areas and the potential problem for aquaculture farms. The Little Black Cormorant feeds socially taking fresh and salt water fish, crustacean and insects. They have been known to herd schools of fish. They tend to take smaller slow swimming fish but because of their abundance on the Hunter and Central Coast have the potential to have significant impacts on aquaculture farms.

Threats: Most frequent visitor to fish farms. If fingerling ponds are not netted they can have a devastating effect. If they build up in numbers greater than 6 they can become a concern. Research is needed to determine what actual effect they have on grow-out ponds.

Pied Cormorant

The Pied Cormorant (*Phalacrocorax varius*) occurs sporadically in most areas of NSW, occasionally in reasonable numbers on the Hunter and Central Coast of NSW. They tend to breed in colonies during the autumn and winter in estuarine areas often on islands or in mangrove swamps producing substantial stick nests. Only immature birds tend to disperse from the breeding colony. They feed principally on fish but also take crustacea and molluscs. Because of their size, they are capable of taking quite large fish but are less of a problem to aquaculture farms compared with the Great Cormorants as their numbers visiting tend not to reach the large numbers of

the Great Cormorants.

Threat: Though they are also capable of taking significant numbers of large fish pose less of a threat because of their lower numbers

Little Pied Cormorant

The Little Pied Cormorant (*Phalacrocorax melanoleucos)* is widespread and the commonest of the cormorants breeding in colonies or pairs along most of the rivers, lagoons and swamps of the Hunter and Central Coast region. Colonies may include as many as 4000 birds. The breeding season is irregular but tends to be in spring and autumn. Birds may disperse between breeding seasons but tend to return to their breeding localities.

Little Pied Cormorants tend to be solitary feeders mainly on freshwater crustacea, invertebrates or small slow moving fish up to about 90mm in size. However, large numbers may accumulate in suitable feeding areas. Generally they are not considered to be a problem for fish farms but can be a major problems for yabby farms. They mainly take slower moving trash fish. Their solitary feeding habit and preference for crustacea contrasts them with the more gregarious fish-loving Little Black Cormorant.

Threats: While they are regular visitors they tend not to be a problem for fish farms provided the fingerling ponds are netted. However they can become a major problem for crustacea farms especially if the numbers build up.

Darter

The Darter (*Anhinga melanogaster*) distribution is similar to other cormorants but is never seen in large numbers. They can be nomadic evidenced by their sudden appearance and disappearance at water bodies. They are known to breed on the Hunter and Central Coast areas, frequently as single pairs but may form colonies of up to 100 birds. The breeding season is irregular and extended.

The main source of food is fish and small crustacea, molluscs and aquatic insects. They catch fish by stalking and spearing them. As a result large and fast moving fish are rarely caught. However, because their size is similar to the Great Cormorant, it can be expected that they will consume similar quantities of fish. However, because they are solitary feeders, they are thought to pose less of a problem than the Great Cormorant.

Threats: If the numbers build up, they can become a problem for smaller fish and crustacea.

Other potential problem birds

Sacred and Straw-neck Ibis, Spoonbills (usually night visits), Nankeen Night Heron (usually at night) and White Faced Herons can be problems especially for crustacea, fry and even larger fish.

Other birds not seen to be a problem

Brahminy Kites, White Breasted Sea Eagles and Ospreys are often frequent visitors to ponds but are not considered to be a problem. Large Egrets tend to take trash fish. Little Egrets can be frequent visitors and tend not to be a problem.

(b) Management approaches

Consideration should be given at the outset as to how the pond systems can be designed so that losses to predator birds can be minimised. Protection in both the daylight and night hours may be necessary. Vigilance is needed as pond may be clear one day but become invaded by a large number of birds during the following day or night. Methods could include

- deterring the birds from gathering around the farm,

- deterring the birds from entering the water,
- providing protection for the fish.

Preferred design: all ponds screened (or equivalent) or as a minimum screening of fingerling ponds and deterrent system for other ponds

Table 20. Summary of Some Fright Methods

Birdscare, Bird eter or recorded calls	Various commercial machines have been developed which generate distress calls of target species, which are turned on and off at random or in response to the presence of birds. Devices that emit more random noises, or respond to movement are likely to be more effective. However used alone the birds can become acclimatised to the device. It is likely to irritate any nearby neighbours
Birdfrite	Cartridges are fired from shotguns or pistols that explode in the air. When fired at random and aimed at the flock it is likely to be more effective. It is labour intensive and is likely to irritate any nearby neighbours
Water bird effigies,	Life size models of birds with the wings open strung up from the head on a string that can be jiggled can simulate a bird in distress. In combination with birdscare calls it can be effective for a time.
Hawk kites & silhouettes	When the wind is favourable, the flying of simulated birds of prey Balinese kites can be effective. The kites can also be suspended from a helium balloon. The approach is labour intensive and effective for a short time but may be useful in scaring a recent "invasion"
Helium balloons	Helium balloons can be strung on a line above the ponds. While the methods has proved effective in some circumstances in the US it has been less successful in Australia
Remote control Model aeroplane	The noise and physical presence of the plane may be effective. It is labour intensive but may be effective for a short time to scare a flock. It could have dual usefulness during school holidays.
Chemicals	The use of Avitrol a chemical hallucinogen that causes tremors, erratic flight, distress calls and ultimately death is not recommended. In theory, the baiting of members of the flock with sub-lethal doses is supposed to scared away the rest of the flock by the distress calls of affected birds. However the effectiveness of the approach with cormorants has not been proven. In addition, the effectiveness of repellents such as Naphthalene, Thiram and Mesurol with waterbirds has not been tested. A permit is required from DEC to use the material. The use of chemicals around the ponds is not recommended.
Scare crow	To be at all effective scarecrows need to be moved around the site from time to time. Otherwise the birds become acclimatised to them.
Dogs	Dogs can be trained to chase birds. The success of the approach will depend on the dog and its training. However dogs which will also swim can be quite effective. Barking dogs however can annoy the nearby neighbours.
Motor bikes	A rider doing the rounds of the ponds from time to time can be very effective. It is labour intensive but can be a useful management tool in the short term when a flock of cormorants is around.

Exclusion netting

Total exclusion netting can be a costly option but may need to be considered in areas where predator birds are prevalent. All fish farms should net fingerling ponds with total exclusion netting. In many circumstances, the existing exclusion netting systems may not be practical for ponds larger than 2 ha. In addition to the capital cost, the existing net systems can be costly to clean and maintain. However new systems are being developed which are likely to be cheaper to install and easier to maintain.

Partial exclusion netting

Where there are likely to be significant management problems, ponds should be constructed as small as practicable so that some form of partial exclusion can be erected if necessary such as parallel nylon lines or lines on a 1 metre grid. The design of long narrow ponds may be possible to make this method more practical. While further research needs to be undertaken to refine these types of system, the approach appears to offer a cost effective partial exclusion option.

Fright methods

For grow out ponds a number of mechanisms may need to be used depending on the bird species and the numbers involved. (Llewellyn 1999) "Fright" approaches such as gas scare guns, birdfrite, birdscare and sonic emitters used alone tend to have limited or short term success and often cause long term problems with the neighbours. Birds also soon get used to scarecrows and helium balloons. Well-trained dogs are likely to have more success. Human presence around the ponds can be most effective. Effective human surveillance (often a person on a motor bike doing "rounds") coupled with a number of fright mechanisms seems to offer the best current option. It is important to understand that the success of these devices are dependent on the vigilance of the operator and their understanding of the behaviour of the bird species. It is preferable that a number of devices are used alternatively. The more methods used, the more effective is likely the control.

Killing of birds

Killing of birds by shooting or trapping is an ineffective method of reducing numbers particularly when dealing with common species (Llewellyn). The random removal of individuals tends to create a vacuum for another bird. For shooting to be an effective component of a management strategy, a knowledge of bird behaviour is required. The shooting of scout birds may be an effective control in certain "social" species, but it should been seen as a last resort. (see *Operating the Farm* section for more information on this matter). Depending on the species it may require an approval not only from the DEC but also from the Commonwealth Government under the EPBC Act requirements.

(c) Other predators

Human predators

Poaching could be an issue in some areas. Controlled access after hours (gates and fencing) can prevent most instances. In other cases, strategically placed movement detection lights may be an effective deterrent.

Fish predators

Poor screening of inlet water can allow the entry of "feral" fish into the system including eels. As well as providing competition for feed, certain feral fish will prey on the fingerlings. Better screening can partly eliminate this problem along with the use of lines or traps.

Water rat predators

Water rats can be a nuisance in some area especially raiding fingerling ponds. Fencing of fingerling ponds should manage the problem.

4.6 Construction of ponds and related facilities

Professional supervision of pond construction is strongly recommended, as correctly constructed ponds will result in long-term savings by avoiding costly maintenance later from pond wall erosion, slump, leakages or failures. Leaking ponds cost money and pose a risk to the environment.

The most common type of pond is the "excavated" pond in which earth is removed and used for building the banks. This type of pond can be

constructed on flat or undulating land. "Levee" ponds are constructed on very flat land typically with imported material and are similar in structure to rice bays except that the banks must be high enough to contain the necessary depth of water.

(a) Soil material

The pond walls and floor should be constructed and/or lined with material capable of retaining water with a hydraulic conductivity (eg $<10^{-9}$metres/sec). Clay or clay/loam are preferable. In loamy soils, heavy compaction using rollers or bulldozers will result in sealed walls though they may leak for a period. However, prior to construction, the proposed site should be surveyed for rock stratas, gravel or sand layers or other soil characteristics that may interfere with the water holding capacities. Ponds constructed in sandy or other porous soils can be made watertight by lining the bottom and sides with clay, bentonite seals or liners, but it can be expensive.

(b) Groundwater

The construction of structurally sound, sealed ponds in areas of high groundwater can be extremely problematic. It is also difficult to build ponds that can be completely drained and dried, in these areas - steps that are necessary for efficient pond management. Saline water ponds leaking to groundwater pose an environmental risk from contamination from nutrient rich saline water.

(c) Climatic conditions

Seasonal conditions can affect construction and must be taken into consideration in the scheduling of the contracts. Wet weather can create difficulties with plant and equipment and add significantly to costs. Dry conditions will necessitate the application of water to maintain soil moisture. The two main factors that contribute to embankment failure are insufficient soil moisture content, lack of compaction and the use of structurally inappropriate material.

(d) Erosion and sediment controls

To minimise erosion and dust, the area to be disturbed at any one time should be kept to a minimum. Appropriate methods should be used to reduce erosion during construction activities including from soil stockpiles, rehabilitation works and truck movements in accordance with the "Urban Erosion and Sediment Control Handbook" 1992.

Measures to be used to reduce erosion occurring and to intercept and retain mobile sediment during construction should include silt fences, sediment traps or straw bales. In some cases, it may be necessary to bund the construction site and stockpile areas to prevent overland flows from entering the construction area.
Measures should include:

- Integrate clearing and grading with layout design; limit grading to those areas involved in current construction activities; limit the time during which unprotected graded areas are exposed to the wind and rain; subdivide drainage catchments into smaller units, at a size appropriate to the type of sediment control measure to be used
- trap sediment as close to the source as possible; locate sediment traps or filters below all disturbed areas to intercept and detain sediment laden runoff; locate sediment filters above environmental sensitive areas such as streams or steep slopes; use sediment traps or basins as

the most effective structures to control concentrated runoff flows; locate multiple sediment basins or major sediment traps so that they drain in parallel not in series to reduce the risk of total failure

- minimise the length and steepness of the slopes; reduce runoff velocity by minimising the length of flow paths, constructing channels with gentle gradients and by providing rough linings to the steeper channels
- intercept, divert and safely dispose of clean runoff flowing onto all disturbed or critical areas, including soil stockpiles; use sediment filters as the most appropriate means of controlling sheet runoff flows; identify areas of existing vegetation which have the potential to filter sediment laden sheet runoff flows
- install permanent stormwater drainage works as soon as possible
- apply temporary vegetation or mulch to all disturbed areas, including soil stockpiles, where construction is only partially completed and which will remain exposed for a period of 14 days or more; progressively stabilise all disturbed areas either with permanent vegetation as each stage is completed.

(e) Rehabilitation of the dam walls and disturbed areas

Topsoil should be stripped off and stored for use on the pond walls, batters or in the rehabilitation of other disturbed areas. As soon as possible, dam walls, pond walls, batters, backfilling and disturbed areas should be rehabilitated preferably with suitable local native vegetation. All cleared vegetation should be mulched or used to help establish disturbed areas. This material should not be placed so as it is likely to be swept back into streams during a flood.

Any disturbance on the riparian zone including the bed or banks of rivers, estuaries or drainage lines should be stabilised and restored as soon a possible with local native vegetation. No species other than local native plant species should be planted in this zone (with the exception of sterile cover crops). Any revegetated areas should be appropriately maintained and weeded to ensure effective rehabilitation.

(f) Contaminated soils

If the site was previously used for agriculture that employed chemicals (pesticide, herbicides, cattle dips), the soils should be tested for chemical residues. If present, it may be necessary to remove all the topsoil and not to use it in the rehabilitation of the pond and batter walls.

(g) Acid sulfate soils

The excavation or disturbance of acid sulfate soils in the construction of the ponds, access roads or circulation drains should be avoided when ever possible. ASS could be a particular issue in the construction of water return drains on estuarine sites. If the disturbance of acid sulfate soils is unavoidable, then the construction must be undertaken in accordance with an approved environmental management plan that is consistent with the ASS Manual. The management plan should relate to any excavated ASS material as well as the drain walls. All excavated ASS material should be treated in accordance with the ASS Manual prior to use on the site or being taken off the site.

(h) Aboriginal heritage

Care should be taken to ensure that accidental disturbance does not occur to any Aboriginal sites (relics) or Aboriginal places protected under the National Parks and Wildlife Act. Any identified Aboriginal sites or places

near the construction area, for which there is no permit authorising disturbance, should be clearly marked or temporarily fenced off.

If during construction, a previously unrecorded Aboriginal site (eg midden or tools) is uncovered, work in the area should cease immediately and the Regional Office of the Department of Environment and Conservation (DEC) should be contacted along with the Local Aboriginal Land Council.

(i) Native vegetation

The level of disturbance of native vegetation (terrestrial or aquatic communities) should be kept to a minimum and should be in accordance with any relevant approvals (eg under the Threatened Species Conservation Act, Native Vegetation Conservation Act, Fisheries Management Act). Generally all areas of native vegetation located near construction activities (which are not to be disturbed) should be marked or temporarily fenced (or equivalent) to ensure that accidental damage does not occur. In particular threatened or protect species for which disturbance has not been approved, should be marked, to avoid accidental disturbance. Where ever possible, native vegetation including grasses should be used in the rehabilitation or stabilisation of disturbed areas.

(j) Construction noise

During construction, the DEC noise guidelines should be adhered to. Recommended maximum noise levels for construction periods measured at nearest residences are:

<4 weeks	background noise levels + 20 dBA
4-26 weeks	background noise levels + 10 dBA
<26 weeks	background noise levels + 5 dBA.

Where these levels are not possible discussions should be held with neighbours and the Council on how noisy activities can be managed to minimise impacts on the neighbours. Reference should be made to the DEC's Industrial Noise Policy. This policy replaces the EPA's Environmental Noise Control Manual after July 2000. Generally a Construction Noise Management Protocol will be required with the level of detail matching the level of noise nuisance. Protocol should include:

- Compliance standards,
- Community consultation,
- Complaints handling monitoring / system and site contact person to follow up complaints; Contingency measures where noise complaints are received,
- Mitigation measures; Design and orientation of the proposed mitigation method demonstrating best practice,
- Construction times,
- Monitoring methods and program.

5. Tanks, Raceways and related facilities

Tanks and raceways commonly refer to those structures that are constructed from materials such as fibreglass, plastics, concrete, glass and metals and are usually situated either wholly or partly above ground.

5.1 General provisions

The interest in tank recirculating systems in Australia has increased significantly, with increasingly reliable recirculation treatment systems. Advantages include control over the stock, conservation of water, flexibility in site selection, smaller labour component, reduced impacts on the environment and extended growing season to year round if temperature controls are incorporated in the design. However, the system often has higher capital and operational costs and the success of the system depends on the successful operation of the recirculation system to avoid losses.

Intensive tank culture systems can be classified as:

- flow-through systems where water passes through the production system once and then is discharged or used for another purpose eg. in raceways. These forms of systems are generally not acceptable under this Strategy unless a demonstrated requirement can be justified such as in salmonoid, marine hatchery or abalone production. However, with such a system, very stringent discharge conditions would be applied. (See Section 5.4 in the Operating the Farm Chapter for further information on discharge considerations and requirements).
- recirculation systems where the water is reconditioned and recycled. The percentage of water recycled depends on the system design. High rates of recycling, together with high stocking levels require sophisticated equipment to polish the reconditioned water. These types of systems have been used successfully with species such as Murray Cod, Barramundi and eels.

If recirculation systems can be built in sheds, the conditions can be controlled to provide for optimum growing conditions. The following buildings, rooms and equipment are essential components of a tank aquaculture facility and their design and location should be planned so that space, labour and equipment are used efficiently and economically. These are:

- Structurally sound sheds or buildings;
- Stock culture tanks;
- Water pumps and drainage system;
- Recirculation system with mechanical filters to remove solids, biological filter system to remove metabolic by-products and a means of dissolved gas and possibly temperature management;
- Laboratory and general workroom with tanks for holding, sorting, quarantining and treating fish - with vehicular access;
- Handling/ packaging room for preparing stock for packaging and dispatch;
- Plant room(s) with backup generators if necessary;
- Store rooms for chemicals, feed, equipment;
- Office(s) and staff meeting room, toilet and washroom;
- Solid waste management facilities (filters, dead fish, packaging, solid waste);
- Reconditioned water-holding tanks and disposal provisions if no trade waste agreement with council.

5.2 The buildings

The recent expansion of aquaculture recirculation systems has resulted in a range of options and alternatives regarding building design and function. However fundamental requirements for a suitable building are:

1) It must be structurally sound and meet the functional needs of the proposal
2) It must be cost effective to construct/convert and maintain
3) It must have sufficient room on the site surrounding the building(s) for all necessary activities.

Relevant building codes and necessary permits must be obtained/complied with. In some circumstances it may be most efficient to construct a purpose built facility. In other cases it may be possible to convert an existing factory/shed complex. A number of intensive recirculation ventures have recently begun operations in disused freezer storage facilities where modifications were only required to provide for adequate drainage systems.

To optimize productivity and efficiency, the functional aspects of the building need thorough consideration. The structure should have sufficient room to accommodate nursery and grow-out tanks as well as isolated quarantine facilities.

The floor and wall materials should be conducive to effective and efficient temperature and humidity management and should be water-resistant. There should be the capacity to design into or retrofit sufficient drainage to avoid standing water on the floors. It is unwise to enclose all drainage lines in the concrete slab as routine cleaning and airing of drainage lines is important. It also allows easy access to all plumbing fixtures and allows for later modifications to the lines if necessary as a result of changing needs or capacity.

There should be sufficient floor space and elevation to accommodate mechanical operations such as biofiltration, mechanical filtration, CO^2 stripping, oxygenation, foam fractionator, sterilisers, temperature regulators, back-up generator (these are usually placed outside) in the recirculation system. Structure layout can serve as a mechanism to preserve biosecurity (minimise introduction of disease and infectious agents and facilitate pest management strategies).

Management of humidity in the building can become an issue. There should be a low humidity area for office and feed storage. Electrical service to the site should be sufficient to accommodate immediate and future needs. The site should be able to be secured.

5.3 The tanks

Generally, the best rearing tanks in a recirculating facility are circular as they allow for efficient recirculation and solids removal. The tanks should be designed to be self-cleaning but this will be dependent on the correct dimensioning of the tanks and water inlet and outlet design. Fibreglass tanks are generally considered better than concrete because of reduced fin wear and friction loss. Drains are of two basic types; single or double with the latter usually being superior in getting solids out of the tank as soon as possible. There are many designs and patented commercial drains available.

5.4 Tank water treatment

Recirculation systems require a high degree of management and knowledge of pumps and filtration systems, fish and organism physiology and water chemistry. The risk of loss in these systems increases proportionally with intensification due to the inherent dependence on life support technology. The basic factors to be considered in selecting a recirculation system include

- the fish to be produced,
- markets being served (weekly niche vs. monthly wholesale sales),
- available water supply and land;
- local, state and federal effluent regulations.

(a) Filters to remove solids

The basic elements of the recirculation system include processes to remove solids, remove ammonia and nitrite-nitrogen, oxygen addition and carbon dioxide removal, and in some cases disinfection.

Recirculation systems must first remove settleable and suspended solids prior to treatment by biological filter systems to convert ammonia and nitrite-nitrogen to less toxic nitrate-nitrogen. Faeces and uneaten food should be removed as fast as possible to minimise solids degradation. This can be achieved with settling tanks, and mechanical filters such as screen filters, disk filters, granular media filters. In most systems, the filtration process targets the removal of waste particles of greater than 30 microns in diameter. If necessary, fines solids and dissolved organic waste can be removed by using a foam fractionator, where these solids attach to the bubbles that float the waste out of the system.

(b) Biofilters to remove dissolved toxic wastes

Recirculation tank systems can be prone to water quality problems associated with the rapid buildup of toxic levels of ammonia and nitrite-nitrogen. Biofilters have an essential function in converting ammonia and nitrite-nitrogen in the water to a less toxic nitrate-nitrogen. This is achieved by use of nitrifying bacteria (eg. *Nitrobacter* sp and Nitrosomonas sp.) in purpose built biofilter systems. These must be adequately sized, operated in optimal temperature range, be designed to accept increasing flow rates up to a maximum load and assure constant shearing of the biofilm. The biofilters should have the right bacterial populations. Pre-activation of the biofilter is essential before stocking.

(c) Post filtration treatment

Additional treatment may be necessary to maintain a healthy environment in the fish culture tanks.

- Ultra -Violet or ozone filters may need to be incorporated into recirculation systems to control pathogens and limit disease occurrences.
- Intensive tanks will require supplemental aeration. In these circumstances the tanks should be fitted with an oxygen/air generator with back up blowers and electrical generators in the case of failures.
- Some form of water temperature control may be required for some species particularly in colder locations.
- Treatment may be necessary to control the pH.
- In intensive systems, gas stripping may be necessary to control the accumulation of carbon dioxide.

(d) Discharged water management

For recirculation tank systems, the volume of discharge water tends to be relatively small (5 - 10% of culture tank volume / day). In industrial estates, the potential exists for wastes and facility wash down water to be disposed of through a sewage system under a Trade Waste Agreement with the local council. In rural areas, freshwater to be discharged will need to be collected in a water storage unit (tank or pond) prior to irrigating to agriculture. (See *Section 4.3 Pond Water Reticulation System*).

5.5 Raceways

Raceway systems are generally utilised for species such as salmonoid, abalone and other species that have a requirement for high water flows. Raceway systems require a high degree of management and knowledge of pumps and filtration systems, fish and organism physiology and water chemistry. The risk of loss in these systems increases proportionally with intensification due to the inherent dependence on life support technology. Raceways are commonly constructed of concrete, plastics, fibreglass or other materials that can withstand the pressures of high water flows. The basic factors to be considered in selecting a raceway system include

- the fish to be produced,
- markets being served (weekly niche vs. monthly wholesale sales),
- available water supply and land
- local, state and federal effluent regulations.

(a) Construction issues

Raceways systems should be constructed to where possible include recirculation systems

Preferred design:	Raceway farms that utilise recirculation systems.

It is preferable that acid sulfate soils are not used for concrete raceway backfill or bank construction. Acid sulfate soils may react with concrete and jeopardise the integrity of the structure.

Groundwater can also cause constructed raceways to be undermined resulting in structural failure.

(b) Inlets

In flow through systems the inlet and discharge points, because of the large volumes of freshwater required, should be placed in close proximity to prevent dramatic modification to stream levels and flows between points. The diversion of water for flow through systems will require extensive consideration by DIPNR in terms of water extraction, embargoes and water quality impacts on the river system. Also embargoes in the Hunter and Central Coast area may prevent the reuse of any water from flow through systems. (See Section 5.4 in the Operating the Farm Chapter for further information on discharge considerations and requirements).

For marine growout facilities and hatcheries the location of inlet systems is critical from an engineering perspective, particularly in areas with high wave

energy. Pipelines traversing sandy beaches are very problematic. Existing infrastructure (eg piers) or utilisation of existing bedrock for anchoring the pipeline is recommended

Preferred design: existing infrastructure to carry inlet pipe at marine sites.

(c) Discharged water management

Raceway systems generally comprise of a flow through system of up to 100%. However, recirculation of part or all of the water should be investigated, such as utilising water for other fish farming enterprises.

Mechanical filtration and/or settlement ponds are required to remove settleable and suspended solids prior to further treatment or discharge. Faeces and uneaten food should be removed as fast as possible to minimise solids degradation. This can be achieved with settling ponds, and mechanical filters such as drum filters, screen filters (eg wedge wire), disk filters and granular media filters. Raceways may be shaped to maximise flow, removal of organic particle matter and to also aerate the water.

Flow through systems may be permitted to discharge under strict conditions, however, this will require extensive consideration by DIPNR in terms of water extraction, embargoes and water quality impacts on the river system. (See Section 5.4 in the Operating the Farm Chapter for further information on discharge considerations and requirements). In a flow through system (eg. salmonoid farm) utilising a flow of 30 ML/day, to obtain a reasonable particle removal from the water mechanical filtering systems down to 1000 microns or a settlement dam with a volume>10% of growout volume may achieve the desired objective.

Preferred design: Zero discharge.

In marine tank/raceway farms utilising saline water mechanical filters or a retention/recirculation pond capable of a retention time of at least 10 times the volume of the growout system would achieve reasonable solids removal. However, recirculation of part or all of the water should be investigated and zero discharge is the preferred design. Retention dam ecosystems may also result in some nutrient stripping however, the size of the retention dam required for a flow through abalone farm would be considerable and may result in other environmental impacts.

Preferred design: Zero discharge.

6. Hatcheries

6.1 General provisions

The development of the aquaculture industry in NSW will depend on the supply of reliable vigorous healthy seed stock. In addition to the demands from a growing aquaculture industry, there is an increasing focus on the development of marine and freshwater hatcheries that can produce fingerlings or shellfish spat for conservation purposes or for stock enhancement of waterways for recreational or commercial fishers. Increasingly, there is a need for modern breeding facilities that can deliver reliable quantities of genetically prescribed stock to meet a range of purposes (See *Section 3 Species Selection*)

In certain species, such as eels, industry still relies on the wild catch of juveniles from nature. In the farming of other species (such as oysters) the supply of juveniles is still mainly dependant on wild catch, though production through hatchery techniques is also undertaken on a commercial basis in New South Wales. For other aquaculture species, such as silver perch, the source of juveniles is solely dependent on the supply from hatcheries, operated under varying degrees of environmental manipulation.

Hatcheries may be stand-alone facilities or integrated with an aquaculture farm. Facilities specifically relating to the hatchery would normally include broodstock rearing facilities, spawning tanks, incubation facilities, nursery/larval rearing tanks (and in some cases ponds). The hatchery facilities must include a laboratory for quality control and management and high quality water treatment and management systems to meet the specific needs of each phase of the hatchery cycle.

The establishment and operation of a hatchery has serious potential hazards both from an environmental and economic perspective. Good hygiene must be practiced in relation to the tanks, transport containers, holding facilities, water reconditioning systems and operational equipment. Each rearing tank should have its own set of operational equipment including sampling and cleaning equipment. Worker transfer of disease on equipment, hands, clothes and shoes from one area of the hatchery to another is one of the common causes of disease spreading in hatcheries. All hatcheries should have the ability to quarantine the facility including storing all reconditioned water if there is a disease outbreak.

6.2 Water management systems

With an integrated hatchery/ aquaculture farm, it is recommended that the hatchery water treatment/ reconditioning system be kept separate from the farm's system. With hatcheries that import salt-water broodstock from interstate, the reconditioned water should be stored, quarantined and not released to any natural water system until disease-free certification of the progeny is approved. As with freshwater aquaculture farms, there should be no release of reconditioned water from freshwater hatcheries to natural waterways or wetlands. Salmonoid production may be considered as an exception however, it would be critically evaluated and strict discharge conditions would be applied. (See Section 5.4 in the Operating the Farm Chapter for further information on discharge considerations and requirements).

For marine hatcheries, the systems are usually designed for discharge but overall discharge and nutrient loading is low because of low biomass and feeding within the hatchery. Mechanical filtering such as drum filters can be employed to remove solids and prevent accidental discharge of larvae.

Preferred design: Zero discharge

6.3 Broodstock supply

Broodstock are the mature individuals of a species capable of naturally spawning or of being artificially induced to spawn in a hatchery environment. The initial source of broodstock in any aquaculture species is from the wild. For species where the broodstock need to be sourced from the wild a permit is required. The permit may stipulate that broodstock sourced from the wild must be returned to the site of capture and released at the end of the breeding program.

However, in some NSW species, particularly certain freshwater native fish, the availability of broodstock from nature is diminishing because of environmental degradation and other factors that have reduced natural populations in recent years. In some cases, such as the silver perch, the species is already considered threatened. To avoid undue environmental impact on these species and the negative image the aquaculture industry may derive from collecting precious broodstock from nature, Department of Primary Industries is encouraging the development of broodstock facilities in conjunction with hatchery projects in species that it considers necessary and feasible to have such a development program.

The long-term benefits of such a program include independence of industry from natural populations of the species and capacity for selective breeding/ domestication. In many species that are cultured here and abroad, broodstock programs are a very valuable part of an overall hatchery development.

Broodstock must be maintained in the hatchery under strict husbandry conditions to ensure that they are healthy and fit and capable of producing viable quantities of offspring or juveniles.

6.4 Genetics

The application of genetic principles in the production of stock is critical both for the reliable production in the aquaculture industry and in the stock enhancement program. Selective breeding programs for the aquaculture industry should be appropriately management and carefully monitored through the grow-out stages (See *Section 3 Species Selection)*.

6.5 Disease and pest transmission

Since the purpose of a hatchery is to provide juveniles for ongrowing in other areas, a hatchery has a potential for disease transmission, both to other aquaculture farms and into the natural environment. Common causes of disease in hatcheries include:

- poorly designed or inadequate facilities especially in relation to the water reticulation system,

- poor fish health management including overcrowding,
- lack of quarantine procedures or safeguards,
- lack of bio-security, eg in relation to bird or feed contamination sources,
- poor understanding of disease origins, prevention and remedy,
- lack of experience and /or poor training of staff in hatchery procedures,
- inadequate maintenance including routine total dry-out of facilities.

6.6 Accreditation and quality control

Well run aquaculture hatcheries providing quality stock to meet the conditions in NSW are fundamental to the future growth of the aquaculture industry in the State. Hatcheries need to be carefully regulated and monitored for the healthy development of the aquaculture industry as well as for the restocking of depleted natural stocks. Hatcheries are relatively complicated, requiring a high degree of technical expertise and experience, and significant capital investment. Hatcheries should not be considered a "do-it-yourself" business as significant environmental hazards to the industry and the environment can result from unprofessionally run facilities.

Hatcheries are a relatively risky venture with a potential for lucrative returns provided they are correctly established and operated with careful consideration of the market and the environment. Establishments which breed fish primarily for release to natural waterways have the potential to cause great environmental damage as well as economic damage to the commercial and recreational fishing industry, as well as tourism. Those breeding for commercial aquaculture farming have the potential for great economic damage on individual growers and the aquaculture industry.

Department of Primary Industries will require all hatcheries to be accredited and to comply with Audit Protocol requirements. Hatcheries will be assessed for risk that will be dependent upon the

- species of fish being cultured,
- the source of broodstock, and
- where the fish are destined.

Hatcheries breeding fish must be accountable for their day-to-day operations and have high levels of duty of care. There should be quality control programs where the hatchery provides an assurance as to the quality and viability of the stock being provided. A daily log should be kept of each rearing tank or pond recording water and fish details and other relevant information. This information should be available to Department of Primary Industries officers and prospective buyers of stock and attached to the Declaration of Origin.

Depending on the species, the log should contain information on the number of fry/larvae, feeding regimes, water quality parameters and any mortalities, abnormal appearances, behaviours or cessation of feeding.

- There should be an approved sampling program of stock to examine for health and vitality.
- All samples must be examined grossly and/or subgrossly with a dissecting microscope for the presence of abnormalities and parasites.
- If there is evidence of disease, the samples should be analysed to determine the causes.

7. Recreational facilities

7.1 Tourist destination

There is a high level of interest in many sectors of the community to visit commercial operating facilities and to buy produce directly from the growers. An aquaculture business can capitalise on this interest by providing visitor facilities and allowing visitors to look over the farm and purchase its products. From a public relations point of view, these types of visits provide an opportunity for the industry to show case the sustainability of the aquaculture industry and for the broader community to develop an increased understanding of fish, aquatic ecology and fish farming.

An aquaculture business can provide visitor facilities with displays explaining the fish growth phases with fish and fish products available for purchase. Tourism facilities would need to include adequate toilet facilities, possibly picnic tables, car parking and an appropriate level of public liability insurance. Local tourism authorities may also assist in providing information on the requirements of local tourists and how an aquaculture business can enhance a region's tourism experience.

If fish are to be maintained in an aquarium for public display, a permit must be issued by the Department of Primary Industries under the Exhibited Animals Protection Act.

7.2 Fishout facility

A fishout is a private dam or pond that is stocked with fish where anglers pay to catch the fish. A fishout sited in attractive landscaped surroundings stocked with trophy sized sport fish can become an attractive destination. A standard Class C commercial aquaculture permit needs to be expanded to include a Class F aquaculture permit for fishouts. The fishout ponds can be stocked from the aquaculture ponds or with fingerlings and allowed to grow. Feeding the ponds results in faster and more even growth. If fish are being grown in ponds, a number of fishout ponds may be required for stock rotation and so the fish do not become hook-shy. Fishing tackle should be provided for anglers as anglers using their own tackle could introduce disease to the farm.

Anglers visiting fishouts do not require licenses as long as the appropriate Class F Permit. Bag and size limits do not apply in fishouts but the operator must supply the angler with a "record" of the fish taken (date, number, size, combined weight by species and location of fishout) so as avoid confusion with wild fish. In some circumstances, fish are tagged or fin clipped to avoid confusion with wild stock.

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Operating the Farm

Hunter and Central Coast Sustainable
Aquaculture Strategy
Land Based Aquaculture

A NSW Government Initiative

Hunter and Central Coast Sustainable Aquaculture Strategy

A NSW Government initiative of Department of Primary Industries, Department of State and Regional Development, Department of Environment and Conservation, Department of Lands, Department of Infrastructure, Planning and Natural Resources and NSW Premiers Department to encourage sustainable aquaculture in New South Wales.

Operating the Farm

Table of Contents

1. Commercial Farm Development Plan

A Commercial Farm Development Plan (CFDP) is required under the Fisheries Management Act, 1994 as part of the application for an aquaculture permit. At the core of the CFDP is the need to address stock and environmental management issues as these have the potential to put at risk all aspects of an aquaculture operation. CFDP should contain all the factors that would normally be included in an environmental management plan (EMP).

The CFDP must be reviewed every 5 years or as otherwise determined by the Minister and an amended plan submitted.

In the event that the CFDP has not been complied with (eg. no farm production for a number of years) the Minister may ask to show cause why the aquaculture permit should not be cancelled.

Land based intensive aquaculture in its various forms requires a fair degree of technical skill as well as prudent business management for the sustainable operation of the enterprise. The development of a CFDP that integrates the business aspects with environmental management can improve productivity and economic returns. The CFDP has the potential to identify ways of reducing costs associated with energy, water and waste management while maintaining sound environmental practices and good community relations.

The CFDP should outline how each growing cycle will be established and managed in an environmentally and commercially successful manner. The CFDP should provide the framework for the ongoing management and monitoring for the life of the proposal and demonstrate how the farm can comply with statutory obligations under environmental licences or approvals. This can be important in demonstrating due diligence and reducing the risks of non-compliance with regulatory obligations.

The CFDP should demonstrate sound environmental practice during the operation (and if appropriate decommissioning) of the farm including:

- business management including annual production goals, products, markets, training and incentives programs for environmentally sound performance,
- stock management including post harvest processes,
- pond and water management,
- management of other environmental issues such as erosion control, chemical storage, odour, noise, dust and waste,
- management of predator issues,
- contingency plans to respond to disease emergencies, incidents and operational abnormalities or any breakdown in environmental performance,
- monitoring of environmental performance and compliance,
- complaints handling procedures including community consultation strategies,
- reporting mechanism on environmental performance.

2. Business management

2.1 Annual production goals, products, markets

Business planning doesn't stop once the business has been established. A business plan is a living document that should be revisited, on a regular basis, or when major events occur or change of species, technology, production rates or management is proposed. The progress of the enterprise should be checked against the business plan. The plan should be reviewed and updated as the business evolves. (*See Business Planning section*)

Swot analysis to check ongoing performance of aquaculture farm

- Review past performance
- Analyse strengths and weaknesses
- Look for opportunities and threats
- Adjust the plan if necessary

2.2 Personnel management and training

Qualified and experienced staff are essential in the operation of a successful aquaculture business. Training in occupational health and safety issues (including first aid) should be considered and appropriate occupational health and safety policy/guidelines should be implemented for the farm. Appropriate signs should be erected for worker safety as well as to remind workers of stock management protocols. Rostering of staff and employment of suitably trained casual labour during peak work times (eg. harvest time) should be planned in advance so there is always suitably qualified staff on the farm.

All new and existing staff should be made aware of the need for the aquaculture enterprise to be operated in an environmentally sustainable manner. It is essential that appropriately qualified and/or experienced staff undertake monitoring of the ponds and stock, including specific training on disease recognition and water quality testing. Training could include:

- critical issues with regard to stock management, health and welfare,
- importance of quality control of the product post harvest, quality assurance and food safety issues,
- pond/tank water management procedures,
- compliance with the permit and license conditions for any discharge water,
- commitment to waste prevention and energy conservation,
- contingency management procedures,
- importance of monitoring and reporting.

A number of aquaculture courses exist and are available at both tertiary and TAFE levels. The operation may also consider outsourcing for specific services in relation to the monitoring requirements.

Preferred management:	On-site trained staff with the ability to implement regular water quality and disease monitoring, good husbandry practices and sound waste management

3. Stock management

3.1 Species management

Only those fish species authorised under an Aquaculture Permit may be cultured on the aquaculture site. It is a requirement to obtain a specified disease clearance for certain finfish sourced from interstate (eg. eels and barramundi).

Before fish are introduced to the culture environment, conditions should be favourable for survival and growth. Water quality variables such as temperature, salinity, pH, dissolved oxygen, ammonia and nitrite need regular monitoring. Potential predators need to be excluded.

Stock should be carefully acclimatised to the culture environment to minimise stress. Water quality parameters should have similar readings between transport and receiving waters. In ponds it is usually preferable to stock during the cooler part of the day. Small cages are useful to monitor initial survival of a sample of the stock.

Recognised hatcheries should be consulted for sourcing seed stock. Where possible, periodic monitoring of the proposed purchase batch during the larval development should be conducted to ensure a history of good health and vigorous development. Laboratory tests to confirm disease free status should be considered.

Stock containment practices must ensure that no farmed stock is released into the environment. Water discharge structures must be screened, in accordance with stock size.

3.2 Stocking densities

In general, stock performs better at lower stocking densities. However, up to a point, increasing stocking density will also increase production together with disease risk and management. Optimum stocking density will vary with species, culture facility design and with operator production strategies and skill. Factors to be considered in calculating densities include:

- Production strategies;
- Farm Design;
- Operators skill and management.

If stocking densities are to be increased, it is wise to trial on a small scale prior to scaling up. Endeavouring to farm stock at "intensive" densities on under capitalised farms and without a sound technical background in water quality and disease management can result in business failure.

3.3 Health management

Management practices need to be designed to minimise stress and reduce disease risk. Initially, the purchase of certified pathogen-free stock is advisable where possible. It is highly desirable to have the capacity to quarantine new stock for an appropriate period of time (3-5 days) to check their health status before stocking into the facility. Introduction of seed stock to a facility without quarantining is a common pathway of disease transmission.

(a) Disease prevention

Disease-specific prevention programs should be put in place to minimise the risks of disease outbreaks occurring. A monitoring protocol should be prepared to identify disease on the farm. Daily monitoring of feeding activity, regular monitoring of both water quality and disease and reporting of stock behaviour are essential.

Priority should be given to ponds or tanks that have:-

- High biomass or high feeding rates particularly during summer months,
- Episodes of poor water quality,
- Signs of sick stock or poor feeding responses,
- Sign of abnormal swimming.

Some disease agents can be introduced to the farm via waterborne, terrestrial, or (less commonly) airborne carriers. Proper management procedures should be implemented to minimise the risk of these carriers entering the ponds or tanks. These procedures should include testing of seed stock to ascertain their disease status and quarantining. The farm should be designed and operated to ensure the operator has the ability to isolate, quarantine and apply treatments to individual ponds or tanks. Equipment and operator transfer between tanks/ponds is a common way of spreading infectious agents once on the farm. Nets, boots etc. should be sterilised using baths (chlorine/iodine) or sun dried.

(b) Disease contingency planning

A contingency plan to deal with likely disease outbreaks in an individual pond/tank or the whole farm is essential. This plan should be included in the CFDP.

The Aquaculture Permit conditions require immediate notification in the event of any disease/suspected disease or any significant deterioration in the wellbeing of the stock (eg >5% mortality). Department of Primary Industries may issue directions including quarantine (such as prohibition of effluent discharge) of the premises in such an event. The permit holder is prohibited from releasing effluent or selling fish with a Declared Disease (suspected or otherwise).

Protocols should include:

- Demonstrated ability to and management procedures to modify the water circulation and treatment system,
- Strict management of equipment to ensure that the disease is not accidentally transferred,
- Strict protocols to ensure staff do not contract the disease or transfer the disease on their hands, boots or clothes,
- Strict management of all wastes to ensure that solid or liquid material does not become a source of infection at other sites.

Provision should be made for the disposal of dead stock and the site must be kept in a clean state. Some high security species eg. barramundi, require that all solid wastes, sludges or waste water is treated prior to disposal or irrigation.

If there is a disease outbreak in one section of the farm, extreme care must be taken to ensure it is not transferred to other ponds or tanks or into the wild.

Preferred management:	On-site trained staff with appropriate facilities for regular water quality and disease monitoring, quarantining facilities and/or arrangement with accredited laboratory or veterinarian to provide these services.

No aquaculture therapeutants (chemicals) should be used unless approved for use (eg. salt) by the National Registration Authority. They should be used in accordance with the manufacturer's instructions as outlined on labels and other supplementary documents, veterinarian directions and relevant State and Federal legislation. Farmers should maintain accurate records regarding the use of chemicals including type, concentrations, reason for use, quantities, frequencies, duration of administration, size and species of stock treated and the result. Movement of stock (eg. harvesting) which have undergone chemical treatment should be recorded. Records of use should be retained for three years.

(c) Therapeutants and chemicals

This strategy places a high emphasis on disease prevention through sound site selection, design, planning and operational systems to minimise the occurrence of disease problems. However, a variety of therapeutants and chemicals may be used to facilitate production or to control diseases or parasites. These include hormones to induce spawning, anaesthetics, antibiotics, antiparasitics, antifungals, herbicides, immunostimulants, vaccines, pesticides, disinfectants, soil and water treatments and feed additives.

Most therapeutants used in aquaculture are of low regulatory priority (eg. salt and fertilisers). The National Registration Authority have approved minor use permits for a number of other chemicals. These permits are species specific.

Inappropriate use of chemicals is not only illegal but can result in:-

- Product having chemical residues with possible market rejection of the product;
- health and safety risks to consumers, workers and neighbours;
- production of chemical resistant strains of pathogens;
- waste of money on chemicals which are used inefficiently;
- adverse off-site impacts on the environment.

All chemicals should be stored and used in accordance with manufacturers' instructions. Appropriate instructions, training and protective clothing should be given to staff using chemicals. Containers must be disposed of in accordance with the manufacturers' instructions and the requirements of the local waste authority (council or waste board).

Pesticides must be used in accordance with the Pesticide Act which places a responsibility on those applying the chemicals and the landowner on whose land the chemicals are used to ensure that there are no unacceptable impacts on the environment.

(d) Predator controls

Predator control should be considered part of health management. To reduce unwanted introduction of eels and finfish, screening of intake and discharge structures with appropriate sized mesh is recommended. For bird predators, a number of management methods should be considered, such as netting of all ponds or at least fingerling ponds, overhead wires, use of dogs, the use of repellent systems and increased personnel around ponds at peak bird feeding times. Generally it is considered that a mixture of bird management methods is necessary as an effective deterrent (See section on *Planning and Design*).

Preferred management	Screening of all incoming pond water, regular clearing of trash fish from storage water and channels or as a minimum screening of fingerling ponds and repellent systems for other ponds.

Licenses to control native avian predators

It is illegal to kill native species without a permit from the Department of Environment and Conservation (DEC). The DEC is responsible for nature conservation and the protection of native animals in NSW. There are provisions under the National Parks and Wildlife Act for the DEC to licence the killing of native species under certain circumstances. Potential predators of fish, such as cormorants, fall into this category. In addition some of these species may also fall under "migratory species of interest" under the Commonwealth Government's EPBC Act. An assessment may be also be required of the likely impacts of shooting the species of birds and a Commonwealth approval may be required (see *Integrated Approvals Section*).

The ultimate goal, however, is for native animals to be managed by using only non-lethal deterrents such as netting and scare devices. This also applies to other agricultural situations, such as flying foxes feeding on fruit crops.

Killing cormorants or other native animals should always be a last resort.

Operators should not rely on the DEC continuing to issue licences to kill predators in the long term and the aquaculture industry should actively investigate other deterrent options.

The DEC has been working with the aquaculture industry to develop alternative approaches. These approaches should include sound site selection as well as screening and/or scare mechanisms. These non-lethal approaches should be the first line of defence. Aquaculture operators should contact the local office of the DEC to discuss these approaches to gain additional advice/information based on DEC's knowledge of bird behaviour in the area taking into consideration seasonal and other factors. This information may be of assistance in improving the efficiency of non-lethal approaches.

Licences issued by DEC under section 121 of the National Parks & Wildlife Act to lethally harm protected fauna is considered to be an extreme measure for managing damage to fish stocks and is unlikely to be issued.

The decision to issue a s.121 licence to kill cormorants or other protected native animals will be based on an evaluation of the following:

- Evaluation of the mitigation measures previously used and their effectiveness,
- Monitoring information on bird species and numbers visiting the ponds and their pattern of behaviour including the time of day when numbers are highest,
- DEC information regarding the population of the “target species” in the area taking into consideration breeding and dispersal behaviour,
- Proposed target species and numbers to be culled. Outline the strategy for culling these target species,
- Evaluation of the likely effectiveness of culling target species taking into consideration seasonal and other behavioural factors,
- Proposed monitoring of bird visitations post culling.

A fee is charged by the DEC for processing licence applications, which is aimed at recovering the administrative costs of assessing an application on its merits. Any funds left over from application fees are used for researching the impacts of licences on native species and for the education of the aquaculture industry and the community about non-lethal methods of managing native predators.

In the event that a s.121 licence "to harm protected fauna" is issued,

1. Operators should whenever possible "shoot to scare" rather than "shoot to kill".
2. If protected fauna is "lethally harmed", the operators should recognise the need for appropriate and humane euthanasia to be applied to injured and maimed animals.
3. All dead birds should be frozen and delivered to DEC to determine the food they have been eating. This information will form the basis for a better understanding of the predator behaviour.
4. Operators should use weapons that pose least danger to neighbouring communities.

If the birds are listed under the Threatened Species Conservation Act, applications for licences to harm threatened species must also be made under the provisions of this Act, which requires more detailed information and a much more thorough and detailed level of assessment. **As a general rule, DEC is not likely to issue a licence to "lethally harm" threatened species**.

Monitoring requirement

A log should be kept of the presence of potential predator birds on the farm on a weekly basis. This information will be useful if a licence is being applied for. The effectiveness of various management devices to manage the birds should be noted. If a licence to shoot birds is issued under s 121 of the NPW Act, a record must be kept of all birds shot and the circumstances. A copy of the log should be provided to DEC when the frozen dead birds are delivered for analysis.

3.4 Feed management

The costs associated with purchase and delivery of formulated feeds for aquaculture are usually the major component of total operating costs. The goal

is to feed efficiently and select the most "cost-effective" diet for the target species (ie. the diet which will produce the most rapid growth and best food conversion efficiency for the least cost). Over feeding results in poor water quality and wastage whereas underfeeding will result in poor growth and health. It should be noted that fish are twice as efficient as chickens at converting feed into flesh and five to ten time more efficient than beef cattle.

Apart from economic imperatives, feed inputs are the major contributors to pond/tank water quality deterioration and eutrophication of effluent waters. To minimise these environmental problems, and to make the most efficient use of expensive feeds, farmers should:

- Regularly monitor the growth of the stock, regulate the ration and grade stock to improve FCR's and growth.
- Select the feed which best meets their species nutritional requirements (eg for protein and essential amino acids, digestible energy, total fat and essential fatty acids and trace minerals and vitamins). Find out as much about the feed from the manufacturers as possible.
- Select the appropriate pellet size for the size of fish being fed; do not change from one type of feed to another too rapidly. This can put animals "off their feed" and contribute to the undesirable build-up of uneaten food in the culture facility. When changing feed types, blend the two types together for a period (6-8 days) to allow fish to adapt slowly.
- Select feed made from fresh, well stabilised ingredients. Do not keep feed for longer than a few months; Store feed in a cool, dry place to prevent mould problems occurring and pests should be excluded (eg. rats).
- Monitor pellet physical attributes and its water stability. If the feed being purchased has more than a few percent "dust" or "fines", inform the manufacturer and/or send it back. If it dissolves too rapidly in the water, let the feed manufacturer know or trail another brand.

Improvements in feeding strategies (ie. feeding frequency, feeding rates and delivery methods) can significantly improve farm profitability. Feeding systems should be managed to maximise growth and minimise waste.

Preferred management:	system to adjust feeding quantities through stock grading, monitoring of growth, feeding responses and health issues.

The quantity of feed eaten should be monitored regularly and feed delivery adjusted accordingly. Most importantly, farmers need to know the biomass of their stock (ie. how much all the animals weigh). If fish mortality goes undetected, overfeeding can result which in turn can lead to water quality problems and more mortality. Recommended feeding tables are available for a number of species.

In general, feed should be delivered to give all animals the best opportunity to eat as much as they need. For bottom dwelling animals, feed should be distributed as evenly over the pond surface as possible. For surface or mid-water column feeders, feed can be spread over a smaller area as long as animals are not too crowded when feeding. Feeding should be suspended when water quality or disease problems are suspected (eg when dissolved oxygen is low or when algal blooms are excessive).

Preferred management: system to broadcast feed homogenously for efficient use.

3.5 Harvest management

Harvest procedures can often affect product quality, marketability and consequently selling price. Harvest procedures should be chosen to minimise stress, even if animals are to be killed. "Rested harvest" is the term given to killing fish to minimise the build up of lactic acid in fish muscle. This can be important as lactic acid can affect the onset of rigor mortis and influence flesh quality. Pre-harvest procedures should be designed to:

- ensure withholding periods of any therapeutants have been complied with;
- ensure facilities are ready for purging fish (if necessary);
- ensure all harvest supplies, any processing and packing materials and all personnel are available and informed of the proposed procedure.

Harvesting methods might include the use of nets, traps, trawls or draining the pond/tank. Drain harvesting of pond fish requires correct design and a degree of skill. Where pond water is drained, effluent water should be treated in the reconditioning system to ensure suspended solids and nutrients settle prior to reuse or discharge. With saline water, water quality performance objectives must be met prior to any discharge to the estuary. With freshwater ponds, sufficient storage must be available to hold and treat the water prior to recycling in the ponds/tanks or use for irrigation. (For tank culture, if there is a trade waste agreement, the water could be discharged to sewer in accordance with the agreement). De-watered sludge from tank culture must be captured and disposed of according to regulations.

4. Safe food issues

NSW Food Authority (formerly “Safefood”) was established in early 1999 and administers the Food Production (Safety) Act 1998. When fully implemented, it will be responsible for food safety arrangements from catch or harvest to "back door of retail". NSW Food Authority is progressively developing Food Safety Scheme regulations for the industry sectors, which it will cover. NSW Food Authority’s legislation requires these Food Safety Schemes to be based on risk assessment to ensure that all known risks are addressed and that resource allocation is commensurate with those risks. Information on the latest developments can be sourced from www.foodauthority.nsw.gov.au .

4.1 Hazard rating for different products

The food safety hazards needs to be identified for each product and is a combination of the inherent hazards of the seafood, the particular hazards of the process and the general hazards associated with all food handling. The following tables summarise the hazards applicable to seafood caught, harvested, processed and sold within NSW, and indicates the priority of the hazards identified.

Table 21. Bivalve Mollusc Hazards

Hazard		Farmed	Wild Caught
Biological	Pathogens [1] Vibrios Viruses	**High** **Med/High** **High**	Low/Med Low Low
Biological Toxins	ASP[2] DSP[3] NSP[4] PSP[5]	**High** **High** **High** **High**	**High** **High** **High** **High**
Chemical	Metals Agrichemicals	Low Med	Low Low

1. Bacterial Pathogens of faecal origin eg. Salmonella, Shigella
2. Amnesic Shellfish Poisoning
3. Diarrhoetic Shellfish Poisoning
4. Neurotoxic Shellfish Poisoning
5. Paralytic Shellfish Poisoning

Table 22 distinguishes farmed from wild caught by assuming farming in rivers and estuaries are subject to greater risk of contamination. This may not always be valid particularly since wild catch may also be in estuaries, but it is a starting point for the risk assessment process. The significance of the biological toxin hazard for scallops is not known.

Table 22. Aquaculture Product Hazards

Hazard		Crustaceans	Finfish
Biological	Pathogens [1] Vibrios *L. monocytogenes*	Low Medium Low	Low Low Low
Chemical	Metals Agrichemicals Feed Ingredients Aquaculture Compounds	Low Low Low Low	Low Low Low Low

1. Bacterial Pathogens of faecal origin eg. Salmonella, Shigella

4.2 Priority hazards in seafood

For each of the hazards identified as a high priority, the likelihood and severity of the hazard was assessed by studying:

- The likelihood of the hazard being present,
- The level at which the hazard is present,
- The illness(es) associated with the hazard.

An assessment report by Ross and Sanderson ranked the hazards associated with wild catch and farmed fish in order of the following "priority" in Australia. A number of the hazards are less relevant for aquaculture species but are indicative of the types of issues which should be considered.

Viruses in bivalve molluscs

Viruses in bivalve molluscs result from contact with contaminated water or infected food handlers. Normal cooking methods will not necessarily destroy viruses. Viral contamination post cooking can occur due to use of contaminated water, contact with infected food handlers or raw food product. Food safety management systems have been developed to control viral contamination of bivalve molluscs including:

- Ongoing microbiological surveys of growing areas and bivalve mollusks,
- Classification of growing areas based on sanitary conditions,
- Periodic closure of growing areas where necessary,
- Depuration (an effective tool only when used in conjunction with the above controls).

Algal biotoxins in bivalve molluscs

Algal biotoxins in bivalve molluscs is caused by algae and other microorganisms present in waterways which produce toxic substances, which can accumulate in bivalve molluscs and if levels are high enough, result in serious health effects in humans. Control strategies used in biotoxin management programs include:

- Monitoring of algal levels,
- Monitoring of algal toxin levels in the shellfish meat,
- Closure of harvest areas where necessary.

Histamine or scombroid poisoning

Histamine or scombroid poisoning is thought to occur following the ingestion of histamines and other amines produced by certain bacteria present in the gills and intestines of certain fish eg scombroid group (tuna, mackerel, sardines and anchovies) and certain other non-scombroid species. The toxicity of histamine is not affected by cooking or canning. Temperature abuse appears to be the major factor contributing to the formation of histamine in fish. Therefore control of the hazard relies primarily on effective chilling of the fish after catch and ensuring the fish remains cool during all subsequent handling and processing.

***Vibrios* species in seafood**

Vibrios species in Seafood occur naturally in marine and coastal or estuarine environments in both tropical and temperate regions of Australia (eg *V. cholerae).* The number of *Vibrios* that may be present in the water and seafood varies with season, with higher levels during the warmer months. In most cases, levels detected in freshly caught or harvested fish and shellfish are usually not high enough to directly cause illness in the consumer. *Vibrios* are usually

destroyed by heat treatments and therefore the consumption of raw foods, cross-contamination and temperature abuse are the main causes of outbreaks. Control of *Vibrios* in seafood relies on:

- Maintaining temperature control from catch/harvest to plate
- Preventing cross-contamination of raw and cooked foods

Enteric bacteria in shellfish

Enteric bacteria in shellfish are generally regarded as those bacteria capable of causing foodborne illness such as haemolytic uraemic syndrome (HUS) due to faecal contamination of either the environment or of the food during processing. Enteric bacteria are fairly heat sensitive, and therefore problems are usually associated with consumption of raw foods or foods contaminated after processing. In marine environments, enteric bacteria will die off fairly rapidly and therefore their presence in waterways would be an indication of significant recent pollution that could pose a risk to human health. Like viruses, enteric bacteria present a risk to seafood consumed raw, in particularly bivalve molluscs, as their filter feeding systems results in enteric bacteria concentrated. Management systems that are used to control viruses in shellfish, were originally implemented to control enteric bacteria in shellfish and are highly effective.

***Listeria monocytogenes* in ready-to-eat smoked fish products**

Listeria monocytogenes is a pathogenic bacterium that has been isolated from a variety of raw and cooked ready-to-eat products. *Listeria monocytogenes* will usually be destroyed by effective heat treatments, although contamination can occur after processing. It can also be readily isolated from moist or wet factory environments and can grow under refrigerated temperatures. Because of this *Listeria monocytogenes* is of concern in many ready-to-eat foods, including seafood products such as smoked salmon and mussels. Due to the variable nature of food poisoning by *L. monocytogenes*, management options are not clear-cut. Some suggested control measures include:

- Effective cleaning and sanitation of the processing facility,
- Proper temperature control during processing, transportation and distribution,
- Setting of a shelf life that limits the potential for growth in the product,
- Education of at-risk-consumers.

Botulism in vacuum packed ready-to-eat seafood products

Botulism is caused by the consumption of food contaminated with botulinum toxin. The toxin produce by *C. botulinum* is heat sensitive and will be destroyed by normal cooking temperatures. Therefore, botulism has been identified as a potential hazard in vacuum packed ready-to-eat seafood products. Botulism from commercial food is rare in Australia. To prevent the growth of *C. botulinum* and toxin production:

- Heat treatments must be designed to destroy *C. botulinum* spores;
- Refrigerated storage temperatures must be maintained throughout the cold chain;
- Preservatives such as salt and acid can be used to inhibit its growth and subsequent toxin production.

Parasites in seafood

Parasites able to cause disease in humans have been reported to occur in Australian fish. Parasites are usually rendered inactive by freezing or normal cooking temperature and are therefore mainly a risk in products such as sushi and sashimi, where the fish is consumed raw. In Australia, parasite infection due to the consumption of seafood is rare. In Japan, where raw, lightly cooked or pickled fish is often consumed, parasite infections are relatively common. With the increase in popularity of raw fish dishes such as sushi and sashimi in NSW, the risk of parasite infection may increase. The risk can be reduced by:

- Avoiding harvest areas where large populations of marine mammals (possible intermediate hosts or vectors) are present;
- Using farmed fish which are thought to be of lower risk than ocean and estuary caught fish;
- Visual inspection (handling) of fish to identify parasites that may be present in the flesh.

Table 23. Seafood Processing Biological Hazards

Product/Process	Hazard			
	Cl b[1]	L.m[2]	S.aur[3]	Gen[4]
Cold smoked – to be cooked			L	
Cold smoked – ready-to-eat	L	**H**	L	L
Hot smoked – ready-to-eat	L	**H**	L	L
Cold/Hot smoked – ready-to-eat vacuum or MAP	**H**	M		
Raw fish – to be cooked – vacuum or MAP	M			
Cooked whole prawns		L	L	M
Cooked peeled prawns		M	M	M
Cooked crab meat		M	M	M
Canned products	L			
Dried seafood		L	L	L
Salted seafood		L	M	L

1. Cl. b = *Clostridium botulinum*
2. L.m = *Listeria monocytogenes*
3. S. aur = *Staphylococcus aureus*
4. Gen = general pathogens, *Vibrios*, *Salmonella*, etc.

4.3 Comprehensive Quality Assurance (QA) systems

Comprehensive quality assurance (QA) systems should be established for the aquaculture enterprise to assure product quality. A number of accredited systems have been developed and these usually revolve around Hazard Analysis Critical Control Point (HACCP pronounced “hass-up”) principles.

The Seven Steps to HACCP

The Seven Steps to a HACCP Plan are as follows:

1. Work out what the hazards are. ‘Hazards’ for the produce at the farm including pre-harvest as well as harvest and post harvest issues.
2. Identify the *Critical Control Points*. These are the steps where the really important things can go wrong, so they are critical to eliminating the hazards. eg product exposure to high temperatures (pond side) following harvest.
3. Set the ‘*critical limits’* for each Critical Control Point. Again, these will vary from

business to business, but examples could be chiller temperature. If the critical limit is exceeded, a problem can occur.
4. Monitor the *critical control points*. See whether the targets are being met and track the results. When things go wrong, they can be detected immediately.
5. Establish corrective *Actions*. These are the things to be done when monitoring shows there is a problem.
6. Verify that the HACCP system is working correctly. It is all very well having an effective system, but it must be doing the job required. This step might involve microbiological testing, for example.
7. Keep an accurate record so those responsible know what is happening and can track trends so that improved management decisions can be made. Record keeping must be thorough. It can help to prevent disastrous mistakes. Regulators also need records for compliance and auditing purposes. Producers who have their quality systems accredited need comprehensive records that can be audited by a third party. Independent auditing can also help prove to customers that the stated procedures are being followed.

Hazards may be introduced into any stage of the handling and distribution of fish products. Prevention relies on:
- Attention to the design and construction of the premises;
- Equipment design;
- Water quality controls;
- Appropriate purging protocols (if necessary for aesthetic or health reasons);
- Pest/vector control programs;
- Cleaning control programs;
- Personal hygiene and health awareness.

These practices are defined as Good Manufacturing Practices (GMP) and Good Handling Practices (GHP). Of particular importance is the need to prevent cross contamination from raw to cooked product and the exclusive use of potable water and ice at all times. Automatic temperature controls are necessary for the maintenance of quality and in some cases is vital for ensuring food safety. Temperature control throughout the distribution chain, from harvest to retail, is an essential precaution.

4.4 SafeFood seafood premises checklist

(a) General requirements

Premises and equipment should be maintained to prevent physical contamination and kept clean and hygienic eg. flyscreens on windows; effective pest control programs; birds not permitted in the seafood handling and storage areas; work areas visually clean and free of pests with no accumulation of waste, dirt or grease.

(b) Food handling areas

Floors, walls and ceilings should be well constructed of solid, non-absorbent and sealed non-toxic materials to prevent the entry of dirt, dust and pests and so they can be easily cleaned. The floors should be in good condition, not eroded and well drained. The joints between walls and floors should be sealed with floor grates and solid traps accessible for cleaning. Work surfaces should be impervious to grease, food particles or water and easy to clean. Food contact surfaces including appliances and equipment should be made of durable, corrosion resistant material that will not contaminate food. Working areas should be well lit, with light fittings which are easy to clean and will not contaminate work area if broken. The area should be sufficiently ventilated to minimise the build up

of condensation, fumes, smoke or vapours.

Fish bins or other containers used to hold seafood should be constructed from non-toxic material with smooth surfaces that are easily cleaned. The bins or containers should be kept in good repair.

(c) Refrigerated storage

The refrigeration and cold storage systems should provide adequate cooling and freezing performance capabilities to deal with large batches of stock. The walls of refrigeration and cold storage areas should be easily cleaned and equipped with thermometers. If fish are to be cooked or processed, then refrigeration systems should have space to separate cooked and raw seafood. The system should have capacity for ice without contamination for raw or cooked seafood. The ice storage areas should be in good repair, non-corrosive and easily cleaned.

(d) Chemical, packaging and waste storage areas

Chemicals should be stored away from food handling area off the floor in appropriately labelled containers with lids. Packaging containers and materials should be stored off the floor in a dry, well-ventilated area. Fish waste should be stored in leak-proof and non-absorbent containers segregated from food handling and other storage areas. Containers should be easily and securely closed. Any waste temporarily stored in food handling areas should be clearly labelled.

(e) Hand washing facilities

Hand washing facilities with warm running potable water, soap/detergent and disposable towels should be readily available within seafood handling areas. These facilities should be maintained in a clean and sanitary condition.

(f) Water supply

Any premises handling seafood should be provided with a suitable and adequate supply of water. A potable water supply should be available in a quantity and pressure that ensures cleaning activities can be conducted effectively.

5. Water management

5.1 Tank, raceway and pond preparation

Preparation of ponds, raceways or tanks for stocking is a crucial step in the actual cultivation of a crop and if incorrectly undertaken, can lead to significant financial loss. In the case of all-in all-out production regimes, this usually follows a farm dry-out, repair and maintenance phase.

A pond, raceway and tank preparation protocol should be developed with a timetable for activities such as maintenance, repair and re-installation of screens, aeration and filtration equipment, pumps and pond and tank structures. Pond preparation usually occurs during cooler non-productive months.

Recirculating aquaculture systems.

In recirculation tank systems pre-activation of the biofilter can be accomplished by seeding with appropriate bacteria. Alternatively, fish may be stocked and a gradual increase in feeding over 4-6 weeks can result in bio-filter colonisation. Biofilters usually take a period of months before being fully colonised and stable.

Dryout periods (Ponds)

Generally, complete dry-out of the entire farm is favoured for some species as this practice has shown to reduce disease incidence and result in higher production. At the end of the previous growing cycle, the ponds need to be dried out completely. A drying period can be completed in about one month under favourable weather conditions.

The bed of the pond is usually tilled (to a depth of 5 – 10 cm) to ensure the oxidation of residual organic matter remaining from the previous crop. Excess silt can be removed and pond walls repaired if necessary. Where soils are acidic, agricultural lime may be added. In the case of disease outbreaks in the previous season, calcium hydroxide ($Ca(OH)^2$) or calcium oxide (CaO) may be used as a caustic disinfectant, to kill residual pathogens and pests.

Establishing optimal plankton populations for larvae/fry rearing stages

Aquaculture pond systems operate in a photosynthetic environment with promotion of an aquatic food web, usually based on plankton in the water column. Various nitrifying plankton and bacteria remove nitrogen. Following pond preparation, correct phytoplankton and zooplankton populations need to be established. There is often more art than science in achieving and maintaining optimal plankton populations. However, sudden weather and other water quality changes can play a significant role in destabilising the plankton populations. Appropriate use of fertilisers (type, quantity, frequency, etc.) and a procedure on how and when to increase or decrease plankton blooms should be detailed.

5.2 Pond/raceway/tank water management

Intensive aquaculture involves the addition of relatively high protein formulated feeds (essentially a potential pollutant) to the culture system. This results in elevated nutrient levels in the system and their effluent.

Poor water quality has been associated with disease outbreaks in aquaculture ponds, raceways and tanks. Correct water management prevents unnecessary stress to cultured species which in turn maximises growth and minimises opportunity for outbreak of disease.

Recirculation systems (tanks or ponds) are prone to water quality problems associated with the build up of potentially toxic substances resulting from the stocks metabolic wastes. Of particular concern is nitrogen in its ammonia and nitrite forms which can be toxic to stock. Biofilters within the culture system have an essential function in removing ammonia and nitrite from water. In the case of recirculation tank systems this is usually achieved by use of nitrifying bacteria (eg *Nitrobacter* sp and *Nitrosomonas* sp.) grown on purpose built biofilter systems. Most tank facilities operate under a partial water exchange routine to replace water lost through backwashing, cleaning and exchange. Water exchange could account for up to 3% of total tank volume per day.

Incoming pond, raceway and tank water should be filtered with appropriate mesh size screens to prevent entry of unwanted organisms. A plan for routine water recirculation and exchange to maintain transparency of pond water and the population of plankton should be developed.

Dissolved gas (essentially oxygen and carbon dioxide) management is crucial in aquaculture operations. Appropriate aeration will result in increased productivity and reduced waste products within the discharge water. Dissolved oxygen is usually the most critical parameter. Carbon dioxide is more of a problem in tank recirculating and transport systems and is a function of design, loading and pH control. Mechanical aeration systems should:

- promote water circulation,
- maintain oxygen levels within acceptable limits (>4ppm for warm water species and > 6ppm for cold water species),
- minimise stratification in the water column, and
- maintain oxygen levels during periods of poor water quality eg high biomass, under some chemical treatments, during inclement weather and following algae bloom “crashes”.

Monitoring

Monitoring of the physical, chemical and biological parameters and maintaining them at optimum levels is essential. Parameters include Dissolved Oxygen, pH, Salinity, Temperature, Ammonia, BOD, Total Alkalinity, Hardness, Ozone, Nitrite and plankton density.

Preferred management:	provision for regular monitoring of pH, Temperature, Ammonia and DO and an arrangement with an accredited laboratory for full water analysis.

5.3 Effluent Water reconditioning system

Effluent water quality issues include:

- dissolved wastes from metabolic activities of stock and biological breakdown of waste feed particles and faecal matter,
- particulate nitrogen and phosphorus originating from waste food particles, faecal matter, algal cells, soil particles (in ponds) and sediments (from poor

quality intake water),
- suspended solids from organic matter, soil particles (in ponds) and sediments (from poor quality intake water),
- excess phytoplankton.

As aquaculture technology has evolved, it has moved towards improved techniques in the management of water quality and in the recirculation of discharge culture water. Reuse may extend from semi/flow through systems with utilisation of the discharge water in downstream crops (eg. shellfish, broad acre crops, orchards or hydroponics commonly referred to as integrated farming) through to complete recirculation of water as currently exists in many native freshwater fish ponds with the only discharge at the end of the growing season.

Properly managed reconditioning systems on most commercial freshwater pond aquaculture farms in NSW can achieve 100% recirculation with the make-up water only needed to replace evaporative losses. In most cases, well aerated ponds are able to assimilate nutrients wasted as metabolites during the growing season. In the case of estuarine pond systems, there is one NSW farm that operates on this basis albeit with lower stocking densities than more intensive farms. However, with improved design and management techniques, the goal of less than 3% exchange daily with the reconditioning ponds, and zero discharge to the natural environment (during growing periods) is achievable at higher stocking rates.

The potential benefits of water reconditioning/recirculation are:
- reduced water requirements which may be a limiting factor (especially with freshwater supplies in water embargoed catchments),
- reduced water discharge which can reduce stress on rivers or estuaries,
- improved quarantine by minimising pathways for introduction of diseases and pests,
- improved on-farm water quality control particularly where the external water source is variable in quality,
- additional economic benefit (eg value adding through use in irrigation),
- reduced energy requirements (eg pumping and heating).

The reconditioning/recirculation system must reintroduce the water to the culture system as close as possible to optimal requirements for the culture species. This usually involves treatment of the water in a sequential process by:
- ❑ removal of solids by use of screens, filters or gravity settlement,
- ❑ removal of metabolic wastes utilising biofilters (eg nitrogenous and phosphorus compounds),
- ❑ removal of other dissolved compounds and biological material (bacteria and plankton) by oxidation and precipitation,
- ❑ adjustment of temperature, pH or other characteristics for optional conditions.

The most common technique for treatment in pond systems is to use settling ponds to remove solids and to some extent dissolved nutrients. The retention time in the system is a critical issue with the minimum acceptable time being 24 hours with a recommended of 6 days of equivalent prior to discharge back to the ponds or to the natural waterbody. Effluent ponds can be designed in a particular way to help achieve these goals.

The water treatment system should not itself impact on water quality such as

increasing turbidity through silt re-entrainment or adding plankton blooms. In some systems, ecological systems within the reconditioning ponds can assist in improving the water quality such as wetland systems, other aquatic organisms, etc.

Preferred management:	For estuarine pond systems, retention of water in the reconditioning ponds for longer than 6 days prior to reuse or discharge

Monitoring

It is important to monitor the reconditioning system routinely using the above parameter to ensure that it is operating effectively. Contingency plans should be established to quickly correct the problems in the water quality. Factors affecting the performance may include:

- the overall load in the system (essentially how much feed is being used);
- the quality of the influent water to the reconditioning system (eg final portion (5-20%) of pond drainage tend to concentrate nutrients and solids);
- residence time of the water - recommended as minimum of 24 hours;
- weather (temperature, cloud cover, rainfall, wind);
- biological parameters (plants, plankton, bacteria);
- pond management practices.

Preferred management:	provision for regular daily monitoring of pH and DO plus on site facilities for basic water quality analysis of other parameters and an arrangement with an accredited laboratory for full water analysis.

5.4 Discharge of reconditioned water

(a) Saline water

Estuarine and marine aquaculture farms are permitted to discharge reconditioned water to natural waterbodies (estuary or ocean) provided they comply with the conditions of the Aquaculture Permit, the Development Consent and a licence under the Protection of the Environment Operations (POEO) Act.

The conditions of these approvals will relate to the location of outlets and the treatment of the water prior to discharge. The conditions will require outlets to be screened (at appropriate sizing relating to the size of stock) to prevent the escape of fish. In the event of disease problems Department of Primary Industries may order the farm water to be quarantined with no discharge being permitted from the premises.

Compliance with best practice principles in a licence will ensure that pollution is minimised. There are administrative fees associated with the DEC licences as well as a scale of fees based on discharge volume and associated operational parameters for the farm.

Discharge of reconditioned water to tidal waterways

Where there is discharge to natural waterways, the interim water quality

objectives for protection of aquatic ecosystems need to be taken into account. Where oyster leases or major fishing grounds are located near by, there may be additional requirements for protection of water quality for safe consumption of foods.

The NSW Government *Water Quality and River Flow Interim Environmental Objectives; Guidelines for River, Groundwater and Water Management Committees* should be referred to for details of the water quality objectives in the relevant catchment (See *Site Selection* Section). The Interim Objectives Booklet for each catchment should be consulted for further information.

There are eleven Water Quality Objectives that provide benchmarks or reference level to guide water quality planning and management. Of these eleven, the following may be relevant in areas where discharge of reconditioned water is to tidal or estuarine waterways:

- Aquatic ecosystems – maintaining or improving the ecological condition of waterbodies and their riparian zones over the long term;
- Visual amenity – aesthetic qualities of waters;
- Secondary contact recreation – maintaining or improving water quality for activities such as boating and wading, where there is low probability of water being swallowed;
- Primary contact recreation – maintaining or improving water quality for activities such as swimming, in which there is a high probability of water being swallowed;
- Aquatic foods (cooked) – Refers to protecting water quality for safe consumption of foods taken from natural waterbodies.

The DEC licence conditions including load and concentration limits, and monitoring and reporting requirements will be determined on a case by case basis. These conditions will be developed with a view to maintaining the water quality objectives determined for the relevant waterway. Final objectives will be determined in the context of water management plans developed by local water management committees, except in catchments where a Healthy Rivers Commission Inquiry has been conducted and recommended objectives accepted by the Government.

Monitoring volume of discharge

The DEC licence may place limits on the daily discharge from the farm (eg. 10,000kL/day) based either on direct flow discharge or indirectly based on intake pump operations.

The volume discharged can be calculated by

- using flow monitoring equipment (approved by the DEC); The flow meters must be fitted to all discharge points and must provide daily and weekly flow levels; The net flow must be calculated taking into consideration the rainfall during the period; monitoring equipment must be regularly maintained and calibrated; Written records must be kept; or
- estimating the flow based on the intake pump capacity taking into consideration the pump operating parameters calibrated against the pond volume and the daily and weekly pumping activities. This indirect estimation method is likely to overestimate the discharge volume on farms that treat and recycle water as intake water can be lost by evaporation especially during

summer months.

Monitoring water quality

Discharge concentration limits for aquaculture developments that hold an environment protection licence under the POEO Act will be determined on a case-by-case basis with a view to maintaining the water quality objectives determined for the relevant waterway, and will include consideration of issues such as existing water quality, streamflow and cumulative impacts. Licence limits will usually be set for a number of parameters, including BOD, NFR, TP, TN, DO and pH.

Typical concentration limits for estuarine aquaculture developments that hold an Environment Protection Licence under the POEO Act are as follows but these may vary on a case by case basis.

Table 24. Monitoring of Discharged Water[⊗]

Parameter	**Sensitive waters** including estuaries where prawn farms located	
	90% limit	**100% limit**
BOD		20 mg/L
NFR[∅]	60 mg/L	90 mg/L
TP		1 mg/L
TN		10 mg/L
DO		>4 mg/L
pH	6.5 to 8.5	

The Queensland EPA (in consultation with the CSIRO) have recently suggested the following performance measures for prawn farms averaged over the growing season and measured as the level above the background and based on a average 4% daily water exchange rate:

- Total suspended solids 12kg/ha/day
- Total Nitrogen as 0.48kg/ha/day
- Total Phosphorus as 0.06kg/ha/day

Reporting and compliance

Monitoring of the above parameters and an annual Statement of Compliance are required under the CFMP and the POEO Act.

(b) Fresh water

Under the Hunter and Central Coast Sustainable Aquaculture Strategy, freshwater aquaculture farms are not permitted to discharge water to natural waterways (exception maybe provided for species approved for flow through production).

Freshwater must be:

- totally recycled in the aquaculture enterprise with no (or virtually no) water available for disposal;
- discharged through a trade waste agreement to a town sewerage system (only available for tank culture in industrial areas);

[⊗] *Sampling point must be up-current of the discharge point between 5-10m from the bank and 5-10m from the discharge point and/or in the intake channel*

[∅] *Exceedence of NFR allowed if NFR> in receiving waters at time of discharge and the farm is being operated in accordance with best practice*

- used as a substitute for raw water in agriculture, hydroponics or horticulture; or
- disposed of by irrigation or evaporation.
- For Salmonoid farm discharge treated to an acceptable DEC levels.

Discharge concentration limits for aquaculture developments that hold an environment protection licence under the POEO Act will be determined on a case-by-case basis with a view to maintaining the water quality objectives determined for the relevant waterway, and will include consideration of issues such as existing water quality, streamflow and cumulative impacts. Licence limits will usually be set for a number of parameters, including BOD, NFR, TP, TN, DO and pH.

Because of the importance of the efficient use of the water as a resource, wherever possible the discharge water should be used as a substitute for raw water in the irrigation of crops rather than a disposal scheme.

The reuse of water on site may require a licence under Part 2 of the Water Act. Users must ensure that the restrictions in place in the Hunter-Central Coast under embargoes are complied with. This includes the reuse of water from aquaculture facilities for irrigation or other uses. DIPNR has requirements for water quality levels to be achieved through any reuse application. Riverine discharge of aquaculture waters must achieve acceptable DEC or catchment target levels.

Substitute for raw water

As part of an integrated farming enterprise, commercial horticultural or agricultural crops may be operated and could utilise the water instead of raw water from the river or groundwater. Other "substitute" uses on the aquaculture farm may include irrigation of landscaping or gardens established as screening or as part of a "tourist" facility. In some locations, it may be possible to form a relationship with nearby farmers to on-sell or take the water. However, the economics of pumping or transferring the water to another farm should be fully costed.

Provision must be made to store the water during rainy periods, when application of water is not required for growth. As with other aspects of the aquaculture property, the land for irrigation should not be within 50 metres of a natural waterbody (and 500 m for barramundi).

Other factors relating to good farming and irrigation practice should be followed including:

- soil characteristics for sustainable plant growth
- avoiding sloping land unless drip irrigation,
- efficient application methods, metering/monitoring so not to over water,
- adequate erosion management provisions,
- avoiding land with salinity or potential salinity problems.

As aquaculture is labour intensive, intergrated projects should consider having a separate labour force.

Reference could be made to the NSW Guidelines for Dairy Effluent Resource Management regarding land application criteria. Under normal circumstances where water is used as a substitute for raw water, specific licence conditions for its use are not required.

Disposal schemes

Where it is not possible to form a relationship with an agricultural, horticultural or other water user, it will be necessary to develop a disposal scheme to "get rid" of

the water. These may include high volume irrigation schemes or evaporation in basins which will require a higher level of environmental assessment during design and a higher level of management during operation. These schemes may need to be licensed under the POEO Act.

5.5 Sludge management

Dried sludge and sediment at the bottom of drained ponds may be either ploughed into the base of the pond or removed depending on the nature of the material.

Sludge from tank aquaculture may need to be collected daily and de-watered. Depending on the location and the type of culture, the sludge should be disposed of regularly through:

- a trade waste agreement with disposal to landfill or to the sewer,
- sent to a commercial composter, or
- used in agriculture – being incorporated in the soil using techniques similar to those used for the disposal of sludge from cattle feedlots or piggeries.

6. Managing other environmental issues

Maintaining good relations with neighbours, tourists, the wider community, relevant regulatory agencies, financiers and customers is simply good business practice. The environmental management plan for the farm should consider issues that may impact on these relations.

6.1 Working hours

Generally the hours of operation shall be restricted to those indicated below except in areas where there are no residences within the noise catchment (this catchment will vary with the topography but could be expected to be about 1 km)

Activity	Monday to Friday	Saturday	Sunday/ Public holidays
Construction work	7:00 am - 6:00 pm	8:00 am - 1:00 pm	Nil
Noisy operations eg. lawn mowing and truck movements	7:00 am - 6:00 pm	8:00 am - 1:00 pm	Nil
Other “quiet” operations & the operation of circulatio pumps & other equipment	Anytime	Anytime	Anytime

6.2 Noise

On farm noise sources such as those associated with equipment for feeding, pumping, aeration, harvesting, maintenance and construction need to be managed, particularly in noise sensitive locations and at noise sensitive times. Sound can be enhanced at night time due to the effects of temperature inversion, air drainage and light winds blowing from the noise source to the neighbours. Consequently, the responsibility is on the operator of the farm to ensure that noise

impacts do not unreasonably affect neighbouring residents not only during the day but also evenings or weekends.

Minimising noise at source

With all plant and equipment, every effort should be made to reduce the noise levels at the source, for example with insulation or maintenance programs. In some case enclosing the equipment in sheds or vegetated bund walls can be used to reduce noise levels. Noisy malfunctioning equipment should be repaired immediately and maintenance programs should ensure that these malfunctions do not occur regularly. For farms needing a licence under the POEO Act, there is a requirement that all plant and equipment should be operated and maintained so as not to exceed the prescribed sound pressure levels for the equipment. The noise levels are based on the performance of new equipment fitted with residential silencers where appropriate. The operator should monitor noise levels to confirm performance in accordance with the method, location and frequency set by the DEC's licence.

The use of noisy predator scare systems, sirens, PA systems, vehicle backing or other noisy devices that may be a noise nuisance should be minimised. These types of devices should not used except in the event of emergency or as required under Occupational, Health and Safety Regulations.

Noise goals at receptors

The daytime or night-time noise level ($L_{A10(15minute)}$) from the operations on the project site for existing meteorological conditions (winds up to 3m/s) shall not exceed the background noise level at the nearest receptor by more than 5dB. Typically the criteria for rural areas would be background + 5dB, however the NSW Government "Industrial Noise Policy" should be referred to. The ($L_{A10(15minute)}$) noise level must be measured or computed at the most affected point on or within the residential property boundary or, if this is not more than 30 metres from the residence, at the most affected point within 30 metres from the residence, using "fast" response on a sound level meter. The background noise level at the nearest receiver locations should be determined in accordance with the methods detailed in Section 3 of the Industrial Noise Policy.

If the noise has substantial tonal or impulsive characteristics, 5 dB(A) must be added to the measured level. To prevent sleep disturbance, the ($L_{A1\ (1minute)}$) noise levels should not exceed the background noise level by more than 15 dB when measured at the most affected point 1 metre from a bedroom window of the nearest affected residences.

Noise impacts that may be enhanced by temperature inversions must be addressed by documenting noise complaints received to identify any higher level of annoyance from the change in impacts or impact patterns as a result of inversions; and where levels of noise complaints indicate a higher level of annoyance, developing and implementing actions to quantify and ameliorate any enhanced impacts under temperature inversion conditions.

It is important to let neighbours know ahead of time if there are likely to be any unusually noisy operations especially in the evening – for example predator scare devices or harvesting at night. Where possible agreed protocols for the noisy activities should be developed.

6.3 Odour

Odour emissions from aquaculture facilities are likely to be principally associated with pond dry out procedures, storage of feeds and management of any dead stock or fish processing wastes. It is an offence under the POEO Act to emit an offensive odour from an DEC licensed facility.

Minimisation of impacts of odours should be considered in the farm layout (eg. feed storage area, equipment, waste, cleaning and maintenance depots) and operational procedures (pond/tank dry-out procedures). Solid waste should be stored, transported and disposed of so as not to cause an odour nuisance.

Sediment from ponds or sludge from tanks must be disposed of in a manner that will minimise odour or leachate problems. Sediments in ponds should not be disturbed until dry when it can be either incorporated into the bed of the pond or removed. Sediment from tanks should be stored in a designated storage area (within appropriate bunding or sediment trap to prevent sediment runoff to adjoining areas/waterways) so it does not become anaerobic and generate odours prior to;

- spreading as top soil in appropriate crop or pasture areas; or
- transport to a commercial composter or landfill.

6.4 Dust

Dust can pose problems during construction stages if the construction erosion and sediment procedures are not followed (*See Planning and Design section*). Appropriate surfacing of high traffic roads and vegetation of wind exposed areas can minimise dust emissions. Until disturbed areas are stabilised, sprinklers can be used to minimise the spread of dust. It is recommended that neighbours be advised ahead of work schedules likely to generate dust to avoid potential problems.

6.5 Visual appearance

A neat and tidy operation with appropriate vegetative screen plantings, earth moundings and low key coloured shed which are sited well in the landscape is more likely to create a good impression on neighbours. In rural environments, landscaping should be used to soften the impact of “industrial” look of shed complexes including “natural looking” planting of native species along boundaries.

Orderly and well-maintained facilities also promote confidence in the operation’s environmental performance.

6.6 Energy and greenhouse issues

While energy competes with other issues for limited resources within a business, implementation of energy efficiency initiatives can lead to benefits which extend beyond energy savings to include pollution prevention, process efficiencies and increased productivity.

Farm operations should be designed to minimise energy usage (eg. by incorporating gravity distribution of water between the ponds) and through the use of renewable energy technologies where possible such as solar or wind power. In addition, there should be awareness of energy usage and conservation

opportunities including:

- Monitoring annual and quarterly energy expenditure;
- Promoting reduced energy management patterns and maintain equipment for optimum performance;
- Isolate and remedy energy wasteful actions or activities including minimising unnecessary vehicle use.

Aquaculture operators may also be able to minimise their greenhouse gas emissions by participation in programs being run by the Sustainable Energy Development Authority (SEDA) and through cooperative agreements under the Greenhouse Challenge Program. To further assist new development proposals the Department of Infrastructure, Planning and Natural Resources is developing guidelines for considering potential greenhouse gas emissions associated with proposed projects as an environmental factor based on the methodology developed by the Australian Greenhouse Office.

6.7 Waste management

Waste management protocols should be developed to reduce and recycle waste and to store and dispose responsibly of waste material. Generally waste materials should be sorted and stored in suitable containers for recycling, reuse or disposal.

The *Protection of the Environment Operations Act 1997* establishes a classification system for wastes which is documented in the *Environmental Guidelines: Assessment, Classification and Management of Liquid and Non-Liquid Wastes* (Waste Guidelines – EPA 1999). The legal obligations in respect of the management of wastes are based on their actual classification as determined in accordance with the Waste Guidelines. The Commercial Farm Development Plan should include details of the name of the contractor and where the waste is to be removed. Receipts for all wastes (including solids and liquids) removed from the project site shall be held on site for a period of 12 months.

Table 25. Waste categories likely to be generated by aquaculture farms

Types of waste	Implications
Non-liquid inert waste *These types of waste are subject to minimal regulation*	
Virgin excavated natural material (VENM) eg. clay, gravel, sand, soil or rock that has not been mixed with other waste. This category does not include chemical contaminated soils or acid sulfate soils unless treated to meet criteria approved by DEC.	If material is to be brought onto the site for the construction of ponds, it should be clearly established that the material is from an approved quarry or meets the VENM classification. In addition if there is excess material to be removed from site following pond construction, ensure that it is not mixed with other materials or waste so it meets the VENM classification. If acid sulfate soils are to be removed from site, ensure that it is treated in accordance with the ASS Manual (ASSMAC) prior to removal from site to neutralise/remove the acid generating potential.
Building and demolition waste not mixed with other wastes or containing asbestos	Preferably building waste should always be sorted into components (eg. brick/concrete, glass, timber and metal) for reuse or recycling.
Packing and office waste (paper, plastics, glass, metal and timber) not mixed with other wastes	Preferably these should be recycled. A major source of waste is the plastic or paper bags used to transport feed. Reductions in the use of feed as a result of efficient feeding management result in reduced waste generated. The recycling of feed bags should also be discussed with the feed supplier or the supply of feed in bulk form.
Solid waste	
Food waste	Should pursue options to recycle material (eg. fishmeal, compost). Otherwise dispose of to an approved landfill.
Cleaned pesticide, biocide, herbicide or fungicide containers (cleaned in according to AVCARE protocols)	Avcare Protocols require recycling of containers as a first option. For copies of the Avcare Container Management Strategy, contact: Avcare, Level 2, AMP Building, Hobart Place, Canberra, mail to Locked Bag 916, Canberra ACT 2601. Phone 02 6230 6399 Fax 02 6230 6355., Email: avcare@ozemail.com.au
Pond/tank sludge that does not contain heavy metals or hazardous chemicals	The preferred use of the material is in compost mixes and/or direct incorporation into the soil for agricultural purposes. Where these preferred uses are not available or inappropriate, landfilling is acceptable at an approved landfill. Composting and agricultural applications of sludge may not be appropriate for sludge arising form salt-water ponds/tanks.
Industrial waste	
Asbestos waste from old buildings or industrial plant	Any asbestos should be managed in accordance with the requirements of Clause 29 of the *Protection of the Environment Operations (Waste) Regulation 1996* and disposed at a lawful waste management facility.
Hazardous liquid or non-liquid waste	
Quarantine waste	This material must be stored, handled, transported and pre-treated in accordance with the requirements of the Australian quarantine and Inspection Service (AQIS) prior to disposal at an approved disposal facility approved by AQIS. It should be noted that most landfills are not licensed for disposal of quarantine waste.

Types of waste	Implications
Chemicals, pharmaceuticals and poisons	If chemicals are not to be use, inquiries should be made with distributors about the possibility of returning the material. Alternatively inquiries could be made as to whether other users are interested in taking the material. As a last option, the *Assessment, Classification and Management* Guidelines should be followed regarding the safe disposal of the material.
Liquid wastes *other than hazardous above*	
Group A: Oils, solvents and solvent containing liquids	Arrangements should be made with a contractor to remove these materials from the site preferably for reuse or recycling.
Group B: Liquid food waste or grease traps from food processing	Arrangements should be made with a contractor to remove these materials from the site preferably for reuse or recycling
Group C: Sewage – if on-site system	Where connection to a reticulated sewerage system is not an option, on-site sewage treatment should be in accordance with the Guideline -–*On-Site Sewage Management for Single Households 1998*.

7. Environmental contingency planning

A contingency plan should be established with specified management actions documented to deal with problems should they occur.

Issues that should be dealt with in the plan include:

- water quality incidents in growing ponds/tanks, reconditioning ponds or storage ponds,
- disease outbreaks,
- feeding problems,
- predators,
- chemical spills,
- flooding,
- dam/pond security,
- power failure or mechanical failure of key equipment (especially important for tank systems).

The contingency plan should include protocols which all staff should be made aware of. The contingency plan should include:

1. agreed indicators that suggest that there is likely to be a problem;
2. requirement to alert appropriate senior person in the company immediately;
3. what actions will be taken should the conditions deteriorate;
4. what actions should be taken in the event that the problem results in an environmental breaches occurring;
5. what actions should be taken in the event that the problem results in a loss of stock;
6. when the regulatory authority and others should be alerted.

Other issues that may need to be included in the contingency plan include drought proof planning in relation to pond/tank and/or potable water supplies in areas where water supply may not be reliable.

8. Decommissioning when a change in land use

The abandonment of failed aquaculture sites was a feature of the 1970s and 1980's when projects were established without an appropriate consideration of site selection, environmental and market factors. The objective of the Hunter and Central Coast Sustainable Aquaculture Strategy is to ensure that aquaculture enterprises are established and operated in a sustainable manner. As a result, emphasis has been placed on the need for careful site selection, design, operation and business management. The principles and technical knowledge behind the best practice in the AIDP are now well understood and consequently there is confidence that enterprises established following this best practice are not likely to fail.

In the event that no production occurs at an aquaculture farm for a number of years, the aquaculture permit may be cancelled because of the failure of the permit holder to comply with the requirements of the Commercial Farm Development Plan. If an aquaculture enterprise is to cease operations, the site should be secured to the extent that it will not generate unacceptable off-site environmental impacts or potential occupational health and safety problems (eg. electrical infrastructure, chemical storage, building security).

Decommissioning works may include:

- Closure of water intake and outlet channels and remove pipes and pumps from any river or estuary;
- Stabilisation of any disturbed areas in the riparian zone;
- Stabilisation of ponds/dams and if necessary filling in of ponds/dams and restoration of topography;
- Revegetation of any disturbed site areas.

9. Interfacing with the community

The managing and maintaining of good public relations is essential for an individual farm and also for the industry as a whole. Aquaculture, in part due to its novelty, attracts a large amount of community interest. It is important to recognise this interest and deal with it in a proactive manner.

9.1 The community

Consumers are increasingly concerned with the environmental credentials of food production and the aquaculture enterprises can benefit from demonstrating its environmental credentials. The public should be dealt with openly and honestly even when things go wrong. It may be useful to seek advice in preparing a public relations management plan for promoting the products as well as for dealing with routine enquiries as well as complaints. Proactive and transparent management of community relationships can pay long-term dividends.

9.2 Tourism and fishout facilities

Making provisions for the public to visit the facility either as part of a tourist visitor centre (with displays and information), with opportunities for purchase of product, can help provide an open-door approach to the local as well as the broader

community. This can help to promote the role of the aquaculture farm in the local economy as well help promote the industry as a whole.

In the same way, a well-run fish-out facility can also provide a useful liaison with another sector of the community. However, with both tourist and fishout related activities, the full environmental and operational costs should be considered.

9.3 Complaints handling procedures

All major aquaculture farms will be required to establish Complaint Handling Protocols under their conditions of consent. The council (if not the consent authority) should be informed of the procedures so if complaints come directly to council, they then are aware of where to refer the complaints. If DEC is the "appropriate approval authority" under the POEO Act, the Complaints Handling Protocols will be a component of their licence.

The Complaints Handling Protocols shall include:

- a contact number and a site contact person who will follow up complaints;
- complaints register including a record of the complainant, the date/time, the nature of the complaint,
- proposed mitigation measures and follow up with the complainant;
- any contingency measures when repeated complaints are received including provisions for additional monitoring and amelioration measures;
- any compliance performance agreements with residents; and
- any reporting procedures to relevant government agencies or council.

When analysing the cause of complaints, consideration should be given to whether the impact causing the complaint resulted from normal operational procedures or from an "incident" or occasional procedure.

- If it resulted from occasional procedures, discussions should be held with complainants regarding whether it was the timing or nature of the impact and where these variables can be changed so as not to cause a nuisance. In many cases an agreement can be reached between parties with regard to notification that the procedures are going to occur and their timing, duration and intensity to reduce annoyance.
- If it resulted from normal operation procedures, these procedures should be reviewed in discussions with the relevant approval authorities.

10. Integrated compliance monitoring and reporting

10.1 Monitoring

An environmental monitoring program should be carefully designed and related to the key environmental indicators that demonstrate the potential sustainability of the aquaculture farm. The program should monitor operational parameters as well as quantify the extent and nature of any off-site environmental impacts attributed to the farm. Parameters that may be relevant include:

- parameters relating to critical operational issues, for instance in relation to stock health issues or management;

- water management parameters;
- if relevant, noise or odour parameters including complaints.

The program should outline the need for and use of any proposed monitoring, including:

- the key information that will be monitored, its criteria and the reasons for monitoring (which may be compliance with regulatory requirements);
- the monitoring location, intervals and duration;
- methodology for sampling and analysis by a suitably qualified person/ laboratory;
- trend analysis of performance (compared baseline and previous results);
- procedures to be undertaken should the monitoring indicate a non-compliance or abnormality;
- links to management practices so that information from the monitoring program can adapt management practices to improve the performance (operational or environmental).

10.2 Record keeping

Comprehensive record keeping is essential, not only as a requirement of licence and permit conditions but as a fundamental tool in farm management and trouble shooting. A computerised database for record keeping should be established for tracking both the business and environmental performance. This makes data storage and analysis routine and reliable and reduces the effort in reporting.

From a business management point of view, the data sets make analysis of expenditures, production levels, returns and environmental performance for sound future planning. In addition the data is available for reporting to the relevant government agencies on the environmental performance. DEC usually requires records to be held for a minimum of 3 years so that the details of longitudinal trends can be checked, if necessary.

10.3 Reporting

(a) Annual reports

A single annual report must be prepared within 6 weeks of the anniversary of the development consent (and then annually) to comply with the reporting requirements under Development Consents, Aquaculture Permits, Environmental Protection Licences and any reporting requirement of any other approval. Monitoring and reporting requirements for aquaculture developments that hold an environment protection licence under the POEO Act will be determined on a case-by-case basis, and might include additional parameters or requirements to those shown in Table 26 below.

Table 26. Monitoring Parameters for the Annual Report

Monitoring parameters	Saline		Freshwater	
	Ponds	Tanks	Ponds	Tanks
Production levels	✔	✔	✔	✔
Stock health incidents	✔	✔	✔	✔

Water recirculation/ reconditioning program	✔	✔	✔	✔
Quality/quantity of discharge water released to natural waterbody (non salmonoid)	✔	✔	N/A	N/A
Quality/quantity of salmonoid farm discharge water released to natural waterbody	N/A	N/A	Salmonoid farms only	Salmonoid farms only
Total nutrient load released from Salmoniod farm	N/A	N/A	Salmonoid farms only	Salmonoid farms only
Reuse of freshwater discharge water	N/A	N/A	✔	✔
Sludge	✔ if not incorporated in pond walls	✔	✔ if not incorporated in pond walls	✔
Waste management	✔	✔	✔	✔
Predation management	✔	N/A	✔	N/A
Incidents	✔	✔	✔	✔
Complaints management	✔	✔	✔	✔
Noise and odour	only if it becomes an issue with the community			

In addition to environmental matters, the report should include matters relating to stock management including translocation issues, disease management, sales and production. The report should include the results of monitoring in tabular and graphical formats and indicate whether the environmental performance complies with the conditions of the approvals.

(b) More regular reports

With farms that discharge water to natural waterbodies, DEC may require more regular reporting (eg. monthly or quarterly). These reports should include a summary of the monitoring data, drawing DECs attention to any trends that may be inconsistent with approval conditions.

(c) Incident reporting

There is an obligation on the aquaculture operator to report environmental accidents or incidents that may not be authorised under an approval to the appropriate regulatory authority. Under the POEO Act, there is a responsibility to immediately notify any pollution incident to the "appropriate regulatory authority" - DEC for licensed aquaculture farms and usually council for others.

If an event occurs which is causing or is likely to cause environmental harm, the authority may require that a written report be prepared within 7 days outlining:

- what happened (materials and quantities involved, time and duration of event);
- who was involved and who witnessed it (names and addresses);
- what were the consequences (include remedial actions taken);
- why the incident occurred (eg human error, failure in design or maintenance or natural disaster);
- how it can be prevented from happening in the future (proposed measures to prevent or mitigate against a recurrence).

Table 27. Incident Reporting

Incidents	Authority	When

Disease outbreak or unusual behaviour of the stock	Department of Primary Industries	As soon as practicable but within 24 hours
Incidents involving breaches of quarantine or translocation protocols	Department of Primary Industries	Immediately and in not more than 24 hours
Incidents causing or likely to cause environmental harm whether on or off the premises which are not authorised under the approval (eg. chemical spills, accidental release of untreated pond water)	DEC pollution line if Appropriate Regulatory Authority or Council or DIPNR	As soon as practicable but within 24 hours
Flooding issues	DIPNR	As soon as practicable
Dam safety	DL	As soon as practicable
Incidents involving harm to birds or other native fauna which are not authorised under the approval	DEC	Immediately and in not more than 24 hours
Bushfires	Fire authority and local council	Immediately

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NSW Agriculture 1999 NSW Guidelines for Dairy Effluent Resource Management NSW Dariy Farmers Association, Sydney

NSW Fisheries 1995. Fish in Farm Dams Fishfact. NSW Fisheries, Sydney.

Queensland Health 1996 A Guide to the Safe Handling and Inspection of Seafood Environmental Health Unit Tel (07) 3234 0938.

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Sinderman, C.J & Lightner, D.V. (Ed) 1988 Disease Diagnosis and Control in North American Marine Aquaculture. Elsevier, Amsterdam.

Project Profile Analysis

Hunter and Central Coast Sustainable Aquaculture Strategy
Land Based Aquaculture

A NSW Government Initiative

Hunter and Central Coast Sustainable Aquaculture Strategy

A NSW Government initiative of Department of Primary Industries, Department of State and Regional Development, Department of Environment and Conservation, Department of Lands, Department of Infrastructure, Planning and Natural Resources and NSW Premiers Department to encourage sustainable aquaculture in New South Wales.

Project Profile Analysis

Table of Contents

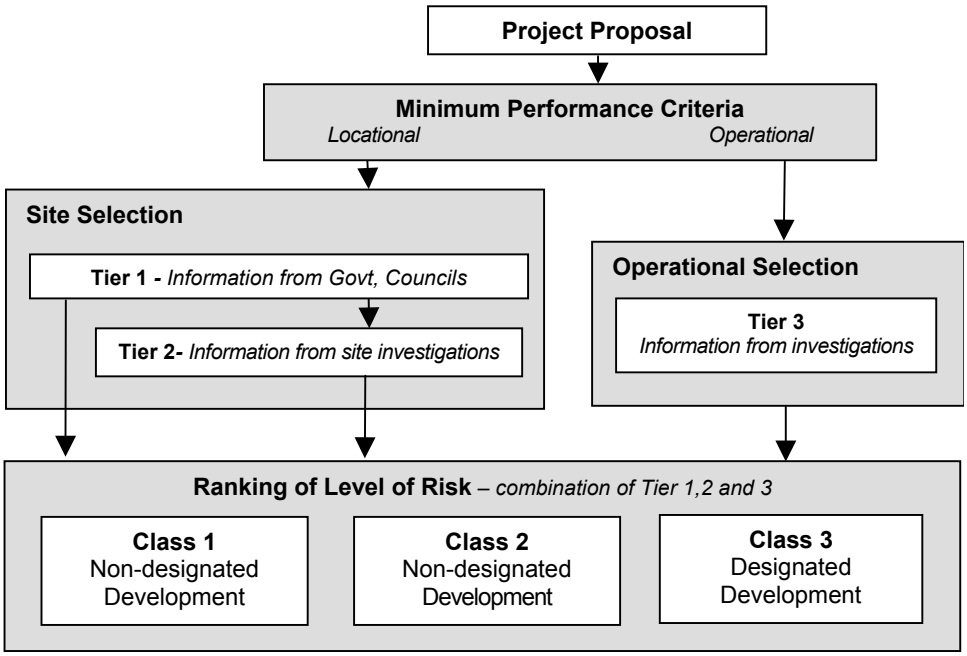
1. Overview of Project Profile Analysis

The Aquaculture Industry Development Plan (AIDP) sets out best practice for the establishment and operation of land based aquaculture projects. Based on this information, a Project Profile Analysis has been developed to enable a preliminary evaluation of the risks associated with site selection, species, design and planning and operational criteria. These criteria allow the applicant and the consent authority to evaluate the likely risks associated with a project and to establish the level of assessment to match the likely risks to the environment.

The Project Profile Analysis provides three "sieves" to evaluate options.

- The ***Minimum Performance Criteria*** provides the first environmental sieve for selecting sites and project characteristics. These must be met in order for the project to proceed.
- The ***Site Selection Criteria*** (Tier 1 and Tier 2) provide the next two environmental sieves to determine the acceptability of risks. Tier 1 information is available from Government or Council sources. Tier 2 information will need to be obtained from site investigation or studies.
- Following the selection of a site, ***Operational Selection Criteria*** (Tier 3) provide the next "sieve" to evaluate various options including species, layout and operation factors. The Tier 3 evaluation can serve as a cost effective device to determine the relative risk associated with species, design and operational options and to assist in deciding if certain options should be excluded from further consideration.

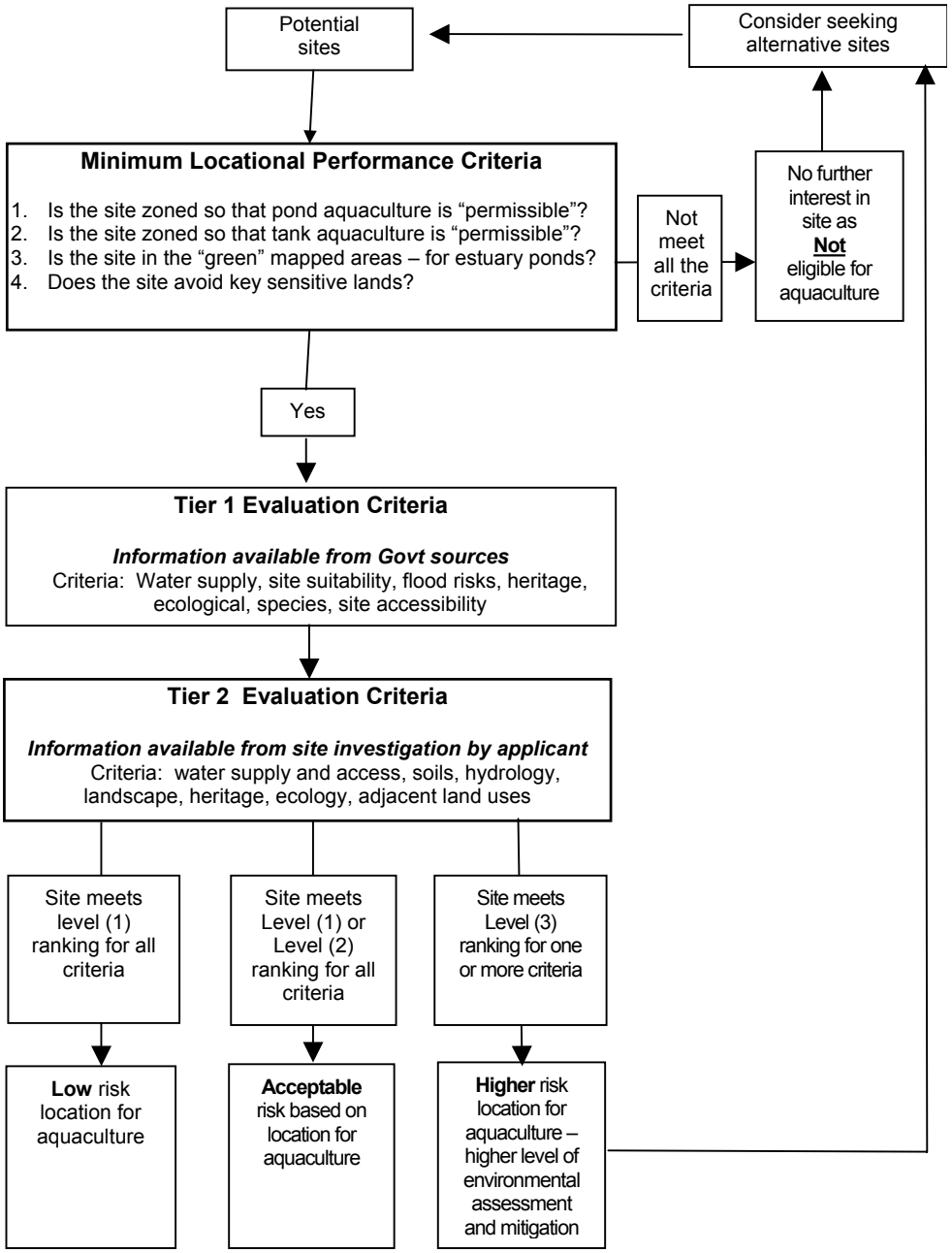
Figure 9. "Sieves" in Project Profile Analysis



2. Site Evaluation Criteria

The Site Selection Section of the AIDP has identified environmental and other factors that should be considered when selecting a site for aquaculture. These factors can be used to rank the likely risks associated with establishing an aquaculture facility in a particular location, e.g. as representing a Level 1, 2 or 3 risk.

Figure 10. Site Selection



2.1 Minimum Site Performance Criteria

It is essential at the outset, that the ***Minimum Performance Criteria for Land-based Aquaculture in the Hunter and Central Coast Region*** (see Project Profile Analysis) is considered, as aquaculture projects that cannot meet these minimum performance criteria are not permissible on the Hunter and Central Coast. Information regarding the minimum locational performance criteria is readily available from Council DLor DIPNR maps and the ***Aquaculture Land Suitability and Estuarine Aquaculture Maps*** for the region provide a quick evaluation to determine if a potential site meets these minimum locational criteria. For estuarine pond sites, the site must be within the areas coloured green on the Estuarine Aquaculture Map for the particular estuary.

2.2 Tier 1 Evaluation

For sites that meet the Minimum Locational Performance Criteria, the Tier 1 information should be sourced to determine the relative acceptability of the site for aquaculture. The Tier 1 criteria can be sourced from information held by Council, Department of Primary Industries, DEC, DL and DIPNR. The ranking of Level 1, 2 or 3 for individual criteria will begin to provide a picture of the potential hurdles in developing a site and the likely level of environmental assessment and regulation which could apply – the lower the level of risk, the lower the level of assessment and regulation required. Whenever possible, higher risk sites should be avoided at the Tier 1 evaluation level.

2.3 Tier 2 Evaluation

For sites that are not eliminated as a result of Tier 1 evaluation, the next layer of information should be sourced. Tier 2 investigations may involve significant expenditure with site investigations by technical experts, and in some cases, laboratory analysis. For example, investigations by consultants may be required:

- to confirm the levels of acid sulfate soils or soil contamination and develop management options,
- to determine soil suitability for dam construction,
- to identify threatened species, populations or ecological communities or their habitat (both flora and fauna surveys required),
- to identify any Aboriginal sites, areas of high potential to contain sites, areas of cultural sensitivity or other values of cultural significance to the Aboriginal community (e.g. bush foods),
- to assess of potential water supply quality and security of supply.

It should be noted that the level of analysis at this stage need not be as detailed as would be required once the site has been selected and the detailed project design is being undertaken. However, it should provide sufficient information for an informed decision to be made so that there will be no unpleasant surprises later, resulting in costly management options.

The level of risks associated with the location along with the risks levels associated with operational constraints (see section 3) will decide the assessment regime for the project. The lower the risks, the lesser the level of assessment complexity, the lower the costs in assessment and mitigation, and the lower the level of environmental supervision by councils and government agencies.

3. Aquaculture Maps

Sound site selection is particularly important in estuarine areas where problems related to suitable water quality, drainage and acid sulfate soils could impose costly constraints on the long-term aquaculture viability in those areas.

Estuarine Aquaculture Maps have been developed for two estuarine areas in which saline pond culture is potentially suitable within the Hunter and Central Coast Region. These two areas are:

11. Port Stephens including Myall and Karauh rivers.
12. Hunter including Hunter, Patterson and Williams Rivers.

These maps will play a pivotal role in identifying sites that meet the minimum locational performance criteria for estuarine pond aquaculture. The maps have been developed using GIS information and identify potential locations based on attributes including

- elevation above Australian Height Datum,
- spatial salinity for the estuary and bathometry assessment,
- acid sulfate soil profile,
- land use zoning, and
- conservation exclusion zones.

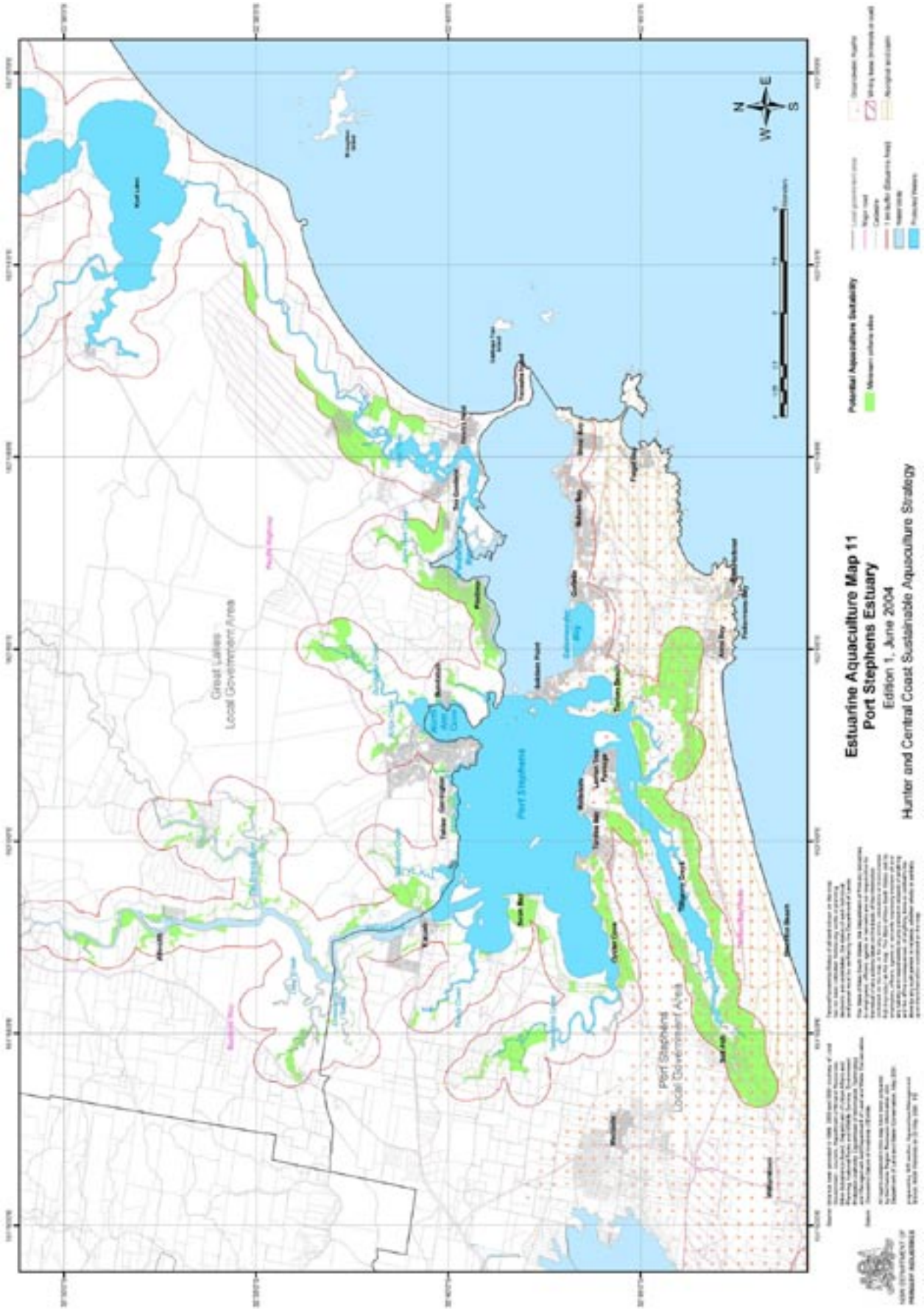
These maps identify land which meet the Minimum Locational Performance Criteria for estuarine pond aquaculture. Other evaluation criteria must still be considered in assessing the suitability of a particular site for aquaculture. The Tier 1 and Tier 2 selection criteria are in the Project Profile Analysis provides details of the site selection factors.

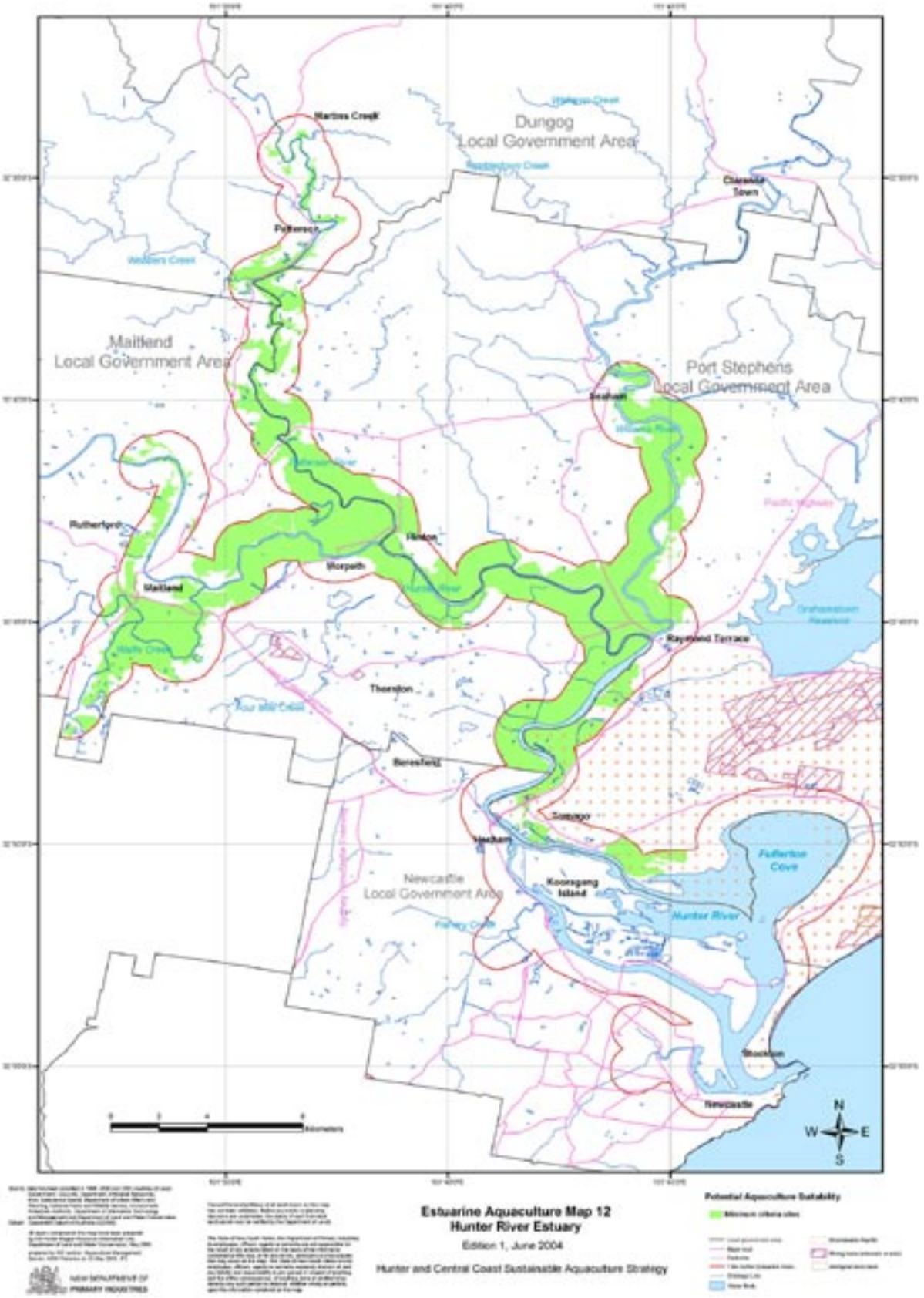
While A4 versions of the estuarine pond aquaculture maps are included in the AIDP, the Aquaculture Division of Department of Primary Industries can provide access to full scale estuarine pond aquaculture maps for estuaries on the Hunter and Central Coast from south of the Manning to the Hawkesbury which identify potentially suitable areas as well as in some cases, specific sites with potential for estuarine pond aquaculture.

Because of the extent of locational possibilities for freshwater tank and ponds, a detailed mapping approach to identify land that meets the Minimum Locational Performance Criteria has not being taken. However, a general overview map (see attached CD) of the Hunter and Central Coast Region is enclosed to provide an indication of potentially suitable sites. Therefore, criteria should be applied at the preliminary stage to eliminate any sites that do not meet these criteria.

It should be noted that the Aquaculture Land Suitability Maps were compiled based on data available at the time of production and only represent areas that may have potential for aquaculture. Detailed site assessment is still required and current LEP and other mapping information may need further investigation.

The site selection factors are discussed in more detail in the Site Selection section of the AIDP.

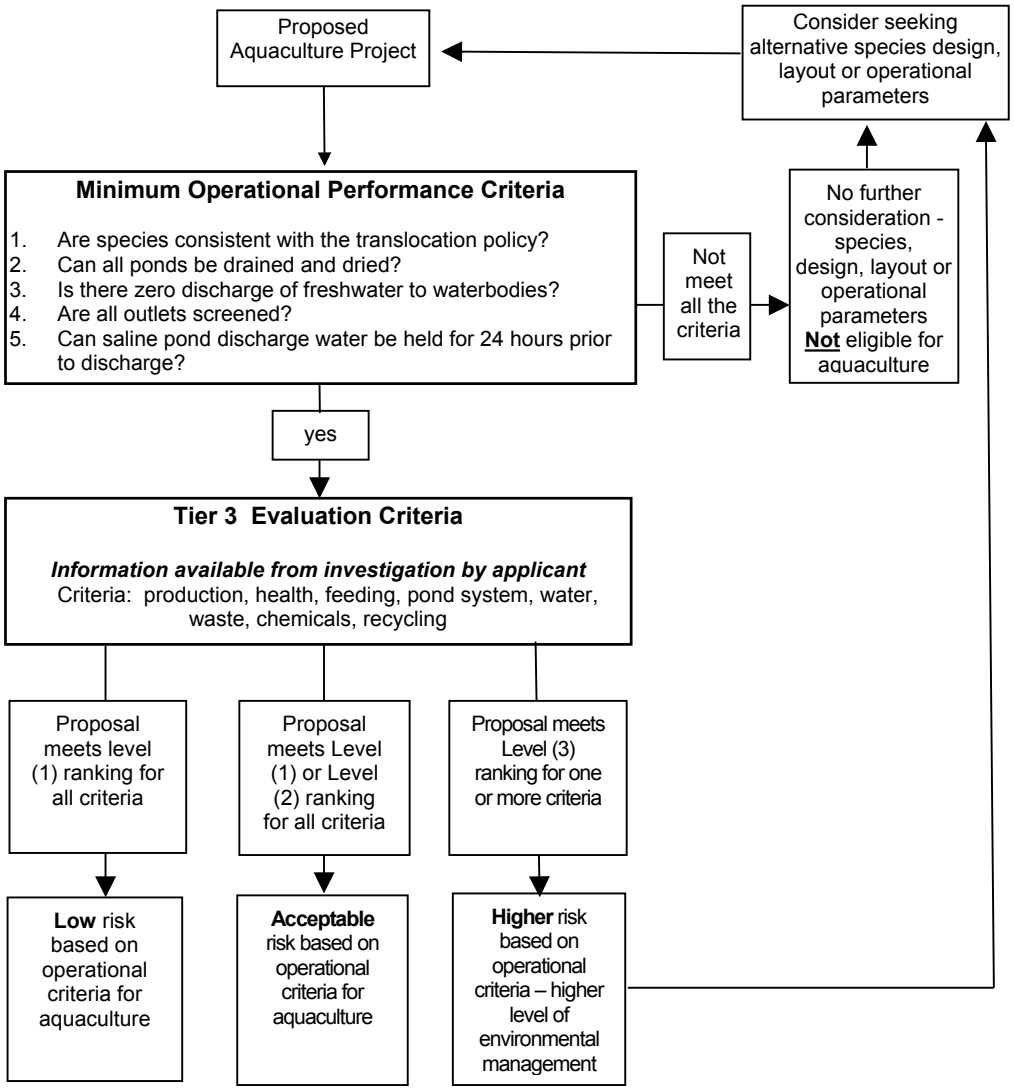

Estuarine Aquaculture Map 11
Port Stephens Estuary
Edition 1, June 2004
Hunter and Central Coast Sustainable Aquaculture Strategy
Great Lakes Local Government Area
Port Stephens Local Government Area
Port Stephens
N
S
E
W


Dungog
Local Government Area
Maitland
Local Government Area
Port Stephens
Local Government Area
Newcastle
Local Government Area
Martins Creek
Paterson
Clarence Town
Seaham
Rutherford
Hinton
Morpeth
Maitland
Raymond Terrace
Thornton
Beresfield
Tarro
Hexham
Kooragang Island
Fullerton Cove
Hunter River
Stockton
Newcastle
N
W
E
S
Estuarine Aquaculture Map 12
Hunter River Estuary
Edition 1, June 2004
Hunter and Central Coast Sustainable Aquaculture Strategy
Potential Aquaculture Suitability

4. Operational Evaluation Criteria

While Tier 1 and Tier 2 Site Selection Criteria provide guidance in the selection of a preferred site, the Tier 3 evaluation criteria aim to provide guidance on the evaluation of alternative operational regimes. Information from planning and design investigations will lead to a project profile ranking which will assist in identifying the likely risks to the environment of various operational alternatives.

Figure 11. Operational Selection



4.1 Minimum Operational Performance Criteria

It is essential at the outset, that the Minimum Performance Criteria for Aquaculture in the Hunter and Central Coast Region be considered, as aquaculture which cannot meet these minimum performance criteria, are not permissible on the Hunter and Central Coast.

4.2 Tier 3 Operational Evaluation

Following the selection of a site, and confirmation that the proposed design and planning parameters meet the Minimum Operational Performance Criteria, Tier 3 evaluation criteria provides the next “sieve” to determine the relative level of risk associated with the aquaculture proposal.

The Tier 3 evaluation can serve as a cost-effective device to determine if any of the proposed operational parameters are likely to lead to longer term costs associated with expensive mitigation measures and should be excluded from further consideration. The ranking of Level 1, 2 and 3 operational criteria will begin to provide a picture of the potential hurdles and the likely level of environmental assessment and regulation which could apply; the lower the level of risk, the lower the level of assessment and regulation required.

5. Interpreting the Rankings

5.1 The Rankings

The tables associated with Tier 1, 2 and 3 provide a ranking in relation to the criteria and the level of risk associated with the project characteristics. These rankings assist in evaluating individual sites and operational options as well as providing for a comparison between alternative options. The values are not to be added up and should result in an aggregate reading of the acceptability of the site for aquaculture.

Table 31. Interpreting the Rankings

Project Profile Analysis Rankings	Class of development	Development Assessment	Assessment Document
Minimum Performance Criteria Not Met	**Prohibited**		
Minimum Performance Criteria met and all the rankings are Level (1)	Class 1	Non-designated Development	SEE
Minimum Performance Criteria met, any of the rankings are Level (2) and none are Level (3)	Class 2	Non-designated Development	SEE
Minimum Performance Criteria met and any of the rankings are Level (3)	Class 3	Designated Development	EIS

It must be reinforced that for aquaculture projects to be undertaken on the Hunter and Central Coast, they must meet the Minimum Locational and Operational Performance Criteria.

5.2 Who makes the decision

It is essential that the consent authority (the local council or the Minister for Infrastructure and Planning) and Department of Primary Industries are consulted prior to lodging the development application.

The applicant should submit sufficient information to the consent authority so that the consent authority can decide whether the project meets the Minimum Performance Criteria and the level of assessment required based on the level of risk according to the Project Profile Analysis. This must be done prior to submitting the development application. It is the responsibility of the consent authority to determine if a proposal is a Class 1, 2 or 3 development.

5.3 Transitional Provisions

Where there is an existing aquaculture enterprise or a site of an abandoned aquaculture enterprise and there is a proposal to upgrade or re-establish an aquaculture operation on that site, the Hunter and Central Coast Sustainable Aquaculture Strategy will apply.

For proposals that do not comply with the best practice in the AIDP and do not meet the Minimum Performance Criteria, the applicant must formally seek and obtain agreement of the Minister for Infrastructure and Planning to be exempted from the Minimum Performance Criteria that would have otherwise made the proposal not permissible.

In making a decision for an exemption from the Minimum Performance Criteria, the Minister shall take into consideration whether the proposal will lead to:

- improved environmental outcomes despite non or partial compliance with the Site Location Minimum Performance Criteria; and
- total compliance with the Operational Minimum Performance Criteria.

Project Profile Analysis for Ponds, Raceways and Tanks

Minimum Performance Criteria

The following are Minimum Performance Criteria which proposals must meet to be permissible development within the Hunter and Central Coast Region.

Information available from Government Sources

Locational Criteria	Minimum Performance
1. LEP zones for ponds	Within zones listed in Column 2 of Zoning Table
2. LEP zones for tanks and raceways	Within zones listed in Column 3 of Zoning Table
3. Estuarine pond based aquaculture	Within an area coloured green on an Estuarine Aquaculture Map
4. Conservation exclusion zones	DEC protected areas (e.g. National Parks, Nature Reserves, Aboriginal Areas, Historic Sites, Karst Conservation Reserves) Aquatic Reserves or Marine Parks (excluding general use zones) Vacant Crown Land[1]
Operational Criteria	
5. Species	Culture method, operation and location must be permissible for all proposed species according to the Species Table in the Species Selection Section. No non-indigenous species shall be cultured in saline pond culture.
6. Intensive Grow-out Pond design	Capable of gravity draining and completely drying ponds.
7. Freshwater pond or tank culture (except for species approved for flow through systems eg. Salmonoids)	Zero discharge of water to a natural water bodies or wetlands.
8. Outlets from ponds and flow through systems.	All outlets must be screened to avoid escape of stock.
9. Outlet from estuarine pond farms (does not include tanks and raceways)	All saline discharge water must be held in a sedimentation system for a minimum of 24 hours prior to discharge and must be returned to saline tidal reaches of the waterway.

LEP Zoning Table For Locational Criteria 1 and 2

Column 1	Column 2	Column 3
Local Environmental Plan	**Zones for Ponds**	**Zones for Tank and Raceway**
Cessnock Local Environmental Plan 1989	1 (a) Rural ``A''	1 (a) Rural ``A'' 1 (a1) Rural ``A1'' 4 (a) Industrial 4 (b) Light Industrial
Dungog Local Environmental Plan 1990	1 (b) General Rural 1 (d) Rural Farmlets	1 (b) General Rural 1 (d) Rural Farmlets 4 (a) General Industrial 4 (b) Light Industrial
Gloucester Local Environmental Plan 2000	1 (a) Rural 7 (d) Environment Protection (Scenic)	1 (a) Rural 4 (a) Industrial 7 (d) Environment Protection (Scenic)

[1] This provision will not apply to the use of such land required for gaining access to water that will be subject an assessment by the appropriate authority for each situation on its merits.

Gosford Interim Development Order No 122 1979	1 (a) Rural (Agriculture) 1 (b) Rural (Highway Protection) 7 (b) Conservation and Scenic Protection	1 (a) Rural (Agriculture) 1 (b) Rural (Highway Protection) 4 (a) Industrial
Gosford Planning Scheme Ordinance 1968		4 (a) Industrial (General) 4 (b) Industrial (Light)
Great Lakes Local Environmental Plan 1996	1 (a) Rural	1 (a) Rural 3 (d) Special Business Waterfront 4 (a) Industrial
Lake Macquarie Local Environmental Plan 1984	1 (a) Rural ``A" 1 (b) Rural ``B"	1 (a) Rural ``A" 1 (b) Rural ``B" 1 (c) Rural ``C" 4 (a) General Industry 4 (b) Special Industry
Lake Macquarie Draft Local Environmental Plan 2002	1 (1) Rural 9 Natural Resources	1 (1) Rural 1 (2) Rural 4 (1) Industrial Core 4 (2) Industrial General 9 Natural Resources
Maitland Local Environmental Plan 1993	1 (a) Prime Rural Land 1 (b) Secondary Rural Land	1 (a) Prime Rural Land 1 (b) Secondary Rural Land 4 (a) General Industrial 4 (b) Light Industrial
Merriwa Local Environment Plan 1992	1 (a) General Rural Zone	1 (a) General Rural Zone 4 (a) Industrial Zone
Murrurundi Local Environmental Plan 1993	1 (a) Rural ``A" Zone	1 (a) Rural ``A" Zone
Muswellbrook Local Environmental Plan 1985	1 (a) Rural ``A" Zone 5 (a) Special Use (power station)	1 (a) Rural ``A" Zone 4 (a) General Industrial Zone 4 (b) Light Industrial Zone 5 (a) Special Use (power station) 7 (L1) Environmental Protection General (Alluvial Areas) Zone
Newcastle Local Environmental Plan 1987		1 (a) Rural Zone 4 (a) Light Industrial Zone 4 (b) General Industrial Zone 4 (c) Eco-industrial Zone
Newcastle Draft Local Environmental Plan 2002	7(a) Conservation	4 (a) Light Industrial Zone 4 (b) General Industrial Zone 4 (c) Eco-industrial Zone
Port Stephens Local Environmental Plan 2000	1 (a) Rural Agriculture ``A" Zone 1 (c1) Rural Small Holdings Zone 6 (a) General Recreation ``A" Zone 6 (c) Special Recreation ``C" Zone 7 (a) Environment Protection Zone 7 (f1) Environment Protection ``F1" (Coastal Lands) Zone	1 (a) Rural Agriculture ``A" Zone 1 (c1) Rural Small Holdings Zone 1 (c2) Rural Small Holdings Zone 4 (a) Industrial General ``A" Zone 6 (a) General Recreation ``A" Zone 6 (c) Special Recreation ``C" Zone 7 (f1) Environment Protection ``F1" (Coastal Lands) Zone
Scone Local Environmental Plan 1986	1 (d) Rural Holdings Zone 1 (e) General Agricultural Zone 1 (i) Intensive Agricultural Zone 1 (s) Small farm zone	1 (d) Rural Holdings Zone 1 (e) General Agricultural Zone 1 (i) Intensive Agricultural Zone 1 (s) Small farm zone 4 (a) General Industrial Zone)
Singleton Local Environmental Plan 1996	1 (a) Rural Zone	1 (a) Rural Zone 4 Industrial Zone
Wyong Local Environmental Plan 1991	1 (a) Rural Zone 1 (c) Rural Holding Zone 7 (b) Scenic Protection Zone	1 (a) Rural Zone 1 (c) Rural Holding Zone 4 (a) General Industrial Zone 4 (b) Light Industrial Zone 4 (e) Regional Industrial and Employment Development Zone 7 (b) Scenic Protection Zone

Project Profile Analysis for Ponds

Tier 1 - Site Evaluation for Ponds

As a first step in the site evaluation process, a "desk top" study should be undertaken of potential sites using readily available information in maps and other data sources held by Councils, DL, DIPNR and government agencies. This desk top study will provide a quick and efficient approach to weeding out unsuitable sites and for focusing in on those sites which would justify a more intensive site evaluation. Tier 1 Evaluation Criteria are used to as a first "sieve" to identify areas that are likely to be suitable for aquaculture.

Information available from Government Sources

SITE EVALUATION CRITERIA FOR PONDS	TIER 1 LEVEL OF ASSESSMENT FOR PONDS		
	Level 1	**Level 2**	**Level 3**
1. Water Supply based on DIPNR information			
(a) Estuarine - Tidal amplitude	> 600mm	100 - 600mm	< 100mm
(b) Fresh - Water availability	• Existing irrigation license approved for bore or river extraction, or • Irrigation licence available for purchase.	• New licence required for bore or river extraction, or • Reliant upon on-farm dam and 10% of local run-off.	
(c) Freshwater projects that plan to pump water from a river – Environmental flows	No access restrictions based on flows in normal conditions	Access permitted only during high flows in normal conditions	
(d) Drinking Water supply protection[ϕ]:	Not located in a drinking water catchment	Located within a drinking water catchment	
2. Acid Sulphate Soils			
If site is < 2metres AHD based on survey data, ASS soil profile based on ASS Risk Maps[1]	ASS Landform Process Class A with Landform Element Class b, l, t, p, y or w	ASS Landform Process Classes A,W, B, E, L, S with other Landform Element than b, l, t, p, y or w	
3. Heritage issues			
(a) Heritage sites based on LEP or REP maps and State Heritage Inventory	No listings on the proposed site	Listings onsite	
(b) Aboriginal heritage based on DEC Aboriginal Sites Register and Local Aboriginal Land Council	No recorded sites or places and the DEC advises that no archaeological assessment is required	Sites or places recorded on the land and/or the DEC advises that an archaeological assessment is required.	Sites/places of regional or national significance present and likely to impact on sites/places.
4. Native Title Issues			
Status of native title interests	• Crown Land, previous determination • Native Title extinguished	Crown Land Native Title interest needs to be determined	
5. Conservation issues[2]			
(a) DEC protected areas, Aquatic Reserves and Marine Parks (except "General Zone")	Not located adjacent these areas and no potential to impact these areas	Adjacent to but no potential to drain into or extract water from these areas or impact on the conservation values.	Activity may impact on these areas.
(b) SEPP 14, SEPP 26, Marine Parks ("General Zone"), World Heritage Areas, Ramsar Wetlands, Critical Habitat	Not located in or adjacent these areas and no potential to impact these areas	Adjacent to but no potential to drain into or extract water from these areas but may involve water pipe access across the areas.	Activity located in areas or draining into these area or may impact on the conservation values
6. ***Site accessibility***			
Vehicle & electricity accessible based on LEP maps & power suppliers information	Existing access and services or access and services can be readily provided	Access or services limited or difficult – e.g. across a wetland (other than SEPP 14 wetlands dealt with above)	Access or services across SEPP 14 or SEPP 26 areas

[1] *Sourced from the Acid Sulphate Soil (ASS) Risk Maps*

[2] *This provision will not apply to the use of land required for gaining access to water*

[ϕ] Note: a drinking water catchment means the restricted areas prescribed by the controlling water authority

Tier 2 - Site Evaluation for Ponds

The next step in site evaluation is to undertake more detail site assessment including investigations by technical experts and in some cases, laboratory analysis. The purpose of this level of investigation is to eliminate sites that have inherent management problems that could result in increased costs during assessment and approval, construction or operation. The information gained from this investigation can provide the basis for preliminary design and operation planning.

Information sourced from site investigations by applicant

SITE EVALUATION CRITERIA FOR PONDS	TIER 2 LEVEL OF ASSESSMENT FOR PONDS		
	Level 1	Level 2	Level 3
7. Water Supply Quality			
(a) Water quality risks from nearby land uses	Grow-out water quality is consistently suitable for aquaculture and has low risk of contamination.	Grow-out water quality is mostly suitable for aquaculture and has low risk of contamination.	Grow-out water quality is not generally suitable for aquaculture and requires treatment OR does not have a low risk of contamination. For estuarine, inlet within 1km of sewage treatment plant outlet
(b) Potable water for processing etc.	• Mains water; or • Onsite existing reliable water of potable quality	• Onsite water of potable quality but may need to be supplemented during drought; or • No existing potable water supply on site	
8. Water Supply Access from rivers or estuaries			
(a) Estuarine ponds - pump station site	Not require sump pit or any deepening of bed of estuary or waterway	Require sump pit in estuary or waterway or need to cross an ocean beach	
(b) Estuarine - Estuary Circulation	Flushing time < 15 days	Flushing time 15 – 30 days	Flushing time > 30 days
(c) Fresh water ponds - pump station site	Not require sump pit or any deepening of bed of river	Require sump pit in river	
9. Mean Site Elevation			
(a) Mean elevation of the land to which the DA applies for Estuarine growing ponds	2-10m AHD[3]	1-2m AHD[3] if less than 5 ha of pond area	1-2m AHD[3] if more than 5 ha of pond area
(b) Mean elevation of the land to which the DA applies for Freshwater growing ponds	>1 metre AHD		<1 metre AHD
10. Topography			
(a) Estuarine ponds - slope of land	< 2% slope	>2% and < 5 % slope	> 5% slope
(b) Freshwater ponds - slope of land	<5% slope.	>5% and <10% slope.	> 10 % slope
(c) Irrigation area landform limitations*	slight	moderate	severe
11. Soils			
(a) Soil Characteristics - Suitability for Pond/Dam Construction	Clayey with mixture of soil/sand and low erosion potential and suitable for dam construction	Sandy/gravelly with erosion potential and/or limited water holding capacity – may need to import most pond clay for lining material or an artificial liner	
(b) Soil Characteristics - Suitability for Irrigation for freshwater ponds	Soils suitable and/or adequate land to irrigate/use recycled water on site or off-site near-by	Soils potentially unsuitable and/or inadequate land to irrigate or use recycled water	
(c) Irrigation area soil limitations*	slight	moderate	severe
(d) Soil Contamination based on SEPP 55 criteria	Suitable for residential use or for animal occupation	Exceed levels safe for animal or residential uses and the contaminated area is less than 3ha	More than 3ha of land exceed levels safe for animal or residential uses
12. Hydrology issues			
(a) Potential to affect groundwater	No underlying potable or high quality fresh groundwater within 3m	Underlying groundwater within 3m is not of high quality or potable.	Underlying potable water within 3m

* see Table 17 in Site Selection chapter for more details.

[3] note:- *Proposals which disturb more than 1 tonne of acid sulfate soils will be required to prepare an Acid Sulfate Soils Management Plan consistent with the ASS Manual.*

SITE EVALUATION CRITERIA FOR PONDS	TIER 2 LEVEL OF ASSESSMENT FOR PONDS		
	Level 1	Level 2	Level 3
(b) Catchment Stormwater Drainage	• No catchment related stormwater drainage across site, or • If present, measures to manage across site flows not likely to affect surrounding area	• Important catchment stormwater drainage across site; or • Change in drainage of stormwater likely to affect surrounding properties	Flood management likely to alter the course of the river
(c) For Estuarine Ponds: Flood liability	Site above 1:100 year flood	Below 1:100 year floods	
13. Stock security			
(a) Proposals for culturing species listed as High Security Status for Disease Pest OR Establishment in the Species Table (see Species Selection Section)	• Site not flood liable (above the PMF level) • Bird exclusion netting on all grow-out ponds; AND Escape management plan prepared.	• Below PMF but above 1:100 year; AND • Bird exclusion netting on all grow-out ponds; AND • Escape management plan prepared	
(b) Proposals for culturing species listed as Low Security Status for Disease Pest and Establishment in the Species Table (see Species selection Section)	Site not flood liable (above the PMF level).	Below PMF but above 1:100 year flood	Below 1:100 year flood but can construct ponds so unlikely to be inundated by 1:100 year flood
14. Excess water disposal			
Management of excess water	• non-irrigation reuse scheme eg hydroponics; OR • irrigation re-use scheme and discharge receival site has adequate area and suitable soils		• no non-irrigation reuse scheme, AND • no identified discharge receival site that has an adequate area and suitable soils.
15. Ecology			
(a) Type of existing vegetation on the actual development site (flora survey required)	Cultivated land, improved pasture, or predominantly cleared. No need for a consent to clear or disturb native vegetation under Native Vegetation Conservation Act or Rivers and Foreshore Improvement Act	Predominantly native vegetation – trees, shrubs, grasslands. Clearing vegetation requires a consent under Native Vegetation Conservation Act or Rivers and Foreshore Improvement Act	
(b) Likely occurrence of threatened species, populations or ecological communities or their habitats (flora & fauna survey required)	No threatened species, populations or ecological communities or their habitats known or likely to occur – 8 Part Test not required	Threatened species, populations or ecological communities or their habitats known or likely to occur – 8 Part Test required	Likely to significantly affect threatened species, populations or ecological communities or their habitats. [1]
(c) Likely impact on aquatic habitats and mangroves.	No likely disturbance or impact	Disturbance or impact on aquatic habitat or mangroves – approval or permit needed to disturb mangroves or seagrasses, reclamation or dredging works or impeding fish passages.	
16. Aboriginal heritage			
(a) Consultation with Aboriginal community (*Call DEC for appropriate contacts*)	No values of cultural significance to the Aboriginal community identified.	Values of cultural significance to the Aboriginal community identified. Agreement reached between Aboriginal community, DEC and proponent on the management of these values.	Values of cultural significance and no agreement reached with Aboriginal community, DEC on the management of these values.
(b) Location of Aboriginal Sites	No recorded Aboriginal site/place and DEC advises that no archaeological assessment is required	Recorded Aboriginal site/place and/or the DEC advises that an archaeological assessment is required	
(c) Likely impact on Aboriginal heritage [4]	No impact on Aboriginal sites/places or values of cultural significance to Aboriginal community	Impact on Aboriginal sites/places or values of cultural significance to Aboriginal community	Sites/places of regional or national significance present and likely to impact on sites/places.

[4] Note: approval from DEC is required.

SITE EVALUATION CRITERIA FOR PONDS	TIER 2 LEVEL OF ASSESSMENT FOR PONDS		
	Level 1	Level 2	Level 3
17. Adjacent land use to pond culture			
(a) Potential for conflict with neighbours	Neighbouring lands utilised for compatible purposes e.g. agriculture/industrial development	Neighbouring land zoned for residential or rural residential purposes or has been identified as suitable for this purpose in an LEP or REP	
(b) Potential visual impact	Site not visible or predominantly obscured from neighbours or from prominent vantage points (e.g. highway)	Site clearly visible to neighbours or from prominent vantage points (e.g. from highway)	
(c) Proximity to residences (not part of the site)	No residences within 400m of the ponds or pumps if line of sight.	Residences within 400m of the ponds or pumps if line of sight.	

Tier 3 - Operational Evaluation Criteria for Ponds

The next sieve in the evaluation process is to consider the operational criteria – species, design, layout and operating regime and the likely risk to the environment from various options. Avoidance of environmental impacts on the community or the environment should be paramount. Where avoidance is not possible, impact minimisation must be considered. The lower the level of environmental risk, the lower the costs of mitigation and the simpler the assessment and approval process

Information sourced from investigations by applicant

OPERATIONAL CRITERIA FOR POND CULTURE	TIER 3 LEVEL OF ASSESSMENT FOR PONDS		
	Level 1	Level 2	Level 3
18. Location of Ponds – Distance from the top of the high bank of a natural waterbody or wetland and the edge of the pond water surface.	> 50 metres		< 50 metres
19. Health Management			
(a) Period of total farm dryout after every production cycle for prawns	>6 weeks between crops	3 - 6 weeks between crops	<3 weeks between crops
(b) Arrangements for the timely identification and treatment of disease	• On site trained staff with appropriate facilities, or • Demonstrated arrangement with accredited laboratory or veterinary practice	No onsite provision for analysis of stock health problems and no backup arrangements with an accredited laboratory or veterinary practice	
(c) Predators management of fingerling ponds	All ponds screened or equivalent systems		No screening for fingerling ponds
(d) Predators management of grow out fish ponds	Combination of systems which may include screening, scare and other management systems not intending harm to predators	Only "scare" systems. May trigger need for 8 Part Test if affect threatened bird species	No control for predators
20. Feeding Management			
(a) Feed storage to prevent odour emissions or vermin problems	Facilities to store feed (e.g. enclosed shed)	Feed stored outdoors or so as not to minimise odour or other problems	
(b) Pond design includes feeding adjustment system	• System to monitor feeding and adjust feed quantities accordingly; or • System can adjust feed via feeding guide schedule	No system to monitor feeding and adjust feed quantities	
(c) Feeding system including mechanical feeders, systematic dispersal equipment and feeding program	• System to broadcast feed homogenously to prevent the creation of "dead" areas"; or • System can broadcast feed in defined feeding strips	No system to broadcast feed homogenously	
21. Water Monitoring			
(a) Capacity to measure DO, temperature, ammonia and pH.	Provisions for regular daily monitoring; e.g. with good quality hand-held meter or test kit;	No provisions for regular daily monitoring	
(b) Capacity to analysis water for N, P, Alkalinity, NFR, BOD	On site facilities for basic water quality analysis, or dependent on accredited laboratory for water analysis	No provision for regular water analysis	
22. Pond water management			
(a) Supply pipe or channel capacity	Largest growout pond can be filled in 1 day or less	Largest growout pond can be filled in 1 - 3 days	Largest pond can be filled in > 3 days
(b) Intensive Pond Outlet system	No pumping required to drain pond completely.	Requires pumping from an external sump to drain pond.	

OPERATIONAL CRITERIA FOR POND CULTURE	TIER 3 LEVEL OF ASSESSMENT FOR PONDS		
	Level 1	Level 2	Level 3
(c) Recycling System capacity for estuarine pond systems which discharge to waterbodies expressed in terms of: (i) Retention period of water prior to reuse or discharge; or (ii) Surface area of water in recycling pond (including drainage channels) relative to total water surface area of growing ponds	• Retention period of >6 days; or • Surface area of recycling pond > 20% of total water surface area of the growing ponds	• Retention period of 1-6-days; or • Surface area of recycling pond 10-20% of total water surface area of the growing ponds	• Retention period of <1 days; or • Surface area of recycling pond <10% of total water surface area of the growing ponds
(d) Estuarine pond discharge limits (averaged over the growing season when measured above the background) based on 4% daily water exchange rate	Nil discharge	< 12kg/ha/day TSS < 0.48 kg/ha/day Total N < 0.06 kg/ha/day Total P	> 12kg/ha/day TSS > 0.48 kg/ha/day Total N > 0.06 kg/ha/day Total P
(e) Storage capacity of recycling pond system (excluding growing ponds) for freshwater ponds	> 2 times the volume of largest growing pond	1-2 times the volume of largest growing pond	< the volume of the largest growing pond
23. Organic Waste Mgt (eg dead fish, processing waste and other putrescible waste)			
(a) Temporary storage of organic waste prior to disposal	• Daily disposal; or • Held prior to disposal so no odour generated (e.g. in freezer in sealed container)	Held in covered containers prior to intermittent disposal	No specific arrangements
(b) Disposal of organic waste on-site or off-site	• Disposed at an approved off-site recycling or landfill facility; or • Buried (with lime) in an area which is > 100m from a waterways and where the groundwater is > 3m. and the soil has low permeability	• Buried (with lime) in an area which is < 100m from a waterways or where the groundwater is < 3m or the soil is not low permeability; or • Composted (with lime)	No specific arrangements
(c) Disposal of stock in the event of a mass mortality, on-site or off-site	Arrangements in place for disposal at an approved off-site recycling or landfill facility.	Buried (with lime) in an approved onsite disposal area.	No specific arrangements
24. Planning and building issues			
(a) Buildings or structures Set back from nearest road boundary	> 5 metres or conforms to local Council standards.	< 5 metres or does not conform to local Council standards.	
(b) Building height excluding any parapet	< 7.2 metres or conforms to local Council standards.	> 7.2 metres or does not conform to local Council standards.	
(c) Driveways with regard to access, widths and turning circle	Complies with the local government's standards and no s.138 permit required from the RTA.	Modifications required to the public road to comply with the standards required by the local government and or a s.138 permit required from the RTA.	
(d) Truck loading and unloading space on site	No queuing or waiting on public roads	Queuing or waiting required on public roads	
(e) Compliance with Building Code of Australia	Meet the "deemed to satisfy" provisions	Modifications required	
(f) If unsewered site, on-site human sewerage system	Reticulated sewerage connection or adequate licensed on-site treatment system installed which complies with the approval requirements of the Local Govt Act	Modifications required to comply with the approval requirements of the Local Govt Act	

Project Profile Analysis for Tanks & Raceways

Tier 1 - Site Evaluation for Tanks & Raceways

As a first step in the site evaluation process, a "desk top" study should be undertaken of potential sites using readily available information in maps and other data sources held by Councils, DL, DIPNR and government agencies. This desk top study will provide a quick and efficient approach to weeding out unsuitable sites and for focusing in on those sites which would justify a more intensive site evaluation. Tier 1 Evaluation Criteria are used to as a first "sieve" to identify areas that are likely to be suitable for aquaculture.

Information available from Government Sources

SITE EVALUATION CRITERIA FOR TANKS & RACEWAYS	TIER 1 LEVEL OF ASSESSMENT FOR TANKS & RACEWAYS		
	Level 1	Level 2	Level 3
1. Grow-out Water Supply *Based on DIPNR information*			
(a) Saline - if dependent on Estuarine – Tidal amplitude	>300mm	100 - 300mm	< 100 mm
(b) Fresh - Water availability	• Existing irrigation licence approved for bore or river extraction; or • Irrigation license available for purchase.	• New licence required for bore or river extraction; or • Reliant upon on-farm dam and 10% run-off	
(c) Projects that plan to use a mains water supply		All projects that plan to use a mains water supply for grow-out, nursery or hatchery	
(d) Fresh water flow through - raceway production eg Salmonoids.	Not within a domestic water supply catchment or above a conservation zone (i.e. National Park)		Within a domestic water supply catchment or above a conservation zone (i.e. National Park).
(e) Freshwater projects that plan to pump water from a river – Environmental flows	No access restrictions based on flows in normal conditions	Access permitted only during high flows in normal conditions	
(f) For Fresh Water Tanks: Drinking Water supply protection [ϕ]	• Not located in a drinking water catchment; or • With a trade waste agreement for the disposal of discharge water	Located within a drinking water catchment.	
2. Acid Sulfate Soils			
If site is < 2 metres AHD based on survey data; ASS soil profile based on ASS Risk maps[1]	ASS Landform Process Class A with Landform Element Class b, l, t, p, y or w	ASS Landform Process Classes A,W, B, E, L, S with other Landform Element than b, l, t, p, y or w	
3. Heritage issue			
(a) Heritage sites based on LEP or REP maps and State Heritage Inventory	No listings on the proposed site	Listings on-site	
(b) Aboriginal heritage based on DEC Aboriginal Sites Register and Local Aboriginal Land Council	No recorded sites or places and the DEC advises that no archaeological assessment is required	Sites or places recorded on the land and/or the DEC advises that an archaeological assessment is required.	Sites/places of regional or national significance present and likely to impact on sites/places.
4. Native Title Issues			
Status of native title interest	• Crown Land, previous determination • Native Title extinguished	Crown Land Native Title interest needs to be determined	
5. Conservation issues[2]			
(a) DEC protected areas, Aquatic Reserves and Marine Parks (except "General Zone")	Not located adjacent these areas and no potential to impact these areas	Adjacent to but no potential to drain into or extract water from these areas or impact on the conservation values.	Activity may impact on the conservation values of these areas.
(b) SEPP 14, SEPP 26, Marine Parks ("General Zone"), World Heritage Areas, Ramsar Wetlands, Critical habitat	Not located in or adjacent these areas and no potential to impact these areas	Adjacent to but no potential to drain into or extract water from these areas but may involve water pipe access across the areas.	Activity located in areas or draining into these area or may impact on the conservation values

[ϕ] Note: a drinking water catchment means the restricted areas prescribed by the controlling water authority
[1] *Sourced from the Acid Sulphate Soil (ASS) Risk Maps*
[2] *This provision will not apply to the use of land required for gaining access to water*

SITE EVALUATION CRITERIA FOR TANKS & RACEWAYS	TIER 1 LEVEL OF ASSESSMENT FOR TANKS & RACEWAYS		
	Level 1	Level 2	Level 3
6. Site accessibility Vehicle & electricity accessible based on LEP maps & power suppliers information	Existing access and services or access and services can be readily provided	Access and services limited or difficult – may involves disturbance of a wetland (other than SEPP 14 wetlands dealt with above)	

Tier 2 - Site Evaluation for Tanks & Raceways

The next step in site evaluation is to undertake more detail site assessment including investigations by technical experts and in some cases, laboratory analysis. The purpose of this level of investigation is to eliminate sites that have inherent management problems that could result in increased costs during assessment and approval, construction or operation. The information gained from this investigation can provide the basis for preliminary design and operation planning.

Information sourced from site investigations by applicant

SITE EVALUATION CRITERIA FOR TANKS & RACEWAYS	TIER 2 LEVEL OF ASSESSMENT FOR TANKS & RACEWAYS		
	Level 1	Level 2	Level 3
7. Water Supply Quality			
(a) Water quality risks from nearly land uses	Grow-out water quality is consistently suitable for aquaculture and has a low risk of contamination	Grow-out water quality is mostly suitable for aquaculture and has a low risk of contamination	Grow-out water quality is not generally suitable for aquaculture and requires treatment OR does not have a low risk of contamination For estuarine, inlet within 1km of sewage treatment plant outlet
(b) Potable water for processing or other purposes	• Mains water; or • Onsite existing reliable water of potable quality	• Onsite water of potable quality but may need to be supplemented during drought; or • No existing potable water supply on site	
8. Water Supply Access from rivers or estuaries			
(a) *Estuarine* - pump station site	Not require sump pit or any deepening of bed of estuary or waterway	Require sump pit in estuary or waterway or need to cross an ocean beach	
(b) *Estuarine* - Estuary Circulation	Flushing time < 15 days	Flushing time > 15 days	
(c) Fresh water - pump station site	Not require sump pit or any deepening of bed of river	Require sump pit in river	
9. Soils			
(a) For freshwater tanks culture: Area to irrigate for agriculture, plantation, horticulture or landscaping if: i. no trade waste agreement for disposal of discharge water or ii. no non-irrigation reuse scheme e.g. hydroponics	• Soils suitable; and/or • Adequate land to irrigate/use recycled water on site or off-site near-by	• Soils potentially unsuitable; and/or • Inadequate land to irrigate or use recycled water-dependent on neighbours or other arrangements for use of water	
(b) Irrigation area soil and landform limitations*	slight	moderate	severe
10. Excess water disposal			
Management of excess water	• non-irrigation reuse scheme eg hydroponics; OR • irrigation re-use scheme and discharge receival site has adequate area and suitable soils		• no non-irrigation reuse scheme, AND • no identified discharge receival site that has an adequate area and suitable soils.
11. Hydrology issues			
(a) Catchment Stormwater Drainage	• No catchment-related stormwater drainage across site; or • With provision to manage across-site flows not likely to affect surrounding area	• Important catchment stormwater drainage across site; or • Change in drainage of stormwater likely to affect surrounding properties	
12. Stock security			
(a) Proposals for culturing species listed as High Security Status for Disease Pest OR Establishment in the Species Table (see Species Selection Section)	• All grow-out facilities totally enclosed in a vermin proof building; AND • Escape management program proposed; AND • All grow-out facilities not flood liable (above the PMF level).		• Any grow-out facility not totally enclosed in a building; OR • Escape management program not proposed; OR • Any grow-out facility below the PMF level.

SITE EVALUATION CRITERIA FOR TANKS & RACEWAYS	TIER 2 LEVEL OF ASSESSMENT FOR TANKS & RACEWAYS		
	Level 1	Level 2	Level 3
(b) Proposals for culturing species listed as Low Security Status for Disease Pest and Establishment in the Species Table (see Species Selection Section)	• All grow-out facilities totally enclosed in a building; AND • All grow-out facilities not flood liable (above the PMF level).	• Any grow-out facility not totally enclosed in a building; OR • Any grow-out facility below the PMF level but above the 1:100 year flood level.	
(c) Proposals for culturing species in Flow through systems	• Escape management program proposed • All grow-out facilities not flood liable (above the PMF level)		• No escape management program proposed • Any grow-out facility below the PMF
13. Ecology			
(a) Type of existing vegetation on the actual development site (flora survey required)	Cultivated land, improved pasture, or predominantly cleared. No need for a consent to clear or disturb native vegetation under Native Vegetation Conservation Act or Rivers and Foreshore Improvement Act	Predominantly native vegetation – trees, shrubs, grasslands. Clearing vegetation requires a consent under Native Vegetation Conservation Act or Rivers and Foreshore Improvement Act	
(b) Likely occurrence of threatened species, populations or ecological communities or their habitats (flora & fauna survey required)	No threatened species, populations or ecological communities or their habitats known or likely to occur – 8 Part Test not required	Threatened species, populations or ecological communities or their habitats known or likely to occur – 8 Part Test required	Likely to significantly affect threatened species, populations or ecological communities or their habitats. [1]
(c) Likely impact on aquatic habitats and mangroves	No likely disturbance or impact	Disturbance or impact on aquatic habitat or mangroves – approval or permit needed to disturb mangroves or seagrasses, reclamation or dredging works or impeding fish passages.	
14. Aboriginal heritage			
(a) Consultation with Aboriginal community (*Call DEC for appropriate contacts*)	No values of cultural significance to the Aboriginal community identified.	Values of cultural significance to the Aboriginal community identified. Agreement reached between Aboriginal community, DEC and proponent on the management of these values.	Values of cultural significance and no agreement reached with Aboriginal community, DEC on the management of these values.
(b) Location of Aboriginal Sites	No recorded Aboriginal site/place and DEC advises that no archaeological assessment is required	Recorded Aboriginal site/place and/or the DEC advises that an archaeological assessment is required	
(c) Likely impact on Aboriginal heritage[4]	No impact on Aboriginal sites/places or values of cultural significance to Aboriginal community	Impact on Aboriginal sites/places or values of cultural significance to Aboriginal community	Sites/places of regional or national significance present and likely to impact on sites/places.
15. Location for tank and raceway farms			
(a) Mean elevation of the land to which the DA applies for tanks and raceways	>1 metre AHD		<1 metre AHD
(b) Location of inlet pipe for Estuarine or Marine tank and raceway farms.	Suitable existing infrastructure to carry inlet pipe	Estuary or rock anchoring of pipeline	Established across ocean beach
16. Adjacent Land use to tank culture			
(a) Potential for Conflict with Neighbours	Neighbouring land zoned for compatible purposes, eg. agricultural or industrial development,	Neighbouring land zoned for residential or rural/residential purposes or has been identified as suitable for this purpose in an LEP or REP	

[4] Note: approval from DEC is required.
* see Table 17 in Site Selection chapter for more details.

SITE EVALUATION CRITERIA FOR TANKS & RACEWAYS	TIER 2 LEVEL OF ASSESSMENT FOR TANKS & RACEWAYS		
	Level 1	Level 2	Level 3
(b) Potential Visual Impact	• In an existing building; or • In a new building < 7.2 metres in height; or • Meets local government design requirements. • Site not visible or predominantly obscured from neighbours or from prominent vantage point (e.g. highway)	• In a new building >7.2 metres in height; or • In a new building in rural area and site is clearly visible to neighbours or from prominent vantage point (e.g. from highway)	
(c) Proximity to residences	• In industrial zone; or • In rural zone with no residences within 200 m of buildings or pumps	Residences in rural zone < 200m of the buildings or pumps	

Tier 3 - Operational Evaluation Criteria for Tanks & Raceways

The next sieve in the evaluation process is to consider the operational criteria – species, design, layout and operating regime and the likely risk to the environment from various options. Avoidance of environmental impacts on the community or the environment should be paramount. Where avoidance is not possible, impact minimisation must be considered. The lower the level of environmental risks the lower the costs of mitigation and the simpler the assessment and approval process.

Information sourced from investigations by applicant

OPERATIONAL CRITERIA FOR TANK & RACEWAY CULTURE	TIER 3 LEVEL OF ASSESSMENT FOR TANKS & RACEWAYS		
	Level 1	Level 2	Level 3
17. Health Management			
(a) Arrangements for the timely identification and treatment of disease	• On site trained staff with appropriate facilities, or • Demonstrated arrangement with accredited laboratory or veterinary	No on-site provision for analysis of stock health problems and no backup arrangements with an accredited laboratory or veterinary	
(b) Clean in Place (CIP)	Systems are designed to ensure total disinfection and dry-out of all facilities to break pathogen cycle	Difficulty in ensuring total disinfection and dry-out of all facilities	No CIP provision
18. Food and Feeding Management			
(a) Feed storage to prevent odour emissions or vermin problems	Facilities to store feed (eg. enclosed shed)	Feed stored outdoors or so as not to minimise odour or other problems	
(b) Feeding system	• Facilities to monitor food consumption and adjust feed; or • Provision of a system to adjust feed quantities via feeding schedule	No system to monitor feeding and adjust feed quantities	
19. Water Monitoring			
(a) Capacity to measure DO, temperature & pH	Provisions for regular daily monitoring	No provisions for regular daily monitoring	
(b) Capacity to analysis water for N, P, Alkalinity/acidity, NFR, BOD and other required parameters.	• On site facilities for basic water analysis; or • Only dependent on contract with accredited laboratory for water analysis	No provision for regular water analysis	
20. Grow-out Water Management			
Tank or raceway systems with water recycling	Recycle system with biofiltration and/or mechanical filtration or better	No mechanical filtration system	
21. Tank and Raceway Water Management			
(a) Storage capacity of recycling ponds	> 2 times the volume of largest growing tank	1 - 2 times the volume of largest growing tank	< the volume of the largest growing tank
(b) Saline tank and raceway culture	Zero discharge	Mechanical filtering <1000 microns or retention dam >10% of growout volume	Mechanical filtering >1000 microns or retention dam <10% of growout volume
(c) Recycling system for freshwater production.	Zero discharge		No recycling of water
22. Flow through Water Management			
(a) Flow through systems for approved Species.	Zero discharge	Mechanical filtering <1000 microns or retention dam >10% of growout volume	Mechanical filtering >1000 microns or retention dam <10% of growout volume
(b) Daily Discharge limits for species approved for freshwater flow through culture eg. salmonoids.	Zero discharge	< 60mg/l TSS < 0.30mg/l Total N < 0.05mg/l Total P	> 60mg/l TSS > 0.30mg/l Total N > 0.05mg/l Total P
(c) Total Discharge load limits for species approved for freshwater flow through culture eg. salmonoids.	Zero discharge	< 55kg N/tonne of fish produced < 12kg P/tonne of fish produced	> 55kg N/tonne of fish produced > 12kg P/tonne of fish produced
(d) In stream water quality objectives.	Zero discharge	In stream water quality objectives met.	In stream water quality objectives not met.
23. Organic Waste Management *(e.g. dead fish, processing waste and other waste)*			
(a) Temporary storage of organic waste prior to disposal (e.g. dead fish, processing waste and other putrescible waste)	• Daily disposal or • Held prior to disposal so no odour generated (e.g. in freezer in sealed container)	Held in covered containers prior to intermittent disposal	No specific arrangements

OPERATIONAL CRITERIA FOR TANK & RACEWAY CULTURE	TIER 3 LEVEL OF ASSESSMENT FOR TANKS & RACEWAYS		
	Level 1	Level 2	Level 3
(b) Disposal of organic waste	• Disposed at an approved off-site recycling or landfill facility; or • Buried (with lime) in an area which is > 100m from a waterways and where the groundwater is > 3m. and the soil has low permeability	• Buried (with lime) in an area which is < 100m from a waterways or where the groundwater is < 3m or the soil is not low permeability; or • composted (with lime)	No specific arrangements
(c) Disposal of stock in the event of a mass mortality, on-site or off-site	Arrangements in place for disposal at an approved off-site recycling or landfill facility.	Buried (with lime) in an approved onsite disposal area.	
24. Planning and building issues			
(a) Buildings or structures Set back from nearest road boundary	>5 metres or conforms to local Council standards.	< 5 metres or does not conform to local Council standards	
(b) Building height excluding any parapet	< 7.2 metres or conforms to local Council standards.	> 7.2 metres or does not conform to local Council standards.	
(c) Landscaping with trees and shrubs on each street frontage or surrounding buildings (except in industrial sites where space is a limiting factor)	> 3 metres in width	< 3 metres in width	
(d) Driveways with regard to access, widths and turning circle	Complies with the local government's standards and no s.138 permit required from the RTA.	Modifications required to the public road to comply with the standards required by the local government and or a s.138 permit required from the RTA.	
(e) Truck loading and unloading space on site	Queuing or waiting not required on public roads	Queuing or waiting required on public roads	
(f) Compliance with Building Code of Australia	Meet the "deemed to satisfy" provisions	Modifications required	
(g) If unsewered site, on-site human sewerage system	Reticulated sewerage connection or adequate licensed on-site treatment system installed which complies with the approval requirements of the Local Govt Act	Modifications required to comply with the approval requirements of the Local Govt Act	

New South Wales

Maitland Local Environmental Plan 1993 (Amendment No 75)

under the

Environmental Planning and Assessment Act 1979

I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), make the following local environmental plan under the *Environmental Planning and Assessment Act 1979*. (N04/00057/S69)

DIANE BEAMER, M.P.,
Minister Assisting the Minister for Infrastructure
and Planning (Planning Administration)

Maitland Local Environmental Plan 1993 (Amendment No 75)

under the

Environmental Planning and Assessment Act 1979

1 Name of plan

This plan is *Maitland Local Environmental Plan 1993 (Amendment No 75)*.

2 Aims of plan

The aims of this plan are:

(a) to rezone the land to which this plan applies from Zone 4 (a) General Industrial and Zone 2 (a) Residential to Zone 6 (b) Private Recreation under *Maitland Local Environmental Plan 1993*, and

(b) to introduce into the *Maitland Local Environmental Plan 1993* a clause to permit certain development on specific land at Rutherford.

3 Land to which plan applies

This plan applies to the land in the City of Maitland, being part of Lot 1223, DP 1017710, corresponding to proposed Lot 102 approved by the Council under subdivision application 02-2185, and Lots 222 and 224, DP 773532, as shown edged heavy black on the map marked "Maitland Local Environmental Plan 1993 Draft (Amendment No 75)" deposited in the office of Maitland City Council.

4 Amendment of Maitland Local Environmental Plan 1993

Maitland Local Environmental Plan 1993 is amended as set out in Schedule 1.

Schedule 1 Amendments

(Clause 4)

[1] Clause 5 How are terms defined in this plan?

Insert in appropriate order in the definition of ***The map*** in clause 5 (1):

Maitland Local Environmental Plan 1993 (Amendment No 75)

[2] Clause 52

Insert after clause 51:

52 Certain development at Mountvale Road, Rutherford (Heritage Green)

(1) This clause applies to Part Lot 1223, DP 1017710, Lot 222, DP 773532 and Lot 224, DP 773532, Rutherford as shown edged heavy black on the map marked "Maitland Local Environmental Plan 1993 (Amendment No 75)".

(2) Despite any other provision of this plan, a person may, with the consent of the consent authority:

(a) erect not more than 450 dwellings, in a maximum of 6 community parcels, on the land to which this clause applies, and

(b) carry out on that land development for commercial purposes or retail purposes, or both.

(3) The consent authority must not grant consent as referred to in subclause (2) unless the consent authority is satisfied that:

(a) the commercial or retail component of the proposed development is required as an integral part of a major tourist recreation facility, being a golf course, and

(b) appropriate steps, including the preparation of a conservation management plan, have been taken to identify and preserve any sites or artifacts of Aboriginal significance, and

(c) the land to which this clause applies will be consolidated into one allotment prior to any subdivision under a community scheme.

(4) The consent authority must not consent to a development referred to in this clause unless it has considered:

(a) an analysis of noise and air quality associated with rail and industrial activities, vegetation, fauna, surface and ground water quality, and hydrological regimes and an assessment

of any changes likely to result from the proposed development on these considerations, and

(b) a description of the measures to be undertaken to guard against actual and potential disturbances from rail and industrial development, and to vegetation, fauna, water quality and hydrological regimes, resulting from the carrying out of the development and whether those measures are satisfactory.

(5) In this clause:

community parcel has the same meaning as in the *Community Land Development Act 1989*.

community scheme has the same meaning as in the *Community Land Development Act 1989*.

New South Wales

North Sydney Local Environmental Plan 2001 (Amendment No 20)

under the

Environmental Planning and Assessment Act 1979

I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), make the following local environmental plan under the *Environmental Planning and Assessment Act 1979*. (S04/01651/S69)

DIANE BEAMER, M.P.,
Minister Assisting the Minister for Infrastructure
and Planning (Planning Administration)

North Sydney Local Environmental Plan 2001 (Amendment No 20)

under the

Environmental Planning and Assessment Act 1979

1 Name of plan

This plan is *North Sydney Local Environmental Plan 2001 (Amendment No 20)*.

2 Aims of plan

This plan aims:

(a) to rezone the land to which this plan applies from the Public Open Space Zone to the Roads Zone under *North Sydney Local Environmental Plan 2001*, and

(b) to reclassify the land from community land to operational land within the meaning of the *Local Government Act 1993*.

3 Land to which plan applies

This plan applies to part of Lot 10, DP 873927, Benelong Lane, Cremorne, being part of Grasmere Reserve, as shown edged heavy black and lettered "Road" on the map marked "North Sydney Local Environmental Plan 2001 (Amendment No 20)" deposited in the office of North Sydney Council.

4 Amendment of North Sydney Local Environmental Plan 2001

North Sydney Local Environmental Plan 2001 is amended as set out in Schedule 1.

Schedule 1 Amendments

(Clause 4)

[1] Schedule 2 Definitions

Insert in appropriate order in the definition of ***map***:

North Sydney Local Environmental Plan 2001 (Amendment No 20)

[2] Schedule 11 Operational land

Insert in alphabetical order of locality in Part 2:

Cremorne

Part of Lot 10, DP 873927, Benelong Lane, being part of Grasmere Reserve, as shown edged heavy black on the map marked "North Sydney Local Environmental Plan 2001 (Amendment No 20)"

New South Wales

Penrith Local Environmental Plan 1996 (Industrial Land) (Amendment No 6)

under the

Environmental Planning and Assessment Act 1979

I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), make the following local environmental plan under the *Environmental Planning and Assessment Act 1979*. (P03/00574/S69)

DIANE BEAMER, M.P.,
Minister Assisting the Minister for Infrastructure
and Planning (Planning Administration)

Penrith Local Environmental Plan 1996 (Industrial Land) (Amendment No 6)

under the

Environmental Planning and Assessment Act 1979

1 Name of plan

This plan is *Penrith Local Environmental Plan 1996 (Industrial Land) (Amendment No 6)*.

2 Aims of plan

This plan aims to rezone the land to which this plan applies from Zone No 3 (d) Special Business (Highway Service Area) under *Interim Development Order No 28—City of Penrith* to Zone No 4 (b) Special Industry Zone under *Penrith Local Environmental Plan 1996 (Industrial Land)* to encourage development for industrial and other employment-generating uses.

3 Land to which plan applies

This plan applies to Lot 2227, DP 857962, Wolseley Street, Jamisontown, as shown coloured purple, edged heavy black and lettered "4 (b)" on the map marked "Penrith Local Environmental Plan 1996 (Industrial Land) (Amendment No 6)" deposited in the office of the Council of the City of Penrith.

4 Amendment of Penrith Local Environmental Plan 1996 (Industrial Land)

Penrith Local Environmental Plan 1996 (Industrial Land) is amended as set out in Schedule 1.

5 Amendment of Interim Development Order No 28—City of Penrith

Interim Development Order No 28—City of Penrith is amended by inserting at the end of clause 1A the following words:

> Land being Lot 2227, DP 857962, Wolseley Street, Jamisontown, as shown coloured purple, edged heavy black and lettered "4 (b)" on the map marked "Penrith Local Environmental Plan 1996 (Industrial Land) (Amendment No 6)" deposited in the office of the Council.

Schedule 1 Amendments

(Clause 4)

[1] Clause 25

Insert after clause 24:

25 Development of land at Wolseley Street, Jamisontown

(1) This clause applies to Lot 2227, DP 857962, Wolseley Street, Jamisontown, as shown coloured purple, edged heavy black and lettered "4 (b)" on the map marked "Penrith Local Environmental Plan 1996 (Industrial Land) (Amendment No 6)".

(2) Despite any other provision of this plan, the council must not grant consent to the carrying out of development on the land to which this clause applies unless it is satisfied that:

(a) the proposed development will retain the *Eucalyptus tereticornis* (Forest Red Gum), identified as Trees 2, 3, 4, 6 (group of 4 trees), 7 and 8 on Fig 9 (Mud map of location of trees) of the Arborist Report dated 17 February 2004 and prepared by Australian Tree Consultants Pty Ltd, a copy of which is deposited in the office of the council, and

(b) the proposed development will be consistent with a tree management plan that has been prepared in accordance with the provisions of *Penrith Landscape Development Control Plan* (7 May 2002) and has been adopted by the council, and

(c) the proposed development will not involve direct vehicular access from the land to Mulgoa Road, and

(d) the proposed form, architectural design, siting, building materials and colours of the proposed new building on the land will complement existing buildings in the surrounding locality and enhance the gateway significance of the site.

[2] Schedule 1 Definitions

Insert in appropriate order in the definition of ***the map***:

Penrith Local Environmental Plan 1996 (Industrial Land) (Amendment No 6)

New South Wales

Wollongong Local Environmental Plan 1990 (Amendment No 234)

under the

Environmental Planning and Assessment Act 1979

I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), make the following local environmental plan under the *Environmental Planning and Assessment Act 1979*. (WOL2000534/S69)

DIANE BEAMER, M.P.,
Minister Assisting the Minister for Infrastructure
and Planning (Planning Administration)

Wollongong Local Environmental Plan 1990 (Amendment No 234)

under the

Environmental Planning and Assessment Act 1979

1 Name of plan

This plan is *Wollongong Local Environmental Plan 1990 (Amendment No 234)*.

2 Aims of plan

The aims of this plan are:

(a) to reclassify part of the land to which this plan applies from community land to operational land for the purposes of the *Local Government Act 1993*, and

(b) to rezone part of the land to which this plan applies from Zone No 6 (a) (Public Recreation Zone) to Zone No 6 (b) (Private Recreation Zone) and Zone No 7 (b) (Environmental Protection Conservation Zone) under *Wollongong Local Environmental Plan 1990*, and

(c) to conserve, protect and maintain a riparian corridor in relation to the land to which this plan applies, and

(d) to permit development to be carried out on the land that is proposed to be rezoned to Zone No 6 (b) (Private Recreation Zone), subject to the condition that the land identified as riparian buffer within the land proposed to be rezoned to Zone No 7 (b) (Environmental Protection Conservation Zone) is rehabilitated for those purposes, and

(e) to protect the visual landscape and natural ecological value of the Brooks Creek catchment, and

(f) to identify riparian buffer land within the land that is proposed to be rezoned to Zone No 7 (b) (Environmental Protection Conservation Zone).

3 Land to which plan applies

This plan applies to certain land at Dapto as shown edged heavy black on the map marked "Wollongong Local Environmental Plan 1990 (Amendment No 234)" deposited in the office of the Council of the City of Wollongong.

4 Amendment of Wollongong Local Environmental Plan 1990

Wollongong Local Environmental Plan 1990 is amended as set out in Schedule 1.

Schedule 1 Amendments

(Clause 4)

[1] Clause 6 Definitions

Insert in appropriate order in the definition of ***the map*** in clause 6 (1):

Wollongong Local Environmental Plan 1990 (Amendment No 234)

[2] Schedule 4B Classification or reclassification of public land as operational land

Insert at the end of the Schedule:

Part of Lot 77, DP 29271, Toronto Avenue, Dapto as shown edged with a broken black line on the map marked "Wollongong Local Environmental Plan 1990 (Amendment No 234)".

[3] Schedule 5 Restricted development

Insert at the end of the Schedule in columns 1, 2 and 3, respectively:

Land within Zone No 6 (b), being part of Lot 77 DP29271, Toronto Avenue Dapto as shown edged heavy black and marked "6 (b)" on the map marked "Wollongong Local Environmental Plan 1990 (Amendment No 234)".	Any development permissible within Zone No 6 (b).	Land identified as riparian buffer on the map marked "Wollongong Local Environmental Plan 1990 (Amendment No 234)" must be rehabilitated for riparian buffer purposes.

ENVIRONMENTAL PLANNING AND ASSESSMENT ACT 1979

REVOCATIONS

I, the Minister for Infrastructure and Planning, revoke:

- the declarations listed in Schedule 1 that were made under sections 76A(7);
- the directions listed in Schedule 2 that were made under s88A;and,
- the directions listed in Schedule 3 that were made under s89

of the Environmental Planning and Assessment Act 1979.

These revocations take effect on the day the declaration is gazetted.

CRAIG KNOWLES, M.P.,
Minister for Infrastructure and Planning
Minister for Natural Resources

Sydney, 18 May 2005.

Schedule 1

Declarations in the Government Gazette under section 76A(7)

General Declarations

- Extractive industry, aquaculture industry and rail freight terminals that meet certain criteria (1999)
- Marina development in the Sydney area (2001).
- Certain Industrial development on Kurnell Peninsula (2001)
- Certain potentially hazardous development in Botany Bay and Randwick LGA (2001)
- Development on land to which SEPP 71 applies (2003)
- Large wind farms (2004)

Specific declarations

- Orica subdivision, Botany (1998)
- Cabonne coal mine (1998)
- Ridgeway gold and copper trial mine (1998)
- Dunmore Lakes - sand extraction (1998)
- Collex - waste management facility, Randwick (1999)
- Lithgow Silicon Project - Charcoal plant, Dubbo (1999)
- Lithgow Silicon Project - Charcoal plant, Gunnedah (2000)
- Lithgow Silicon Project - quartz pebble mine (1999)
- Goulburn effluent storage pond (1999)
- BHP multi-purpose terminal, Newcastle (1999)
- Muswellbrook coal mine loop (1999)
- Kempsey Prison (2000)
- Hexham combined cycle gas turbine plant (2000)
- Warehouse, Storage and Distribution Centre, Yennora (2001)
- Lithgow Silicon Project - charcoal plant, Mogo (2001)
- Sydney Gas Camden Coalbed Project, Camden (2001)
- Redevelopment of Printing Facility, Lewisham (2002)

- Electricity Generating Station, Mt Thorley, Parish of Vere (2002)
- Whitehaven Coal Mine Coal Handling and Preparation Plant, Gunnedah Colliery (2002)
- Bowens Road West Pit , Stratford Open Cut Coal Mine (2002)
- Container examination facility , Australian Customs Service, Bumborah Road, Matraville (2002)
- Solar Tower Power Facility - Tapio Station, Wentworth (2002)
- Integrated Tourist Facility - Wyong Magenta: 213 tourist unit facility, 411 lot subdivision, and golf course (2004)

Schedule 2

Directions under section 88A of the EP&A Act

- Lord Howe Island - teacher housing (1998)
- Stanwell Tops: Two single dwelling homes on a cliff face (2001)
- Vincentia: Four dwellings (17 bed accommodation) on 1.4 hectares (2001)
- Fame Cove: Rural subdivision comprising 10 lots of between 40-42 hectares each (1998)
- Ballina Ramada Hotel: 6 story building (2003)
- Oyster Creek: 44 lot rural subdivision, Nambucca (2001)
- Taralga Wind Farm (2004)
- Optus Development, North Ryde - construction and partial fit out of a technology orientated campus style development comprising two four-storey and four five-storey buildings over a basement carpark with shared, communal, ancillary facilities including a gymnasium, food service areas and a child care centre to be used exclusively by the tenant of the building (2004)

Schedule 3

Directions under section 89 of the EP&A Act

- Gay Olympics - sailing event (2002)
- 2 Fire stations in Lake Macquarie area (2002)
- Chatswood Transport Precinct Project - development including the erection of residential flat buildings, associated car parking and other ancillary uses, on, above or below the land shown edged heavy black on the map entitled "Section 89 Direction - Chatswood Transport Precinct Residential Development" and deposited with the Head Office of the Department of Infrastructure, Planning and Natural Resources (2004)

Natural Resources

WATER ACT 1912

Notice Under Section 22B – Pumping Suspensions

Bogan River
(from the confluence of Gunningbar Creek to the confluence with the Barwon River)

THE Department of Infrastructure, Planning and Natural Resources pursuant to section 22B of the Water Act 1912, is satisfied that the quantity of water available in the Bogan River, from the confluence of Gunningbar Creek to the confluence with the Barwon River, is insufficient to meet all requirements and hereby gives Notice to all holders of permits, licences and authorities under Part 2 of the Act that from Monday, 13 June 2005 and until further notice, the right to pump water is SUSPENDED.

This suspension excludes water supply for town water supply, stock and domestic purposes.

Any person who contravenes the restrictions imposed by this Notice is guilty of an offence and is liable on conviction to a penalty not exceeding:

(a) where the offence was committed by a Corporation – 200 penalty points.

(b) where the offence was committed by any other person – 100 penalty points.

One penalty point = $110.00.

Dated this 6th day of June 2005.

GA2:306728

REX STEEL,
Manager,
Resource Access and Compliance,
Central West Region

WATER ACT 1912

APPLICATIONS under Part 2, within proclaimed (declared) local areas under section 5(4) of the Water Act 1912.

Applications for licences under section 10 for works within a proclaimed (declared) local area as generally described hereunder have been received from:

Macquarie River Valley

Bruce Robert MACKENZIE and Lorraine Edith MACKENZIE for a pump on the Bell River, Crown Land fronting Lot 795. DP 829600, Parish of Three Rivers, County of Wellington, for water supply for stock and domestic purposes and irrigation of 17 hectares (lucerne) (application to split up existing entitlement) (in lieu of ad, western magazine w/c 9.5.05) (Reference: 80SL96213).

Bruce Robert MACKENZIE and Lorraine Edith MACKENZIE for a pump on the Bell River, Crown Land fronting Lot 797, DP 829600, Parish of Three Rivers, County of Wellington, for water supply for stock and domestic purposes and irrigation of 3.33 hectares (lucerne) (application to split up existing entitlement) (Reference: 80SL96216).

Written objections to the applications specifying grounds thereof, may be made by any statutory authority or local occupier within the proclaimed local (declared) area and must be lodged with the Departments Regional Office at Dubbo, within twenty-eight (28) days as prescribed by the Act.

AN application for a licence under Part 5 of the Water Act 1912, as amended, has been received from:

Gordon Thomas DITCHFIELD and Pauline June DITCHFIELD for a proposed artesian bore on Lot 13, DP 754209, Parish of Geelnoy, County of Leichhardt, for water supply for stock and domestic purposes (new bore to replace GW006863) (Reference: 80BL242845).

GA2:306727

Written objections to the applications specifying grounds of how your interests may be affected may be made by any statutory authority or local occupier within the proclaimed local (declared) area and must be lodged with the Departments Office at Dubbo, by 24 June 2005, as prescribed by the Act.

Any inquiries regarding the above should be directed to the undersigned (telephone: 6884 2560).

FRED HUNDY,
Water Access Manager,
Macquarie

Department of Infrastructure, Planning and Natural Resources,
PO Box 717, Dubbo NSW 2830.

WATER ACT 1912

AN application for a licence under Part 2 of the Water Act 1912, being within a proclaimed (declared) local area under section 5(4) of the Act.

An Application for a license under section 10 of Part 2 of the Water Act 1912, has been received as follows:

Lachlan River Valley

Murray ALDRIDGE and Deborah May ALDRIDGE for a pump and pipeline on the Belubula River, on Lot 223/750175 and 205/750175, Parish of Nanami, County of Ashburnham, for domestic purposes (in lieu of advertisements in the *Government Gazette* No. 138, dated 27 August 2004 and the *Canowindra News* dated 1 September 2004) (new licence) (Reference: 70SL091010) (GA2:466374).

Written objections specifying grounds thereof, may be made by any statutory authority or local occupier within the proclaimed local area whose interests may be effected and must be lodged with the Department within 28 days of the date of this publication as prescribed by the Act.

VIV RUSSELL,
Resource Access Manager,
Central West Region

Department of Infrastructure, Planning and Natural Resources,
PO Box 136, Forbes NSW 2871,
telephone: (02) 6852 1222

WATER ACT 1912

AN application under Part 2 within a proclaimed (declared) local area under section 5(4) of the Water Act 1912.

An application for a licence under section 10 for works within a proclaimed (declared) local area as generally described hereunder have been received from:

Murrumbidgee Valley

James Laurence COE, Karen Dianne COE, John Graham MARTIN and Helen Margaret MARTIN for a diversion bank and off creek storage on Cooba Creek, Lot 2, DP 751420, Parish of Cooba, County of Clarendon, for a water supply for irrigation of 50 hectares of grapevines (new licence – allocation via permanent transfer within existing guidelines) (Reference: 40SL71059).

Any enquires regarding the above should be directed to the undersigned (telephone: (02) 6953 0700).

Formal objections to the application specifying the grounds thereof, may be made by any statutory authority or a local occupier within the proclaimed area and must be lodged with the Department's Regional Director at Leeton within the 28 days as fixed by the Act.

S. F. WEBB,
Resource Access Manager,
Murrumbidgee Region

Department Infrastructure, Planning and
Natural Resources,
PO Box 156, Leeton NSW 2705.

WATER ACT 1912

AN application for a licence under Part 5 of the Water Act 1912, as amended, has been received as follows:

Murrumbidgee Valley

DELLAPOOL NOMINEES PTY LIMITED for a bore on Lot 32, DP 754569, Parish of Wauberrima, County of Mitchell, for irrigation purposes (conversion of a test bore licence – new licence) (Reference: 40BL190537).

Written submissions of support or objections with grounds stating how your interest may be affected must be lodged before 12 July 2005, as prescribed by the Act.

S. F. WEBB,
Resource Access Manager,
Murrumbidgee Region

Department of Infrastructure, Planning and
Natural Resources,
PO Box 156, Leeton NSW 2705.

WATER ACT 1912

THE Local Land Board for the Land District of Metropolitan will at 10:00 a.m., on Thursday, 21 July 2005, at North Sydney Court House publicly inquire as to the desirability of granting the application for a licence under Part 2 of the Water Act 1912, by BALGOWLAH GOLF CLUB LTD for an overshot dam on Lot 110//774196 and Part Lot 19//836340 and 2 x 80mm centrifugal pumps on Lot 110//774196, all on Burnt Bridge Creek, Parish of Manly Cove, County Cumberland, for the conservation of water and water supply for recreation purposes and the irrigation of 10.5 hectares (replacement licence – no increase in authorised area) (Reference: 10SL055271) (GA2:493399).

WAYNE CONNERS,
Natural Resource Project Officer,
Sydney/South Coast Region

Department of Infrastructure, Planning and
Natural Resources,
PO Box 3720, Parramatta NSW 2124.

WATER ACT 1912

AN application under Part 2, being within a proclaimed (declared) local area under section 10 of the Water Act 1912, as amended.

An application for a licence within a proclaimed local area as generally described hereunder has been received as follows:

Namoi River Valley

Raymond Carl CHRISTIE and OTHERS for an existing diversion channel and four (4) pumps (two (2) existing and two (2) additional pumps) on Millie Creek on Lot 98/753957, Parish of Thalaba, County of Jamison. Application seeks to amalgamate three (3) existing licences – 90SL100621 (2,803 megalitres of which 1,021 megalitres only are available for extraction from Millie Creek) on "Ellimatta", with 90SL044966 (648 megalitres) from "Lower Water" and 90SL045057 (648 megalitres) from "Milton Park" – all existing Millie Creek entitlements.

This application seeks to authorise 2,317 megalitres for stock and domestic purposes and irrigation.

Re-advertised due to the omission of two (2) pumps (to replace three (3) pumps currently licensed by 90SL044966 and 90SL045057 (Reference: 90SL100837).

GA2:472207

Written objections to the application specifying the grounds thereof may be made by any statutory authority or local occupier within the proclaimed (declared) area, whose interest may be affected and must be lodged with the Department's Manager, Resource Access, Tamworth, within 28 days as specified in the Act.

GEOFF CAMERON,
Manager,
Resource Access

Department of Infrastructure, Planning and
Natural Resources,
PO Box 550, Tamworth NSW 2340.

Department of Lands

BOARD OF SURVEYING AND SPATIAL INFORMATION
Panorama Avenue (PO Box 143), Bathurst NSW 2795
Phone: (02) 6332 8238 Fax: (02) 6332 8240

SURVEYING ACT 2002

Registration of Surveyors

PURSUANT to the provisions of the Surveying Act 2002, section 10(1)(a), the undermentioned persons have been Registered as a Land Surveyors in New South Wales from the dates shown.

Name	Address	Effective Date
Anthony William George CLARKE	308 Booker Bay Road, Booker Bay NSW 2257	29 April 2005
David John CRAIG	2 Kepeto Court, Mildura VIC 3500	28 April 2005
Nigel DELFS	2/17 Berner Street, Merewether NSW 2291	18 April 2005
Nathan Forbes MILLIGAN	2/7 Williams Parade, Dulwich Hill NSW 2203	5 May 2005
Eric Kenneth SMITH	"Rock Ridge" Comobella Road, Guerie NSW 2831	11 May 2005
Ivan Viktorovich STERLIGOV	9/47-51 Pacific Parade, Dee Why NSW 2099	28 April 2005
Shannon WILSON	36 Pacific Street, Caves Beach NSW 2281	13 May 2005

W. A. WATKINS,
President

G. K. A. LEATHERLAND,
Registrar

SURVEYING ACT 2002

Registration of Surveyors

PURSUANT to the provisions of the Surveying Act 2002, section 10(1)(b), the undermentioned person has been Registered as a Mining Surveyor (Unrestricted) in New South Wales from the date shown.

Name	Address	Effective Date
Peter John SERGEANT	6A Dianne Street, Elmore Vale NSW 2283	1 July 2005

W. A. WATKINS,
President

G. K. A. LEATHERLAND,
Registrar

SURVEYING ACT 2002

Restoration of Name to the Register of Surveyors

PURSUANT to the provisions of the Surveying Act 2002, Section 10 (1)(a), the undermentioned Land Surveyors have been restored to the Register of Surveyors.

Name	Date of Original Registration	Removal Date	Restoration Date
Kevin Joseph DONOVAN	3 October 1967	18 December 1998	1 March 2005
Mark Lee GREY	23 November 1984	1 November 2004	22 April 2005
Wayne Anthony HAYES	9 October 2003	1 November 2004	10 March 2005
Peter Michael McCARTNEY	20 September 1963	1 November 2004	1 March 2005
Paul Kevin SANT	23 September 1983	1 November 2004	22 February 2005
Brian TUCKER	23 March 1984	1 November 2004	23 March 2005

W. A. WATKINS,
President

G. K. A. LEATHERLAND,
Registrar

DUBBO OFFICE
142 Brisbane Street (PO Box 865), Dubbo NSW 2830
Phone: (02) 6841 5200 Fax: (02) 6841 5231

NOTIFICATION OF CLOSING OF ROADS

IN pursuance of the provisions of the Roads Act 1993, the roads hereunder specified are closed and the lands comprised therein are freed and discharged from any rights of the public or any other person to the same as highways.

TONY KELLY, M.L.C.,
Minister for Lands

Description

Local Government Area of Wurrumbungle;
Land District of Coonabarabran

Lot 1, DP 1082144, Parish of Gundi, County of Gowen (not being land under the Real Property Act).

File No.: DB04 H 67.

Note: On closing, the title for Lot 1 shall remain vested in the State of New South Wales as Crown Land.

FAR WEST REGIONAL OFFICE
45 Wingewarra Street (PO Box 1840), Dubbo NSW 2830
Phone: (02) 6883 3000 Fax: (02) 6883 3099

APPOINTMENT OF TRUST BOARD MEMBERS

PURSUANT to section 93 of the Crown Lands Act 1989, the persons whose names are specified in Column 1 of the Schedule hereunder are appointed, for the terms of office specified thereunder, as members of the trust board for the reserve trust specified opposite thereto in Column 2, which has been established and appointed as trustee of the reserve referred to opposite thereto in Column 3 of the Schedule.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2	COLUMN 3
Lynette Rae TWEEDIE (re-appointment).	Silverton War Memorial Youth Camp Trust.	Reserve No.: 88980. Public Purpose: War memorial and youth centre. Notified: 3 August 1973. File No.: WL90 R 41/2.

Term of Office

For a term commencing the date of this notice and expiring 10 February 2010.

ASSIGNMENT OF NAME TO A RESERVE TRUST

PURSUANT to Clause 4(3) of Schedule 8 to the Crown Lands Act 1989, the name specified in Column 1 of the Schedule hereunder, is assigned to the reserve trust constituted as trustee of the reserve specified opposite thereto in Column 2 of the Schedule.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2
Euabalong West Rubbish Depot Reserve Trust.	Reserve No.: 84375. Public Purpose: Rubbish depot. Notified: 5 April 1963. File No.: WL91 R 12/1.

ALTERATION OF CORPORATE NAME OF RESERVE TRUST

PURSUANT to section 92(3) of the Crown Lands Act 1989, the corporate name of the reserve trust specified in Schedule 1 hereunder, which is trustee of the reserve referred to in Schedule 2, is altered to the corporate name specified in Schedule 3.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE 1

Heritage Purposes (R.230073) Reserve Trust.

SCHEDULE 2

Reserve No.: 230073.

Public Purpose: Heritage purposes.

Notified: 4 December 1992.

File No.: WL90 R 73/1.

SCHEDULE 3

White Rocks Reserve Trust.

SCHEDULE 1

Lightning Ridge Public Recreation (R230076) Reserve Trust.

SCHEDULE 2

Reserve No.: 230076.

Public Purpose: Public recreation.

Notified: 12 March 1993.

File No.: WL91 R 1/1.

SCHEDULE 3

Lightning Ridge Lions Club Park Reserve Trust.

SCHEDULE 1

Wentworth Kindergarten (R230030) Reserve Trust.

SCHEDULE 2

Reserve No.: 230030.

Public Purpose: Kindergarten.

Notified: 28 August 1987.

File No.: WL87 R 100.

SCHEDULE 3

Wentworth Pre-School Reserve Trust.

REVOCATION OF RESERVATION OF CROWN LAND

PURSUANT to section 90 of the Crown Lands Act 1989, the reservation of Crown land specified in Column 1 of the Schedules hereunder, is revoked to the extent specified opposite thereto in Column 2 of the Schedules.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE 1

COLUMN 1	COLUMN 2
Land District: Western Division. Local Government Area: Albury City Council. Locality: Reserve No.: 387. Public Purpose: Camping. Notified: 30 September 1879. File No.: WL98 R 1035/1.	The part being Lot 6873, DP No. 48198, Parish Taila, County Taila, of an area of 47.1 hectares.

Note: Lot is being converted to freehold. Reserve no longer required.

SCHEDULE 2

COLUMN 1	COLUMN 2
Land District: Balranald. Local Government Area: Balranald Shire Council. Locality: Benanee. Reserve No.: 395. Public Purpose: Travelling stock. Notified: 10 March 1875. File No.: WL99 R 176/1.	The part being Lot 6873, DP No. 48198, Parish Taila, County Taila, of an area of 472 hectares.

Note: Lot affected by reserve is being converted to freehold. There is no further need for TSR.

ERRATUM

IN the notification appearing in the *Government Gazette* of 15 April 2005, Folio 1401, under the heading Revocation of Reservation of Crown Land in Schedule 2 showing in Column 2 The whole being Lot 323, DP No. 755649, Parish Cobar, County Robinson, of an area of 10.88 hectares should have read The whole being Lot 323, DP 725333, Parish Cobar, County Robinson, of an area of 10.88 hectares.

File No.: WL98 R 813.

TONY KELLY, M.L.C.,
Minister for Lands

GOULBURN OFFICE
159 Auburn Street (PO Box 748), Goulburn NSW 2580
Phone: (02) 4828 6725 Fax: (02) 4828 6730

APPOINTMENT OF TRUST BOARD MEMBERS

PURSUANT to section 93 of the Crown Lands Act 1989, the persons whose names are specified in Column 1 of the Schedule hereunder are appointed, for the terms of office specified in that thereunder, as members of the trust board for the reserve trust specified opposite thereto in Column 2, which has been established and appointed as trustee of the reserve referred to opposite thereto in Column 3 of the Schedule.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2	COLUMN 3
Brad BOOKER (new member), Colin Francis SMYTH (new member).	Bribbaree Recreation Reserve Trust.	Reserve No.: 54721. Public Purpose: Public recreation. Notified: 22 July 1921. File No.: GB80 R 241.

Term of Office

For a term commencing the date of this notice and expiring 11 March 2009.

NOTIFICATION OF CLOSING OF PUBLIC ROAD

IN pursuance of the provisions of the Roads Act 1993, the road hereunder described is closed and the land comprised therein ceases to be a public road and the rights of passage and access that previously existed in relation to the road are extinguished. Upon closing, title to the land comprising the former public road vests in the body specified in the Schedule hereunder.

TONY KELLY, M.L.C.,
Minister for Lands

Description

Parish – Young; County – Monteagle;
Land District – Young; Council – Young Shire Council.

Lot 1, DP 1074157 (not being land under the Real Property Act).

File No.: GB02 H 350:KW.

SCHEDULE

Note: In accordance with section 44 of the Roads Act 1993, the Crown consents to the land in Lot 1, DP 1074157, being vested in the Young Shire Council as operational land, to be given by the Council as compensation for other land acquired by the Council for the purposes of the Roads Act.

GRAFTON OFFICE
76 Victoria Street (Locked Bag 10), Grafton NSW 2460
Phone: (02) 6640 2000 Fax: (02) 6640 2035

PROPOSED ADDITION TO CROWN LAND DEDICATED FOR A PUBLIC PURPOSE

IT is intended, following the laying before both Houses of Parliament in the State of New South Wales of an abstract of the proposed addition in accordance with section 82 of the Crown Lands Act 1989, to add the Crown Land specified in Column 1 of the Schedule hereunder, to the dedicated Crown Land specified opposite thereto in Column 2 of the Schedule.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2
Land District: Bellingen. Local Government Area: Bellingen Shire Council. Locality: Bellingen. Lot 7013, DP No. 1069242, Parish North Bellingen, County Raleigh; Lot 7014, DP No. 1069242, Parish North Bellingen, County Raleigh. Area: 2300 square metres. File No.: GF80 R 180/1.	Dedication No.: 540022. Public Purpose: Showground. Notified: 26 July 1911. Lot 12, DP No. 112142, Parish North Bellingen, County Raleigh. New Area: 5.086 hectares.

MOREE OFFICE
Corner Frome and Heber Streets (PO Box 388), Moree NSW 2400
Phone: (02) 6752 5055 Fax: (02) 6752 1707

REVOCATION OF RESERVATION OF CROWN LAND

PURSUANT to section 90 of the Crown Lands Act 1989, the reservation of Crown Land specified in Column 1 of the Schedule hereunder, is revoked to the extent specified opposite thereto in Column 2 of the Schedule.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2
Land District: Narrabri. Local Government Area: Walgett Shire. Locality: Rowena. Reserve No.: 25201. Public Purpose: Travelling stock. Notified: 28 November 1896. File No.: ME98 H 250.	The part being Lot 73, DP 45317 and Lots 7 and 16, DP 753953, Parish Oreel, County Jamison, of an area of 75.31 hectares.

NOWRA OFFICE
5 O'Keefe Avenue (PO Box 309), Nowra NSW 2541
Phone: (02) 4428 6900 Fax: (02) 4428 6988

ESTABLISHMENT OF RESERVE TRUST

PURSUANT to section 92(1) of the Crown Lands Act 1989, the reserve trust specified in Column 1 of the Schedule hereunder, is established under the name stated in that Column and is appointed as trustee of the reserve specified opposite thereto in Column 2 of the Schedule.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2
Austinmer/Coledale/Wombarra Beaches (R.88873) Reserve Trust.	Reserve No.: 88873. Public Purpose: Public recreation. Notified: 16 March 1973. File No.: NA79 R 133.

APPOINTMENT OF CORPORATION TO MANAGE RESERVE TRUST

PURSUANT to section 95 of the Crown Lands Act 1989, the corporation specified in Column 1 of the Schedule hereunder, is appointed to manage the affairs of the reserve trust specified opposite thereto in Column 2, which is trustee of the reserve referred to in Column 3 of the Schedule.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2	COLUMN 3
Wollongong City Council.	Austinmer/Coledale/ Wombarra Beaches (R.88873) Reserve Trust.	Reserve No.: 88873. Public Purpose: Public recreation. Notified: 16 March 1973. File No.: NA79 R 133.

ORANGE OFFICE
92 Kite Street (PO Box 2146), Orange NSW 2800
Phone: (02) 6393 4300 Fax: (02) 6362 3896

NOTIFICATION OF CLOSING OF PUBLIC ROAD

IN pursuance of the provisions of the Roads Act 1993, the road hereunder described is closed and the land comprised therein ceases to be a public road and the rights of passage and access that previously existed in relation to the road are extinguished. On road closing, title to the land comprising the former public road vests in the body specified in the Schedule hereunder.

TONY KELLY, M.L.C.,
Minister for Lands

Description

Parish – Orange; County – Wellington;
Land District – Orange; Shire – Orange.

Road Closed: Lots 3, 4 and 5 in Deposited Plan 1065309 at Bowen.

File No.: OE04 H 122.

Note: On closing, the land within Lots 3, 4 and 5, DP 1065309 remains vested in Orange City Council as operational land for the purposes of the Local Government Act 1993.

SYDNEY METROPOLITAN OFFICE
Level 12, Macquarie Tower, 10 Valentine Avenue, Parramatta 2150
(PO Box 3935, Parramatta NSW 2124)
Phone: (02) 9895 7657 Fax: (02) 9895 6227

NOTIFICATION OF CLOSING OF ROADS

IN pursuance of the provisions of the Roads Act 1993, the roads hereunder specified are closed and the roads cease to be public roads and the rights of passage and access that previously existed in relation to the roads are extinguished.

TONY KELLY, M.L.C.,
Minister for Lands

Description

Land District – Metropolitan; L.G.A. – Ryde.

Lot 1, DP 1080804 at Ryde, Parish Hunters Hill (Sheet 4), County Cumberland.

File No.: MN03 H 51.

Notes: 1] On closing, title for the land in Lot 1 remains vested in City of Ryde Council as operational land.

2] The road is closed subject to the easement to drain water 13m, 14m wide and variable, the easement for gas main 3m wide and the easement for electricity purposes 2m wide as shown in DP 1080804.

Description

Land District – Metropolitan; L.G.A. – Holroyd.

Lot 1, DP 1080975 at Yennora, Parish St John (Sheet 2), County Cumberland.

File No.: MN03 H 15.

Notes: 1] On closing, title for the land in Lot 1 remains vested in Holroyd City Council as operational land.

2] The road is closed subject to the easement for gas mains 3m wide and variable width, the easement for electricity purposes 6 wide and variable width, easement for overhead and underground electrical equipment 15 wide and variable, easement for transmission line variable width, easement for overhead power lines 6 wide as shown in DP 1080975.

TAMWORTH OFFICE
25-27 Fitzroy Street (PO Box 535), Tamworth NSW 2340
Phone: (02) 6764 5100 Fax: (02) 6766 3805

ROADS ACT 1993

ORDER

Transfer of Crown Road to Council

IN pursuance of provisions of section 151, Roads Act 1993, the Crown public roads specified in Schedule 1 are transferred to the Roads Authority specified in Schedule 2 hereunder, as from the date of publication of this notice and as from that date, the roads specified in Schedule 1 cease to be Crown public road.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE 1

Parish – Evan; County – Buckland;
Land District – Tamworth;
L.G.A. – Liverpool Plains Shire Council.

Crown public road of 20.115 metres wide and described as south-east and within Lot PT103, DP 751014 and the most westerly road within and separating Lot B from Lot A, DP 188106.

SCHEDULE 2

Roads Authority: Liverpool Plains Shire Council.

File Nos: TH03 H 22 and TH03 H 79.

TAREE OFFICE
98 Victoria Street (PO Box 440), Taree NSW 2430
Phone: (02) 6552 2788 Fax: (02) 6552 2816

ROADS ACT 1993

ORDER

Transfer of Crown Public Road to a Council

IN pursuant of the provisions of section 151, Roads Act 1993, the Crown public roads specified in Schedule 1 are transferred to the Roads Authority specified in Schedule 2 hereunder, as from the date of publication of this notice and as from that date, the road specified in Schedule 1 cease to be Crown public road.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE 1

Parish – Beryan; County – Gloucester;
Land District – Taree;
Local Government Area – Greater Taree.

Crown public roads between the north eastern corner of Lot 1 and the south western corner of Lot 5, DP 622594 (known as Spicers Road Rainbow Flat).

File No.: TE03 H 237(6).

Parish – Kundibakh; County – Gloucester;
Land District – Taree;
Local Government Area – Greater Taree.

Crown public road known as Roys Road Krambach from the Bucketts Way to a point 20 metres west of the north eastern corner of Lot 1, DP 328118.

File No.: TE03 H 237(7).

SCHEDULE 2

Roads Authority: Greater Taree City Council.

WAGGA WAGGA OFFICE
Corner Johnston and Tarcutta Streets (PO Box 60), Wagga Wagga NSW 2650
Phone: (02) 6937 2700 Fax: (02) 6921 1851

DECLARATION OF LAND TO BE CROWN LAND

PURSUANT to section 138 of the Crown Lands Act 1989, the land described in the Schedule hereunder, is hereby declared to be Crown Land within the meaning of that Act.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

Description

Land District – Temora; Shire – Temora;
Parish – Bundawarrah (Town – Temora);
County – Bland.

Lot 1, DP 786998, being land in the name of the Her Most Gracious Majesty Queen Elizabeth II (Minister for Agriculture and Rural Affairs) and comprising land in Folio Identifier 1/786998.

File No.: WA03 H 139.

DISSOLUTION OF RESERVE TRUST

PURSUANT to section 92(3) of the Crown Lands Act 1989, the reserve trust specified in Column 1 of the Schedule hereunder, which was established in respect of the reserve specified opposite thereto in Column 2 of the Schedule, is dissolved.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE

COLUMN 1	COLUMN 2
Burrandana Boy Scouts (R89499) Reserve Trust.	Reserve No.: 89499. Public Purpose: Boy Scouts. Notified: 11 July 1975. File No.: WA03 R 2.

ROADS ACT 1993

ORDER

Transfer of Crown Road to a Council

IN pursuance of the provisions of section 151, Roads Act 1993, the Crown public roads specified in Schedule 1 are transferred to the Roads Authority specified in Schedule 2 hereunder, as from the date of publication of this notice and as from that date, the roads specified in Schedule 1 cease to be Crown public road.

TONY KELLY, M.L.C.,
Minister for Lands

SCHEDULE 1

Parish – South Gundagai; County – Wynyard;
Land District – Gundagai; Shire – Gundagai.

Crown public road 20.115 wide described as the road south of Lots 1, 2, 6, 7 and 8 in DP 757248.

SCHEDULE 2

Roads Authority: Gundagai Shire Council.

File No.: WA05 H 242.

Department of Primary Industries

Agriculture

POULTRY MEAT INDUSTRY ACT 1986

Price Order No. 39

THE Poultry Meat Industry Committee, pursuant to sections 6(c) and 10 of the Poultry Meat Industry Act 1986, has determined on 30 November and 14 December 2004, the base rates for the following classes of batch poultry to be paid by processors to growers for designated poultry, namely chickens of the species [*Gallus gallus*] which are not more than 18 weeks old, and turkeys of the species [*Meleagris gallopavo*] from 1 July 2004, being the base rate adjustment date from which this order has effect, being base rates as follows, based on the requirements of section 10(4) of the Act.

Bartter Enterprises Pty Ltd:

Bartter turkey conventional shed class of batch poultry:

$2.27 per bird.

Rural Funds Management Ltd (RFM) Griffith class of batch poultry:

$53.25 per m^2 per annum.

Sunnybrand Chickens Pty Ltd:

Conventional shed class of batch poultry:

56 cents per bird.

Tunnel shed class of batch poultry:

54.7 cents per bird.

Baiada Poultry Pty Limited:

Baiada Sydney conventional shed class of batch poultry:

52.25 cents per bird, plus a cleanout fee of 3.0 cents per bird per batch.

Baiada Sydney tunnel shed class of batch poultry:

53.25 cents per bird, plus a cleanout fee of 3.0 cents per bird per batch.

Baiada Tamworth conventional shed class of batch poultry:

51.5 cents per bird, plus a cleanout fee of 48.44 cents per m^2 per batch.

Baiada Tamworth tunnel shed class of batch poultry:

51.5 cents per bird, plus a cleanout fee of 48.44 cents per m^2 per batch

Baiada Peats Ridge – Darren Smith class of batch poultry:

51.75 cents per bird.

Baiada ProTen Tamworth class of batch poultry:

$56.25 per m^2 per annum.

Cordina Chicken Farms Pty Ltd/Summertime Chicken Pty Ltd:

Conventional shed class of batch poultry:

53 cents per bird.

Tunnel shed class of batch poultry:

54.25 cents per bird.

S. CARROLL,
Chairman, PMIC
21 December 2004

NSW Fisheries

F98/169(2)

FISHERIES MANAGEMENT ACT 1994

Section 11 and Section 8 Notification – Fishing Closure

Clarence River, its lakes, lagoons, inlets, channels, creeks and tributaries
County of Clarence

I, IAN MACDONALD, M.L.C., revoke the closure notifications "Clarence River, its lakes, lagoons, inlets, channels, creeks and tributaries" published in *Government Gazette* Numbers 14 and 35 of 17 January 2003 and 13 February 2004 respectively and all amendments thereto.

I do now, by this notification, prohibit the taking of fish by the methods of fishing specified in Column 1 of Schedules 1 to 11 of this notification from the waters shown opposite in Column 2 of each schedule. Fishing is further subject to the 'conditions', 'time periods' and 'provisions' specified in the schedules of this notification.

This notification will be in effect for 5 years from the date of Gazettal.

The word 'Regulation', where appearing in this notification, refers to the Fisheries Management (General) Regulation 2002.

Note: Four Recreational Fishing Havens have been established in the Clarence River as prescribed in Clause 8A of the Regulation and commercial fishing is not permitted in these areas, other than the use of general purpose haul nets used by commercial fishers from 1 April through to 31 August in the waters adjacent to Wave Trap Beach.

IAN MACDONALD, M.L.C.,
Minister for the Department of Primary industries

SCHEDULE 1

Clarence River, North Arm and Broadwater – mesh nets – 45 minute attended set
(known locally as "splashing")

Column 1 **Methods**	*Column 2* **Waters**
Meshing nets as prescribed by cl 41 of the Regulation, if retrieval of the net does not commence within 45 minutes of the net being shot or if the conditions below are not complied with.	**Clarence River** – all waters upstream of the Middle Wall Recreational Fishing Haven to a line drawn across the River from the southern most extremity of Paddy's Point south-easterly to the north-western corner of portion 166 at Taloumbi. **Various Channels** – Oyster Channel, Romiaka Channel, Micalo Channel and Palmer's Channel. **Clarence River (North Arm)** – all waters from the junction of the north arm of the Clarence River and the main channel of the Clarence River upstream to a line drawn from the western bank of the entrance to the Esk River southerly to the north western corner of portion 151 at Harwood. **Esk River** – all waters of the Esk River upstream of the junction between the Esk River and the North Arm of the Clarence River. **Broadwater** – that part of the Broadwater north of a line between the post marked FD1 on the foreshore of Emerald's Point generally westerly to the post marked FD2 located on Neddy's Point.
Conditions: 1. The net is to be attended at all times, 2. Where practicable, the fish are to be removed from the net as the net is retrieved (to minimise discard mortality).	
The purpose of this schedule is to prohibit 3 hour sets and overnight setting of mesh nets in the above waters all year.	

SCHEDULE 2

Lake Wooloweyah – 45 minute attended set September to May
(known locally as "splashing")

Column 1 **Methods**	*Column 2* **Waters**
Meshing nets as prescribed by cl 41 of the Regulation, if retrieval of the net does not commence within 45 minutes of the net being shot or if the conditions below are not complied with.	The whole of the waters of Lake Wooloweyah.
Conditions: 1. The net is to be attended at all times, 2. Where practicable, the fish are to be removed from the net as the net is retrieved (to minimise discard mortality). Time period: This schedule applies from 1 September through to 31 May each year (dates inclusive).	
The purpose of this schedule is to prohibit 3 hour sets and overnight setting of mesh nets in the above waters from 1 September through to 31 May each year.	

SCHEDULE 3

Clarence River, Esk River, Coldstream River, Shark Creek, Sportsman's Creeks Mesh nets
45 minute attended set 15 May to 31 August
(known locally as "splashing")

Column 1 **Methods**	*Column 2* **Waters**
Meshing nets as prescribed by cl 41 of the Regulation, if retrieval of the net does not commence within 45 minutes of the net being shot or if the conditions below are not complied with.	**Clarence River** – all waters of the Clarence River including the Orara River and all tributaries upstream from the Koolkhan Power Station. **Esk River** – all waters of the Esk River upstream of the junction between the Esk River and the North Arm of the Clarence River. **Coldstream River** – all waters of the Coldstream River upstream of the Tucabia road bridge to its junction with Deep Creek. **Sportsman's Creek** – all waters of Sportsman's Creek from its junction with the Clarence River upstream to the weir above Lawrence. **Shark Creek** – all waters of Shark Creek upstream from its junction with the South Arm Clarence River.
Conditions: 1. The net is to be attended at all times, 2. Where practicable, the fish are to be removed from the net as the net is retrieved (to minimise discard mortality). Time period: This schedule applies from 15 May to 31 August each year (dates inclusive).	
The purpose of this schedule is to prohibit 3 hour sets and overnight setting of mesh nets in the above waters from 15 May through to 31 August each year to protect Australian Bass.	

SCHEDULE 4

Various areas – Netting

Column 1 **Methods**	*Column 2* **Waters**
Nets of every description except the landing net as prescribed by cl 53 of the Regulation.	**Orara River** – The Orara River and the creeks and tributaries feeding into the Orara River, upstream from a line drawn across the Orara River at its junction with Jacky's Creek (ie. located approximately 11km upstream of the junction of the Orara and Clarence Rivers). **Crystal Bay** – Crystal Bay, south and east of a line drawn from the centre of the turning circle of Westringa Place to the northern most point of Witonga Drive. **Sportsman's Creek** – Sportsman's Creek together with its creeks, tributaries and inlets from the weir above Lawrence upstream to its source. **Headwaters** – The Mann River (Mitchell River), Nymboida River, and the upper reaches of the Clarence River together with all their lakes, lagoons, inlets, channels, creeks and tributaries upstream from a line drawn across the Clarence River at the power line above the rapids approximately 5km upstream of Copmanhurst.
The purpose of this schedule is to prohibit the use of all nets, other than the landing net, in the above waters all year.	

SCHEDULE 5

Clarence River – Trawl Nets permitted in Lake Wooloweyah and parts of the Clarence River

Column 1 **Methods**	*Column 2* **Waters**
Otter trawl net (prawns) as prescribed by cl 38 of the Regulation.	The whole of the Clarence River together with its lakes, lagoons, inlets, channels, creeks and tributaries other than, **Lake Wooloweyah** – The whole of the waters of Lake Wooloweyah. The boundary between Lake Wooloweyah and Oyster Channel is determined by a line drawn from the south eastern extremity of Joss Island to the eastern extremity of Corokos Island. **Clarence River** – The whole of the waters of the main channel of the Clarence River from a line drawn between the Waterways Authority Navigation Aid No 097 (located on the downside of the most easterly opening in Middle Wall) then north westerly across river to the western extremity of Moriarty's Wall, upstream to the vehicular ferry crossing at Ulmarra, including Palmer's Channel. The boundary between the main channel of the Clarence River and the Broadwater is determined by a line drawn from a post marked FD1 on the foreshore of Emerald's Point generally westerly to a post marked FD2 located on Neddy's Point. **North Arm, South Arm, Coldstream, Sportsman's Creek and Back Channel** – the whole of the waters of the North Arm, the South Arm, The Coldstream River, Sportsman's Creek and Back Channel, other than the waters in which commercial fishing is prohibited as prescribed by cl 8A of the regulation (ie. The North Arm Recreational Fishing Haven). **Parts of Yamba Bay & Oyster Channel and behind Freeburn Island** – the whole of the waters of Yamba Bay west of a line drawn from the south eastern corner of Freeburn Island to the remnants of the old viaduct on Rabbit Island then onto the Public Reserve at Shores Drive, upstream and northwest to the main channel of the Clarence River (ie. behind Freeburn Island) and upstream and southwest to a line drawn between the NSW Fisheries post RFH 1 and NSW Fisheries Post RFH 2 (ie. The Oyster Channel Recreational Fishing Haven).

Time period:

Lake Wooloweyah – Trawling is only permitted from 8.00 am to 6.00 pm on Mondays, and from 7.00 am to 6.00 pm on each of the days Tuesday to Friday inclusive, excluding public holidays, in each week from the first Tuesday on or after 1 October in each year (inclusive) to the Friday nearest to 31 May in each succeeding year.

Clarence River, North & South Arms, Coldstream River, Sportsman's Creek, Back Channel and those parts of Yamba Bay & Oyster Channel as outlined above – Trawling is only permitted from 8.00 am to 6.00 pm on Mondays, and from 7.00 am to 6.00 pm on each of the days Tuesday to Friday inclusive, excluding public holidays, in each week from the Monday nearest 1 December in each year (inclusive) to the Friday nearest to 31 May in each succeeding year.

Provisions:

The District Fisheries Officer NSW Fisheries may extend the time period for trawling by 15 working days in total each season, either at the start of the season (Clarence River only) or at the end of the season (Clarence River and Lake Wooloweyah) or a combination of both. For the purpose of extending the time period, the District Fisheries Officer may arrange for a trail to be conducted in waters that are closed under this notification to determine the availability and size of prawns or the level of bycatch.

For the purpose of travelling to preferred trawl grounds within the Clarence River including Lake Wooloweyah, licensed fishing boats with a S5 or a S6 endorsement are permitted to be on the water for a maximum of 1 hour prior to the opening of the fishery each day provided all net(s) and trawl gear or parts thereof remain onboard the boat.

Explanatory note:

Public holiday means a gazetted state wide public holiday.

The purpose of this schedule is to restrict trawling to the waters and time periods above.

SCHEDULE 6

Clarence River – General Weekend Netting Closure

Column 1 **Methods**	*Column 2* **Waters**
All nets, other than the following nets as prescribed by Regulation, dip or scoop net, push or scissors net, hoop or lift net, hand hauled prawn net, landing net, hauling net, prawn set pocket net	The whole of the waters of the Clarence River together with all its lakes, lagoons, inlets, channels, creeks and tributaries upstream from the South Pacific Ocean to its source.

Time period:

All nets (other than those listed above) are prohibited from 8.00 am each Saturday to 8.00 am the following Monday.

Provision:

For the purpose of travelling, commercial fishers endorsed to used mesh nets are permitted to be on the water and in possession of a mesh net for up to ½ hour (ie. 7.30 – 8.00 am) prior to the opening of the fishery each Monday between the Monday nearest 1 December and the Friday nearest 18 June provided all net(s) or parts thereof remain on board the boat. If the time period (ie. season) for trawling is extended in accordance with the provisions of schedule 6 above, the travelling provision for fishers in possession of mesh nets is also extended for the same period.

The purpose of this schedule is to prohibit the use of all nets, other than those above, in the Clarence River system on weekends.

SCHEDULE 7

Clarence River – Weekend Hauling during the mullet travelling season

Column 1 **Methods**	*Column 2* **Waters**
General purpose hauling nets as prescribed by cl 26 of the Regulation.	The whole of the waters of the Clarence River together with its lakes, lagoons, inlets, channels, creeks and tributaries other than; **Wave Trap Beach** – the waters adjacent to Wave trap Beach located at the western end of the northern breakwall at the entrance of the Clarence River. **Clarence River** – The whole of the waters of the main channel of the Clarence River from a line drawn between the Waterways Authority Navigation Aid No 097 (located on the downside of the most easterly opening in Middle Wall) then north westerly across the river to the western extremity of Moriarty's Wall, upstream to a line drawn from the western bank of Palmer's Channel to the wharf at the Harwood slipway on the northern side of the main channel of the Clarence River. **North Arm** – The whole of the waters of the North Arm of the Clarence River from its junction with the main channel of the Clarence River at Iluka, upstream to the Mororo Bridge. **Yamba Bay & Oyster Channel and behind Freeburn Island** – The waters of Yamba Bay extending upstream and northwest to the main channel of the Clarence River (ie. behind Freeburn Island) and the waters of Oyster Channel upstream to a line drawn from the south eastern extremity of Joss Island to the eastern extremity of Corokos Island at the entrance to Lake Wooloweyah, but excluding the waters of the Middle Wall and Oyster Channel Recreational Fishing Havens.
Time period: Hauling nets are prohibited from 8.00 am each Saturday to 8.00 am the following Monday, except during the period 1 April through to 31 August each year. Note: As prescribed in Clause 8A of the Regulation general purpose hauling nets may be used by commercial fishers from 1 April through to 31 August in the waters adjacent to Wave Trap Beach as an exemption to the general prohibition on commercial fishing (ie. the Middle Wall Recreational Fishing Haven).	
The purpose of this schedule is to restrict hauling on weekends to the 'mullet travelling season' (1 April to 31 August each year) and only in the above waters.	

SCHEDULE 8

Clarence River – Fish Traps restricted to the Middle Wall trap ground May to August

Column 1 **Methods**	*Column 2* **Waters**
Fish traps prescribed by clause 59 of the Regulation.	The whole of the waters of the Clarence River other than, **Middle Wall & Collis Wall trap ground** – the waters bounded by a line drawn from the downstream side of the most easterly opening in Middle Wall across to the western extremity of Moriarty's Wall, then upstream to a wooden peg marked "FT1" located at the upstream end of the training wall which runs adjacent to the Spencer Street Boat ramp at Iluka, then westerly to the NSW Waterways Authority Lead beacon number 037 located adjacent to the south eastern extremity of Goodwood Island, then upstream to NSW Waterways Authority Lead beacon number 041, then in a line south westerly to the north western extremity of Freeburn Island, then downstream along the north eastern side of Freeburn Island and north eastern side of Middle Training Wall to the point of commencement.
Time period: Fish traps may be used in the Middle Wall & Collis Wall trap ground between 1 May and 31 August each year only.	
The purpose of this schedule is to restrict the use of fish traps to the waters and time period above.	

SCHEDULE 9

Clarence River – Eel Traps

Column 1 **Methods**	*Column 2* **Waters**
Eel traps as prescribed by cl 65 of the Regulation.	The Orara River upstream of the Gwydir Highway road bridge, and the main arm of the Clarence River from the powerlines that extend from Carrs Island across the top of Susan Island to the western bank of the River, downstream to a line drawn across the River at the eastern most end (ie. bottom end) of Elizabeth Island.
Condition: In all waters other than the Clarence River Broadwater, no part of the trap shall be more than 5 metres from the shore measured horizontally irrespective of tidal position.	
The purpose of this schedule is to prohibit eel trapping in the waters around Grafton and the upper reaches of the Orara River as described above, and to establish a requirement for eel traps to set within 5 metres of the shore other than in the Clarence River Broadwater.	

SCHEDULE 10

Clarence River – Crab Traps

Column 1 **Methods**	*Column 2* **Waters**
Crab traps as prescribed by cl 61 of the Regulation.	The whole of the waters of the Clarence River together with all its lakes, lagoons, inlets, channels, creeks and tributaries upstream of a line drawn across the River from the boat ramp adjacent to the Maclean Court House (ie. the Old Ashby Ferry crossing).
The purpose of this schedule is to prohibit crab trapping upstream of the boat ramp adjacent to the Maclean Court House all year.	

SCHEDULE 11

Clarence River – Prawn Hauling

Column 1 **Methods**	*Column 2* **Waters**
Prawn hauling nets as prescribed by cl 32 of the Regulation.	The whole of the waters of the Clarence River together with all its lakes, lagoons, inlets, channels, creeks and tributaries from its confluence with the South Pacific Ocean upward to its source.
The purpose of this schedule is to prohibit prawn hauling nets in the Clarence River system all year.	

NOTICE OF RECEIPT OF APPLICATION FOR AQUACULTURE LEASE

Notification under s.163 (7) of the Fisheries Management Act 1994, and cl.33 of the Fisheries Management (Aquaculture) Regulation 2002

NSW Department of Primary Industries incorporating NSW Fisheries (DPI) advises that an application has been received for an aquaculture (oyster) lease over public water land for the purposes of cultivating Sydney rock oysters.

Location is Wallis Lake, for an area to be known as AL04/053 (if granted) of approximately 0.8416 hectares over former oyster lease OL76/220. Application by Graham BARCLAY of Forster NSW. If granted the lease will be subject to standard covenants and conditions of an aquaculture lease as imposed by DPI, and any other conditions by Council or other approval body.

DPI is calling for written submissions from any person supporting or objecting to the oyster lease proposal, citing reasons for the support/objection.

DPI is also calling for expressions of interest from persons or corporations interested in leasing the area specified above, for the purposes of aquaculture. An expression of interest must be in the form of a written response referring to lease number AL04/053, signed and dated with a return address.

Specific details of the proposed lease can be obtained, or enquiries made with the Aquaculture Administration Section, Port Stephens on (02) 4982 1232.

Objections or expressions of interest for consideration in the determination of the application must be received at the address below, within 30 days from the date of publication of this notification.

Director, Fisheries Management, Agriculture and Fisheries Division, DPI, Aquaculture Administration Section, Port Stephens Fisheries Centre, Private Bag 1, Nelson Bay NSW 2315.

If additional expressions of interest are received, DPI may offer the area for leasing through a competitive public tender process, or via auction or ballot.

Dr NICK RAYNS,
Director,
Fisheries Management,
Agriculture and Fisheries Division,
Department of Primary Industries

Mineral Resources

COAL MINES REGULATION ACT 1982

Our Reference: 04/1847.
Comet ID: 31752167001.

Section 5(4)(a)(i) and (ii)
Coal Mines Regulation Act 1982, as amended

Declaration that a Place be Deemed not to be Part of a Mine
(Cumnock No. 1 Underground Colliery)

and

be Deemed to be Part of a Mine
(Cumnock South Open Cut Mine)

IT is hereby notified by virtue of delegated authority from the Minister that a certain area described in the schedule hereunder within Cumnock No. 1 Underground Colliery is deemed not to be part of the Mine pursuant to section 5(4)(a)(ii) of the Coal Mines Regulation Act 1982, as amended.

It is further notified that a certain area described in the Schedule hereunder is deemed to be part of the Cumnock South Open Cut Mine pursuant to section 5(4)(a)(i) of the Coal Mines Regulation Act 1982, as amended.

SCHEDULE

The attached mine plans prepared and signed by registered mine surveyor Ian Gordon Innes:

1. "Cumnock No. 1 Underground Colliery – Notice of place of mine to be deemed not part of a mine as per section 5(4)(a)(ii) of the CMRA, 1982" – dated 23 March 2005; and
2. "Cumnock South Open Cut – Notice of place to be deemed part of a mine as per section 5(4)(a)(i) of the CMRA 1982" – dated 21 February 2005,

detail the location and extent of the subject area in relation to the mine, and the schedule of coordinates accurately maps the boundary around the Cumnock Coal Preparation Plant.

The approval is subject to the observance of the conditions attached to letter of notice provided to the managers of the mines to which this declaration applies.

ROB REGAN,
Director,
Safety Operations and
Chief Inspector of Coal Mines

COAL MINES REGULATION ACT 1982

Approval No.: MDA TBS 051751.
File No.: 05/1751.
Date: 19 April 2005.

Notice of Type Approval (Transport Braking System)

It is hereby notified that the Approved System listed herein has been assessed for compliance with the Coal Mines Regulation Act and appropriate standards or requirements and is hereby APPROVED in accordance with the requirements of the COAL MINES REGULATION ACT 1982. This approval is issued pursuant to the provisions of Clause 70, Part 8 of Approval of Items of the Coal Mines (General) Regulation 1999.

This APPROVAL is issued to:	PWG KING & SONS PTY LTD, ABN 24 000 236 733.
Address of Approval Holder:	57 Gardiner Street, Rutherford NSW (PO Box 179, Maitland NSW 2320).
Description of Item:	Type Approval for the Transport Braking System (TBS) on a PWG King & Sons Pty Ltd, Kings Koal Hauler Shuttle Car models 48", 54" & 64", as per the listed documents.
CMRA Approval Clause:	61(1)(b) of the Coal Mines (Underground) Regulation 1999.
Specific Approval Category:	TBS (Transport Braking System)

This Approval is issued subject to compliance with the requirements of the Occupational Health and Safety Act 2000.

The Authority issuing the Approval has, for the purposes of the Occupational Health and Safety Act, 2000, appended a list of conditions, (including drawings, documents, etc.) that are applicable to this approved system, as identified during test and/or assessment, to assist the Approval Holder and User to comply with the obligations of the Occupational Health and Safety Act, 2000. The onus is on the Supplier and/or User to ensure the Approved System, and any deviation from the list of conditions, in reference to that system is not inferior in any way to the item tested and/or assessed, this includes the supply, installation and continuing use of the Approved System.

The Approval Number shall appear in a conspicuous place and in a legible manner on each approved system, unless specifically excluded.

A copy of the Approval Documentation shall be supplied to each user of the Approved System and shall comprise the number of pages listed in the footer block together with supplementary documentation as listed in the Schedule and in respect to drawings, ALL drawings as listed in the schedule and those drawings specifically nominated for the purposes of repair and maintenance.

Any maintenance, repair or overhaul of approved systems shall be carried out in accordance with the requirements of the Coal Mines Regulations Act 1982.

G. D. JERVIS,
Senior Inspector of Mechanical Engineering
(under the delegated authority of the Chief Inspector of Coal Mines)

TYPE APPROVAL SCHEDULE

1.0 Detailed Description of Approved Item (s) and Variation (s):

Type approval for the Transport Braking System (TBS) on a PWG King & Sons Pty Ltd, Kings Koal Hauler shuttle car models 48", 54" & 64", as per the listed documents.

1.1 Assessment Criteria

This braking system was assessed against the following documents:

(a) Handbook for approval assessment of Transport braking systems on free-steered vehicles in underground coal mines, MDG39.

2.0 Documents Submitted for Approval

2.1 Approval Drawings

The drawings listed must be supplied and kept with each Transport Braking System approval package.

Drawing No.	Issue	Date	Title
1642AGA	Original	20/1/2005	Reel-Safe Circuit

2.2 Drawings Submitted for Reference

These drawings are listed for reference only and need not be supplied with each Transport Braking System approval package.

Drawing No.	Issue	Date	Title
K1-G-002	A	25/8/2004	Kings Koal Hauler General Arrangement

2.3 Approval Documents:

The document listed must be supplied and kept with each Transport Braking System approval package.

Drawing No.	Issue	Date	Title
S45155-3	A	10/3/2005	Verification statement by SR Plain of Colliery Diesel & Electric Pty Ltd

2.4 Documents Submitted for Reference

These documents are listed for reference only and need not be supplied with each Transport Braking System approval package.

Drawing No.	Issue	Date	Title
S45115-2	A	9/3/2005	Kings Koal Hauler Maintenance Data sheet
S45115-1	B	8/3/2005	Brake System Assessment & Test Report by Colliery Diesel & Electric Pty Ltd
S45009-2	B	3/3/2005	Failure Mode and Effects Criticality Analysis (FMECA) by Colliery Diesel & Electric Pty Ltd
PTT-381-0	—	3/10/2003	PT Tech, Hydraulic Service / Spring Applied Brake (A+ brake)

3.0 Conditions for Supply and Use

3.1 General Conditions

1. The user of the Approved System shall conduct a site specific Operational Risk Assessment and implement all barriers to risk identified in the Risk Assessment prior to the introduction of the system into a Coal Mine in New South Wales. This Operational Risk Assessment shall be reviewed when operating conditions vary and at periods not exceeding five (5) years.
2. The Chief Inspector of Coal Mines has the right to vary or revoke this approval at any time.
3. The manufacture is to certify in writing that the particular system supplied is in accordance with the requirements of this approval insofar as those matters assessed for the approval are concerned.

4. There shall be no variation in the materials, design or construction of the equipment associated with this approval without prior consent of the Chief Inspector. Unauthorised alteration or substitution of approved equipment shall render this approval void.

5. The Owner of this System shall ensure that adequate information is retained at the mine to enable the system to be operated, tested and maintained in the approved condition. This information shall also be made available wherever the system is overhauled or repaired.

6. This approval ceases to be valid if the system is not designed, modified, examined, tested, maintained, overhauled and repaired in accordance with the approval conditions, Occupational Health and Safety Act, 2000 Coal Mines Regulation Act, 1982 and Associated Regulations.

7. The Mine Managers Defect Management System required by Clause 42 Part 2 Division of the Coal Mines (General) Regulation 1999 should include providing details of any defects to the approval holder.

8. The Manager of the mine shall ensure the recommendations of the Approval Holder are complied with as far as they relate to the system, unless an appropriate documented risk assessment process is used to identify alternative means of providing at least equivalent levels of safety and these alternatives are implemented.

9. In accordance with the Occupational Health and Safety Act, 2000 it is a requirement that the Mine Management, Equipment Manufacturers, Equipment Owners, Hire / Lease Organisations, Approval Holders and the Designer of the equipment all take considerable responsibility for the safety related aspects of the system. Compliance with safety related recommendations of the Approval Holder should be viewed as an integral part of the responsibility of all concerned.

10. A safety audit of the Approved System shall be carried out at intervals not exceeding five (5) years. This safety audit shall be documented and shall include:
    (a) an assessment for compliance against these approval conditions, and
    (b) an assessment for compliance against the current community standards, applicable to the Approved System at the time of the audit, and implementation of interim control measures to reduce risk to an acceptable level, and
    (c) an assessment of the safety defects identified since the previous audit and a review of the improvements required to minimise these defects.

3.1 Specific Conditions

1. The Type Approval system identification number, MDA TBS 051751 and the Supplier's name or mark, the brake performance limits, the maximum operating grades, speed and masses shall be inscribed on a durable plate fixed in a prominent position on the equipment.

2. The Mine Manager shall ensure that appropriate systems are in place to reduce the parameters in condition (4) to suit local conditions in accordance with Clause 60 Transport Rules, Division 4 Underground Transport, Coal Mines (Underground) Regulation 1999.

3. Handbook MDG 39 as issued by the Department of Mineral Resources or any relevant Australian Standard should be considered in the development of the mine's standards of engineering practice for the maintenance of the brake system.

4. The operating parameters for idea conditions shall not exceed:

(a) Maximum gross vehicle mass	44,680	kg
(b) Tare mass	23,000	kg
(c) Maximum load	21,680	kg
(d) Maximum operating speed	10	km/h
(e) Maximum grade	25%	(1:4)

G. D. JERVIS,
Senior Inspector of Mechanical Engineering,
(under the delegated authority of the Chief Inspector of Coal Mines)

COAL MINES REGULATION ACT 1982

Approval No.: MDA EXP 043939.
File No.: 04/3939.
Date: 24 March 2005.

Notice of Type Approval (Explosives)

IT is hereby notified that the Approved System listed herein has been assessed for compliance with the Coal Mines Regulation Act and appropriate standards or requirements and is hereby APPROVED in accordance with the requirements of the COAL MINES REGULATION ACT 1982. This approval is issued pursuant to the provisions of Clause 70, Part 8 of Approval of Items of the Coal Mines (General) Regulation 1999.

This APPROVAL is issued to:	HILTI (AUST.) PTY LTD, ABN 44 007 602 100.
Address of Approval Holder:	23 Egerton Street, Silverwater NSW 2128.
Description of Item:	Type Approval for Hilti Powder Actuated Tool Charges with code numbers, 50352/4 (Yellow), 50353/2 (Red), 50354/0 (Black) for use in a Hilti Pty Ltd DX460 Low Velocity Powder-Actuated Fastening Tool System, Model No's. 367134 and 305174 as per the documents listed.
CMRA Approval Clause:	158 of the Coal Mines (Underground) Regulation 1999.
Specific Approval Category:	EXP (Explosives).

This Approval is issued subject to compliance with the requirements of the Occupational Health and Safety Act 2000.

The Authority issuing the Approval has, for the purposes of the Occupational Health and Safety Act, 2000, appended a list of conditions, (including drawings, documents, etc.) that are applicable to this approved system, as identified during test and/or assessment, to assist the Approval Holder and User to comply with the obligations of the Occupational Health and Safety Act, 2000. The onus is on the Supplier and/or User to ensure the Approved System, and any deviation from the list of conditions, in reference to that system is not inferior in any way to the item tested and/or assessed, this includes the supply, installation and continuing use of the Approved System.

The Approval Number shall appear in a conspicuous place and in a legible manner on each approved system, unless specifically excluded.

A copy of the Approval Documentation shall be supplied to each user of the Approved System and shall comprise the number of pages listed in the footer block together with supplementary documentation as listed in the Schedule and in respect to drawings, all drawings as listed in the schedule and those drawings specifically nominated for the purposes of repair and maintenance.

Any maintenance, repair or overhaul of approved systems shall be carried out in accordance with the requirements of the Coal Mines Regulations Act 1982.

R. W. REGAN,
Chief Inspector of Coal Mines

TYPE APPROVAL SCHEDULE

1.0 Detailed Description of Approved Item (s) and Variation (s):

Type Approval for Hilti Powder Actuated Tool Charges with code numbers, 50352/4 (Yellow), 50353/2 (Red), 50354/0 (Black) for use in a Hilti Pty Ltd DX460 Low Velocity Powder-Actuated Fastening Tool System, Model No's. 367134 and 305174 as per the documents listed.

1.1 Assessment Criteria

The explosive tool was tested assessed against the following procedure:

(a) The explosive tool was placed in a small flameproof test chamber which was filled with a mixture of 7.5% ethylene in air by volume and the tool was loaded with the relevant strip-mounted cartridges and two sizes of fasteners. Testing was performed at maximum and minimum power selections and using a short and long fastener and different target materials. The tool was tested with the extension trigger assembly fitted and some of the testing included the use of the magazine also.

2.0 Documents Submitted for Approval

2.1 Documents Submitted for Reference

These documents are listed for reference only and need not be supplied with each Diesel Engine System approval package.

Document No.	Issue	Date	Title
Report No. 25514	Original	4/8/2004	Explosion Protection Testing of Explosive Power Tool Model DX460 by Test Safe Australia
Report No. 25516	Original	4/8/2004	Explosion Protection Testing of Explosive Power Tool Model DX460 by Test Safe Australia

3.0 Conditions for Supply and Use

3.1 General Conditions

1. The user of the Approved System shall conduct a site specific Operational Risk Assessment and implement all barriers to risk identified in the Risk Assessment prior to the introduction of the system into a Coal Mine in New South Wales. This Operational Risk Assessment shall be reviewed when operating conditions vary and at periods not exceeding five (5) years.
2. The Chief Inspector of Coal Mines has the right to vary or revoke this approval at any time.

3. The manufacture is to certify in writing that the particular system supplied is in accordance with the requirements of this approval insofar as those matters assessed for the approval are concerned.

4. There shall be no variation in the materials, design or construction of the equipment associated with this approval without prior consent of the Chief Inspector. Unauthorised alteration or substitution of approved equipment shall render this approval void.

5. The Owner of this System shall ensure that adequate information is retained at the mine to enable the system to be operated, tested and maintained in the approved condition. This information shall also be made available wherever the system is overhauled or repaired.

6. This approval ceases to be valid if the system is not designed, modified, examined, tested, maintained, overhauled and repaired in accordance with the approval conditions, Occupational Health and Safety Act, 2000 Coal Mines Regulation Act, 1982 and Associated Regulations.

7. The Mine Managers Defect Management System required by Clause 42 Part 2 Division of the Coal Mines (General) Regulation 1999 should include providing details of any defects to the approval holder.

8. The Manager of the mine shall ensure the recommendations of the Approval Holder are complied with as far as they relate to the system, unless an appropriate documented risk assessment process is used to identify alternative means of providing at least equivalent levels of safety and these alternatives are implemented.

9. In accordance with the Occupational Health and Safety Act, 2000 it is a requirement that the Mine Management, Equipment Manufacturers, Equipment Owners, Hire / Lease Organisations, Approval Holders and the Designer of the equipment all take considerable responsibility for the safety related aspects of the system. Compliance with safety related recommendations of the Approval Holder should be viewed as an integral part of the responsibility of all concerned.

10. A safety audit of the Approved System shall be carried out at intervals not exceeding five (5) years. This safety audit shall be documented and shall include:
    (a) an assessment for compliance against these approval conditions, and
    (b) an assessment for compliance against the current community standards, applicable to the Approved System at the time of the audit, and implementation of interim control measures to reduce risk to an acceptable level, and
    (c) an assessment of the safety defects identified since the previous audit and a review of the improvements required to minimise these defects.

3.1 Specific Tool Conditions

1. Only Hilti Powder-Actuated tool charges with code numbers, 50352/4 (Yellow), 50353/2 (Red), 50354/0 (Black) shall be used. They shall only be used in a Hilti DX460 Powder-Actuated fastening tool, Model No's. 367134 and 305174.

2. The cartridges and fasteners shall be supplied by Hilti (Aust) Pty Ltd, and their recognised agents only.

3. The Hilti DX 460 Powered-Actuating fastening tool shall not be used unless a fastener is installed.

4. Nail fasteners shall be in the range of 19mm to 62mm long and otherwise identical to:
    (i) For 19mm single nails X-EDNI19P8 Code number 34537/1
    (ii) For 62mm single nails X-DNI62P8 Code number 34363/2
    (iii) For 19mm magazine nails EDNI19MX Code number 34542/1
    (iv) For 62mm magazine nails X-DNI62MX Code number 34386/3

5. Magazine nail fasteners shall only be used with a MX72 magazine for fasteners.

6. The design, construction and characteristics of the explosive charges and the fastening tool system shall be in accordance with:
    AS 1873.2, 'Power-actuated (PA) hand-held fastening tools, Part 2: Design and construction'
    AS 1873.3, 'Power-actuated (PA) hand-held fastening tools, Part 3: Charges'
    AS 1873.4, 'Power-actuated (PA) hand-held fastening tools, Part 4: Fasteners'

7. In addition to the requirements of AS 1873 the Type Approval No. MDA EXP 043939, the Suppliers name and model number shall be inscribed on a durable plate fixed in a prominent position on the explosive tool.

3.1 Specific Mine Site Conditions

1. The explosive tool shall be selected, operated and maintained in accordance with AS 1873.1 'Power-actuated (PA) hand-held fastening tools, Part 1: Selection, operation and maintenance'.

2. The mine manage shall prepare and implement an explosive tool safety management plan for the use of explosive tools prior to the explosive tool being used in the mine. The plan shall include requirements for:

(i) Assessment and control of the risks associated with the use of explosive tools in the mine in accordance with Chapter 2 of Occupational Health and Safety Regulation 2001.

(ii) The appointment in writing of competent people and assessment of their competencies for the use of explosive tools.

(iii) A work permit system for the transport, use and security of explosive tools in the mine.

(iv) Site inspections for the presence of a flammable gas and flammable materials within 20m before, during and after use.

(v) Prohibition of use of the explosive tool where the methane concentration is greater than 0.25%.

(vi) Notification to mining officials of explosive tool activity in the mine.

(vii) Recording of inspections, use of explosive tools and movement of explosive cartridges in and out of the mine.

(viii) Consultation with employees.

(ix) Emergency response.

R. W. REGAN,
Chief Inspector of Coal Mines

Roads and Traffic Authority

ROADS ACT 1993

Notice Under Clause 17 of the Road Transport (Mass, Loading and Access) Regulation 1996

DUBBO CITY COUNCIL, in pursuance of Division 2 of Part 3 of the Road Transport (Mass, Loading and Access) Regulation 1996, by this Notice, specify the roads and road related areas on or in which Road Trains may be used subject to any requirements or conditions set out in the Schedule.

MARK RILEY,
General Manager,
DubboCity Council
(by delegation from the Minister for Roads)

SCHEDULE

1. Citation

This Notice may be cited as the Dubbo City Council Road Train Notice No. 3/2005.

2. Commencement

This Notice takes effect on the date of Gazettal.

3. Effect

This Notice remains in force until 8 June 2010, unless it is amended or repealed earlier.

4. Application

4.1 This Notice applies to Road Trains which comply with Schedule 1 to the Road Transport (Mass, Loading and Access) Regulation 1996 and Schedule 4 to the Road Transport (Vehicle Registration) Regulation 1998.

5. Routes

Road Train routes within the Dubbo City Council.

Type	Road No.	Road Name	Starting point	Finishing point	Conditions
RT	000	Purvis Lane, Dubbo	Newell Highway	Yarrandale Road	

ROADS ACT 1993

Notice Under Clause 17 of the Road Transport (Mass, Loading and Access) Regulation 1996

BELLINGEN SHIRE COUNCIL, in pursuance of Division 2 of Part 3 of the Road Transport (Mass, Loading and Access) Regulation 1996, by this Notice, specify the routes and areas on or in which B-Doubles may be used subject to any requirements or conditions set out in the Schedule.

PETER DOYLE,
General Manager,
Bellingen Shire Council
(by delegation from the Minister for Roads)

SCHEDULE

1. Citation

This Notice may be cited as the Bellingen Shire Council B-Double Notice No. 2/2005.

2. Commencement

This notice takes effect from date of gazettal.

3. Effect

This notice remains in force until 31 December 2006, unless it is amended or repealed.

4. Application

This Notice applies to B-Doubles which comply with Schedule 1 to the Road Transport (Mass, Loading and Access) Regulation 1996 and Schedule 4 to the Road Transport (Vehicle Registration) Regulation 1998.

5. Routes

B-Double routes within the Bellingen Shire Council.

Type	Road No.	Road Name	Starting Point	Finishing Point	Conditions
25m	000	Gleniffer Road.	McMullens Road.	Coffs Harbour City Council boundary.	Operation during daylight hours only. Maximum speed of 40km/hr. Gazettal expires 31/12/2006.

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Kurri Kurri in the Cessnock City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

———————

SCHEDULE

ALL that piece or parcel of land situated in the Cessnock City Council area, Parish of Heddon and County of Northumberland, shown as Lot 41 Deposited Plan 1082569, being part of the land in Certificate of Title 1/850223, excluding from the acquisition of Lot 41 any existing easements.

The land is said to be in the possession of Hunter Water Corporation Limited.

(RTA Papers FPP 5M1543; RO 9/85.1112)

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Northmead in the Parramatta City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

———————

SCHEDULE

ALL that piece or parcel of land situated in the Parramatta City Council area, Parish of St John and County of Cumberland, shown as Lot 3 Deposited Plan 1081289, being part of the land in Certificate of Title 3/520812.

The land is said to be in the possession of Parramatta City Council.

(RTA Papers FPP 5M1640; RO 354.12223)

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Sydney in the Sydney City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

SCHEDULE

ALL those pieces or parcels of land situated in the Sydney City Council area, Parishes of St Lawrence and St James and County of Cumberland, shown as:

Lots 2 and 3 Deposited Plan 1082647, being parts of the land dedicated for Public Recreation notified in the Government Gazette of 3 May 1878 on page 1780 and said to be in the possession of the Crown and Sydney City Council as the corporation appointed to manage the affairs of Hyde Park (D.500450) Reserve Trust;

Lots 24 and 25 Deposited Plan 1082638, being parts of the land in Certificates of Title 3/873273 and 2/873273 respectively and said to be in the possession of the Crown and Sydney City Council as the corporation appointed to manage the affairs of Cook Park West Reserve Trust; and

Lot 26 Deposited Plan 1082638, being part of the land in Certificate of Title 7/873273 and said to be in the possession of the Crown and Sydney City Council as the corporation appointed to manage the affairs of Phillip Park East Reserve Trust.

(RTA Papers FPP 3M1372

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Katoomba in the Blue Mountains City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

SCHEDULE

ALL that piece or parcel of land situated in the Blue Mountains City Council area, Parish of Blackheath and County of Cook, shown as Lot 7 Deposited Plan 1066824, being part of land dedicated for Hospital (addition) by notification in Government Gazette No 75 of 17 April 1953 on page 1273.

The land is said to be in the possession of the Crown and Wentworth Area Health Service.

(RTA Papers FPP 4M4585; RO 5/44.12400)

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Kurri Kurri in the Cessnock City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

———————

SCHEDULE

ALL that piece or parcel of land situated in the Cessnock City Council area, Parish of Heddon and County of Northumberland, shown as Lot 36 Deposited Plan 1082569, being part of the land in Certificate of Title 1/773714, excluding from the acquisition of Lot 36 any existing easements.

The land is said to be in the possession of Minister for Education and Youth Affairs.

(RTA Papers FPP 5M1783; RO 9/85.138)

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Northmead in the Parramatta City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

———————

SCHEDULE

ALL that piece or parcel of Crown land situated in the Parramatta City Council area, Parish of St John and County of Cumberland, shown as Lot 4 Deposited Plan 1081289, being part of the land in Reserve No 51119 from Sale notified in Government Gazette No 206 of 17 November 1915 on page 6849, excluding from the compulsory acquisition of Lot 4 any existing easements.

(RTA Papers FPP 5M1699; RO 354.12216)

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Ardlethan in the Coolamon Shire Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

———————

SCHEDULE

ALL that piece or parcel of land situated in the Coolamon Shire Council area, Parish of Warri and County of Bourke, shown as Lot 3 Deposited Plan 1067401, being part of the land in Certificate of Title 195/750867.

The land is said to be in the possession of the Crown and John Edward Wood (perpetual lessee).

(RTA Papers FPP 4M3527; RO 17/96.176)

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Hinchinbrook in the Liverpool City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the Schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

———————

SCHEDULE

ALL that piece or parcel of land situated in the Liverpool City Council area, Parish of St Luke and County of Cumberland, shown as Lot 4 Deposited Plan 1076401, being part of the land in Reserve No 73163 for Public Recreation notified in Government Gazette No 75 of 6 May 1949 on page 1334.

The land is said to be in the possession of the Crown and Hoxton Park Reserve (R73163) Reserve Trust (trustee).

(RTA Papers FPP 5M126; RO 259.12460)

ROADS ACT 1993

LAND ACQUISITION (JUST TERMS COMPENSATION) ACT 1991

Notice of Compulsory Acquisition of Land at Prestons in the Liverpool City Council area

THE Roads and Traffic Authority of New South Wales by its delegate declares, with the approval of Her Excellency the Governor, that the land described in the schedule below is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for the purposes of the Roads Act 1993.

T D Craig
Manager, Compulsory Acquisition & Road Dedication
Roads and Traffic Authority of New South Wales

SCHEDULE

ALL that piece or parcel of land situated in the Liverpool City Council area, Parish of Minto, County of Cumberland, shown as Lot 12 Deposited Plan 1071175, being part of the land in Certificate of Title 7/225521, excluding from the compulsory acquisition of Lot 12 any existing easements.

The land said to be in the possession of Carmela Corigliano (registered proprietor) and National Australia Bank Limited (mortgagee).

(RTA Papers: FPP 5M217; RO 259.12428)

Other Notices

ANTI-DISCRIMINATION ACT 1977

Exemption Order

UNDER the provisions of section 126 of the Anti-Discrimination Act 1977 and on the recommendation of the Anti-Discrimination Board, an exemption is given from the provisions of sections 49ZYB(1)(a) and (b), 49ZYH and 51 of the Anti-Discrimination Act 1977, to SageCo Pty Ltd to do the following:

- advertise positions for persons over 40 years of age;
- enable SageCo Pty Ltd, and employers and principals using its services, to recruit people over 40 years of age through its "SageConnect" initiative; and
- enable SageCo Pty Ltd to screen registrations for "SageCommunity" on the basis of age and limit eligibility for its programs to people over 40 years of age.

This exemption will remain in force for a period of five years from the date given.

Dated this 31st day of May 2005.

BOB DEBUS, M.P.,
Attorney General

APPRENTICESHIP AND TRAINEESHIP ACT 2001

Notice of Making a Vocational Training Order

NOTICE is given that the Commissioner for Vocational Training, in pursuance of section 6 of the Apprenticeship and Traineeship Act 2001, has made the following Vocational Training Order in relation to the recognised traineeship vocation of Public Services.

Citation

The Order is cited as the Public Services Order.

Order

A summary of the Order is given below.

(a) Term of Training

(i) Full-time

Training shall be given, via direct entry, for a nominal term of:

Qualification	Nominal Term
Certificate II	12 months
Certificate III	24 months
Certificate IV	24 months

or until achievement of the relevant competencies to this Vocational Training Order is demonstrated.

(ii) Part-time

The nominal term for a part time traineeship is determined by the average weekly hours worked in the traineeship (including structured training) and the nominal full-time term for that traineeship.

The table below identifies the allowable hours which may be undertaken and the nominal terms for part-time traineeships.

Full-time Traineeship Term	6 mths	12 mths	18 mths	24 mths	30 mths	36 mths	48 mths
Weekly Hours	Nominal Term Required (Months)						
15	15	30	45	Not Allowable			
16	15	29	44				
17	14	28	42				
18	14	27	41				
19	13	26	39				
20	13	25	38				
21	12	24	36	48			
22	12	23	35	46			
23	11	22	33	44	55		
24	11	21	32	42	53		
25	10	20	30	40	50	60	
26	10	19	29	38	48	57	
27	9	18	27	36	45	54	72
28	9	17	26	34	43	51	68
29	8	16	24	32	40	48	64
30	8	15	23	30	38	45	60
31	Not Allowable		22	28	35	42	56
32			20	26	33	39	52

(b) Competency Outcomes

Trainees will be trained in and achieve competence in the units of competence specified in the Public Sector Training Package.

(c) Courses of Study to be undertaken

Trainees will undertake the following courses of study:

PSP20104 – Certificate II in Government

PSP30104 – Certificate III in Government

PSP40104 – Certificate IV in Government

PSP30304 – Certificate III in Government (Court Compliance)

PSP30404 – Certificate III in Government (Land Administration)

PSP40304 – Certificate IV in Government (Court Compliance)

PSP40404 – Certificate IV in Government (Court Services)

PSP40504 – Certificate IV in Government (Financial Services)

PSP40804 – Certificate IV in Government (Injury Claims Administration)

PSP40904 – Certificate IV in Government (Injury Rehabilitation Management)

PSP41004 – Certificate IV in Government (Land Administration)

PSP41104 – Certificate IV in Government (Occupational Health and Safety)

PSP41204 – Certificate IV in Government (Project Management)

PSP41304 – Certificate IV in Government (Procurement)

PSP41804 – Certificate IV in Government (Road Transport Compliance).

Availability for Inspection

A copy of the Vocational Training Order may be inspected at any State Training Centre of the Department of Education and Training or on the Internet at http://apprenticeship.det.nsw.edu.au.

CATCHMENT MANAGEMENT AUTHORITIES ACT 2003

Hunter-Central Rivers Catchment Management Authority

Determination Concerning Catchment Contributions
1 July 2005 to 30 June 2006
(Schedule 4 of the Catchment Management Authorities Act 2003)

THE Hunter-Central Rivers Catchment Management Authority in pursuance of Schedule 4 of the Catchment Management Authorities Act (2003) and in accordance with the Hunter-Central Rivers Catchment Management Authority Regulation 2005, does hereby make the following determination in respect of the year commencing 1 July 2005:

a. It proposes to raise $2,935,000 by way of catchment contribution.

b. The catchment contribution is to be levied on all rateable land within the Hunter catchment contribution area as delineated by maps held at the authority's offices.

c. The basis of the catchment contribution is a rate based on land values provided by the appropriate local government councils.

d. The catchment contribution rate for the year commencing 1 July 2005 will be 0.0147 of a cent in the dollar (land value).

Dated at Paterson this 26th day of May 2005.

L.S.

THE COMMON SEAL OF THE HUNTER-CENTRAL RIVERS CATCHMENT MANAGEMENT AUTHORITY was affixed hereto this 26th day of May 2005 pursuant to a resolution of the Authority in the presence of two board members whose signatures appear opposite hereto.

(Sgd)
W.E.J. Paradice
.....
Chairman

(Sgd)
Arthur Burns
.....
Board Member

CHILDREN (DETENTION CENTRES) ACT 1987

CHILDREN (DETENTION CENTRES) REGULATION 2000

Clause 3(3): Declaration of articles, or classes of articles, to be Instruments of Restraint.

I, DAVID SHERLOCK, declare the following articles, or classes of article, to be Instruments of Restraint for the purposes of the Children (Detention Centres) Regulation 2000:

handcuffs
disposable flexi-cuffs
restraint belts
ankle cuffs
protective shields
protective helmets

DAVID SHERLOCK,
Director General
NSW Department of Juvenile Justice

CHILDREN (PROTECTION AND PARENTAL RESPONSIBILITY) ACT 1997

Safer Community Compact – Order

I, the Honourable BOB DEBUS, M.P., Attorney General of the State of New South Wales, in pursuance of section 39(1) of the Children (Protection and Parental Responsibility) Act 1997, do, by this my Order, approve the Leichhardt Crime Prevention Plan as a Safer Community Compact for the purposes of Division 3 of Part 4 of that Act.

This Order takes effect on 23rd May 2005 and remains in force until 22nd May 2008.

Signed at Sydney, this 27th day of May 2005.

BOB DEBUS, M.P.,
Attorney General

DISTRICT COURT OF NEW SOUTH WALES

Direction

PURSUANT to section 173 of the District Court Act 1973, I direct that the District Court shall sit in its criminal jurisdiction at the place and time shown as follows:

Orange, 10:00 a.m., 14 June 2005 (2 weeks), in lieu of Bathurst 14 June 2005 (2 weeks), sittings moved from Bathurst to Orange.

Dated this 31st day of May 2005.

R. O. BLANCH,
Chief Judge

GEOGRAPHICAL NAMES ACT 1966

Notice of Discontcontinuance of Geographical Names

PURSUANT to the provisions of section 14 of the Geographical Names Act 1966, the Geographical Names Board hereby notifies that it has this day discontinued the name Mount Wollumbin which had been assigned to a hill

situated about 3km NNE of Mount Uki and about 5km NW by N of Uki and shown on the Burringbah 1:25,000 Topographic Map.

WARWICK WATKINS,
Chairperson.

Geographical Names Board,
PO Box 143, Bathurst NSW 2795.

GEOGRAPHICAL NAMES ACT 1966

Assignment of Address Locality Name Boundaries
in the Bega Valley Local Government Area

PURSUANT to the provisions of section 10 of the Geographical Names Act 1966, the Geographical Names Board hereby notifies that it has this day assigned the name Nungatta South as an address locality in the Bega Valley Local Government Area as shown on map GNB3735.

The position and extent of these features is recorded and shown within the Geographical Names Register of New South Wales. This information can be accessed through the Board's web site at www.gnb.nsw.gov.au.

WARWICK WATKINS,
Chairperson

Geographical Names Board,
PO Box 143
BATHURST NSW 2795

GEOGRAPHICAL NAMES ACT 1966

PURSUANT to the provisions of section 10 of the Geographical Names Act 1966, the Geographical Names Board has this day assigned the geographical names listed hereunder.

Assigned Name:	Burrill Lake Lions Park.
Designation:	Reserve.
L.G.A.:	Shoalhaven City Council.
Parish:	Woodburn.
County:	St Vincent.
L.P.I. Map:	Tabourie.
1:100,000 Map:	Ulladulla 8927.
Reference:	GNB 5046.

Assigned Name:	Smithys Point.
Designation:	Point.
L.G.A.:	Shoalhaven City Council.
Parish:	Woodburn.
County:	St Vincent.
L.P.I. Map:	Tabourie.
1:100,000 Map:	Ulladulla 8927.
Reference:	GNB 5046.

The position and the extent for these features are recorded and shown within the Geographical Names Register of New South Wales. This information can be accessed through the Board's Web Site at www.gnb.nsw.gov.au.

WARWICK WATKINS,
Chairperson

Geographical Names Board,
PO Box 143, Bathurst NSW 2795.

ERRATUM

IN the notice referring to the amendment of locality boundaries in the Boorowa Local Government Area between the localities of Boorowa and Godfreys Creek, Folio 9826, 24 December 2004. The notice should also have stated that the localities of Goba Creek and Kenyu have been discontinued and absorbed into the locality of Boorowa, this notice corrects that error.

W. WATKINS,
Chairman

Geographical Names Board,
PO Box 143 Bathurst 2795

HERITAGE ACT 1977

Direction Pursuant to Section 34(1)(a)
to List an Item on the State Heritage Register

The Chalet
SHR No. 1727

IN pursuance of section 34(1)(a) of the Heritage Act 1977, I, the Minister Assisting the Minister for Infrastructure and Planning (Planning Administration), having considered a recommendation of the Heritage Council of New South Wales, direct the Council to list the item of environmental heritage specified in Schedule "A" on the State Heritage Register. This listing shall apply to the curtilage or site of the item, being the land described in Schedule "B".

Dated: Sydney, 15th day of May 2005.

DIANE BEAMER, M.P.,
Minister Assisting the Minister for Infrastructure
and Planning (Planning Administration)

SCHEDULE "A"

The item known as The Chalet, situated at 2 Yerton Avenue, Hunters Hill, on the land described in Schedule "B".

SCHEDULE "B"

All those pieces or parcels of land known as Lot 1, DP 13564 in Parish of Hunters Hill, County of Cumberland, shown on the plan catalogued HC 1986 in the office of the Heritage Council of New South Wales.

LOCAL GOVERNMENT ACT 1993

MARIE BASHIR, Governor.

I, Professor Marie Bashir A C, Governor of the State of New South Wales, with the advice of the Executive Council, and in pursuance of section 218B of the Local Government Act 1993, hereby alter the boundaries of the Area of Gwydir Shire as described by Proclamation in Government Gazette No. 57 of 17 March 2004 and the Area of Tamworth Regional as described by Proclamation in Government Gazette No. 138 of 17 August 2004, by taking part of the Area of Gwydir Shire described in Schedule A hereto and adding it to the Area of Tamworth Regional so that the boundary of the Area of Gwydir Shire and the boundary of the Area of Tamworth Regional shall be described in Schedules B and C hereto. I hereby also make the provisions in Schedule D for the apportionment of rates between the two affected Councils.

Signed and sealed at Sydney, this 25th day of May 2005.

By Her Excellency's Command,

Hon TONY KELLY, M.L.C.,
Minister for Local Government

GOD SAVE THE QUEEN!

Schedule A

Area Proposed To Be Transferred

Area about 173.77 square kilometres. Commencing at the intersection of the Nandewar Range and the generally southern boundary of Lot 5, DP 754846: and bounded thence by that boundary and its prolongation, generally westerly to the Horton River; by that river, downwards and Second Water Creek, upwards to the eastern prolongation of the generally north-eastern boundary of Lot 53, DP 754846; by that prolongation, boundary and its prolongation, generally north-westerly, part of the eastern and part of the generally northern boundaries of Lot 55, DP 754846, northerly and generally westerly, part of the generally south-western boundary of the Parish of Boomi, County of Murchison, generally north-westerly, the south-eastern boundary of Lot 7, DP 754860, south-westerly, the generally south-eastern and generally south-western boundaries of Lot 5, DP 754860, generally south-westerly and generally north-westerly, the south-western boundaries of Lots 18 and 26, DP 754860, north-westerly, part of the south-western boundary of Lot 2, DP 754860, north-westerly, the generally south-western and the generally north-western boundaries of Lot 29, DP 754860, generally north-westerly and generally north-easterly, again, part of the south-western boundary of Lot 2, DP 754860, north-westerly, the generally south-western boundary of Lot 30, DP 754860, generally north-westerly and part of the generally south-eastern boundary of the Parish of Paleroo, generally south-westerly to the Nandewar Range, aforesaid and by that range, generally south-easterly and generally north-easterly to the point of commencement.

Schedule B:

Area of Gwydir Shire (as altered)

Area about 8947.93 square kilometres. Commencing at the intersection at the southern prolongation of the western boundary of Portion 58, Parish of Yagobe, County of Burnett and Gwydir River: and bounded thence by that prolongation, boundary and its prolongation northerly to a point 1,750 metres north of the northwestern corner of the lastmentioned portion; by a line easterly to the southern prolongation of the western boundary of Portion 13, Parish of Bogamildi; by that prolongation northerly to the generally western boundary of Lot 2, DP 787422; by that boundary generally northerly to the generally western boundary of the County of Burnett; by part of that boundary generally northerly to the southeastern prolongation of the road forming the southwestern boundaries of Portions 7, Parish of Holmes, County of Stapleton, 41, Parish of Toongcooma, 31, 28, 29, 19, Parish of Currumbah, 23, 10 and 9; by that prolongation and road northwesterly and Newell Highway northeasterly to the southwestern boundary of Portion 31, Parish of Coolanga; by part of that boundary southeasterly, part of the northwestern boundary of Portion 24, parish of Currumbah and the northwestern boundaries of Portions 18 and 32, a line, and the northwesternmost northwestern boundary of Lot 1, D.P. 596588 and its prolongation northeasterly to the generally northwestern boundary of the Parish of Mungle; by part of that boundary generally northeasterly to the northwestern boundary of Portion 8, Parish of Mobbindry; by that boundary, a line, the generally northwestern boundary of Portion 28, Parish of Whalan, a line, the northwestern boundary of Portion 88, a line, and the southeastern boundary of Portion 9, Parish of Merriwa and its prolongation generally northeasterly and part of the southeastern boundary of Portion 25 and its prolongation northeasterly to Macintyre River; by that river upwards to the northern prolongation of the western boundary of Portion 33, Parish of Tucka Tucka; by that prolongation, boundary, a line and the western boundary of Portion 17 southerly to Ottleys Creek; by that creek upwards to the north-western prolongation of the north-eastern boundary of Portion 50, Parish of Ottley, County of Burnett; by that prolongation, boundary, the north-eastern boundary of Portion 49 south-easterly, the western and generally southern boundaries of Portion 40 southerly and generally easterly, the southern boundaries of Portions 43 and 42, Parish of Russell, County of Arrawatha easterly, the western and southern boundaries of Portion 108 southerly and easterly and the southern boundary of Portion 107 and its prolongation easterly to the eastern boundary of Portion 106; by part of that boundary and part of the southern boundary of that portion southerly and easterly, the western boundary of Portion 58, Parish of Redbank, a line, and the eastern boundary of Portion 50, Parish of Gullungutta, County Burnett southerly, the southernmost northern boundary of Portion 10 and the northern and western (and its prolongation) boundaries of Portion 9 westerly and southerly to a point 575 metres south of the northernmost northern boundary of Portion 90; by a line easterly 625 metres and a line southerly to the northern boundary of Portion 108; by part of that boundary westerly to a point north of the southwestern corner of that portion; by a line south to that corner and its continuation southerly for a distance of 180 metres; by a line easterly 320 metres and a line southerly to Boundary Road; by that road generally southwesterly to the eastern boundary of Portion 124, Parish of Gragin; by the former original position of the last mentioned road generally southwesterly to Black Creek; by that creek and Warialds Creek downwards to the western boundary of the Parish of Gunnee; by that boundary and its prolongation southerly to the Moree-Inverell Railway; by that railway generally easterly to the northern prolongation of the eastern boundary of Portion 22, Parish of Balfour, County of Murchison; by that prolongation, boundary and its prolongation southerly to Reserve Creek; by that creek and Sheep Station Creek downwards and by Myall Creek and Sandy Creek upwards to the northern boundary of Portion 2, Parish of Dingo; by part of the generally north eastern boundary of that parish generally south easterly to the northernmost corner of Lot 5, DP 249163; by the western boundary of that lot and the western and southwestern boundaries of Lot 6, southerly and southeasterly to the southernmost corner of the said Lot 6; again, by that generally northeastern boundary of that parish generally southeasterly to the westernmost corner of Lot 1, Plan catalogued Ms 3059 Ae R; by the generally southwestern boundary of that lot, generally southeasterly to the southernmost corner of that lot; again, by the generally northeastern boundary of that parish, generally southeasterly to the westernmost corner of Lot 3; by the southwestern boundaries of that lot southeasterly to the southernmost corner of that lot; again, by that generally northeastern boundary of that parish, generally southeasterly to the westernmost corner of Lot 5; by the southwestern and southeastern

boundaries of that lot southeasterly and northeasterly to the easternmost corner of that lot; again, by the generally northeastern boundary of that parish generally southeasterly to the said Gwydir River: thence by that river upwards to its intersection with a line along the southern boundary of portion 58, Parish of Cooper, County of Hardinge; by that line westerly to the generally western boundary of the said Parish of Cooper; by part of that boundary generally southeasterly to the northwestern corner of portion 134; by the generally northern and the generally eastern boundaries of that portion, the generally eastern boundaries of portions 125 and 126 and part of the said generally western boundary of the parish generally easterly and generally southerly to the Nandewar Range; by that range generally south-westerly to the generally southern boundary of Lot 5, DP 754846; by that boundary and its prolongation, generally westerly to the Horton River; by that river, downwards and Second Water Creek, upwards to the eastern prolongation of the generally north-eastern boundary of Lot 53, DP 754846; by that prolongation, boundary and its prolongation, generally north-westerly, part of the eastern and part of the generally northern boundaries of Lot 55, DP 754846, northerly and generally westerly, part of the generally south-western boundary of the Parish of Boomi, County of Murchison, generally north-westerly, the south-eastern boundary of Lot 7, DP 754860, south-westerly, the generally south-eastern and generally south-western boundaries of Lot 5, DP 754860, generally south-westerly and generally north-westerly, the south-western boundaries of Lots 18 and 26, DP 754860, north-westerly, part of the south-western boundary of Lot 2, DP 754860, north-westerly, the generally south-western and the generally north-western boundaries of Lot 29, DP 754860, generally north-westerly and generally north-easterly, again, part of the south-western boundary of Lot 2, DP 754860, north-westerly, the generally south-western boundary of Lot 30, DP 754860, generally north-westerly and part of the generally south-eastern boundary of the Parish of Paleroo, generally south-westerly to the Nandewar Range, aforesaid, by that range generally north-westerly and the range forming the generally southwestern and western watersheds of Rocky Creek and the western watershed of Horton River generally northwesterly and northerly to the Slaughterhouse Pinnacle; part of the generally western boundaries of the County of Burnett generally northwesterly and generally northerly to Gwydir River, aforesaid and by that river downwards to the point of commencement.

Schedule C

Area of Tamworth Regional (as altered)

Area about 9653.25 square kilometres. Commencing at the intersection of the generally northern boundary of the County of Brisbane and the Great Dividing Range: and bounded thence by that boundary, generally easterly to the north-western corner of Portion 113, Parish of Ellerston, County of Brisbane; by part of the generally south-western boundary of the Parish of Yeerawun, County of Hawes generally south-easterly to the southernmost corner of Portion 34; by part of the generally western boundary of the Parish of Barry generally northerly to the north-western corner of Portion 13; by the northern boundary of that portion easterly to Ben Halls Creek; by that creek downwards to the western boundary of Portion 10; by a line along that boundary northerly to Barnard River; by that river downwards to the south-western corner of Portion 7, Parish of Hall; by the southernmost western, the northern and the northernmost western boundaries of that portion, northerly, easterly and again northerly to Tuggolo Creek; by that creek upwards to the eastern prolongation of the northern boundary of Portion 4, Parish of Parkes; by that prolongation and boundary westerly to the range dividing the waters of Tuggolo Creek from those of Barnard River; by that range generally north-westerly to the generally southern boundary of Portion 8, Parish of Coolcumber; by part of that boundary and part of the generally western boundary of that portion westerly and generally northerly, the southern and part of the generally western boundaries of Portion 48 westerly and generally northerly to the range dividing the waters of Tuggolo Creek from those of Barnard River, aforesaid; by that range generally westerly and Great Dividing Range generally north-easterly to the northern boundary of Lot 8, D.P. 846906; by that boundary westerly to again the Great Dividing Range; by that range generally north-easterly and Moonbi Range generally north-westerly to the south-western boundary of Portion 11, Parish of Walcha, County of Parry; by part of that boundary and its prolongation north-westerly, part of the generally eastern, the northern and the western boundaries of Portion 44 and the western boundaries of Portions 49, 50, 51, 52 and 53 northerly, generally westerly and southerly, and the southern boundaries of Portions 4 and 46 (and its prolongation) westerly to Mulla Mulla Creek; by that creek downwards to the southern prolongation of the eastern boundary of Portion 1; by that prolongation and boundary and the eastern boundary of Portion 2, a line, and part of the eastern boundary of Portion 43 northerly, the southern and easternmost eastern boundaries of Portion 102, Parish of Ainsley and the eastern and generally northern boundaries of Portion 122 easterly, northerly and generally westerly, the north-eastern, generally south-eastern, generally southern and western (and its prolongation) boundaries of Portion 72 south-easterly, generally south-westerly, generally westerly and northerly, part of the generally southern boundary of Portion 145 and the generally southern boundary of Portion 2 generally westerly to Larrys Range; by that range generally north-westerly to the westernmost boundary of Portion 36; by that boundary and the western boundaries of Portion 34 and 10 (and its prolongation) northerly to Shearins Creek; by that creek upwards to the southern prolongation of the eastern boundary of Portion 34, Parish of Vernon; by that prolongation, boundary and its prolongation, boundary and its prolongation northerly to Fairy Ground Creek; by that creek downwards to the southern prolongation of the western boundary of Portion 27; by that prolongation and boundary northerly, part of the southern boundary of Portion 29, the southern and generally western boundaries of Portion 40 and the western boundaries of Portions 28 and 26 (and its prolongation) westerly and generally northerly to Cauborn Creek; by that creek upwards to the western prolongation of the northern boundary of Portion 23; by that prolongation and part of that boundary easterly and the western boundary of Portion 76 northerly to the generally southern boundary of the Parish of Scott, County if Inglis; by part of that boundary westerly and the generally south-western boundary of that parish generally north-westerly to the Main Northern railway; by that railway generally north-easterly to MacDonald River; by that river downwards and Congi Creek upwards to the generally eastern boundary of the Parish of Tara; by that boundary and the generally eastern boundary of the Parish of Looanga, generally northerly to the northmost corner of Portion 92; by the Nandewar Range, generally westerly to the eastern boundary of Portion 18, Parish of Roumalla, County of Hardinge; by part of that boundary, the southern and the western boundaries of that portion, southerly,

westerly and northerly, the southern, the north-eastern and the northern boundaries of Portion 40, Parish of Winton, County of Inglis, easterly, north-westerly and westerly to the Nandewar Range, aforesaid; by that range, generally north-westerly to the south-western corner of Portion 67, Parish of Roumalla, County of Hardinge; by the road from Bundarra to Bendemeer, north-westerly to the northern boundary of Portion 14, Parish of Retreat; by that boundary, westerly, the generally north-eastern boundary of Portion 20, generally north-westerly, the eastern boundaries of Portions 2 and 19, northerly and part of the northern boundary of Portion 19, westerly to the Nandewar Range, aforesaid; by that range generally north-westerly to the eastmost corner of Portion 42; by part of the generally north-eastern boundary of the Parish of Retreat, generally north-westerly to again, the Nandewar Range at the northmost corner of Portion 12; by that range generally northerly and generally south-westerly to the generally southern boundary of Lot 5, DP 754846; by that boundary and its prolongation, generally westerly to the Horton River; by that river, downwards and Second Water Creek, upwards to the eastern prolongation of the generally north-eastern boundary of Lot 53, DP 754846; by that prolongation, boundary and its prolongation, generally north-westerly, part of the eastern and part of the generally northern boundaries of Lot 55, DP 754846, northerly and generally westerly, part of the generally south-western boundary of the Parish of Boomi, County of Murchison, generally north-westerly, the south-eastern boundary of Lot 7, DP 754860, south-westerly, the generally south-eastern and generally south-western boundaries of Lot 5, DP 754860, generally south-westerly and generally north-westerly, the south-western boundaries of Lots 18 and 26, DP 754860, north-westerly, part of the south-western boundary of Lot 2, DP 754860, north-westerly, the generally south-western and the generally north-western boundaries of Lot 29, DP 754860, generally north-westerly and generally north-easterly, again, part of the south-western boundary of Lot 2, DP 754860, north-westerly, the generally south-western boundary of Lot 30, DP 754860, generally north-westerly and part of the generally south-eastern boundary of the Parish of Paleroo, generally south-westerly to the Nandewar Range, aforesaid; by that range generally south-easterly to the generally north-western boundary of Portion 20, Parish of Rusden, County of Nandewar; by that boundary, generally south-westerly, the generally western boundaries of that portion and Portion 21, generally southerly, the generally south-western and generally south-eastern boundaries of Lot 1, DP 592877, generally south-easterly and generally north-easterly, the generally southern boundary of Lot 2, DP 592877, generally easterly, part of the generally south-western boundary of the Parish of Lindesay, generally south-easterly, the generally southern boundary of Lot 52, DP 704695, generally easterly, the generally eastern boundary of Portion 42, generally northerly, part of the generally north-eastern boundary of the Parish of Lindesay, generally south-easterly, the generally western boundary of Portion 43, generally southerly, the generally western and generally southern boundaries of Portion 45, generally southerly and generally easterly and part of the generally south-eastern boundary of Portion 19, generally south-westerly to Coxs Creek; by that creek , Gap Creek and Maules Creek, downwards to the northern prolongation of the western boundary of Portion 21, parish of Connor; by that prolongation, boundary and part of the southern boundary of the portion, southerly and easterly, the eastern and the southmost southern boundaries of Portion 27, southerly and westerly, part of the eastern boundary of Portion 23, southerly, the southern boundary of Portion 39, easterly, part of the western and the southern boundaries of Portion 9, southerly and easterly, the southern boundary of Portion 7, easterly, part of the generally eastern and part of the generally southern boundaries of the Parish of Connor, generally southerly and generally westerly, the generally south-western boundaries of Portions 35 and 36, Parish of Mihi, generally south-easterly, the generally south-western and the generally south-eastern boundaries of Portion 33, generally south-easterly and generally north-easterly, a line, part of the western and the generally southern boundaries of Portion 20, southerly and generally easterly, part of the generally north-western, the generally north-eastern and the generally south-eastern boundaries of the Parish of Rangira, generally north-easterly, generally south-easterly and generally south-westerly, the generally eastern boundary of the Parish of Willuri and part of the generally eastern boundary of the Parish of Tulcumba, generally south-easterly, south-westerly and southerly to the north-western corner of Portion 74, Parish of Namoi, County of Darling; by the northern and eastern boundaries of that portion and part of the eastern boundary of Portion 56, easterly and southerly to a point west of the south-western corner of Portion 82, Parish of Dowe; by a line east to a point south of the southmost south-eastern corner of Portion 68; by a line north to that corner; by a line east to the Namoi River; by that river upwards to the western prolongation of the northern boundary of Portion 246, Parish of Keepit; by that prolongation, boundary and part of the eastern boundary of that portion, easterly and southerly to the intersection of the latter boundary with the western prolongation of the northern boundary of Portion 119; by that prolongation, boundary and part of the eastern boundary of that portion and the northern, eastern and a line along the southern boundary of Portion 118, generally easterly, southerly and westerly to the eastern boundary of Portion 58; by part of that boundary and a line along the southern boundary of that portion and Portions 59 and 60, southerly and westerly to the eastern boundary of Portion 22; by a line along that boundary and the eastern boundary of Portions 63 and 69, southerly to the south-eastern corner of the said Portion 69; by the southern boundary of that portion, the southern boundary and a line along the south-western boundary of Portion 64, westerly and north-westerly to the north-eastern corner of Portion 250; by the north-eastern and south-eastern boundaries of that portion, south-easterly and south-westerly, part of the north-eastern boundary of Portion 41 and the north-eastern boundaries of Portions 185, 186, 187, 224, 188, 161 and 227, south-easterly, by a southern, an eastern, again a southern, a western, again a southern and an eastern boundary of the said Portion 227, westerly, southerly, again westerly, northerly, again westerly and southerly to the eastmost north-eastern corner of Portion 226; by an eastern, a southern, again an eastern, again a southern and again an eastern boundary of that portion, southerly, westerly, again southerly, again westerly and again southerly to the Namoi River, aforesaid; by that river downwards and the Peel River upwards to the northern prolongation of the eastern boundary of portion 44, Parish of Moorowara, County of Parry; by that prolongation, boundary and part of the southern boundary of that portion, southerly and westerly, the westmost western boundary of Portion 97 and it's prolongation, southerly to the generally south-western boundary of the County of Parry; by part of that boundary, generally south-easterly, the generally western boundary of Lot 54, DP 751025, generally southerly, the western and southern boundaries of Lot 55, DP 751025, southerly and westerly, again the generally south-western boundary of the County of Parry, generally south-easterly,

the western boundary of Lot 266, DP 751011, southerly, the western and generally southern boundaries of Lot 197, DP 751011, southerly and generally easterly, the southern and part of the south-eastern boundaries of Lot 267, DP 751011, easterly and north-easterly, a line westerly to the south-western corner of Lot 30, DP 755344, part of the generally south-western boundary of the County of Parry, aforesaid, generally southerly, the northern, the western and part of the southern boundaries of Lot 109, DP 751011, easterly, southerly and westerly, a line and the eastern boundary of Lot 1, DP 728396, southerly, the generally north-eastern boundary of Lot 1, DP 748602, generally south-easterly, the northern prolongation of the eastern boundary of Lot 84, DP 751011, that boundary and it's southern prolongation, southerly to Currabubula Creek; by that creek, upwards to the northern prolongation of the western boundary of Lot 2, DP 880436; by that prolongation, boundary and part of the southern boundary of that lot, southerly and easterly, the western and part of the southern boundaries of Lot 93, DP 751011, southerly and easterly, the northern prolongation of the eastern boundary of Lot 92, DP 751011 and that boundary, southerly, a line, south-easterly, the western boundary of Lot 257, DP 751011, southerly, the generally north-western and the southern boundaries of Lot 1, DP 780038, and its prolongation, generally south-westerly and easterly to, again Currabubulla Creek; by that creek, upwards to the eastern prolongation of the northern boundary of Lot 28, DP 751011; by that prolongation, boundary and the western boundary of that lot, westerly and southerly, the western boundary of Lot 29, DP 751011, southerly, the western and part of the southern boundaries of Lot 163, DP 751011, southerly and easterly, the generally northern and generally north-eastern boundaries of Lot 247, DP 751011, generally easterly and generally south-easterly, the generally eastern boundary of Lot 273, DP 751034, generally southerly, the western prolongation of the northern boundaries of Lots 139 and 138, DP 751014 and their boundaries, easterly, part of the generally south-western boundary of the County of Parry, generally south-easterly to range forming the watershed dividing Spring and Sugarloaf Creeks; by that range south-easterly to the northernmost north-western corner of Portion 193, Parish of Evan, County of Buckland; by part of the generally northern boundary of that portion and the generally north-eastern boundary of Portion 181, generally easterly and generally south-easterly to the range forming the north-western watershed of Wiles Gully, by that range generally south-easterly to the eastern boundary of Portion 112, Parish of Parnell, by part of that boundary southerly to the north-western corner of Portion 146; by the northern boundary of that portion westerly to the said range forming the north-western watershed of Wiles Gully; by that range generally south-easterly to the north-western corner of Portion 172; by part of the generally north-eastern boundary of the said Parish of Parnell generally south-easterly to the generally northern boundary of the County Of Brisbane, aforesaid and by part of that boundary generally easterly to the point of commencement.

Schedule D

Rates

1. All rates and charges levied over the parcels of land affected by this Proclamation shall, on and from 1 September 2004 continue to be collected by Gwydir Shire Council in accordance with the rates notices already duly issued by that Council.
2. Gwydir Shire Council will pay to Tamworth Regional Council:
   (a) any rates and charges it has collected over the parcels of land affected by this Proclamation on and from 1 September 2004; and
   (b) an amount equivalent to the rates and charges due and payable to Gwydir Shire Council from 1 September 2004 to 30 June 2005 where any rates and charges levied by Gwydir Shire Council for the year 2004/2005 have been paid in full for the parcels of land affected by this Proclamation.
3. Tamworth Regional Council and Gwydir Shire Council will negotiate the frequency and method of the payment of rates and charges collected by Gwydir Shire Council in accordance with subclause 1, 2 (a) and (b)."

LOCAL GOVERNMENT ACT 1993

Land Acquisition (Just Terms Compensation) Act 1991

Notice of Rescission of Compulosry Acquisition of Land

IN pursuance of section 31 of the Land Acquisition (Just Terms Compensation) Act 1991, Her Excellency the Governor with the advice of the Executive Council does by this notice rescind the Notice of Compulsory Acquisition of Land under the Local Government Act 1993, dated 4 April 2003 and published by the Lachlan Shire Council in Government Gazette No 74 of 17 April 2003, in respect of the land described in the schedule below.

Dated this 2nd Day of June 2005.

R. W. BAILEY,
General Manager

SCHEDULE

Lot 173 DP 752329.

NATIONAL PARKS AND WILDLIFE ACT 1974

Burnt School and Strike-a-Light Nature Reserves
Mount Dowling Nature Reserve
Hattons Corner Nature Reserve
Black Andrew Nature Reserve
Mudjarn Nature Reserve

Plans of Management

DRAFT plans of management for the above nature reserves have been prepared and are on exhibition until 16 September 2005.

Copies of the plans are available free of charge from the NPWS offices at 6 Rutledge St, Queanbeyan NSW 2620 (ph 6299 2929) and 7a Adelong Rd, Tumut NSW 2720 (ph 6947 7000). The plans are also on the NPWS website: www.nationalparks.nsw.gov.au. Written submissions on these plans must be received by The Planner, National Parks and Wildlife Service, PO Box 472, Tumut NSW 2720 by 16 September 2005.

All submissions received by NPWS are a matter of public record and are available for public inspection upon request to NPWS. Your comments on this draft plan may contain information that is defined as "personal information" under the NSW Privacy and Personal Information Protection Act 1998. The submission of personal information with your comments is voluntary.

PARKİNG SPACE LEVY ACT 1992

Section 12A

Notice of Determination of Amount of Levy

I, John Watkins, Minister for Transport in accordance with section 12A of the Parking Space Levy Act 1992 specify that the amount of the levy determined in accordance with section 12 of the Parking Space Levy Act 1992 payable on 1 September 2005 is:

(a) $880 for each parking space within a Category 1 area for which the levy is payable, or

(b) $440 for each parking space within a Category 2 area for which the levy is payable.

JOHN WATKINS, M.P.,
Minister for Transport

Sydney 1 June 2005.

POISONS AND THERAPEUTIC GOODS ACT 1966

Order under Clause 171(1),
Poisons and Therapeutic Goods Regulation 2002

Withdrawal of Drug Authority

IN accordance with the provisions of Clause 171(1) of the Poisons and Therapeutic Goods Regulation 2002, an Order has been made on Catherine WHITELOCK of 63 Princes Street, Ryde NSW 2112, prohibiting her, until further notice, as a nurse from having possession of and supplying drugs of addiction as authorised by Clauses 101 and 103 of the Regulation. This Order is to take effect on and from Wednesday, 8 June 2005.

ROBYN KRUK,
Director-General

Department of Health, New South Wales.
Sydney, Monday, 6 June 2005.

POISONS AND THERAPEUTIC GOODS ACT 1966

Order Under Clause 171(1),
Poisons and Therapeutic Goods Regulation 2002.

Withdrawal of Drug Authority

IN accordance with the provisions of Clause 171(1) of the Poisons and Therapeutic Goods Regulation 2002, an Order has been made on Dr William HUANG of 8 Carrick Close, Cardiff NSW 2285, prohibiting him until further notice, as a medical practitioner from supplying or having possession of drugs of addiction as authorised by Clause 101 of the Regulation and issuing a prescription for a drug of addiction as authorised by Clause 76 of the Regulation.

This Order is to take effect on and from Wednesday, 15 June 2005.

ROBYN KRUK,
Director-General

Department of Health, New South Wales.
Sydney, Wednesday, 8 June 2005.

PUBLIC WORKS ACT, 1912

Land Acquisition (Just Terms Compensation) Act 1991

Compulsory Acquisition

Queanbeyan Government Office Building

The Minister for Commerce, with the approval of Her Excellency the Governor, declares that the land described in the Schedule hereto, is acquired by compulsory process under the provisions of the Land Acquisition (Just Terms Compensation) Act 1991 for public offices and public buildings.

On publication of this notice in the Government Gazette the land is vested in the Minister for Commerce as Constructing Authority under section 4 of the Public Works Act, 1912.

The Minister for Commerce is satisfied that immediate vacant possession of the land described in the Schedule is required.

JOHN DELLA BOSCA, M.L.C.,
Minister for Commerce

SCHEDULE

Land

Lot 3 Section 56 Deposited Plan 758862.

Lot 5 Section 56 Deposited Plan 758862.

DoC Reference 271.

ROADS ACT 1993

ORDER

Marie Bashir, Governor

I, Professor MARIE BASHIR, A.C., Governor of the State of New South Wales, with the advice of the Executive Council and in pursuance of the definition of approved toll camera in section 250A of the Roads Act 1993, do, by this my Order, approve the following types of digital camera as being designed to take a photograph of a vehicle that is driven in contravention of a requirement to pay a toll and to record on the photograph the matters specified in that definition:

Types of digital camera:

TRANSCAM MK 2 CAMERA (also known as JAI CV-M7+)

and

KAPSCH TRAFFICCOM CAMERAS (also known as VR Sensors 8633 001-356 [colour] and 8633 001-415[monochrome])

Signed at Sydney, this 8th day of June 2005.

By Her Excellency's Command,

MICHAEL COSTA, M.L.C.,
Minister for Roads

SPORTING INJURIES INSURANCE ACT 1978

Order of Declaration Under Section 5

IN pursuance of section 5 of the Sporting Injuries Insurance Act 1978, I declare by this Order the BELMONT MACQUARIE TENNIS CLUB INC., to be a sporting organisation, for the purposes of the provisions of the Act, in respect of the activity of Tennis.

Dated: Sydney, 13th May 2005.

IAN EATHER,
A/Chairperson,
Sporting Injuries Committee

SPORTING INJURIES INSURANCE ACT 1978

Order of Declaration Under Section 5

IN pursuance of section 5 of the Sporting Injuries Insurance Act 1978, I declare by this Order the ARMIDALE SQUASH CLUB INC to be a sporting organisation, for the purposes of the provisions of the Act, in respect of the activity of Squash.

Dated: Sydney, 25th May 2005.

JON BLACKWELL,
Chairperson,
Sporting Injuries Committee

TENDERS

Department of Commerce

SUPPLIES AND SERVICES FOR THE PUBLIC SERVICE

Information in relation to the Department of Commerce proposed, current and awarded tenders is available on:

http://www.tenders.nsw.gov.au

PRIVATE ADVERTISEMENTS

COUNCIL NOTICES

ALBURY CITY COUNCIL

Roads Act 1993, Section 162

Roads (General) Regulation 2000

Naming of Roads

NOTICE is hereby given that Albury City Council, pursuant to the above Act and Regulation, has renamed the road named Box Place, Thurgoona. This road is hereby renamed as Ash Grove. MARK CLIFFORD HENDERSON, General Manager, Albury City Council, 553 Kiewa Street, Albury NSW 2640. [1339]

GUNDAGAI SHIRE COUNCIL

Local Government Act 1993

Land Acquisition (Just Terms Compensation) Act 1991

Notice of Compulsory Acquisition of Land

GUNDAGAI SHIRE COUNCIL declares with the approval of Her Excellency the Governor, that the land described in the Schedule below, excluding any mines or deposits of minerals in the land, is acquired by compulsory process in accordance with the provisions of the Land Acquisition (Just Terms Compensation) Act 1991, for the purposes of residential subdivision. Dated at Gundagai this 6th day of June 2005. G. A. J. TICKNER, General Manager, Gundagai Shire Council, 255 Sheridan Street (PO Box 34), Gundagai NSW 2722.

SCHEDULE

Portions 351, 352, 353 and 354, DP 751421.

Lot 100, DP 1066569. [1337]

LACHLAN SHIRE COUNCIL

Local Government Act 1993

Land Acquisition (Just Terms Compensation) Act 1991

Notice of Rescission of Compulosry Acquisition of Land

IN pursuance of section 31 of the Land Acquisition (Just Terms Compensation) Act 1991, Her Excellency the Governor with the advice of the Executive Council does by this notice rescind the Notice of Compulsory Acquisition of Land under the Local Government Act 1993, dated 4th April 2003 and published by the Lachlan Shire Council in *Government Gazette* No. 74 of 17 April 2003, in respect of the land described in the Schedule below. Dated this 2nd day of June 2005. R. W. BAILEY, General Manager, Lachlan Shire Council, 58-64 Molong Street (PO Box 216), Condobolin NSW 2877.

SCHEDULE

Lot 173, DP 752329. [1346]

LAKE MACQUARIE CITY COUNCIL

Proposed Naming of Roads in Subdivision

NOTICE is hereby given that Council proposes to name the private roads in Community Title subdivision shown hereunder:

Location	Name
Lots 13 and 15, DP 129150, Newport Road, Cooranbong.	Ellenborough Drive and Ashton Place.

Written objections to the proposed naming will be accepted up to one month after publication date of this notice. The reasons for objection need to be clearly stated. For further information, contact Stephen Pichaloff on (02) 4921 0534. KEN HOLT, General Manager, Lake Macquarie City Council, Box 1906, Hunter Region Main Centre NSW 2310. [1336]

MAITLAND CITY COUNCIL

Naming of Public Roads

NOTICE is hereby given that Maitland City Council, in pursuance of section 162 of the Roads Act 1993 and Part 2 of the Roads (General) Regulation 2000, has approved the following new road name/s for gazettal:

Deposited Plan/Location	Road Name
DP 573182, off River Road, Windella.	Sandstone Drive.
DP 573182, off River Road, Windella.	She Oak Close.
DP 573182, off River Road, Windella.	Lomandra Place.

The above road names have been advertised and notified. No objections to the proposed names have been received during the prescribed 28 day period. DAVID EVANS, General Manager, Maitland City Council, High Street (PO Box 220), Maitland NSW 2320. [1338]

PARRAMATTA CITY COUNCIL

Roads Act 1993, Section 162

Naming of Public Roads

NOTICE is hereby given that the Parramatta City Council, in pursuance of section 162 of the Roads Act 1993, proposes to name the lane as shown in the Schedule hereunder:

Description of Road	New Name
That sealed dead-end lane which commences at Gray Street, Granville and proceeds northerly to A'Beckett Street.	Bill Hoare Lane.

Authorised by Resolution of Council on 19th July 2004. JOHN NEISH, General Manager, Parramatta City Council, PO Box 32, Parramatta NSW 2124. [1340]

TAMWORTH REGIONAL COUNCIL

Roads Act 1993, Section 162

Roads (General) Regulation 2000, Part 2, Division 2

Naming of Public Roads

NOTICE is hereby given that in pursuance of the above mentioned Act and Regulation the roads created by the subdivision DA0467/2003 (Lot 61, DP 1008887 – Maralinga Crescent, Hillvue NSW 2340), have been named as follows:

G. INGLIS, Tamworth Regional Council, PO Box 555, Tamworth NSW 2340. [1348]

TWEED SHIRE COUNCIL

Proposed Renaming of Road

IN pursuance of section 162(1) of the Roads Act 1993 as amended, Council proposes to rename the part of Chinderah Bay Drive from Fingal Road to Waugh Street, Chinderah, in the Shire of Tweed as shown below:

"Chinderah Bay Drive North".

A period of thirty days from the date of this notice is allowed for any person to lodge a written objection to the proposed naming. Any objections should state clearly the reasons for such objections. GENERAL MANAGER, Tweed Shire Council, PO Box 816, Murwillumbah NSW 2484. [1341]

ESTATE NOTICES

NOTICE of intended distribution of estate.–Any person having any claim upon the estate of THOMAS JOHN NOEL FOLEY, late of 15 Bass Place, St Ives, in the State of New South Wales, company director, who died on 30th January 2005, must send particulars of the claim to the executors, Jean Duncan Foley, Ian Benjamin Preston and Stephen Julian Cordell, c.o. Home Wilkinson Lowry, Lawyers, Level 9, 55 Hunter Street, Sydney NSW 2000, within one (1) calendar month from publication of this notice. After that time the executors may distribute the assets of the estate having regard only to the claims of which at the time of distribution they have notice. Probate was granted in New South Wales on 24th May 2005. HOME WILKINSON LOWRY, Lawyers, Level 9, 55 Hunter Street, Sydney NSW 2000 (DX 367, Sydney), tel.: (02) 8270 8600. Reference: SPN:JS:49461. [1335]

NOTICE of intended distribution of estate.–Any person having any claim upon the estate of DAPHNE IRENE CLARK (in the will called Daphne Clark), late of Newtown, in the State of New South Wales, who died on 6th December 2004, must send particulars of his claim to the executrix, Barbara Daphne Murphy (in the will called Barbara Murphy), c.o. Newnhams Solicitors, 122 Castlereagh Street, Sydney NSW 2000, within one (1) calendar month from publication of this notice. After that time the executrix may distribute the assets of the estate having regard only to the claims of which at the time of distribution she has notice. Probate was granted in New South Wales on 31st May 2005. NEWNHAMS SOLICITORS, 7th Floor, Highmount House, 122 Castlereagh Street, Sydney NSW 2000 (DX 665, Sydney), tel.: (02) 9264 7788. Reference: BLM:MLH:5347. [1347]

COMPANY NOTICES

NOTICE of meeting of members.–RETLOC HOLDINGS PTY LIMITED, ACN 001 390 192 (in liquidation).–Notice is hereby given that pursuant to section 509(2) of the Corporations Act 2001, the final meeting of the abovenamed company will be held at 1st Floor, 25 Bolton Street, Newcastle, on 15th July 2005, for the purpose of laying before the meeting the liquidators' final account and report and giving explanation thereof. Dated this 3rd day of June 2005. ROBERT TABER, Liquidator, c.o. Cutcher & Neale, Chartered Accountants, The Bolton Building, 25 Bolton Street (PO Box 694), Newcastle NSW 2300, tel.: (02) 4928 8500. [1333]

NOTICE of voluntary liquidation.–BARBIZON CONNECTION PTY LTD, ACN 081 903 488 (in liquidation).–Notice is hereby given pursuant to section 491(2) of the Corporations Law that at a meeting of members of the abovenamed company held on the 1st June 2005, the following special and ordinary resolutions were passed: "That the company be wound up as a members voluntary liquidation and that the assets of the company may be distributed in whole or in part to the members in specie should the liquidator so desire" and "that Mark Leslie Arenson be appointed liquidator of the company". Notice is also given that creditors having claim against the company should furnish particulars of that claim to the liquidator within 28 days of this date, otherwise distributions of the assets will take place without regard to such claims. Dated 1st June 2005. MARK L. ARENSON, Liquidator, c.o. Mark Arenson & Co Pty Ltd, Certfied Practising Accountant, PO Box 135, Ryde NSW 1680. [1334]

NOTICE of voluntary liquidation.–INFOSYSTEMS AUSTRALIA PTY LIMITED, ACN 084 941 122 (in liquidation).–At an extraordinary general meeting of the abovenamed company duly convened and held at Suite 1, Level 2, 1 York Street, Sydney, on 5th May 2005, the following special resolution was passed: "That the company be wound up as a members' voluntary liquidation and that the assets of the company be distributed in whole or in part to the members in cash or in specie should the liquidator so desire". At the abovementioned meeting, Glenn Merchant was appointed liquidator for the purposes of the winding up. Dated this 5th day of May 2005. GLENN MERCHANT, Liquidator, c.o. Mitchell & Partners, Chartered Accountants, Suite 1, Level 2, 1 York Street, Sydney NSW 2000, tel.: (02) 9251 3838. [1343]

NOTICE of meeting of members.–STAFFBID PTY LIMITED, ACN 050 108 506.–Notice is hereby given that pursuant to section 509 of the Corporations Law, the final meeting of members of the abovenamed company will be held at the offices of Steel Walsh & Murphy, 103 Kendal Street, Cowra NSW 2794, on the 30th June 2005, for the purpose of laying before the meeting the liquidator's final account and report and giving any explanation thereof. Dated this 30th day of May 2005. REGINALD THOMAS CASSIDY, Chartered Accountant, c.o. Steel Walsh & Murphy, 103 Kendal Street (PO Box 363), Cowra NSW 2794, tel.: (02) 6342 1311. [1344]

NOTICE convening final meeting of creditors.–B A S TRANSPORT PTY LTD, ACN 002 134 152 (in liquidation).–Notice is hereby given pursuant to section 509 of the Corporations Law that the final creditors meeting of the abovenamed company will be held at the office of Lower, Russell & Farr, 1st Floor, 81 Henry Street, Penrith, on the 1st July 2005, at 10:00 a.m., for the purpose of having an account laid before them showing the manner in which the winding up has been conducted and the property of the company disposed of. Persons claiming to be creditors are required to prove their debt by no later than 4 o'clock of the previous day. In default they will be excluded from the benefit of the dividend. Dated this 2nd day of June 2005. STEPHEN HENRY LOWER, Liquidator, c.o. Lower, Russell & Farr, Chartered Accountants, 1st Floor, 81 Henry Street (PO Box 459), Penrith NSW 2751, tel.: (02) 4732 3033. [1345]

NOTICE of final meeting.–GOSFORD PROPERTIES PTY LIMITED, ACN 000 258 766 (in liquidation).–Notice is hereby given that a final meeting of the abovenamed company will be held at Suite 1, Level 2, 1 York Street, Sydney, at 11:30 a.m., on 27th June 2005. The objective of the meeting is to present accounts in relation to the fully wound-up affairs of the company and the final report on liquidation. MITCHELL & PARTNERS, Chartered Accountants, Suite 1, Level 2, 1 York Street, Sydney NSW 2000, tel.: (02) 9251 3838. [1349]

NOTICE of final meeting.–JOPAT INVESTMENTS PTY LIMITED, ACN 000 182 794 (in liquidation).–Notice is hereby given that a final meeting of the abovenamed company will be held at Suite 1, Level 2, 1 York Street, Sydney, at 11:45 a.m., on 27th June 2005. The objective of the meeting is to present accounts in relation to the fully wound-up affairs of the company and the final report on liquidation. MITCHELL & PARTNERS, Chartered Accountants, Suite 1, Level 2, 1 York Street, Sydney NSW 2000, tel.: (02) 9251 3838. [1351]

NOTICE of meeting of dissolution of the co-operative.–PUNKINA HOUSING CO-OPERATIVE LIMITED (in liquidation).–Take notice that a meeting is convened at 1/8 Bank Street Wellington NSW, on Friday, 15th July 2005, at 9:00 a.m., for the purpose of laying before the meeting the account of the winding up of the co-operative. Dated: 10th June 2005. PAUL JAMES CAMPION, Liquidator, 10 Bank Street, Wellington NSW 2820. [1350]

NOTICE of voluntary winding up.–JAGAIA HOLDINGS PTY LIMITED, ACN 003 981 708 (in liquidation).–Notice is hereby given that at an extraordinary general meeting of members of the abovenamed company, duly convened and held at 60 Castlereagh Street, Sydney NSW, on 15th April 2005, the following special resolution was duly passed: "That the company be wound up voluntarily". It was further resolved that Arthur Duffield be appointed liquidator of the company for the purposes of winding up the affairs and distributing the assets of the company. Dated: 15th April 2005. ARTHUR DUFFIELD, Liquidator, c.o. Brooks, Deane & Powne, Chartered Accountants, Level 1, 10 Spring Street, Sydney NSW 2000. [1352]

OTHER NOTICES

Form 4

CHURCHES OF CHRIST IN NEW SOUTH WALES INCORPORATION ACT 1947

Registration of Trustees – Certificate No. 165

IN accordance with the provisions of Part V of the above Act the Church of Christ at **Tamworth** having made application for the registration of the Churches of Christ Property Trust as Church Trustee under section 27 of the said Act and having done all things necessary for such registration it is hereby certified that the Church Trustee of the said Church of Christ as from the date of this certificate is the Churches of Christ Property Trust.

Dated at Marrickville this 21st day of May 2005.

PETER DIXON
Registrar

[1342]

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