

ESTUARY PRAWN TRAWL EIA REPORT

**Prepared for:
NSW Fisheries**

November 2001

Prepared by:



**SMEC Australia Pty Ltd
ACN 065 475 149**

Project Number: 31229.001



PREPARATION, REVIEW AND AUTHORISATION

Project Name: Estuary Prawn Trawl EIA Report Project No.: 31229.001

Prepared by: Ros Taplin Signature: _____

Position: Senior Greenhouse Consultant Date: 15th November 2001

Reviewed by: Michael Wiener Signature: _____

Position Environmental Scientist Date: 15th November 2001

This report was prepared in accordance with the scope of services set out in the contract between SMEC Australia Pty Ltd (SMEC) and the Client. To the best of SMEC's knowledge the proposal presented herein reflects the Client's intentions when the report was printed. In preparing this report, SMEC relied upon data, surveys, analyses, designs, plans and other information provided by the Client and other individuals and organisations referenced herein. Except as otherwise stated in this report, SMEC has not undertaken further verification regarding the accuracy or completeness of these information sources.

TABLE OF CONTENTS

1	INTRODUCTION	1-1
1.1	BACKGROUND.....	1-1
1.2	METHODOLOGY	1-1
1.3	CONSULTATION	1-2
2	ESTUARY PRAWN TRAWL FISHERY DESCRIPTION.....	2-1
2.1	ESTUARIES.....	2-1
2.1.1	Description.....	2-1
2.1.2	Land Uses Surrounding Estuaries.....	2-1
2.2	FISHERY DESCRIPTION.....	2-2
2.2.1	Overview.....	2-2
2.2.2	Methods.....	2-3
2.2.3	Controls	2-4
2.2.4	Environmental Interactions.....	2-6
3	IMPACT ASSESSMENT	3-1
3.1	NOISE	3-1
3.1.1	Impact Assessment.....	3-1
3.1.2	Mitigation Measures.....	3-3
3.2	LIGHT	3-3
3.2.1	Impact Identification	3-3
3.2.2	Mitigation Measures.....	3-4
3.3	AIR QUALITY	3-4
4	ENERGY AND GREENHOUSE ISSUES	4-1
4.1	DESCRIPTION OF FISHING FLEET.....	4-1
4.2	ENERGY AND GREENHOUSE ASSESSMENT.....	4-2
5	REFERENCES	5-1

APPENDICES

A Questionnaire to Councils

1 INTRODUCTION

1.1 BACKGROUND

NSW Fisheries is currently preparing fishery management strategies for the State's commercial marine fisheries. Concurrently, environmental assessments are being prepared under Division 5, Part 5 of the *Environmental Planning and Assessment Act 1979*. The assessments will estimate the level of pressure on the environment from the fishing activities and predict the likely impacts of implementing the draft fishery management strategies. The guidelines for the preparation of the environmental assessments issued by the Department of Urban Affairs and Planning (DUAP) requires that among other issues NSW Fisheries address noise, light, air quality, and energy and greenhouse issues.

SMEC Environment was commissioned by NSW Fisheries to prepare assessments addressing noise, light, air quality, energy and greenhouse issues for three commercial fisheries, Estuary General, Ocean Haul and Estuary Prawn Trawl. This report presents the assessment of the Estuary Prawn Trawl Fishery.

1.2 METHODOLOGY

Estuary Prawn Trawl fishing:

- involves only otter haul net fishing;
- is undertaken by 294 fishing businesses;
- occurs in five major estuaries in NSW (Clarence River, Hunter River, Hawkesbury River, Port Jackson and Botany Bay); and
- involves four primary target species.

The methodology adopted involved:

- consultation with NSW Fisheries, members of the fishing industry and local councils;
- broadly describing the method of fishing and identifying the activities that may generate noise, light or air emissions;
- identifying the types of land use that occurs within the estuaries;
- combining the above two factors to identify whether there was any potential for significant adverse effects; and
- identifying mitigation measures to minimise or reduce identified areas of impact.

Greenhouse and energy issues were considered by examination of the fishing fleet and methods of fishing.

To present the findings of the investigations this report contains four sections:

1. this brief introduction;
2. a description of the fishing activity and estuarine environments;
3. an impact assessment for noise, light and air quality issues; and
4. a consideration of greenhouse and energy issues.

1.3 CONSULTATION

To facilitate an understanding of the Estuary Prawn Trawl Fishery and relevant environmental issues consultation was undertaken with members of the Estuary Prawn Trawl Management Advisory Committee (EPTMAC), local Councils and the staff of NSW Fisheries.

i Consultation With EPTMAC Members

Three members of EPTMAC, Mr. William Baker, Mr. Dennis Hyde and Mr. Graeme Hillyard, were contacted regarding issues in the Estuary Prawn Trawl Fishery. The members of EPTMAC serve as industry representatives for commercial fishing operators in the Estuary Prawn Trawl Fishery and have first-hand experience of the fishery's issues.

As with all commercial fisheries, the Estuary Prawn Trawl Fishery is subject to a large number of restrictions, the majority of which are imposed by NSW Fisheries. The National Parks and Wildlife Service (NPWS) also imposes some restrictions in estuaries that are bounded by National Parks, while the Maritime Services Board (MSB) maintains controls on vessel standards. The commercial fishermen themselves are also responsible for placing restrictions on their own activities, which receives strong support within the industry because it is in the overall interest of the fishery.

In relation to noise, light, air quality and energy/greenhouse issues, the general feeling was that the Estuary Prawn Trawl Fishery has very limited impact. However, some issues were raised.

- **Noise Issues**

Noise issues associated with the fishery, while being acknowledged as having a greater impact in comparison to light, air quality, energy and greenhouse issues, were generally considered to be minor. For the most part, commercial fishermen are aware of noise issues associated with their operations, and make efforts to reduce its' impact. Noise was not regarded as a consideration when operations occur in areas removed from residential areas. The main issue in residential areas is early morning noise, in particular, noise associated with starting boat engines. Boats with steel or aluminium decks have rubber matting fitted in working areas to reduce noise.

- Light Issues

The impact of lights was thought to be very minor and irrelevant for the Hunter and Clarence fisheries, as Estuary Prawn Trawling only occurs during the day. Night activity only occurs in the Hawkesbury, Port Jackson and Botany Bay. Fishing in these areas is done sufficiently far from residential areas to ensure there is no impact from the lights being used.

- Air Quality/Energy and Greenhouse Issues

Diesel fuel is generally used on boats undertaking Estuary Prawn Trawling. The use of wet exhausts helps to limit the level of air pollution caused by boat engines. Prawn cookers fuelled by bottled LPG are a further source of emissions. Overall, it was felt that Estuary Prawn Trawl activities were well dispersed, and thus there is no concentration of boats leading to a high level of air emissions within a small area.

ii Consultation With Local Councils

Six local councils, Leichhardt City Council, Maclean Shire Council, Newcastle City Council, Rockdale City Council, and Sutherland Shire were contacted. A copy of the questionnaire is included as Appendix A. These Councils were selected because they contain some of the major prawn trawling estuaries within New South Wales, and because they offer a diversity of estuary types within their local government areas.

Responses were received from Leichhardt, Newcastle, Rockdale and Sutherland Councils but no response was received from the Maclean Shire Council. The responses were, on the whole, very similar, with all indicating that these Councils had very little to do with commercial fishing management, largely because the Councils do not have the staff expertise to effectively deal with fishery issues. As a result, management of commercial fishing is left to NSW Fisheries.

No public complaints have been recorded with regard to estuarine fishing and prawn trawling activities at Leichhardt, Rockdale and Sutherland Councils. To date, a very low level of complaints related to early morning noise and slipways noise has been received by Newcastle City Council. Newcastle City Council's Environmental Services Coordinator, however, did express the opinion that rising levels of complaints about noise from commercial fishing trawlers may occur in the future from people now taking up residence in Newcastle's new developments around the harbour.

iii Consultation With Regional Offices of NSW Fisheries

Regional offices of NSW Fisheries were contacted to determine the number and type of complaints received concerning commercial fishing activity.

Max Withnell, Regional Manager North, indicated that in northern New South Wales very few complaints are received concerning commercial fishing operations. For the most part, the complaints that are received relate to noise issues. In particular, the complaints have identified banging the sides of boats with oars or other objects to scare fish into meshing nets, use of

outboard motors in residential areas at night, noise from winches and noise from prawn cookers (gas burners) when used near residential areas.

Roy Mills, Regional Manager South, indicated that no complaints had been received about commercial fishing operations during the current fishing season.

2 ESTUARY PRAWN TRAWL FISHERY DESCRIPTION

2.1 ESTUARIES¹

2.1.1 Description

Estuaries are partially enclosed bodies of waters that are connected to the ocean. The *Fisheries Management Act 1994* defines estuarine waters as “waters other than ocean waters that are ordinarily subject to tidal influence”. Estuaries are characterised by brackish water caused by the mixing of ocean and fresh waters. They generally comprise complex ecosystems and sustain high levels of biodiversity, supporting a wide variety of fish and invertebrates and providing a diverse range of habitats, including mangroves, seagrasses, mud flats and sheltered rocky reef. Estuaries and their associated habitats also provide a significant contribution to terrestrial biodiversity, supporting insects, reptiles, mammals and, especially, birds.

Estuaries are found along the entire New South Wales coastline, with a total of 950 water bodies being identified, many of which are small and unnamed. Of these water bodies, 135 are considered to be major estuaries. Prawn trawling is only permitted in five major estuaries: the Clarence River, the Hunter River, the Hawkesbury River, Port Jackson and Botany Bay². Trawling also occurs in the harbour at Coffs Harbour and in Jervis Bay but these are designated as part of the Ocean Prawn Trawl Fishery.

2.1.2 Land Uses Surrounding Estuaries

Many of the estuaries throughout NSW have become a focus for anthropogenic activities and land use. In particular, urban development has become more concentrated around estuaries due to the attractive environments they offer. This has placed increasing pressures on the estuaries and their surrounding environment. Brief descriptions of the estuaries where prawn trawl fishing occurs and their associated land use follow.

- Clarence River

There is a range of diverse land uses found close to the Clarence River. Significant areas of State Forest (Fortis Creek State Forest) exist in the region, while there are also areas used for agriculture. Large urban areas, most notably, Grafton, are found on the shores of the river, while a number of smaller urban villages, such as Copmanhurst, Moleville and Eatonsville can also be found along the river.

¹ Much of the information presented in this section has been sourced from the *Draft Estuary Prawn Trawl Fishery Management Strategy* (NSW Fisheries 2001).

² Botany Bay will become a recreational fishing area in May 2002 and all commercial fishing in the bay will subsequently cease (NSW Fisheries pers. com. November 2001).

- Hunter River

The Hunter River joins the Pacific Ocean at Newcastle on the lower north coast of NSW. The river has a busy maritime port in the harbour area located near its confluence with the Pacific Ocean. The Hunter River reaches in a north-westerly direction toward Singleton and into fresh water areas in the upper catchment.

- Hawkesbury River

The Hawkesbury River is located to the north of Sydney with the overall water body encompassing Pittwater in the northern suburbs of Sydney and Brisbane Water near Gosford on the lower central coast of NSW. The river is a drowned river valley that is incised into a rock foundation and has relatively deep sections in the lower reaches. The river reaches in a westerly direction and into brackish waters toward the north west outskirts of Sydney. Parts of the lower reaches of the river meander through National Park areas with numerous inlets and bays. As such the river is popular as a recreational boating destination.

- Port Jackson

Port Jackson includes Sydney Harbour, Middle Harbour, Manly Cove and the Parramatta River, which are located in the centre of the urban Sydney environs. The port is a drowned river valley, which is incised into a sandstone rock foundation and has many deep sections. The river reaches in a westerly direction through suburban areas and access is restricted by a weir near Parramatta. Sydney Harbour is a busy commercial port with large amounts of commercial and recreational boating occurring throughout both the harbour and river.

- Botany Bay

Botany Bay is located in the southern residential and commercial areas of Sydney with the estuary reaching in a westerly and south-westerly direction into the Georges and Woronora rivers. The Towra Point Aquatic Reserve and Nature Reserve are located on the southern shore of the bay. These reserves protect internationally recognised wetlands listed under the RAMSAR convention. The shoreline of the estuary is adjacent to a combination of commercial, residential and undeveloped crown land. There is a commercial shipping port in Botany Bay and both the bay and rivers are popular as recreational boating destinations.

2.2 FISHERY DESCRIPTION³

2.2.1 Overview

The Estuary Prawn Trawl Fishery involves the taking of prawns from within estuarine waters. The main species targeted by the fishery are the school prawn, which comprise approximately 90% of the total catch, and, secondarily, the eastern king prawn. Other prawn species caught

³ Much of the information presented in this section has been sourced from the *Draft Estuary Prawn Trawl Fishery Management Strategy* (NSW Fisheries 2001).

in small quantities include the inshore greasyback and the brown tiger prawn. Squid is a target species in the case of the Hawkesbury estuary and a secondary species (marketable non-target catch) in the others. A variety of species of fish, crab and octopus make up other secondary catch for Estuary Prawn Trawl Fishery.

The Clarence River has by far the largest prawn catch of the five estuaries open to prawn trawling. Its total catch is more than double the next largest estuary catch, being the Hawkesbury River. The Hunter River is third, followed by Botany Bay and Port Jackson.

2.2.2 Methods

The Estuary Prawn Trawl Fishery uses the method of trawling by otter prawn trawl nets. No other methods are used to take the catch. The otter prawn trawl net is a funnel of net towed along close to the seabed at speeds of between 2.5 and 3 knots. The net is held open by otter boards. These are small flat boards set at an angle to the direction of the towed net and act as hydrovanes. As the boards move through the water, the forces exerted on these boards spread the net open. Between the otter boards and nets are sweeps (ropes) which attach the net to the otter board. The mesh size of the net must be between 40-60mm, while the codend must be between 40-50mm. The codend or bag is the last section of net where the prawns are collected and held. In order to reduce the number of non-target fish (bycatch) that are caught, these nets must incorporate some form of bycatch reducing device. These devices are designed to allow bycatch (unwanted species) to escape from the net without significantly reducing the prawn catch.

Two trawling nets are used by vessels in some estuaries. In the Clarence River all trawlers use two nets. Elsewhere almost all vessels use one net although two nets may be used in Broken Bay (Hawkesbury River), Botany Bay and Port Jackson. Echo-sounders may be used to trace the sea floor. Mechanical winches allow the boats to trawl in deeper waters and allow greater efficiency of trawling activities.

Prawn trawling is allowed in certain areas of the estuaries and at certain times of the year. The warmer months between September and May are the 'peak' season. The majority of catches occur during the 'dark' of the moon (between the last and first quarter) on either run out or 'slack' tides. In rivers, prawn trawling is entirely a daytime operation, while in bays the operations tend to be more night based. Brief descriptions of the areas where trawling is permitted and times of operation in each of the estuaries are given below.

- Clarence River

Trawling for prawns is permitted between the mouth of the estuary and the wires of the vehicular ferry at Ulmarra and is also permitted in Lake Wooloweyah, which lies to the south of the river entrance. Times when trawling is permitted are equivalent to 16% of the total time in a year.

- Hunter River

Trawling for prawns is permitted between the mouth of the estuary and the junction of the Williams and Hunter Rivers. Times when trawling is permitted are equivalent to 17% of the total time in a year.

- Hawkesbury River

Trawling is permitted between a line drawn from the southern extremity of Box Head to the northern extremity of Barrenjoey Head, upstream to the vehicular ferry crossing at Lower Portland. Within this area many tributaries are closed to trawling. Trawling is permitted in the Hawkesbury River all year round.

- Port Jackson

Trawling for prawns is permitted throughout Port Jackson but Manly Cove and the Lane Cove River are closed to trawling together with parts of Middle Harbour. Times when trawling is permitted are equivalent to about 21% of the total time in a year not including possible extensions of the season as determined by the local District Fisheries Officer.

- Botany Bay

Trawling for prawns is permitted in Botany Bay from a line drawn between Endeavour Light to the Northern Extremity of Sutherland Point upstream (westerly) to a line from Doll's Point to Towra Point. The Cooks River is closed to trawling, as are parts of the Port Development and Airport. Times when trawling is permitted are equivalent to 16% of the total time in a year not including possible extensions of the season as determined by the local District Fisheries Officer.

2.2.3 Controls

The Estuary Prawn Trawl Fishery is managed entirely via input controls. These are controls that limit the resources that can be used by commercial fishermen, thus indirectly controlling the catch size. There are no direct restrictions on catch size or quotas. Input controls include restrictions on the number of licences available, the size and engine capacity of boats, the length and mesh size of nets and the locations and times that can be worked. NSW Fisheries is responsible for the majority of controls imposed on the Estuary Prawn Trawl Fishery, although the National Parks and Wildlife Services also imposes some controls, as do various local councils.

An overview of the controls is provided below.

i Limited Entry

Access to the Estuary Prawn Trawl Fishery is restricted by a licence endorsement system. A licensing system provides a mechanism for controlling the number of commercial operators undertaking Estuary Prawn Trawling.

ii Log Books

Commercial fishermen are required to complete a monthly log book outlining the main method of fishing undertaken and the species and quantity landed. These logs must be submitted on a monthly basis.

iii Equipment Controls

Controls on equipment make up the greatest number of controls imposed within the Estuary Prawn Trawl Fishery. These controls include:

- Boat replacement policy – designed to prevent increases in the size of vessels and engine capacity within the Estuary Prawn Trawl fishing fleet, the policy essentially prevents fishermen from replacing their existing boats with larger more powerful boats.
- Boat size – boats must not exceed a specified length.
- Vessel licences – all vessels must be a Licensed Fishing Boat and be endorsed in the Estuary Prawn Trawl Fishery.
- Net size – all nets must comply with length and design guidelines, and must meet requirement for mesh size.
- Bycatch Reduction Devices – on 2 December 2000, Bycatch Reduction Devices were made mandatory in the Estuary Prawn Trawl Fishery.

iv Closures

Table 2.1 describes the daily and seasonal closures that apply to the Estuary Prawn Trawl Fishery.

Table 2.1 Summary of the time closures in the Estuary Prawn Trawl Fishery (as at August 2001)

Closure Type	Clarence River	Hunter River	Hawkesbury River	Port Jackson	Botany Bay
<i>Weekend</i>	Closed, but only from 8am Saturday	Closed	Closed, except for downstream from Juno Point (but only to 6pm Sunday)	Closed, except to 8am Sat.	Closed
<i>Public Holiday</i>	Open	Closed	Open	Open	Open
<i>Night</i>	Closed	Closed	Open, except Marra Marra Creek, (Berowra)	Open	Open
<i>Day</i>	Open	Open	Open	Closed	Closed
<i>Winter</i>	Closed	Closed	Open	Closed	Closed

Open: Estuary Prawn Trawling permitted

Closed: Estuary Prawn Trawling not permitted

Source: NSW Fisheries (2001)

2.2.4 Environmental Interactions

Estuary Prawn Trawl fishing activities may interact with the environment in relation to noise, light, air emissions, and energy and greenhouse. Table 2.2 outlines the environmental implications of Estuary Prawn Trawl fishing on each of these areas.

Table 2.1 Estuary Prawn Trawl fishing and environmental interactions

Method	Catch	Noise	Light	Air Emissions	Energy/ Greenhouse
Otter haul net	School prawn, Eastern king prawn, Broad squid, Bottle squid	Boat engines, Winches, Trawling equipment, Prawn cookers, Crew members' instructions	Operations and boat movements at night	Boat engines, Prawn cookers	Boat engines, Prawn cookers

Source: NSW Fisheries (2001)

2.2.5 Other Features

This assessment of the Estuary Prawn Trawl Fishery is limited to activities directly associated with its management. It does not extend to shore-based activities such as processing plants, cooperatives and boat ramps.

Other general characteristics of the Estuary Prawn Trawl Fishery include:

- There are 294 fishing businesses with prawn trawl entitlements in NSW.
- Boats generally used are between 4.5 to 11.6 metres long and usually are made from wood and/or fibreglass with diesel engines. These constitute approximately 17 % of the fishing fleet in NSW. However, some of the vessels are used to fish in other fisheries such as the Ocean Prawn Trawl, Estuary General and Trap and Line fisheries. Table 2.3 summarises the characteristics of the estuarine prawn trawling vessels in each zone.

Table 2.1 Summary of the characteristics of vessels used in the Estuary Prawn Trawl Fishery in each Zone.

Characteristic	Parameter	Zone				
		Clarence River	Hunter River	Hawkes-bury River	Port Jackson	Botany Bay
Hull Design	Displacement or Planing	Both	Both	Both	Displacement	Displacement
Length	Range (m)	17.2 - 4.3	13.1 - 6.2	15.7 - 4.7	9.2 - 5.6	9.6 - 4.5
	Average (m)	9.9	8.6	8.0	8.0	8.1
Engine Power	Range (kW)	269 - 6.3	134 - 30	165.5 - 20.1	156.6 - 22.4	250 - 41
	Average (kW)	97.12	71.73	81.12	77.78	91.36

Source: Information supplied by NSW Fisheries

3 IMPACT ASSESSMENT

3.1 NOISE

3.1.1 Impact Assessment

Potential sources of noise impact were identified in Table 2.2. They were noise from:

- boat engines - engine size reflects the power needed by fishing vessels for estuarine prawn trawling with the median engine size 67 kilowatts and 90% of the fishing fleet has motors sized 110 kilowatts or less;
- prawn cookers (on boats and on wharfs);
- fishing activities such as water release, hauling equipment and general noise; and
- crew members talking/instructions.

These activities can occur at any time of the day or night depending on the opening times of the fishery.

For noise to have an effect there must be a receptor who or which would be disturbed by the noise. For Estuary Prawn Trawl fishing these receptors are either people who live adjoining the estuary or wildlife.

i Residents Adjoining Estuaries

Noise from Estuary Prawn Trawl fishing may cause adverse effects to residents where houses are close enough to the estuary for the prawn trawling activity to cause disturbance. Given the type of activity and likely low sound power level of the potential noise sources it is probable that there is only a potential for disturbance during night-time and early morning operations. The potential for disturbance would be determined by the following factors:

- size of boat engine;
- duration of prawn trawling and prawn cooking (on the vessel) activity;
- number of other trawlers operating in the same area;
- position of the house, both its distance from the activity and intervening topography; and
- land-based activity such as prawn cooking on a wharf in the vicinity of the house. A house in a coastal town or close to a wharf could be expected to have a higher background noise level to an isolated farm house.

A brief description of land use surrounding several estuaries was given in Section 2. Given the variety of estuaries there will be areas where Estuary Prawn Trawling causes disturbance at nearby houses whether these are houses in villages or towns or isolated farm or holiday houses.

ii Wildlife

Noise from Estuary Prawn Trawling activities would only affect wildlife when:

- trawling is undertaken in areas where wildlife that is sensitive to noise is present; and/or
- noise from trawling activities disturbs wildlife either due to the volume or type of noise generated.

Noise impacts could result from fisherman's voices, the sound of equipment contacting boats, engines, winches operating, prawn cooking and the splashing of water. Wildlife that could be affected may include birds, terrestrial mammals, aquatic mammals and non-target fish. Any such wildlife that is disturbed may:

- remain in the area but become inactive (ie hide);
- temporarily move away from the area to return when the disturbance has ceased; or
- may permanently move away from the area (this is more likely if the disturbance is prolonged or occurs frequently).

Birds and terrestrial mammals could be impacted where prawn trawling is undertaken sufficiently close to shore to impact upon these species. Aquatic mammals and non-target fish could be impacted anywhere within the estuary.

During the daytime, fauna that is sensitive to noise is more likely to occur at secluded estuary locations. These areas are likely to be fringed by native plant communities such as saltmarsh, mangrove, coastal scrub, sclerophyll forest and woodland or rainforest. Such locations are likely to be relatively free of human activity and are more likely to harbour noise sensitive species. Noise sensitive wildlife may also occur in developed areas if these are relatively quiet and support suitable habitat.

During the night-time, background noise levels are reduced. The area affected by noise and the severity of the noise impacts would be greater. A greater range of species is likely to be affected during the night-time. This would include diurnal species disturbed from their sleep and nocturnal species whose behaviour is altered as a result of noise from fishing activities.

Impacts on sleeping diurnal species would only occur where fishing is sufficiently close to their habitat to disturb such species. Prawn trawling would impact upon sleeping diurnal birds and terrestrial mammals where trawling is undertaken close to the shore or near aquatic vegetation.

Nocturnal wildlife would utilise the secluded areas referred to above. They may also move into developed areas that are noisy during the day but quiet at night. Therefore, noise sensitive species may be encountered at night-time over a greater area than during the daytime.

The significance of the disturbance to wildlife would vary depending on the species and on the timing of the disturbance. The greatest impacts could be expected during the nesting or breeding season. At these times, any disturbance could impact upon the reproduction of a species and may endanger the viability of local populations. This would be particularly be the case if the disturbance were a frequent, regular or on-going activity.

Species most likely to be impacted by prawn trawling during the nesting or breeding season would include birds that nest in aquatic or riparian vegetation or in vegetation near the water's edge. Non-target fish could similarly be impacted if trawling is undertaken near nurseries or breeding habitat such as mangroves and areas of seagrass.

3.1.2 Mitigation Measures

A potential for adverse effects caused by noise from Estuary Prawn Trawl fishing on people and wildlife has been identified. This is not a new potential as Estuary Prawn Trawl fishing has been a continuing industry for 75 years. There are existing controls relating to area and time of operation on the Estuary Prawn Trawl Fishery that are summarised in Section 2.2.3. These controls were instigated for a number of reasons including conservation and to prevent disturbance to people living close to the estuaries.

The levels of complaint received concerning noise levels from the Estuary Prawn Trawl Fishery are monitored. Two authorities currently receive complaints, local councils (who tend to refer these to NSW Fisheries) and regional offices of NSW Fisheries. The number and type of complaints should be used as an input into reviewing the existing controls.

3.2 LIGHT

3.2.1 Impact Identification

i Residents

The only potential for adverse effects from lights used in the fishery would be from spotlights used as part of the prawn trawling activity. Navigation lights or deck lighting would not have a potential for significant adverse effect. Spotlights would only cause an adverse effect where these were shone into houses adjoining the estuary. The activities of the Estuary Prawn Trawl Fishery generally do not require intensive use of spotlights nor high strength lights. It is not anticipated that this type of lighting would have a potential for significant adverse impacts.

ii Wildlife

Impacts from light upon wildlife are unlikely to be significant unless light beams repeatedly or continuously affect the same individuals. The severity of this impact would increase with the intensity of the light.

Wildlife most susceptible to impacts from light would be those occurring in the water, on aquatic vegetation or near the water edge. Species would include aquatic mammals, non-target fish, terrestrial mammals and birds. Nocturnal species would be most likely to be impacted. However, diurnal species disturbed from their sleep could also be impacted.

3.2.2 Mitigation Measures

Mitigation measures outlined for noise impacts are generally applicable for reducing the potential for adverse effects from lighting. In summary these were:

- existing controls to limit the location and hours of Estuary Prawn Trawling; and
- monitoring of levels of complaint.

3.3 AIR QUALITY

The identified source of air emissions from the Estuary Prawn Trawl Fishery are emissions from boat engines and prawn cookers. These emissions do not have a potential to significantly affect air quality, as they:

- do not represent a concentrated source of inputs as they occur in estuaries along the NSW coast;
- vary according to both season and time of day; and
- are from engines and cookers.

Mitigation measures to reduce air quality emissions are the same as those proposed to reduce energy and greenhouse inputs. These are discussed in Section 4.

4 ENERGY AND GREENHOUSE ISSUES

4.1 DESCRIPTION OF FISHING FLEET

Boats used in the Estuary Prawn Trawl Fishery are medium sized vessels generally of wood and/or fibreglass construction using diesel marine engines.

Table 4.1 contains a summary of the characteristics of the Estuary Prawn Trawl fishing fleet. The median figure represents the size above or below which 50% of the fleet lies. The 80% range indicates the size range within which 80% of the fleet lies, while the range indicates the smallest and largest size in the fleet. Most engines are powered by diesel (97%) with smaller numbers using petrol (2%).

Prawns are generally cooked on the vessels. Bottled LPG is used as fuel to boil the water in the prawn cookers.

No data were available for the typical use of boats in terms of hours used. This would vary according to the prawn trawling business, the estuary operated in, and the time of year.

Table 4.1 Fishing Fleet Characteristics

Characteristic	Number Registered	Median	80% Range	Range
Engine (kilowatt)	176	67.0	53.7 to 94.8	6.3 to 263.8
Boat Length (metres)	176	7.6	7.0 to 8.8	4.5 to 11.6

Source: Data supplied to SMEC by NSW Fisheries

Maintenance is the responsibility of the fishing vessel owner. Manufacturers' maintenance instructions should be followed to ensure engine efficiency and emission control systems work properly. Lack of compliance by vessel owners with instructions can result in lower levels of energy efficiency (ie fuel wasting) and higher greenhouse emission rates. There is no specific information on 'typical' marine engine maintenance practices but given the size and type of the industry there is likely to be a varied response to maintenance.

Diesel and petrol fuels have similar CO₂ emission factors as shown in Table 4.2. On that basis the fuels are not dissimilar in their potential greenhouse impact although this would depend on other factors such as comparative efficiency between diesel and petrol motors and motor size availability.

Consumption of LPG for prawn cooking results in CO₂ emissions as indicated in Table 4.2. LPG is a relatively efficient fuel and there are currently no viable opportunities for fuel substitution.

Table 4.2 CO₂ Emission Factors

Fuel	CO ₂ Emission Factor (kg CO ₂ /GJ)
Diesel	69.0
Petrol	65.3
LPG	58.8

Source: *Factors and Methodologies, The Greenhouse Challenge* (Australian Greenhouse Office 2001)

4.2 ENERGY AND GREENHOUSE ASSESSMENT

Energy and greenhouse effects are considered together as the only potential for greenhouse gas inputs is from the energy consumed in the boat engines and the LPG used for the prawn cookers. Overall, the numerical size of the fleet and the size of the boats, engines and gas cookers used, means that the overall consumption of energy resources and subsequent greenhouse gas emissions is not significant. The Estuary Prawn Trawl Fishery consists of many small businesses operating in a low technology environment. Potential measures to reduce energy and greenhouse emissions may not be practicable for many of these ventures due to initial cost.

Renewable energy sources for fishing vessel operation could include solar and wind energy. However utilisation of these energy alternatives is not currently considered economically viable for estuarine prawn trawl fishing vessels.

Potential measures to maximise energy efficiency and hence minimise the emission of greenhouse gases for commercial fishing vessels involved in estuarine prawn trawl fishing have not been investigated in detail in Australia. These measures fall into two main areas, material and technology selection, and operational practice. Specific measures applicable to each of these aspects of commercial fisheries are outlined below.

i Material and Technology Selection

Material and technology selection options may significantly affect energy usage and greenhouse gas emissions. Opportunities for the reduction of greenhouse impacts and improvement of energy efficiency include:

- Improved performance marine engines.

The US EPA and the State of California EPA's Air Resources Board (ARB) (<http://www.arb.ca.gov>) and the US EPA (<http://www.epa.gov/oms/marine.htm>) introduced parallel regulations commencing in 2001 requiring manufacturers to market improved performance marine engines. According to the ARB the regulations were introduced due to concerns that many conventional two-stroke marine engines burn fuel inefficiently and 'discharge up to 30 percent unburnt fuel into the environment'; the ARB recommend switching from a two-stroke to a more efficient four-stroke marine engine. ARB analysis shows that advanced technology marine engines burn up to 30 percent less fuel and oil.

- High strength lightweight polyethylene trawler nets.

Fuel savings of 10 to 20 percent per vessel, 40 percent drag reduction and very short term paybacks in fuel cost savings can be achieved with the use of strong high performance polyethylene smaller diameter fibre in trawl nets.

- Improvements in Bycatch Reduction Devices.

NSW Fisheries leads research into the improved performance of these devices. Reduction in bycatch size should result in fuel savings.

- Selection of equipment with low embodied energy content.
- Energy use minimisation control equipment, including timer controls, thermostats, and sensors and controls to optimise: flow rates, temperatures, pressures and other energy relevant variables.
- Matching equipment size and machinery to catch and journey requirements to minimise energy utilisation.
- Use of energy efficient lighting systems and controls.
- Potential application of the Australian appliance energy rating system (<http://www.energyrating.gov.au>) to assist consumers in selecting energy efficient marine engines and vessels. California's ARB has also introduced a marine engine and watercraft labelling system to indicate to purchasers which vessels 'meet', 'exceed' or 'greatly exceed' their new regulatory requirements.

ii Operational Practice

A number of decisions made during operational practice can have significant impacts on energy efficiency and greenhouse gas emissions. Relevant facets of operational practice include:

- Development of systematic and cyclic maintenance programs.
- Implementation of energy and greenhouse management processes, such as:
 - ongoing education for the Estuary Prawn Trawl fishing industry owners and employees in energy and greenhouse mitigation strategies through the distribution of information through industry associations and the boat and fishing licence registration system; and
 - energy and greenhouse audits.
- Ongoing consideration of new technologies as they become available and economically viable.

5 REFERENCES

Anon (1999). Summary and Analysis of Comments: Control of Emissions from Marine Diesel Engines. US EPA EPAA420-R-99-028.

Australian Greenhouse Office (2001). Factors and Methodologies, The Greenhouse Challenge. Commonwealth of Australia, Canberra.

CADDET (1994). Shrimp trawling net gives increased catch with lower fuel consumption. <http://www.caddet-ee.org/techpdf/R177.pdf> ; accessed July 2001.

CADDET (1995). High strength, lightweight fibres in trawler nets. <http://www.caddet-ee.org/techpdf/R215.pdf> ; accessed July 2001.

California Air Resources Board (2001). Off-Road Mobile Source Emission Reduction Program. Recreational Marine Vehicles. <http://www.arb.ca/msprog/marine/marine.htm> ; accessed July 2001.

NSW Fisheries (2001). Draft Estuary Prawn Trawl Fishery Management Strategy.

Appendix A
Questionnaire to Councils

Commercial Fishing Questionnaire

This questionnaire is concerned with any Council involvement in the regulation of commercial fishing, specifically commercial fishing activity in estuaries and from ocean beaches.

Estuary fishing is fishing that occurs in tidal estuary waters, such as lagoons and rivers. It includes the removal of finfish, shellfish and prawns from estuary waters using a variety of methods, such as trapping and netting. Ocean haul fishing is fishing using nets from open ocean beaches.

1. Are you aware of any commercial fishing in estuaries and/or from beaches within your area?

Yes

No

2. Does Council have any formal controls on commercial fishing in estuaries and/or from beaches within your area?

Yes

No (skip to Q.3)

↓

2a. What do these controls deal with? *(Tick all that apply)*

Location of commercial fishing

Operating hours of commercial fishing

Other – please specify: _____

2b. Can you please provide an overview of the nature of any of these controls

3. Are there any joint arrangements between Council and NSW Fisheries for the management of commercial fishing in estuaries and/or from beaches in your area?

Yes

No (Skip to Q.4)

↓

(Answer Q.3a overleaf)

3a. Please outline these arrangements:

4. Does your Council have any records of complaints about commercial fishing in estuaries and/or from beaches?

Yes

No (Skip to Q.5)



4a. Approximately how many complaints have been received?

Less than 5

5-10

10-50

More than 50

4b. What do these complaints specifically relate to? (*Tick all that apply*)

Noise pollution

Air pollution/air quality

Water pollution

Other – please specify: _____

4c. Can you provide some brief comments on the nature of these complaints:

5. Any other relevant comments you would like to add:

Name: _____

Thank you for your time, it is most appreciated.