Just cruising?

Environmental effects of cruise ships

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Preface

Cruising on luxurious ships, being indulged and indulgent, is a rapidly growing pursuit worldwide. It is a sector of the tourism industry that is likely to continue to expand; a product of affluence, an ageing population in many nations, and the relative security and safety of holidaying on a cruise ship.

In the New Zealand context, cruise ships allow access to some of the world's grandest scenery and wild places: Fiordland and the sub-Antarctic Islands. Such jewels are also environmentally fragile with little scope for absorbing major pollution events or cumulative impacts. Thus a precautionary approach could well be New Zealand's best response to managing potential environmental effects of cruise ships.

The large increase in cruises and the number of ships involved in recent years led to my decision to investigate New Zealand's management of actual and potential environmental impacts. It was a decision based on the very simple principle that, given the economic value of the cruising business and the intrinsic values of the places visited, it is better to be safe than sorry. My team and I trust that this contribution to the understanding of international and local cruise ship management systems will contribute to ensuring that environmental risks are further reduced and visitor experiences protected.

Dr J M Williams
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1 Introduction

New Zealand has many advantages as a cruise destination.[1] It has magnificent and varied scenery. The two main islands are long and narrow, enabling inland attractions such as Rotorua and Mt Cook to be easily visited by day trips from a nearby port. Ports are in close proximity to each other and, in most cases, progress from one to the next only requires an overnight voyage. A stop at a number of ports adds variety to a voyage.

Cruise ships give tourists access to regions not easily explored by land, such as Fiordland and Stewart Island. These ships have opened up pristine and highly sensitive ecosystems to tourism, and to the effects of an increasing number of visitors.

The primary environmental impacts associated with cruise ships are: the waste streams produced by the passengers and the ship; and the introduction of exotic marine species via ballast water or marine species attached to the hull. There are other possible direct and indirect impacts facing visited marine environments, such as damage from turbidity and anchors. In response to these potential detrimental effects, international, national and regional legal frameworks have arisen.

In July 2001, the Minister of Tourism released a press statement about the economic benefits of the increasing number of cruise ships visiting New Zealand.[2] The Minister stated that the Government intended to work closely with the private sector to ensure the sustainable growth of the cruise ship industry. The press statement raised concerns about: potential environmental effects associated with cruise ships; what controls exist to avoid, remedy or mitigate these effects; and whether the existing controls are adequate. The Parliamentary Commissioner for the Environment (PCE) decided to investigate and provide information on these matters.[3]

1.1 Background

Cruise ships have been sailing around the Pacific for over a hundred years.[4] The Peninsular and Oriental Steam Navigation Company (P&O) began cruising in the Pacific in the 1930s, and the Union Steamship Company was also operating cruises around New Zealand at this time.[5]

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1 Heslop, James. Forthcoming. The New Zealand Cruise Industry: An Analysis by Itinerary.
2 New Zealand Government press release. *Cruising to a Bright Future*. 26 July 2001.
3 The environmental effects of the New Zealand tourism industry as a whole, and management of these effects, were examined in the Parliamentary Commissioner for the Environment's 1997 report *Management of the Environmental Effects Associated with the Tourism Sector*.
4 Douglas and Douglas. 1996. Cited in Heslop. Forthcoming. op. cit.
5 Heslop. Forthcoming. op. cit.

The modern cruise industry really began to establish itself in the 1960s, with a decrease in the role of ships for transporting people to a particular destination, and an increase in emphasis on the voyage itself. Cruise ship companies concentrated on vacation trips in the Caribbean, and on creating a casual environment and providing extensive on-board entertainment.

The worldwide cruise ship fleet consisted of more than 223 ships carrying an estimated 9.5 million passengers in 1998.[6] During the 2001/02 summer season, 59 cruises by 16 vessels carried 57,560 passengers through New Zealand waters, and 54 of these cruises were four and five star[7] vessels.[8] The cruise vessels range in capacity from 128 to 1,928 passengers.

The cruise industry in New Zealand grew rapidly between the 1996/97 and 1998/99 summer seasons but levelled off in the 2000/01 season, with no growth in the number of cruises since the previous year. The 2001/02 season showed renewed growth, with passenger numbers rising by 78 per cent. And while the estimated numbers have decreased slightly for the 2002/03 season (table 1.1),[9] passenger numbers are expected to continue to grow in the future.

Table 1.1: New Zealand cruise industry summary 1999–2003

	1999/2000	2000/2001	2001/2002	2002/2003[a]
Total cruises	51	51	59	58
Total passengers	26 235	32 227	57 560	*55 515*
Total passenger days	243 635	248 567	401 350	*366 000*

Note:

[a] The number of cruises for 2002/2003 is known, but the number of passengers, and passenger days are estimated. The economic report for the 2002/03 season is due out in September 2003.

Source: Market Economics, 2002, and McDermott Fairgray, 2001.

Cruise ships make a noteworthy contribution to the income generated by the tourism industry in New Zealand. In the 2001/02 season, the 57,560 passengers are estimated to have directly spent $181 million, which led to $649 million in economic activity, $201 million in additional Gross Domestic Product (GDP) and the equivalent of 3,210 full-time jobs.[10] The economic activity for the 2002/03 season is estimated to be worth $614 million[11] to the economy.[12]

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6 United States General Accounting Office. 2000. Marine Pollution: Progress Made to Reduce Marine Pollution by Cruise Ships, but Important Issues Remain. GAO/RCED-00-48.

7 This is the luxury rating of the vessel, which can be up to six stars (the highest).

8 Market Economics. 2002. The Economic Impacts of Cruise Ship Visits: 2001–2002 Season.

9 Market Economics. 2002. op. cit.

10 Market Economics. 2002. op. cit.

11 Market Economics. 2002. op. cit.

12 "Tourism plays a key role in the growth of the New Zealand economy through employment, foreign exchange earnings, investment and regional development. In the year

The economic impact of cruise ships in a given region of New Zealand is generally proportional to the number of passenger days spent in its ports, with the exception of Auckland. Because providoring (purchasing provisions of food and alcohol) and external flight arrivals are predominantly concentrated in Auckland, it receives the greatest economic benefit from the cruise industry. In the 2001/02 season, Auckland attracted 59 per cent of total direct cruise ship expenditure.[13]

There are no New Zealand owned or New Zealand based cruise lines.[14] The cruise ships visiting from abroad for a period each summer form the core of the New Zealand cruise industry. Table 1.2 shows the itinerary types for ships visiting New Zealand's shores in the 2000/01 season. For example, one Holland America Line service came from Singapore to New Zealand and then continued to Tahiti, and ultimately Los Angeles.

Table 1.2: Types of cruises visiting New Zealand waters in 2001/02

Category of itinerary	Number of cruises	Capacity [a]	%
Multiple countries [b]	12	13,839	9.3
Australia and New Zealand [c]	29	36,680	76.5
Around New Zealand [d]	23	4,254	12.6
New Zealand to Pacific [e]	3	1,500	1.6
Total	45	56,273	100.0

Note:

[a] Figures on the actual numbers of cruise passengers were not available at the time of James Heslop's (Massey University) study.

[b] Multiple country itineraries are World or Circle Pacific cruises, where New Zealand is just one of many countries visited and not a focal point. Most of these cruises call at Auckland and many also call at Milford Sound.

[c] These 'back-to-back' cruises travel through a number of Australian ports followed by several New Zealand ports, and finish in Auckland. The ship usually then performs the itinerary in reverse, with a new complement of passengers.

[d] Cruises whose entire journey remains within New Zealand waters are usually undertaken by small ships, which can visit places without port facilities. This category also includes cruises destined for sub-Antarctic islands and Antarctica.

[e] These cruises use New Zealand as a hub to the Pacific. Cruise ships begin in Auckland and cruise to the Pacific islands and back.

Source: Heslop, James (forthcoming). The New Zealand Cruise Industry: An Analysis by Itinerary.

ended March 2000, tourists spent an estimated $13.2 billion in the New Zealand economy. An estimated 94,000 full-time equivalent employees were directly engaged in tourism over this period." (Source: Statistics New Zealand). Cruise ship tourism forms an increasing share of this industry.

[13] Market Economics. 2002. op. cit.

[14] Heslop. Forthcoming. op. cit.

Ports visited by cruise ships, at some time:[15]

- Akaroa
- Auckland
- Bluff (Invercargill)
- Kaikoura
- Lyttelton (Christchurch)
- Milford Sound (Fiordland)
- Napier
- Nelson
- Oban (Stewart Island)
- Opua (Bay of Islands)
- Picton
- Port Chalmers (Dunedin)
- Tauranga
- Wellington
- Westport

1.2 Purpose

Pursuant to section 16(c) of the Environment Act 1986, the purpose of this investigation has been to assess the potential environmental impacts of the cruise ship industry, and to review the legislative framework for regulating cruise ship activity.

The focus of this investigation has been an assessment of the environmental effects of cruise ships within New Zealand waters. However, the investigation has also examined issues that have arisen in other jurisdictions that may be of relevance to the New Zealand situation. Cruise ships are often foreign flagged, so it has been necessary to consider both international and New Zealand maritime law.

This report discusses sources of environmental risk from cruise ships, including those from waste discharges, biosecurity risks, and maritime accidents. It reviews the legislative, regulatory and non-regulatory mechanisms relating to cruise ships, including international conventions and industry codes of practice. It also discusses overseas examples of mechanisms for identifying and resolving adverse environmental effects associated with cruise ships.

This report is not intended to be a comprehensive review of the environmental effects of cruise ships. The aim is to review the effects of most relevance to New Zealand, and highlight where problems may occur, given the likely increase in visits by cruise ships. The report also aims to inform those with an interest in the environmental effects of cruise ships. It suggests some options for how these effects can be addressed, including outlining some of the steps already being taken, both in New Zealand and overseas.

[15] Mihi Smith, McKay Shipping, pers. comm., email, 16 July 2002.

1.3 Terms of reference

The terms of reference are to identify and review:

- environmental effects of cruise ships
- the legislative framework for regulating cruise ship activity
- the effectiveness of the legislative framework to avoid, remedy or mitigate the potential environmental effects.

2 Environmental effects of cruise ships

Cruise ships travel between the oceans of the world. They move between different marine environments, and they may visit relatively inaccessible and unmodified ecosystems. Cruise ships provide an opportunity to see regions that may be difficult to reach by other means. However, cruise ship visits bring risks that include those from pollution, invasive species, and physical damage. Changes that occur to the natural environment may be irreversible.

The International Maritime Organisation (IMO) has established a convention for regulating marine pollution, the International Convention for the Prevention of Pollution from Ships, known as MARPOL 73/78 (see section 3.1). To enable New Zealand to become party to MARPOL, regulations and rules have been established in national legislation (see section 3.2).

2.1 Waste discharges to water

Pollution of water from waste is the most widely discussed type of environmental damage originating from cruise ships. It is a more significant issue for cruise ships than for other marine traffic, because of the pristine and sensitive environments that cruise ships visit, and because of the volume of waste produced by the high number of passengers.

Cruise ships have been likened to 'floating cities', and just like any land-based town, they produce both liquid and solid wastes. These can be subjected to varying degrees of treatment and released in a number of forms. Liquid wastes include sewage, grey water, bilge water, and hazardous wastes. Solid wastes include food waste and packaging.

For tangata whenua, water is a taonga of fundamental importance, and thus maintenance of its quality and integrity—physically and in cultural and spiritual terms—is an ongoing priority for kaitiaki.[16] The responsibilities of kaitiaki include working for the appropriate management and protection of coastal systems, harbours, mahinga kai, customary fisheries, and places of spiritual and historical significance such as wahi tapu or tauranga waka.[17] The discharge of sewage (including treated sewage) or other wastes to water and the sea has been rejected by many iwi and hapu as offensive and against tikanga and traditional values.[18]

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[16] Douglas, Edward M.K. 1984. He Timatanga: Waiora, Waimaori, Waikino, Waimate, Waitai.

[17] For example, Huakina Development Trust and Tainui Maori Trust Board. 1996. *Waikato Iwi Resource Management Plan for the Manukau Harbour and Catchments*. Huakina Development Trust: Pukekohe; Te Runanga o Ngai Tahu. No date. *Freshwater Policy*. Te Runanga o Ngai Tahu: Christchurch; or other iwi environmental and resource management plans.

[18] For example, Te Hao o Ngati Whatua. 1999. *Te Tiko*. Report prepared for North Shore City Council, Auckland.

2.1.1 Liquid wastes

Discharged liquid wastes can affect organisms in a marine ecosystem either directly by poisoning, or indirectly by changing the nutrient balance of the ecosystem. Filter-feeding organisms such as shellfish are particularly vulnerable to liquid waste discharges. They can accumulate discharged contaminants and pathogens to harmful levels, which can affect species population levels, and in turn impact on community and ecosystem structures. These toxic substances can also adversely affect the health of any organism eating them, because they bio-accumulate up the food chain. This can have an economic impact on the aquaculture industry if a marine farm has to shut down in order to protect human health, or loses production because of contamination. In August 2001 the operations of 18 Bay of Island oyster farms were shut down, because of sewage contamination that may have come in part from commercial and recreational boating.[19]

The effects of nutrient-rich wastes on marine habitats can be significant when introduced into an aquatic environment that is relatively still, and thus susceptible to algal blooms because of reduced mixing. These risks are alleviated to some degree if the ship is travelling at speed at the time of discharge, which will usually be when the ship is in open coastal water. This allows for faster dilution and dispersion of the contaminants, because the water depth and degree of mixing are greater.

Sewage

Sewage, or black water, is waste from toilets, medical sinks and other similar facilities. It is usually separated from grey water (see next section). Ships discharge either untreated or treated sewage. The raw sewage from ships is generally more concentrated than domestic raw sewage, because cruise vessels use smaller volumes of water for sewage disposal.[20] The sewage from vessels introduces disease-causing micro-organisms and excessive nutrients into the marine environment.

In addition to this, chemicals such as chlorine, ammonia and formaldehyde are used in many marine sanitation devices (MSDs), and are harmful to marine life.[21] Even ships with MSDs do not always treat the sewage to the required standard. A study by the State of Alaska in 2000 found that MSDs on many of the cruise ships tested were not being correctly operated or maintained.[22] In response to this study, many cruise ships made an effort to improve their performance while in Alaskan waters.[23]

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[19] Northland Regional Council. Media release, 28 March 2002. www.nrc.govt.nz/reports.and.news/media.releases/2002/march/mr_280302_nrc_commits_boat_sewage_control.shtml

[20] United States Environmental Protection Agency Office of Water, Oceans and Coastal Protection Division. Cited in Schmidt, K. 2000. *Cruising for Trouble: Stemming the Tide of Cruise Ship Pollution*.

[21] Schmidt. 2000. op. cit.

[22] Alaska Cruise Ship Initiative. 2001. *Part 2 Final Report.*

[23] Klein, R. A. 2002. *Left In Its Wake*.

Cruise line companies are now testing and installing on-board advanced wastewater treatment systems, designed to produce treated sewage of high quality and purity.[24] These treatment systems produce large amounts of sludge,[25] which can be offloaded for disposal at port but is often discharged out at sea.[26]

Grey water

Grey water consists of wastewater from showers, sinks, laundries and galleys, and includes contaminants such as cooking oil and grease, pesticides, detergents, metals, and cleaners. The contents of grey water can adversely affect marine life and habitats by depleting dissolved oxygen, and through the toxicity of its contents.[27] Grey water also contains faecal coliforms, largely from laundry wastes. Consequently, some regional councils regulate grey water in their regional coastal plans (see section 3.2). In the internal waters of Fiordland, grey water discharge is prohibited, and elsewhere in New Zealand it has to satisfy the conditions in the coastal plan before it can be discharged. In the past, cruise ships overseas would discharge grey water at any time, but now the common practice is for cruise ships to discharge grey water only once en route, and when travelling over the speed of six knots, which results in the grey water discharged being diluted.[28]

Oil

Oil can have severe or lethal effects on marine life, even in low concentrations. Ingestion can kill birds and fish, while marine mammals may suffer from skin and eye lesions from contact with oil, and ingestion and inhalation can cause a range of internal injuries such as liver toxicity and lung congestion. Long-term exposure to low concentrations of oil can cause as much harm as short-term exposure to high concentrations.[29]

Between 1993 and 1998, 81 of the 87 illegal discharge cases in United States (US) waters from foreign-flagged cruise ships were for oil or related chemicals.[30] Around three-quarters of these cases were accidental. It is estimated that one-third of petroleum discharges into the world's oceans each year are not related to collisions or other accidents.[31]

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[24] International Council of Cruise Lines. 2001. *Cruise Industry Waste Management Practices and Procedures*. Attachment to ICCL Standard E-1-01, (Revision 1).

[25] Solid material that is separated from the sewage during the treatment process.

[26] The Zenon system, which Holland America Line has installed on its ships that travel to Alaska, is reported to produce between 30 and 50 tonnes of sludge per week. This is usually discharged beyond the 12 nautical mile limit imposed on ships over 400 gross tonnage by the international MARPOL convention (see section 3.1 for more details). Source: Klein. 2002. op. cit.

[27] The Ocean Conservancy. 2002. Cruise Control: A Report on How Cruise Ships Affect the Marine Environment.

[28] Kim, D. K. 2000. Cruise Ship Waste Dispersion Analysis: Report on the Analysis of Graywater Discharge.

[29] The Ocean Conservancy. 2002. op. cit.

[30] United States General Accounting Office. 2000. Marine Pollution: Progress Made to Reduce Marine Pollution by Cruise Ships, but Important Issues Remain. GAO/RCED-00-48.

[31] National Research Council. 1985. Cited in The Ocean Conservancy. 2002. op. cit

In New Zealand, discharged bilge water is a common cause of reported oil spills.[32] Water collecting in a ship's bilge, which is the lowest part of the interior of the ship's hull, is discharged periodically. As a result of internal spills following equipment malfunction or human error, bilge water may contain oily liquid wastes including fuels, oils, wastewater from engines, on-board spills, and other fluids from machinery that collect in the bilge. Bilge water can also have high levels of Biochemical and Chemical Oxygen Demand (BOD[33] and COD[34] respectively), and contain dissolved solids, oils and other harmful chemicals. It may also contain rags, metal shavings and glass.

On most ships bilge water is usually filtered before discharge, to reduce the oil concentration to the legal limit (usually this is 15 parts per million).[35] Section 3 discusses regulatory controls on the discharge of oil, including bilge water.

Hazardous wastes

The main hazardous wastes produced on board cruise vessels include: photo processing chemicals (which are high in toxic silver residues); dry cleaning sludge (containing perchloroethylene (PERC)); print waste such as ink, solvents, and cleaners (containing chlorinated hydrocarbons and heavy metals); other dirty solvents; batteries (which contain lead, cadmium and lithium); fluorescent lamp bulbs (containing mercury); and unused and expired pharmaceuticals.[36] Previously some of these liquid hazardous wastes were simply mixed in with grey water and discharged without treatment. Now they are generally recognised as toxic wastes and treated accordingly. This can be done by either storing the wastes for treatment and disposal on land, or by removing the toxic chemical, for example removing silver from photo processing wastes.

2.1.2 Solid wastes

Another potential hazard from cruise ships is the discharge of solid wastes. On average, each passenger on a cruise ship accounts for 3.5 kilograms of solid waste daily, and cruise vessels account for over three-quarters of all ship waste.[37] This consists of food wastes, glass, plastics, paper, cans, cardboard and wood. In comparison, an average of 5 kilograms of domestic waste is produced per person per week in Auckland.[38] Cruise ships produce a large amount of food waste, because of the provision of excess food for passengers.[39]

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[32] Maritime Safety Authority. *Safe Seas—March 2003.* http://www.msa.govt.nz/Publications/publications/SafeSeas200303.pdf
[33] Indicates organic pollution.
[34] Indicates inorganic pollution.
[35] The Ocean Conservancy. 2002. op. cit.
[36] The Ocean Conservancy. 2002. op. cit.
[37] Campbell, Frank A. 1999. *Whispers and Waste*.
[38] www.arc.govt.nz/arc/big-clean-up/reduce-rubbish-campaign/
[39] Klein. 2002. op. cit.

Most solid waste is usually incinerated aboard the vessels, and the resulting ash is then either offloaded or discharged into the ocean.[40] This ash may be toxic if batteries and other hazardous wastes are incinerated with the non-hazardous rubbish.[41] If cruise ships fail to incinerate their solid waste before disposing of it into water, or if passengers throw litter overboard, this can result in the release of plastics, which have the potential to harm marine animals through ingestion or entanglement.[42] This also has a visual impact on beaches, where some of the rubbish will eventually wash up.

There has been a high rate of illegal solid waste discharge in the past. In the last decade of the 20th century, several cruise companies were fined large amounts for illegal discharge of rubbish in US waters.[43] In New Zealand, some regional councils have recognised a need for the infrastructure for onshore disposal of marine wastes, and have included this in their regional coastal plans. Most ports also offer incineration facilities. At the Port of Auckland the standard amount of rubbish taken off a cruise ship for incineration is between 50 and 100 fifty-four kilogram drums.[44]

To improve their situation regarding waste management, many cruise companies have agreed to take steps to reduce the amount of rubbish they produce. These steps include source reduction by buying in bulk and choosing products with less packaging, and by recycling glass, paper, wood, cardboard, and aluminium and other metals. As a result of these measures, the total waste on passenger vessels was reduced by nearly half in the ten years to 2001.[45]

2.2 Waste discharges to air

Cruise ships have two main emission sources for discharges to air: a solid waste incinerator; and the 'master and slave' engines used for propulsion and electricity generation. Every ship has a number of engines of different sizes, and they may use the same engines for both movement and power generation. Marine engines generally burn cheap residual fuel oil[46] of low quality (not the standard diesel).[47]

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40 Royal Caribbean International. 1998. Cited in The Ocean Conservancy. 2002. op. cit.

41 The terms 'garbage' and 'rubbish' are used interchangeably throughout this report. The term 'garbage' is used in international legislation, whilst New Zealanders generally use the term 'rubbish'.

42 For example, it is estimated that as many as 30,000 Northern fur seals die annually from entanglement in debris. Giuliano, J. A. 2000. *Cruise Ship Pollution—A Holiday of Toxins*.

43 US General Accounting Office, Accounting Office. 2000. op. cit.

44 Leigh Rusbridge, Marine Operations Coordinator, Ports of Auckland, pers. comm., 14 February 2003.

45 International Council of Cruise Lines. 2001. *Cruise Industry Waste Management Practices and Procedures.* Attachment to ICCL Standard E-1-01, (Revision 1).

46 Residual fuel is the heavier oils that remain after the distillate fuel oils and lighter hydrocarbons are distilled away in refinery operations. Source: Nebraska Energy Office—Glossary of Energy Terms.
http://www.state.ne.us/home/NEO/glossary/glossary.htm

47 Ships travelling to Alaska have started to use a better quality residual fuel oil. Switching to diesel would double their fuel costs.

Annex VI of MARPOL is concerned with the prevention of air pollution from ships. This annex is not yet in force internationally, because of a lack of signatories. New Zealand has not yet acceded to this annex (see section 3.1).

When in port, cruise ships still require electricity on board, which is often generated by running the engines. The infrastructure does not exist at any New Zealand port for the ships to connect to the local electricity grid, because of the large electricity requirement of a ship for only a short time. This means the quality of the fuel burnt is then important, since in many ports the resulting air pollution is being introduced into a populated area.

Environmental impacts from cruise ship smokestack emissions are often visible (figure 2.1). The opacity of the discharges from a ship's smokestack immediately and directly impact on the aesthetic value of its surroundings, by clouding the view in a smoky haze. This is less of a problem when the ship is in port, because the generators will not be producing large amounts of exhaust. However, it becomes more of an issue when the ship is sailing in or out of port, or around a harbour or fiord, or in any area where an inversion layer can form.

Figure 2.1: A cruise ship in Milford Sound with stack discharges constrained by an inversion layer.[48]

Source: Environment Southland, 2000/01 Compliance Monitoring Report.

The gases and particulate matter contained in the smokestack emissions may have longer-lasting and wider-ranging effects than the impact on amenity values. These emissions generally contain particulates (measured as PM_{10}

[48] An inversion layer occurs when a layer of warm air forms over a layer of cooler air, trapping pollutants in the cooler layer. For more information see: http://www.niwa.cri.nz/ncc/cu/2002-07/backgrounder

and $PM_{2.5}$)[49] as well as oxides of carbon, nitrogen and sulphur.[50] These contents scatter and absorb light, allowing the emissions to be seen. Small amounts of hazardous pollutants such as PCBs (polychlorinated biphenyls) and PAHs (polycyclic aromatic hydrocarbons) are also emitted, which may also be produced by the solid waste incinerator. The smokestack and exhaust emissions produced in one day by a single cruise ship have been estimated to be equivalent to those produced by 12,000 automobiles.[51]

If emissions occur into a populated environment, they may have an effect on people's health. Particulates may irritate eyes, throat and lungs, and contribute to respiratory problems.[52] Nitrogen oxide is mainly produced from the combustion of fossil fuels. It then reacts with other gases in the atmosphere to produce nitrogen dioxide, which is a pungent, corrosive and strongly oxidising gas. Inhaling nitrogen dioxide affects the respiratory system and increases the chances of lung infection.

Sulphur dioxide is produced from the combustion of fossil fuels, especially diesels. It can irritate eyes, throat and lungs, and may cause respiratory problems. Overseas, sulphur dioxide and nitrogen oxides may contribute to the acidification of rain, although this is not currently a problem in New Zealand. In addition, carbon dioxide and nitrogen oxide emissions contribute to global climate change.

The quantity and quality of emissions from a ship are dependent on the quality of the fuel oil used, and the overall efficiency of the vessel. There is a financial incentive for the ship's operator to address factors affecting performance (e.g. engine efficiency) and maintenance of the cruise ship (e.g. hull cleaning). For example, a ship with less than six months unprotected hull exposure (i.e. no antifouling treatment—see section 2.9) can result in sufficient hull fouling to increase fuel consumption by 50 per cent.[53]

There are now industry initiatives to improve the quality of emissions from cruise ships. Some examples on recently commissioned vessels are the use of gas turbines, which can reduce exhaust emissions by up to 90 per cent, exhaust gas cleaning systems, and the introduction of new electronic propulsion systems, which offer fuel savings.[54] Some ships such as *The World*, which visited New Zealand in 2003, have changed to marine diesel, which is cleaner and less viscous than the heavy residual fuel oil usually

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[49] PM_{10}—particles with a diameter of less than 10 microns. $PM_{2.5}$—particles with a diameter of less than 2.5 microns.

[50] In Alaska, the State does not have a limit for these pollutants because Marine vessels are not included under the US Clean Air Act. The US Environmental Protection Agency (EPA) is moving to include them. Whether or not EPA has jurisdiction over foreign-flagged vessels remains unclear. EPA believe they have jurisdiction and are proposing regulations for limits of NO_x, SO_2, CO, CO_2 and PM. Source: Carolyn Morehouse, Alaska Department of Environmental Conservation, pers. comm., 9 September 2002.

[51] www.stopcruisepollution.com/index.cfm?fuseaction=factsheet_detail&factsheetID=990

[52] Ministry for the Environment website www.mfe.govt.nz/issues/air/breathe/particles.html

[53] WS Atkins. 1998. Cited on www.ortepa.org/pages/ei17.htm

[54] Johnson, D. 2002. Environmentally Sustainable Cruise Tourism: A Reality Check.

used by ships this size.[55] In the event of an oil spill, marine diesel does not persist in the environment because it evaporates quickly.

2.3 Biosecurity risks

2.3.1 Hull fouling and ballast water

Hull fouling is the settlement, attachment and growth of marine plants and animals on the ship's hull, propellers, underwater discharge and suction openings and their gratings (known as sea chests), and on various other appendages, such as fins and thrusters. This presents a biosecurity risk when the fouling organisms are flushed out into port waters from pipe-work systems, when the hull is cleaned, or when pieces chip off as the hull knocks against structures.

The cruise ship itself is not the only means for introducing species. The smaller craft that cruise ships often provide, such as kayaks, also pose a risk. These recreational vessels may only be used occasionally, but this will be in various places along the cruise ship's voyage.

A study by the National Institute of Water and Atmospheric Research (NIWA) estimated that, of the 159 known species of exotic marine organisms introduced into New Zealand waters, 3 per cent arrived in ballast water, and 69 per cent arrived attached to hulls.[56] A more recent study by the Cawthron Institute suggests that sea chests are the main pathway for the transfer of unwanted marine invertebrates into New Zealand waters.[57] Sea chests provide a more sheltered environment for the organisms to be transported in, as they are not exposed to the fast water flows that occur in ballast tanks. A combination of preventative measures is likely to be needed to address this problem, including the use of toxic chemicals and electricity to kill the organisms, and more research will help to determine the best approach.[58]

While the impact of many of these organisms is largely unknown, potential effects include the destruction of indigenous ecosystems, human health risks, and economic impacts. Exotic marine organisms could also have adverse effects on mahinga kai and customary fisheries important to tangata whenua, or on traditionally significant coastal and marine taonga species,[59] their habitats or food sources. With the recent boom in New Zealand's aquaculture industry,[60] the introduction of an organism that may threaten production has a potentially high economic cost.

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55 www.residensea.com/about/

56 NIWA. 2000. Vessel Hulls: Continuing Vectors of Exotic Marine Organisms?

57 Dodgshun, T. and Coutts, A. 2002. Ships' Sea Chests: A 'Side Door' for Marine Pests?

58 Dodgshun and Coutts. 2002. op. cit.

59 For example toroa (albatross), titi (muttonbird or shearwater), and kuaka (godwit).

60 In 2000, Greenshell™ mussels were New Zealand's second largest seafood export, with total sales of $169 million. New Zealand Seafood Industry Export Summary—www.seafood.co.nz

A seasquirt from the North Atlantic, *Ciona intestinalis*, introduced by hull fouling, smothers mussel lines and is causing a problem for the aquaculture industry in the Marlborough Sounds.[61] In the US Great Lakes, since the European Zebra Mussel was introduced in 1988, US$1 billion has been spent each year removing it from blocked intakes on vessels, power plants, and other industrial installations.[62]

The Ministry of Fisheries has proposed regulations under the Biosecurity Act 1993 to combat hull-fouling risks. The regulations will require collection and controlled disposal of fouling material removed from hulls, as well as treatment of any water discharge that has been used in the cleaning process.[63]

As with all large ships, cruise ships need to carry ballast, which is weighted material carried to maintain stability and ensure the ship is deep enough in the water to enable effective operation of the propellers. Ballast can be permanent or portable. Water is usually used as portable ballast. Some cruise ships use portable ballast, and will take on and discharge sea water for ballast. This is usually done when the ship is being loaded, as fuel oil and freshwater supplies are used up, or to maintain stability with the movement of passengers.[64] Ballast water presents a biosecurity risk when this water is carried from foreign marine environments, because it can act as a means for exotic organisms to reach New Zealand waters.

Ballast water from cruise ships often poses a greater threat than ships such as cargo and oil tankers, because cruise ships travel primarily in coastal waters close to the shore, and often visit relatively pristine environments. To avoid the time and cost of going out to sea to exchange ballast water, the ships often pick up and discharge ballast water close to shore.[65] Although in New Zealand most discharged ballast water would be from our own territorial sea, there is still the risk that unwanted organisms, which have established in isolated pockets, will be spread around the country. This is recognised as a serious risk in the Fiordland area.[66]

The Ministry of Fisheries has introduced ballast water controls in an Import Health Standard under the Biosecurity Act 1993. Permission is required to discharge ballast water inside New Zealand's territorial waters, if the water was loaded in another country. This permission will generally be granted if it can be shown that the ballast was exchanged in international waters or is freshwater. Exceptions are allowed for emergency discharges for ship and

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61 www.fish.govt.nz/sustainability/ballast/hull-cleaning/consultation.htm

62 www.fish.govt.nz/sustainability/ballast/hull-cleaning/consultation.htm

63 Ministry of Fisheries, *Public Consultation Paper—Proposed Biosecurity (Hull Cleaning) Regulations*. www.mfish.govt.nz/sustainability/ballast/hull-cleaning/consultation.htm

64 Captain Mike Pearson, Harbourmaster, Environment Southland, pers. comm., 4 February, 2003.

65 Environmental Law Foundation. *Ballast Water and Cruise Ships.* www.bluewaternetwork.org./reports/rep_ss_cruise_ballastfacts.pdf

66 Guardians of Fiordland's Fisheries and Marine Environment Inc. 2002. Draft Integrated Management Strategy for Fiordland's Fisheries and Marine Environment.

crew safety, or if it can be shown that an exchange of ballast water could not have been undertaken safely on the voyage.[67] The rationale for requiring deepwater ocean exchanges is that while it is not possible to exchange all the ballast water, this at least dilutes the contaminated water somewhat and lessens the chances of survival for any invasive species that may be present. Because of Fiordland's unique ecosystem, invasive freshwater species have a higher chance of survival, and hence Fiordland has been identified as at risk from freshwater ballast.[68]

The following are some examples of exotic marine organisms that have been introduced to New Zealand, probably in ships' ballast water or by hull fouling:

- The Asian mussel, *Musculista senhousia*, was introduced to New Zealand in the late 1970s.[69] *M. senhousia* subsequently invaded the east coast of New Zealand in the Auckland region, where it lives in sandy intertidal and shallow subtidal sediments, in mats of byssal thread that accumulate mud. Densities of other marine fauna, especially bivalves, are reduced within these patches. However, the patches persist for only 1–2 years, so adverse effects are thought to be short term and localised.
- The laminarian kelp, *Undaria pinnatifida*, a native of the northwest Pacific, was introduced to New Zealand during the 1980s.[70] Although *U. pinnatifida* has potential as a farmed sea vegetable, it is causing concern in a number of highly valued coastal areas in New Zealand, where its invasive nature threatens native algal biodiversity and ecosystem structure and function.
- An encrusting tubeworm, *Ficopomatus enigmatica*, was introduced to New Zealand in the 1960s.[71] Its extensive encrustations extended to the cooling water intakes of the power station in Otara, Auckland, resulting in closures of the plant and, eventually, the installation of alternative cooling technologies.

2.3.2 Undeclared food items

The Ministry of Agriculture and Forestry (MAF) has identified a biosecurity risk from passengers taking fruit off ships when they are in port. This has been estimated to be 82 per cent of the total biosecurity risk from cruise ship passengers. To combat this risk, MAF has committed to producing a video specifically aimed at cruise ships to be shown on arrival in port, along with

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[67] Ministry of Fisheries website. www.fish.govt.nz/sustainability/biosecurity/ballast_health.html
[68] Guardians of Fiordland's Fisheries and Marine Environment Inc. 2002. op. cit.
[69] Forrest, B., et al. 1997. Foreign Marine Species in New Zealand: Towards a Risk Assessment and Management Model.
[70] Forrest et al. 1997. op. cit.
[71] www.fish.govt.nz/sustainability/ballast/hull-cleaning/consultation.htm

appropriate signage.[72] This is being carried out as part of MAF's 'Protect New Zealand' programme. MAF inspects all cruise ships arriving in New Zealand, and hand luggage of disembarking passengers and crew must be available for inspection by MAF quarantine officers, and sometimes also by detector dogs.[73] In the 1999/2000 cruise season, MAF also trialled a system of providing 'safe' fruit for passengers to uplift on the gangway to discourage illegal fruit removal, following some success with a similar trial in the early 1990s.[74]

2.4 Risks from maritime accidents

Maritime accidents can result from operator error, poor seaworthiness of ships, or inclement weather. Between 1991 and 1999, at least ten cruise ships worldwide had to be evacuated because of running aground or a fire on board.[75] While few such accidents have occurred in New Zealand waters, the potential for environmental damage can be high, mainly because of the risk from an oil spill.

Cruise ships are not currently a major contributor to waterway congestion, as New Zealand's cruise ship industry is still in its infancy. However, if the number of cruise ships visiting New Zealand continues to increase, the risk of cruise ships colliding with other water users will also increase. There is also a risk of cruise ships colliding with other obstacles during their sightseeing voyages, including wildlife and reefs.

The sinking of the Russian cruise ship the *Mikhail Lermontov* in the Marlborough Sounds in 1986 was the result of operator error.[76] The ship was taken through an area that was too shallow, and was grounded on rocks, damaging the hull and causing the ship to take on water. All passengers were evacuated safely from the ship. One crew member drowned, most likely immediately after the collision. An environmental disaster was avoided as no oil was lost during the collision that damaged the vessel, and all oil was removed from the ship's tanks in the two months following the sinking.

Poor seaworthiness can result from inadequate maintenance and inspections, or the age of the vessel. However, this is not often a problem with passenger vessels, as they have much stricter regulations than for cargo ships. The Maritime Safety Authority (MSA) inspects 55–60 per cent of ships visiting New Zealand, especially first-time visitors and older vessels.[77] This is primarily a safety inspection and will not always detect more subtle

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[72] MAF Cruise Ship Survey 1999–2000 Season, Dr Carolyn Whyte, MAF Quarantine Service, Auckland. Cited in Mitchell, Andy. 2001. *The New Zealand Cruise Industry—an informal industry sector review*.

[73] www.maf.govt.nz/quarantine/ships-yachts/

[74] Mitchell. 2001. op. cit.

[75] Hamer, Mike. 2001. Abandon Ship! *New Scientist*, 18 August 2001.

[76] For more details see http://library.christchurch.org.nz/Childrens/NZDisasters/MikhailLermontov.asp and www.nzmaritime.co.nz/lermontov.htm

[77] Jack Hutchings, Manager Ship Safety Inspections, Maritime Safety Authority, pers comm., 29 May, 2003.

problems, such as a leak in the hull, unless the ship's operator tells the inspector about this. In March 2003 the cruise ship *Pacific Sky* made an unscheduled return to Auckland, after departing for Tonga three days before with 1,479 passengers.[78,79] The ship was taking on water. Inspections showed that water had entered two water escape ducts, which had corroded, and this had also caused a small part of the hull to corrode.[80] The MSA detained the ship, and the MSA and the Lloyd's Classification Society needed to be satisfied with the repairs before the ship could depart. The repairs took more than two weeks. While the ship was in no danger of sinking, such an incident, while rare, shows there is a risk from poor seaworthiness of cruise ships, in particular for highly sensitive and remote areas such as Fiordland.

If a collision between a cruise ship and another object occurs, an oil spill may result. Cruise ships carry a large amount of fuel oil,[81] usually heavy grade and highly viscous. A large oil spill could result in the death of a large number of sea birds. Sea birds have a high risk of contact with spilled oil, because of the amount of time they spend on or near the surface of the sea and on oil-affected foreshores. Marine mammals and marine life close to shore would also be affected, and oil settling on the seabed would smother other marine life, including corals. An oil spill could also have adverse impacts on mahinga kai and customary fisheries, and on cultural and historical values for tangata whenua in coastal and marine areas.

The New Zealand Marine Oil Spill Response Strategy adopts a three-tiered approach for dealing with marine oil spills.[82] A small oil spill (Tier One) will be cleaned up by the spiller, if it is not too large for them to cope with. The regional council is responsible for larger spills (Tier Two), or if the spiller cannot be identified. If an oil spill occurs that is too large for the regional council to manage, or if there is a significant spill beyond 12 nautical miles, the MSA takes control (Tier Three).

The potential for an environmental disaster resulting from an oil spill places a significant onus on regional councils because of their requirement, under the Maritime Transport Act 1994, to act in the event of a Tier Two spill. They are required to prepare a contingency plan to promote and provide a planned and coordinated response to marine oil spills, which may also

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78 MSA press release. *MSA inspects cruise ship Pacific Sky*. 17 March 2003. www.msa.govt.nz/Publications/pressreleases/20030317.htm.
The New Zealand Herald website has details of this story. Go to www.nzherald.co.nz—do a search for 'Pacific Sky'; also see: New Zealand Herald. *Leaking liner cuts Pacific cruise short*. 16 March 2003. www.nzherald.co.nz/marine/marinestorydisplay.cfm?storyid=3201114&reportid=57034

79 More details can be found in New Zealand Ship and Marine Society. 2003. Nautical News. *Journal of the New Zealand Ship and Marine Society 51 (3):* 151–152.

80 These ducts are used to divert water from higher up on the ship to ensure the ship remains stable and upright if it is taking on water, and would normally not contain water. The ducts had very likely not been inspected for several years as they were in a confined space, making adequate inspections difficult.

81 Cruise ships visiting New Zealand do not refuel here, because they carry enough fuel for the entire voyage. For example, *Star Princess*, 109,000 tonnes, carries 2,250 tonnes of fuel, and *Regal Princess*, 70,000 tonnes, carries 2,714 tonnes of fuel. Ken Swinney, Policy and Planning Manager, Environment Southland, pers. comm., 2003.

82 See www.msa.govt.nz/Protection/strategy.htm

include assisting with restoration of oil-damaged environments. This is an additional responsibility in areas like Fiordland, which otherwise would not be visited by vessels carrying large amounts of oil.

The MSA is currently working with Environment Southland (Southland's regional council) to develop an oil spill response plan for Fiordland.[83] Environment Southland has the capacity to deal with a small diesel spill from a fishing vessel but for anything larger, the MSA is responsible. The oil used for fuel on cruise ships is usually low grade residual black oil, so there is a high risk of environmental damage if a spill occurs. The oil spill response plan assesses the ecological risk of an oil spill. It is the first one of its type to be developed in New Zealand, and similar plans will probably be developed for other high risk areas.

2.5 Effects on wildlife

Boats can adversely affect marine wildlife when they enter an area. Studies of bottlenose dolphins in the Bay of Islands found that, as tourism levels increased, the dolphins became 'sensitised' to swimmers, and had started to avoid boats.[84] There is also evidence of behavioural changes in whales because of the whale-watching activities in Kaikoura. However, because cruise ships do not often visit this area, they are not yet contributing to this problem.

Collisions with marine mammals can cause injury or death to the animals. An Otago University study found that 7 per cent of the bottlenose dolphins in Fiordland bore scars from boat collisions—and an unknown number might not have survived collisions.[85] In July 2001, a pregnant humpback whale, an endangered species, was killed in the waters of Glacier Bay National Park in Alaska by a collision with a cruise ship.[86] In Canada, in June 1999, a cruise ship that had passed through the Johnstone Strait docked in Vancouver and a dead fin whale was found impaled on its bow.[87] In January 2003, the Department of Conservation (DOC) expressed concern over the number of whales, mainly Brydes whales, which have been found dead in the Hauraki Gulf. Four of the five dead whales found in the previous 18 months were confirmed to have been victims of vessel collisions.[88]

2.6 Turbidity

There is a potential environmental impact from turbidity effects caused by the wake of marine vessels. These effects are caused by waves resulting from the wake increasing erosion of the shoreline, or by the vessels stirring up sediment from the seabed. The increased turbidity decreases light levels,

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[83] Julian Roberts, Environmental Analyst, Maritime Safety Authority of New Zealand, pers. comm., 30 May 2003.
[84] 'Dolphins hit by eco-tour boats', *Dominion Post*, 29 August 2002, p. A3.
[85] *Dominion Post*, 2002. op. cit.
[86] www.acsonline.org/Conservation0110.htm
[87] www.wavelengthmagazine.com/1999/as99archipelago.php
[88] Holby, K. 2003. 'Alarm over spate of whale deaths', *NZ Herald*, 8 January 2003, p. A5.

and the suspended material may also clog fish gills and settle over benthic habitats.[89] Such sedimentation and disturbance can have adverse impacts on shellfish beds and other mahinga kai resources important to Maori. Adverse effects from increased coastal erosion can include exposure of urupa (burial grounds) or koiwi (human remains), which will require tangata whenua involvement with appropriate protocols to deal with the tapu. A deed of agreement between the cruise industry and Environment Southland limits the speed of vessels to five knots within 200 metres of the shore and within 20 metres of other vessels, to control potential damage by the ship's wake (see section 3.6 and Appendix B). In other areas, regional councils also impose vessel speed limits in their regional coastal plans.

2.7 Risks to specific ecosystems

The New Zealand Sub-Antarctic Islands are on the United Nation's World Heritage List. Small cruise ships have regularly visited some of these islands since the 1980s. To guard against negative environmental impacts on these islands, there is a strict code of conduct enforced by DOC. All visitors must have a permit, be accompanied by a DOC representative, and a maximum of 600 visitors per year are allowed to land at each site.[90]

A subtle environmental effect of cruise ships suggested as a potential risk for the World Heritage-listed Port Davey/Bathurst Harbour region of Tasmania, Australia, could be a risk for Fiordland, also a World Heritage area.[91] In Bathurst Harbour, freshwater run-off from the surrounding land is rich in tannin and creates a tea-stained layer of fresh water overlying the seawater. Nutrient levels are very low, and the amount of light filtering through the dark tea-stained layer and reaching the seabed is similar to that for much deeper water. These conditions create an environment attractive to a range of wire corals, sea fans and other fragile organisms that are normally found only in very deep water out in the Indian Ocean.

The Tasmanian Conservation Trust claims that bringing a large cruise ship into the constricted area of the Bathurst Narrows or Bathurst Harbour could easily damage this delicate environment.[92] They suggest that the wash from propellers and thrusters would create powerful water movements and rip delicate wire corals and other organisms off the seabed. Anchors would also be very destructive for much of the seabed. An additional impact would occur if the passage of a large vessel disrupted the layers of water, mixing the tannin-stained low salinity water on the surface with the underlying

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[89] Water on the Web, wow.nrri.umn.edu/wow/under/parameters/turbidity.html, sourced from Michaud, J.P. 1991. A Citizen's Guide to Understanding and Monitoring Lakes and Streams and Moore, M.L. 1989. NALMS Management Guide for Lakes and Reservoirs.

[90] Protected Areas Programme—World Conservation Monitoring Centre website. www.wcmc.org.uk/protected_areas/data/wh/subantar.htm

[91] Tasmanian Conservation Trust. *Cruising to Destruction: Cruise Ships Threaten Unique Marine Environment in Tasmania's South West.* www.tct.org.au/marc1.htm

[92] Tasmanian Conservation Trust. op. cit.

seawater. Through mixing, the reduced salinity of water near the seabed could poison bottom-dwelling life forms.

In Fiordland the seawater is covered in a layer of fresh water, containing tannin, detritus and humic material, from snow and rain runoff. This layer absorbs light and inhibits kelp and algal growth, allowing plants that normally grow in deeper water to establish closer to the surface and in turn support a unique ecosystem of other marine organisms.[93] Environment Southland's deed of agreement limits the areas accessible to cruise ships, and allows a maximum of two cruise ships to be in any one place at one time (see section 3.6 and Appendix B). In a detailed study done by the Guardians of Fiordland's Fisheries and Marine Environment, cruise ships, as they are currently controlled, are thought to pose no substantial risk, other than collisions or spills.[94]

2.8 Anchor damage

The anchors used by marine vessels can cause damage to the ocean floor. This can be a significant effect for regions with coral reefs present. If no docking structures exist, anchors must be used when a cruise ship comes into port. Also, an anchor can be used to save fuel if a cruise ship wants to stay in one place while in a current, because engines are not then required to hold its position.

Debate has occurred in the Cayman Islands, in the Caribbean, regarding the need for permanent cruise ship moorings. The aim of such moorings is to protect the fragile marine environment that is the basis for the Cayman's world-class dive industry. Currently, when ships enter the harbour they release their anchors, and the anchor chains can cause extensive damage to the reefs as they drag along the coral.[95]

There are a number of worst-case examples from around the world, where cruise ship anchors have done tremendous damage to coral reef structures. In one example, a cruise ship anchor was found to have destroyed a coral reef the size of half a football field in one day, and half as much again, which was covered by rubble, died later. It was estimated that coral recovery would take 50 years.[96] Another study found reefs in 90 of the 109 countries with coral reefs were being damaged by cruise ship anchors and sewage, by tourists breaking off chunks of coral, and by commercial harvesting for sale to tourists.[97] To address these problems, some cruise line companies are now investing in rehabilitation projects. After the Holland America Line's ship *The Maasdam* accidentally damaged a major reef in the Cayman Islands in

[93] Guardians of Fiordland's Fisheries & Marine Environment Inc. 2002. op. cit.
[94] Guardians of Fiordland's Fisheries & Marine Environment Inc. 2002. op. cit.
[95] www.motherjones.com/coral_reef/cayman.html
[96] www.ompersonal.com.ar/ecology/bigblue.htm
[97] Smithsonian Ocean Planet
http://seawifs.gsfc.nasa.gov/OCEAN_PLANET/HTML/education_threats.html

1996, the company undertook an extensive restoration operation, with some success.[98]

With the exception of Fiordland, New Zealand corals generally grow in deepwater environments, so they are not in the areas where cruise ships would anchor. In Fiordland, all cruise companies who enter the fiords sign a deed of agreement with Environment Southland (see Appendix B for conditions), which specifies where the vessels are permitted to travel and to anchor, or they must obtain a resource consent to travel or anchor elsewhere. This process ensures potential coral and marine environment damage by cruise ships is controlled, and so far no damage to the fragile corals has been observed.

2.9 Antifouling chemicals

There are risks associated with the impacts of the antifouling chemicals added to paints used for ships. These chemicals are used to prevent organisms growing on the hulls of vessels. Organism deposits decrease manoeuvrability, increase fuel consumption and increase the risk of transporting unwanted exotic organisms into new areas. These chemicals become an issue when the ship is in one place for an extended length of time, or when the hull is cleaned or stripped for repainting.[99]

Tributyltin (TBT) is an organotin used since the 1960s as an antifouling additive to paint.[100] In the late 1970s, people started to notice TBT was causing adverse effects on marine wildlife, especially marine snails.[101] TBT acts as an endocrine disrupter to target species, but it also causes sterilisation and development of male sex organs (or imposex) on females of many types of shellfish around the world, even when present in very low concentrations. In the early 1990s, when a detailed survey was done of *Lepsiella scobina* (or dogwhelk) populations in the Waitemata Harbour, Auckland, it was found that in certain areas there was a 100 per cent occurrence of imposex.[102] Besides posing a risk to native ecosystems, these additives may pose an economic risk to New Zealand's aquaculture industry. The high use of TBT in the 1970s led to the collapse of the oyster industry in Arcachon Bay on the Atlantic Coast of France in the early 1980s.[103]

In 1989, New Zealand banned application of TBT as an antifoulant on hulls of vessels less than 25 metres in length.[104] In 1993, application of any organotin-containing paint to any vessels was prohibited.[105] However, there was no way to prohibit its use on many large international vessels that

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[98] Johnson. 2002. op. cit.
[99] Santillo D., et al. 2002. Tributyltin (TBT) Antifoulants: A Tale of Ships, Snails and Imposex.
[100] Organotins such as TBT are organic compounds containing bonds to tin.
[101] Santillo *et al.* 2002. op. cit.
[102] Stewart, C. et al. 1992. Imposex in New Zealand Neogastropods.
[103] Santillo *et al.* 2002. op. cit.
[104] Pesticides (Antifouling Paints) Order 1989, although vessels with aluminium hulls were exempt.
[105] The Pesticides (Organotin Antifouling Paints) Regulations 1993.

entered New Zealand's harbours, although many of these vessels now use controlled-release organotin paints to try and reduce the negative effects.[106] The IMO has now agreed to phase out the use of TBT by the year 2008.[107]

2.10 Economic impacts

Cruise ships can cause a large influx of people to popular destinations. They have specific infrastructure demands, requiring deep berthing sites, large amounts of fresh water, and waste incineration facilities. None of the New Zealand ports have the infrastructure to supply electricity to a cruise ship, so the ships generate their own electricity at port by keeping the engines running.

The large number of tourists can be good for the local economy. However, in some destinations overseas the cruise companies have established their own onshore tourist operations. This reduces the economic benefits to the local community, while still putting strain on the local infrastructure. New Zealand does not yet have a big enough cruise market for cruise companies to set up their own activities, so at present most of the onshore activities are locally operated.

To combat the problem of tourist profits going offshore, some destinations, such as Belize, have introduced tourism policy to favour local businesses.[108] Hawaii and Florida have tried voluntary mechanisms through a memorandum of understanding.[109] However, vulnerability to economic retribution inhibits many of the Caribbean islands from asking for the same environmental standards from the cruise companies, as the companies might then decide not to visit that island any more.[110]

2.11 Summary

Cruise ships produce the same types of wastes as land-based towns, but these discharges have been subject to fewer controls and may occur in any area. Controls on these wastes are now beginning to be put in place, both through the international MARPOL convention and through New Zealand regulations. Many incidents of illegal discharges of wastes by cruise ships have occurred overseas, but to date none have been reported in New Zealand.

Many improvements can be made to reduce the environmental effects of wastes from cruise ships. Newer ships have fewer environmental impacts. Treatment of liquid waste prior to discharge is improving and treatment facilities are increasingly being added to ships. Effectiveness of these

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[106] ORTEP Association, Organotin Environmental Programme, History And Background of Tributyltin-Based Antifoulants, www.ortepa.org/pages/b1.htm
[107] Earth Crash Earth Spirit, http://eces.org/ec/pollution/tributyltin.shtml
[108] www.kevinmodera.com/cruise_s.htm
[109] www.dep.state.fl.us/legal/legaldocuments/opagree/da_entities/CruiseLine/cruise_agree.htm
[110] Klein. 2002. op. cit.

treatment facilities depends upon their proper operation. Steps to reduce solid wastes have been taken by many cruise companies, such as recycling, and reducing packaging. Gas turbines and cleaner fuel reduce emissions to air, and newer, more efficient propulsion systems reduce fuel usage.

The most significant potential environmental impacts of cruise ships, other than those from waste discharges, are biosecurity risks and maritime accidents. Controls have been brought in by the Ministry of Fisheries to address biosecurity risks from ballast water and hull fouling. The Ministry of Agriculture and Forestry has taken measures to deal with biosecurity risks from food brought onshore by passengers.

The *Pacific Sky* incident, which was dealt with by Maritime Safety Authority procedures, highlighted the potential risks from maritime accidents. Potential environmental effects such as those from anchors and turbidity, and effects on wildlife and specific ecosystems can be dealt with by controlling ship movement. Effects from antifouling chemicals can be addressed by prohibiting the use of harmful chemicals.

Some risks or potential effects of cruise ships have particular significance in relation to environmental, cultural and spiritual values of tangata whenua, and their traditional relationships with marine and coastal species, areas and specific sites. Those values and relationships are guaranteed under the Treaty of Waitangi and protected under legislation, policy and case law.[111] Identifying these risks and effects, and addressing them appropriately, will require processes of dialogue and partnership with the iwi and hapu concerned.

[111] PCE, 1999. Setting Course for a Sustainable Future: The Management of New Zealand's Marine Environment. PCE, Wellington, pp. 66–70.

3 Legislative regimes and voluntary initiatives

3.1 International law

3.1.1 The IMO and MARPOL

On an international scale, the most important regulating body for shipping law is the United Nations International Maritime Organisation (IMO), which entered into force in 1958. One of the IMO's main purposes is "to encourage and facilitate the general adoption of the highest practicable standards in matters concerning maritime safety, efficiency of navigation and prevention and control of marine pollution from ships".[112] The IMO has established a number of conventions, and the most important one for regulating marine pollution is the International Convention for the Prevention of Pollution from Ships, known as MARPOL 73/78. The Convention's six annexes cover pollution by oil, noxious chemicals, goods in packaged form, sewage, garbage, and air pollution (table 3.1).[113]

Countries ratifying MARPOL must accept Annexes I and II (prevention of pollution by oil, and control of pollution by noxious liquid substances, respectively), while the other annexes are voluntary, and only enter into force internationally when acceded by 15 countries with a combined merchant fleet of not less than 50 per cent of world shipping tonnage. Once a country becomes Party to the Convention, Annexes I and II (and any other annexes acceded) apply to all ships flagged to that signatory country, wherever they sail. Any ships violating the MARPOL Convention within the jurisdiction of any Party to the Convention, may be punished either under the law of that Party or under the law of the country where the ship is flagged.[114]

Annexes III (prevention of pollution by harmful substances in packaged form) and V (prevention of pollution by garbage from ships) are already in force internationally, while Annex VI (prevention of air pollution from ships) is yet to come into force as only 10 countries have acceded it. Annex IV (prevention of pollution by sewage from ships) will come into force on 27 September 2003.

New Zealand is party to Annexes I, II, III, and V, but has not yet acceded to Annexes IV and VI.

[112] http://www.imo.org/home.asp
[113] The terms 'garbage' and 'rubbish' are used interchangeably throughout this report. The term 'garbage' is used in international legislation, whilst New Zealanders generally use the term 'rubbish'.
[114] http://www.imo.org/Conventions/contents.asp?doc_id=678&topic_id=258#1

Table 3.1: Annexes of the MARPOL Convention

Annex	Subject	Number of signatories	% world tonnage	Date in force
I	Prevention of pollution by oil	125	97	1983
II	Control of pollution by noxious liquid substances	125	97	1983
III	Prevention of pollution by harmful substances in packaged form	107	83	1992
IV	Prevention of pollution by sewage from ships	91	51	Sept 2003
V	Prevention of pollution by garbage from ships	112	89	1988
VI	Prevention of air pollution from ships	10	53	*Not yet in force*

Source: http://www.imo.org/Conventions/mainframe.asp?topic_id=247

3.1.2 Private international law

In response to widespread concerns about the activities of multinational or transnational corporations (TNCs) such as cruise ship companies, governments and intergovernmental organisations have attempted to regulate TNC activities on an international level.[115] This has been undertaken via the establishment of a number of voluntary agreements that encourage TNCs to comply with the policies of the countries in which they operate. Some of these voluntary agreements incorporate environmental considerations, such as the Organisation for Economic Co-operation and Development (OECD) Guidelines for Multinational Enterprises.

3.2 National legislation

New Zealand's coastline is 15,000 km, and its vast marine zone (figure 3.1) is covered by an array of legislation.[116] There are two main pieces of legislation that concern cruise ship impacts on the environment—the Resource Management Act 1991 (RMA) and the Maritime Transport Act 1994 (MTA).

The RMA applies in the Coastal Marine Area (CMA),[117] the area from the mean high water spring tide level (MHWS) on the foreshore out to 12 nautical miles.[118] The MTA applies in the Exclusive Economic Zone (EEZ), the area from 12 nautical miles out to 200 nautical miles from MHWS. To enable New Zealand to become party to MARPOL, regulations and rules

[115] Oceans Blue Foundation. 2002. Report on the International and Domestic Legal Regimes Regulating Waste Streams and Other Marine and Terrestrial Environmental Impacts of Cruise Ship Operations. http://www.oceansblue.org/bluetourism/chartacourse/cruiseship/documents/Report_International_and_Domestic_Legal_Regimes.pdf

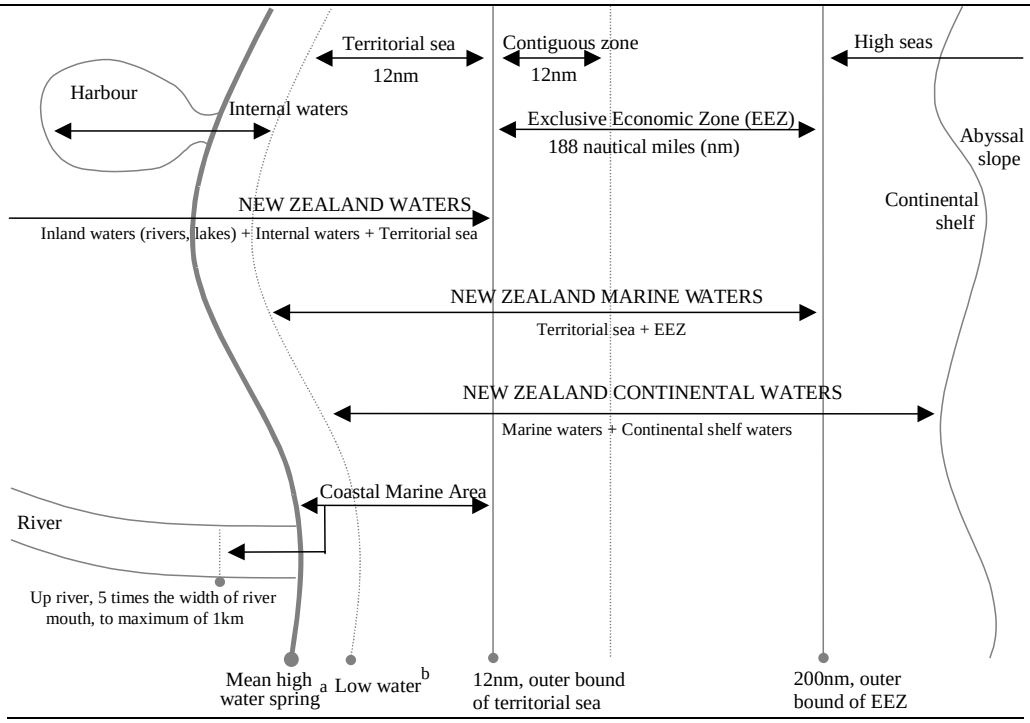
[116] PCE. 1999. Setting Course for a Sustainable Future: The Management of New Zealand's Marine Environment. pp 26–27.

[117] Also known as the territorial sea.

[118] A nautical mile is 1.15 miles and 1.85 kilometres.

have been established under the RMA and the MTA for their respective marine zones.

Figure 3.1: New Zealand's marine jurisdiction



Note:

[a] Mean high water spring—the average of each pair of successive high waters during that period of about 24 hours in each semilunation (approximately every 14 days), when the range of tides is the greatest.

[b] Low water—the minimum height reached by a falling tide.

3.2.1 The Resource Management Act 1991

The purpose of the RMA is to promote the sustainable management of natural and physical resources. The Act requires that there be a New Zealand Coastal Policy Statement (NZCPS) to guide local authorities on management of the coastal marine area. The Act authorises regional councils to prepare regional coastal plans, which must be consistent with the NZCPS. In addition to this, the Act establishes Resource Management (Marine Pollution) Regulations 1998, which fulfil New Zealand's MARPOL obligations within the CMA.

The New Zealand Coastal Policy Statement 1994

The NZCPS is established under the RMA by the Minister of Conservation. The purpose of the NZCPS is to establish policies to achieve the sustainable management of natural and physical resources of the coastal environment in

New Zealand. The NZCPS also includes provisions for the protection of characteristics of the coastal environment that have significance to Maori.[119] The section of the NZCPS most relevant to cruise ships deals with "Limiting of Adverse Environmental Effects from Vessel Waste Disposal or Maintenance". This section establishes policies in relation to: rubbish disposal; provision of sewage collection facilities; encouraging use of collection facilities for rubbish and sewage; considering a minimum distance from shore for disposal of sewage for regional coastal plans; and prohibiting the discharge of non-biodegradable rubbish into the sea. At a recent workshop where representatives from local government were asked for feedback on the effectiveness of the NZCPS, Environment Southland commented that the NZCPS did not address the adverse effects of cruise ships.[120]

Regional coastal plans

Under the RMA, regional coastal plans must be prepared by regional councils and must be consistent with the NZCPS.[121] The purpose of the plan is to assist a regional council to carry out any of its functions in order to achieve the purpose of the RMA. The plans apply within the CMA and are required to have been developed with a process of consultation with communities and tangata whenua.

Plans must also be prepared in accordance with the Resource Management (Marine Pollution) Regulations 1998 unless otherwise stated in the Regulations (see next section).[122] This provides certainty for ships, particularly international ships, whichever port they sail into.

Therefore, rules within regional coastal plans may permit activities, such as the discharge to water of sewage, food wastes and oily bilge water, as long as the rules are in accordance with the NZCPS and the Resource Management (Marine Pollution) Regulations.

The Resource Management (Marine Pollution) Regulations 1998

The Resource Management (Marine Pollution) Regulations 1998, established under the RMA, give effect to MARPOL Annexes I, II, III and V in New Zealand's CMA. The regulations cover the discharge of oil, noxious liquid substances, sewage and garbage. The regulations apply to all ships operating within the CMA—whether foreign, New Zealand or New Zealand Defence Force. Some iwi have expressed concern about the regulations for cultural and practical reasons. Regional councils are responsible for enforcing the regulations.

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[119] PCE. 1999. Setting Course for a Sustainable Future: The Management of New Zealand's Marine Environment. PCE, Wellington, p. 68.
[120] Young, D. 2003. Monitoring the Effectiveness of the New Zealand Coastal Policy Statement: Views of Local Government.
[121] Sections 64 and 67(2)(a) RMA.
[122] Section 66 RMA.

The discharge of oil, or mixtures containing oil, is prohibited under the regulations unless the ship is en route and the oil content of the discharge does not exceed 15 parts per million (Regulation 9).

The discharge of untreated sewage is prohibited under the regulations, unless that discharge occurs more than 500 metres (0.27 nautical miles) seaward from MHWS or any marine farm or customary fishing (mataitai) reserve, or 200 metres from any marine reserve.[123] Discharge must occur in water deeper than five metres (Regulation 11). The regulations state that a regional council, in its regional coastal plan rules, may increase these distances and the water depth in which discharge of untreated sewage is allowed.

The regulations provide for two standards of on-board sewage treatment systems for boats—Grade A and B. The discharge of Grade A treated sewage is permitted, unless within 100 metres of a marine farm (Regulation 12; see Appendix A). The Regulations state that Environment Southland's regional plan may include rules restricting where the discharge of Grade A treated sewage can take place in the internal waters of Fiordland.[124] Other regional councils cannot make their rules for the discharge of Grade A sewage stricter than the regulations.

Discharge of Grade B treated sewage is permitted, unless within 500 metres of a marine farm or mataitai reserve (Regulation 12A). The regulations state that a regional council, in its plan rules, may increase these distances and specify the minimum depth in which discharge of Grade B treated sewage is allowed.

The regulations prohibit the discharge of plastics anywhere in the CMA. The discharge of garbage, other than plastics and packing materials, is permitted provided the discharge occurs at least 5,500 metres (three nautical miles) from the shore, and is ground up into particles 25 millimetres or less in diameter (Regulation 13).

3.2.2 The Maritime Transport Act 1994

The Maritime Transport Act 1994 establishes Marine Protection Rules to fulfil New Zealand's MARPOL obligations within the CMA.

The Marine Protection Rules

The Marine Protection Rules give effect to requirements of MARPOL Annexes I, II, III and V in New Zealand's EEZ, and to Annex IV in the Antarctic Treaty Area.[125] The discharge requirements set out in the rules apply to New Zealand ships[126] operating anywhere outside the New Zealand

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[123] The Regulations were amended in 2002 to increase protection for marine farms, customary fishing (mataitai) reserves and marine reserves from sewage discharges from boats. See: http://www.mfe.govt.nz/laws/meas/marine.html

[124] Fiordland is included on the United Nation's World Heritage List.

[125] The marine protection rule giving effect to Annex IV in Antarctica is required to fulfil New Zealand's obligations under the Environmental Protocol to the Antarctic Treaty. These obligations are met via the Antarctica (Environmental Protection) Act 1994.

[126] There is an exception: ships of the New Zealand Defence Force are not subject to Part 150.

coastal marine area and to foreign ships operating within New Zealand's EEZ. The Maritime Safety Authority (MSA) is responsible for enforcing the rules.[127]

Part 120 of the rules deals with the discharge of oil. Part 140 deals with the discharge of noxious liquid substances. Part 150 deals with the prevention of pollution by harmful substances carried by sea in packaged form. Part 160 deals with the discharge of sewage in the Antarctic Treaty Area. Part 170 deals with the discharge of garbage from ships.

3.3 New Zealand legislation and Annex IV

New Zealand is yet to accede to Annex IV of MARPOL, concerning the prevention of pollution by sewage from ships, but intends to do so in the future. Annex IV comes into force in September 2003. It requires ships on international voyages that are 400 gross tonnage and over (or under 400 gross tonnage and certified to carry more than 15 persons) to be equipped with an approved sewage system.[128]

Regulation 11 of Annex IV is concerned with the discharge of sewage. Paragraph one states that the discharge of sewage from ships at sea is prohibited unless carried out through a sewage treatment plant; or carried out using a comminuting and disinfecting system, providing the ship is more than three nautical miles from the nearest land; or carried out from a holding tank, providing the ship is more than 12 nautical miles from the nearest land. Regulation 11 also states that the above provisions do not apply to ships flagged to party countries operating in waters under the jurisdiction of a country with less stringent requirements.

If a country acceding to Annex IV wishes international ships in its waters to comply with the above provisions of Regulation 11, they must provide adequate facilities at ports and terminals for the reception of sewage, without causing delay to ships (Regulation 12). Countries can have less stringent requirements for sewage discharge if they have not provided these facilities. Therefore, New Zealand could proceed to become party to Annex IV while retaining its existing sewage discharge controls under the Resource Management (Marine Pollution) Regulations and not be obliged to provide additional reception facilities, provided the existing reception facilities were commensurate with the existing controls. New Zealand's sewage discharge

[127] The MSA is a Crown entity with the principal objective of undertaking activities that promote a safe maritime environment and provide effective marine pollution prevention and an effective marine pollution response system. The MSA has responsibility for inspecting foreign vessels in port to ensure they comply with international safety and environmental protection standards in line with New Zealand's international obligations.

[128] There are three approved on-board systems: (a) a sewage treatment plant; (b) a sewage comminuting and disinfecting system for the temporary storage of sewage when the ship is less than three nautical miles from the nearest land; or (c) a holding tank for the retention of all sewage, having regard to the operation of the ship, the number of persons on board, and other relevant factors.

controls would apply to all international ships, whether from countries party to Annex IV or not.

The rules concerning the prevention of pollution by sewage from ships in the CMA differ from the requirements of Paragraph one of Regulation 11 of Annex IV:

- New Zealand legislation in the CMA dealing with the discharge of sewage applies to ships of *all sizes*, that is, the same rules apply to both large ships and small recreational boats.
- New Zealand legislation in the CMA allows the discharge of untreated sewage provided the ship is more than 500 metres (0.27 nautical miles) seaward from MHWS. Paragraph one of Annex IV's Regulation 11 requires ships (more than 400 gross tonnage) discharging untreated sewage to be more than 12 nautical miles from shore. This much reduced distance in New Zealand's legislation reflects the rule's application to small recreational boats. Regional councils are able to increase the 500 metres distance via a rule in their regional coastal plan.

3.4 Other legislation

There are other statutes and regulations that relate to environmental aspects of cruise ship activities in some way. As discussed earlier, under the Biosecurity Act 1993 there are ballast water and proposed hull-fouling regulations, and controls on bringing rubbish, fruit, and other restricted items onshore. Cruise ships are also subject to customs legislation. Other acts relevant to cruise ship activities include the Marine Reserves Act 1971, the Marine Mammals Protection Act 1978, and the Historic Places Act 1993 (with regards to the disturbance of shipwrecks classified as archaeological sites, that is, where the wreck occurred before 1900).

3.5 Industry initiatives

There are two cruise industry groups operating in New Zealand—'Cruise New Zealand' (CNZ; New Zealand only) and 'Cruising the Southern Cross' (Australia and New Zealand). CNZ is an incorporated society whose members are Air New Zealand, regional tourism organisations, port authorities, shipping agents and tour operators. It acts as an agent for the cruise ship companies that visit New Zealand, and is party to Environment Southland's deed of agreement on behalf of the cruise companies that visit Southland (see section 3.6). This agreement is the only environmental agreement the cruise ship industry has in New Zealand. Otherwise, the general practice in New Zealand is to make direct agreements with port authorities through shipping agents regarding what ships are permitted to do, over and above the requirements of national and international legislation. These agreements are not in a legally binding form.[129]

[129] Leigh Rusbridge, Marine Operations Co-ordinator, Ports of Auckland, pers. comm., 14 February 2003.

The main international cruise industry group is the International Council of Cruise Lines (ICCL), based in the US. In June 2001, the ICCL adopted mandatory environmental standards, outlined in *Cruise Industry Waste Management Practices and Procedures*,[130] for all of its cruise ships. The member cruise ship companies agree to various environmental standards as part of their conditions for membership. The organisation has 16 member lines, some of which come to New Zealand (table 3.2).

Table 3.2: ICCL membership of cruise ship principals cruising in New Zealand

Principal	ICCL membership
Cunard Line	✓
HAL–Holland America Line	✓
Hapag-Lloyd	-
MTC—Marine Trade Consulting	-
NCL—Norwegian Cruise Line	✓
New World Ship Management—Clipper Cruise	-
Orient Lines	✓
Princess Cruise Line	✓
P&O Cruises	-
Radisson Seven Seas Cruises	✓
ResidenSea	-
Royal Caribbean Cruises Ltd	✓
Silver Sea	-
Windstar	✓

There are standards for grey water and sewage discharge, hazardous chemical waste such as photo processing fluid and dry-cleaning chemicals, unused and outdated pharmaceuticals, used batteries and burned-out fluorescent and mercury vapour lamps. The standards are based on the following principles:

- designing and constructing cruise ships to be as environmentally friendly as possible
- embracing new technology
- complying fully with international and US environmental laws

[130] International Council of Cruise Lines. 1999. *Cruise Industry Waste Management Practices and Procedures*. ICCL Standard E-1-01, (Revision 1).

- minimising waste production, and
- maintaining cooperative relationships with the regulatory community.

Member cruise companies must integrate these standards into their internationally mandated Safety Management System (SMS), an international code created by the IMO in 1998. The standards further specify that the members are committed to operating vessels so as to: minimise their environmental impact; implement the MARPOL goal of zero discharge and Annex V; and strengthen programmes for monitoring and auditing on-board environmental practices. They have also adopted methods to reduce their waste volumes by source reduction. While this all seems very comprehensive, none of it is binding, and violations continue. The ICCL does no monitoring and applies no enforcement protocols.[131]

These standards differ from MARPOL in that they are more specific to the cruise industry and they are not enforceable by the courts. The cruise industry has generally used a voluntary approach to these types of specific environmental standards.

The ICCL standards do not subject the cruise lines to criminal liability unless they have been incorporated in enacted state or federal laws. Alaska, Florida and California are the only states to have specifically implemented these laws, with Alaska's being the most stringent and well enforced. Consequently, most cruise companies send their most modern, environmentally-friendly vessels to this area, and their older vessels go elsewhere.[132]

Since many of the ICCL member companies cruise to New Zealand, we might expect to receive the positive benefits of these standards. Holland America Line has a number of ships that boast state-of-the-art wastewater treatment systems that purify wastewater to drinking water standards, but have only installed these systems on ships that travel to Alaska.[133] The large amount of sludge produced is then discharged at sea just beyond 12 nautical miles. The Holland America Line vessel *Prinsendam*, which visited New Zealand in the summer of 2003, spends the other half of the year in Alaska, so presumably its environmental benefits also apply in our waters.

Another form of industry initiative is a memorandum of understanding (MOU), such as the one signed between the Florida-Caribbean Cruise Association (FCCA) and the Florida Department of Environmental Protection (FDEP).[134] This MOU basically reinforces the ICCL standards with the cruise lines that are members of the FCCA, but is made more specific to the Florida region. It has also created a forum for the groups and the coastguard to work together on cruise ship environmental matters.

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[131] Klein. 2002. op. cit. p. 23.
[132] Klein. 2002. op. cit.
[133] Klein. 2002. op. cit. p. 23.
[134] www.dep.state.fl.us/legal/legaldocuments/opagree/agreements/cruise%20Line/cruiselinemou12-06-01.pdf

3.6 Environment Southland Deed of Agreement

The Environment Southland Agreement is a deed of agreement between Environment Southland (Southland Regional Council) and Cruise New Zealand on behalf of the cruise ship industry. The agreement addresses potential environmental impacts of cruise ship activity within the Southland CMA (see Appendix B for conditions), and is outside the formal RMA framework. The agreement seeks to add value to the provisions of the RMA and of the Southland Regional Coastal Plan, both of which come into effect if the arrangements in the agreement fail. Therefore, the cruise ships entering the fiords under the agreement do not need a resource consent for the agreed controlled activities. However, they must still comply with the general duties and obligations under the RMA and marine regulations. The agreement acknowledges that most ship discharges are regulated by MARPOL, but it further requires vessels to implement a 'zero discharge' to water regime while in the Southland CMA. Cruise vessels are not permitted to discharge any sort of sewage while in the Fiordland area, even if it is Grade A treated. Smoke stack emissions are currently permitted, but smoke opacity is to be minimised while in the Southland CMA.The agreement also covers speed and noise limits, safety provisions, hull cleaning and ballast water restrictions, wildlife protection and the use of ancillary vessels.

The deed of agreement requires the cruise industry to make a financial contribution in order to maintain the values of the area that make it attractive to visitors. The total contribution received is reasonably significant, as most ships visit Fiordland. Environment Southland is responsible for managing 17 per cent of New Zealand's coastline, much of which is nationally significant, and the money obtained from the fee is put towards this management. Activities funded include coastal monitoring, enforcement, and oil spill contingency measures. Environment Southland received nearly $450,000 in the 2001/02 season from the Environment Southland Marine Fee (ESMF), the levy on cruise ships entering Fiordland.[135] This charge is based on the gross registered tonnage of the vessel, and is calculated so that the total gross registered tonnage of the cruise ship multiplied by $NZ 0.34 gives the ESMF payable (plus Goods and Services Tax (GST) if applicable). This fee rises every two years in accordance with inflation as measured by the Consumers Price Index.

[135] Ken Swinney, Policy and Planning Manager, Environment Southland, pers. comm.

4 Challenges

4.1 The risks

Waste discharge is the most significant environmental impact from cruise ships. The risk can be addressed by controlling activities allowed, especially in areas of particular ecological sensitivity or of significance to tangata whenua. Waste discharge is often the main focus of international and domestic regulation addressing cruise ship impacts, and in voluntary standards developed by cruise ship industry groups. These voluntary standards, introduced in the last few years, are a significant improvement, but they do not subject cruise line companies to criminal liability for breaching them unless they are written into legislation.[136]

New Zealand's sewage discharge regulations in the Coastal Marine Area (CMA) apply to vessels of all sizes, therefore ships over 400 gross tonnage can discharge untreated sewage beyond 500 metres of mean high water springs (MHWS), unless a regional council has more stringent rules in its regional coastal plan. When New Zealand accedes to Annex IV of MARPOL, this regulation could remain unaltered, unless New Zealand provides adequate on-shore sewage reception facilities and enforces paragraph one of Annex IV's Regulation 11 (see section 3.3). Alternatively New Zealand could make a stricter rule in its sewage discharge regulations that applies to larger vessels.

The International Maritime Organisation (IMO) has stated that "evidence suggests that all cruise ships and large passenger ships already have sewage treatment plants on board, so that ships are not seen as a major source of sewage pollution".[137] However, there is no guarantee that these sewage treatment plants are operated properly (see section 4.2).

There is concern from some international environmental non-governmental organisations (NGOs) about the lack of 'concrete scientific knowledge' on the immediate and accumulated impacts of waste discharges from cruise ships.[138] In light of this uncertainty, they feel a precautionary approach should be taken, and any discharge should be assumed harmful.

The other main environmental impact from cruise ships is that of a biosecurity breach. This can be from organisms attached to the hull, in ship sea chests, or in discharged ballast water. Under the Biosecurity Act 1993, the Ministry of Fisheries has introduced ballast water controls, and has proposed regulations to address hull-fouling risks. Food brought onshore by passengers is also a biosecurity risk. The Ministry of Agriculture and Forestry is addressing this as part of its 'Protect New Zealand' programme.

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[136] The Ocean Conservancy. 2002. op. cit.
[137] http://www.imo.org/Environment/mainframe.asp?topic_id=237
[138] Dobson, S., Gill, A., and Baird, S. 2002. *A Primer on the Canadian Pacific Cruise Ship Industry*. http://www.sfu.ca/coastalstudies/Cruise_Ship.pdf

4.2 Enforcement of environmental regulations

There have been no court cases that deal with marine pollution from cruise ships in New Zealand, nor have there been any reported incidents of pollution breaches by a cruise ship. However, authorities do not monitor cruise ship behaviour out of port in New Zealand, and hence face a challenge in ensuring that regulations are being adhered to. The following from a Canadian report highlights this point:

> *Cruise ships travel between various jurisdictions in open ocean space, which makes it very difficult to adequately regulate their activity. Due to the costs of enforcement generally and of cruise ship regulation specifically, governmental authorities are usually forced to make decisions that maximise existing resources and focus on the most blatant and harmful abuses of national laws. As a result, enforcement agencies may focus their efforts at reducing oil spills, intentional oil and toxic substance discharge and other violations of state laws to the exclusion of other forms of non-compliance. Even the industry itself may find it difficult to regulate its own ships and crew to ensure that the applicable laws and internal policies and procedures are being followed.*[139]

A significant contribution to enforcement problems is the use of 'flags of convenience' by cruise ship companies. Cruise ships are often registered in countries that offer reduced costs (for example, lower taxes), and hence a competitive advantage within the industry. Although 'flag of convenience' countries may be signatory to MARPOL, there can be a failure on the part of these countries to enforce these requirements. Any violation of MARPOL within the jurisdiction of any Party to the Convention is punishable under the law of that Party or under the law of the flag country. Many flag countries do not follow up violation cases referred to them.

Between 1989 and 1992, the US referred 111 alleged MARPOL Annex V violations by all types of foreign flagged ships in US waters to the relevant flag countries. Only 12 of these cases were acted upon, and only two of these cases received small fines.[140] As a result, in 1992 the US Government changed its enforcement policy for MARPOL Annex V violations by flag countries in US waters, and now takes direct enforcement action rather than referring such violations to the flag countries.

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[139] Oceans Blue Foundation. 2002. Report on the International and Domestic Legal Regimes Regulating Waste Streams and Other Marine and Terrestrial Environmental Impacts of Cruise Ship Operations. Canada. http://www.oceansblue.org/bluetourism/chartacourse/cruiseship/documents/Report_International_and_Domestic_Legal_Regimes.pdf

[140] United States General Accounting Office. 2000. Marine Pollution: Progress Made to Reduce Marine Pollution by Cruise Ships, but Important Issues Remain. GAO/RCED-00-48.

Between 1993 and 1998 there were 87 confirmed illegal discharge cases from foreign-flagged cruise ships in US waters. Seventeen other alleged incidents were referred to flag countries, because jurisdiction could not be clearly established or because the incidents occurred outside US waters. These 87 confirmed cases and 17 alleged incidents involved 69 ships from 42 cruise companies. Eighteen of those 42 companies were cited for intentional discharges.[141] In 1999, Royal Caribbean Cruises Ltd, based in Florida, was fined $US18 million after pleading guilty to 21 counts of violating federal water pollution laws.[142] The company pleaded guilty to charges of fleetwide practices of dumping waste oil and hazardous chemicals by deliberately bypassing pollution control devices, and falsifying records.[143] The ships involved were flagged to either Norway or Liberia.

Given the industry's vulnerability to bad environmental publicity, Klein (2002) recommends that publicity should be used as a means to compel the companies to improve their environmental performance.[144] In the past, passengers have aided the detection of illegal activities by alerting authorities when witnessing activities they believe to be illegal. A reward of US$250,000 (half the amount of the fine imposed) was awarded to a passenger who videotaped rubbish being thrown overboard by the crew on a cruise, and handed the video over to the authorities.[145] Two-thirds of the 87 confirmed cases of illegal discharge were reported by the offending cruise vessel (as required by law) or third parties (e.g. witnesses or passengers).[146] In a meeting of Canada's Oceans Blue Foundation in March 2002, industry participants commented that the cruise industry was now one of the most regulated in the world and they believed they had done a lot to clean up their practices.[147]

Environment Southland has found Cruise New Zealand (CNZ) very helpful and cooperative to date in applying their deed of agreement, as CNZ realises that maintaining the unique features that make Fiordland attractive to visitors depends upon their compliance.[148] There has only been one known breach of the agreement since it came into force in October 2001, when a cruise vessel entered a restricted area without a permit. This was followed up with the cruise ship operators, and they have assured Environment Southland that it will not happen again.[149]

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[141] United States General Accounting Office. 2000. *op.cit.*
[142] Johnson. 2002. op. cit. p.267.
[143] United States General Accounting Office. 2000. *op.cit.*
[144] Klein. 2002. op. cit. p.26.
[145] Johnson. 2002. op. cit. p.266. For other examples of fines paid see www.stopcruisepollution.com/index.cfm?fuseaction=page&pageID=984
[146] http://www.oceansblue.org/bluetourism/chartacourse/cruiseship/waves010606.html#12
[147] The proceedings of this meeting are available from: http://www.oceansblue.org/bluetourism/chartacourse/cruiseship/documents/index.html
[148] Captain Mike Pearson, Harbourmaster, Environment Southland, pers. comm., 4 February 2003.
[149] Environment Southland Environmental Compliance Division, Environmental Compliance Monitoring Report 2001/02, Environment Southland Publication No. 2002–8 July 2002. http://www.envirosouth.govt.nz/compliance_reports.htm

4.3 The future?

At this time, there appear to be no significant environmental impacts from cruise ships, probably because of the low numbers of cruise ships currently visiting New Zealand but, as discussed, monitoring is difficult. The risk of environmental impacts could increase if the number of ships visiting New Zealand increases. Some regions may need to take steps to cope with the associated risks.

The deed of agreement developed by Environment Southland for cruise ships visiting Southland's CMA provides a good example of how regional councils can work with the cruise industry to reduce the environmental impacts of cruise ships. The agreement has been developed for a particularly sensitive environment, so some measures contained in it might not be relevant for other regions. However, it could be a resource for regional councils who believe that an increase in visits by cruise ships in their region could present an environmental risk.

Cruise operators benefit from the agreement, because protecting the relatively unmodified nature of the environment helps to ensure that passenger expectations are met. Cruise operators also benefit from the removal of requirements to obtain resource consents, provided that they comply with the agreement. In addition to this, the financial contribution paid by cruise operators contributes to management of the coastal marine area of the Southland region.

Central government could provide more guidance on steps to take to deal with the environmental risks associated with cruise ships, to ensure national consistency, rather than individual regions having to develop their own rules.

To further improve the protection of the environment from an increase in cruise ship visits, some of the recommendations of the Ocean Conservancy's *Cruise Control* report,[150] on the effects of cruise ships on the marine environment in North America, could be considered for New Zealand. Recommendations included:

- reducing and regulating cruise ship discharges
- improving monitoring and inspections
- strengthening enforcement mechanisms
- improving air quality control
- developing education and training programmes
- improving research and development.

[150] The Ocean Conservancy. 2002. op. cit.

Regulations recently implemented under Alaska's 'Commercial Passenger Vessel Environmental Compliance Programme' could also be relevant to New Zealand.[151] These regulations were developed following a scheme to monitor cruise ship wastewater and air emissions, which showed that discharges were failing to meet required water and air quality standards.[152] The programme sets terms and conditions for cruise ship discharges. The regulations prohibit the discharge of untreated sewage in Alaskan waters. A discharge limit is set for treated sewage and grey water contamination levels, and discharge is only permitted when the vessel is moving at a speed of at least six knots, and is more than one nautical mile from shore. The Alaskan Department of Environmental Conservation monitors and supervises these discharges through a registration system. Vessels are required to provide a record of wastewater discharges, take samples of discharges, and provide the results of tests on the samples. Regulations have also been introduced to control the visibility of marine vessel emissions within three miles of shore.

4.4 Conclusions

- **There currently appear to be no significant environmental effects due to cruise ships in New Zealand waters.** This is probably because there is currently a low frequency of visits by cruise ships, but might also be because monitoring is difficult to carry out. However, numbers are increasing, so there is a need to be aware of the environmental risks and how these can be addressed.

- **There is potential for impacts on sensitive environments.** These have been well managed by Environment Southland for Fiordland, through their deed of agreement. However, it could be argued that marine biosecurity is compromised. While this risk is not specific to cruise ships, they do visit areas not normally visited by other ships. There is also a risk from maritime accidents.

- **There is room for improvement.** More national guidance for managing the environmental effects of cruise ships could be provided by the Ministry for the Environment and the Maritime Safety Authority. Regional coastal plans could be modified to include additional measures, perhaps some from the Environment Southland deed of agreement if appropriate. More monitoring of cruise ship discharges to air and water may be needed to ensure they are meeting the required standards. The need to improve controls for cruise ship air emissions should be considered. Also, current regulation allows ships to discharge untreated sewage 500 metres offshore. Although cruise ships have sewage treatment facilities on-board, their effectiveness relies on their proper operation. Is the 500-metre distance adequate for large ships?

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[151] Alaska Cruise Ship Initiative. Commercial Passenger Vessel Environmental Compliance Program. 2001 Legislative Summary. http://www.state.ak.us/local/akpages/ENV.CONSERV/press/cruise/legsummary2001.htm

[152] Klein. 2002. op. cit.

4.5 Recommendations

To the Minister for the Environment

Review and consider revising Regulation 11 of the Resource Management (Marine Pollution) Regulations 1998, to assess the adequacy of permitted sewage discharge distances for ships that are 400 gross tonnage and over, or under 400 gross tonnage and certified to carry more than 15 persons (as set out in Regulation 2 of MARPOL Annex IV).

Note: The Commissioner acknowledges that the Resource Management (Marine Pollution) Regulations 1998 provide regional councils with a management tool to control the cumulative effect of untreated sewage discharge from small recreational boats close to New Zealand's coastline. However, as the Regulations apply to all vessels, they allow large ships to discharge untreated sewage 500 metres from MHWS.

To Regional Councils

If they have not already done so, to assess the environmental risks from cruise ships in their region, and initiate or strengthen any systems required to address these risks.

Note: The approach taken by Environment Southland is a good example of how regional councils can address the potential environmental impacts of cruise ship visits, as well as recover some of the cost of maintaining the special qualities of the region that make it attractive to visitors.

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Glossary and acronyms

BOD	Biochemical Oxygen Demand
CMA	Coastal Marine Area
CNZ	Cruise New Zealand
COD	Chemical Oxygen Demand
DOC	Department of Conservation
EEZ	Exclusive Economic Zone
Environment Southland	Southland Regional Council
EPA	United States Environmental Protection Agency
ESMF	Environment Southland Marine Fee
FCCA	Florida-Caribbean Cruise Association
FDEP	Florida Department of Environmental Protection
GDP	Gross Domestic Product
hapu	Maori family or district groups, communities
ICCL	International Council of Cruise Lines
IMO	International Maritime Organisation
iwi	Maori tribal groups
kaitiaki	iwi, hapu or whanau group with the responsibilities of kaitiakitanga
kaitiakitanga	the responsibilities and kaupapa, passed down from the ancestors, for tangata whenua to take care of the places, natural resources and other taonga in their rohe, and the mauri of those places, resources and taonga
kaupapa	plan, strategy, tactics, methods, fundamental principles
koiwi	human remains
kuaka	godwit
mahinga kai	places where food and other resources are traditionally gathered, and those foods and resources
MAF	Ministry of Agriculture and Forestry
MARPOL	International Convention for the Prevention of Pollution from Ships

mataitai reserves	areas of traditional importance to Maori where the tangata whenua manage all non-commercial fishing by making bylaws. The bylaws must apply equally to all individuals. These reserves may only be applied for over traditional fishing grounds and must be of special significance to tangata whenua.
mauri	essential life force, the spiritual power and distinctiveness that enables each thing to exist as itself
MHWS	mean high water spring tide level
MOU	memorandum of understanding
MSA	Maritime Safety Authority
MSDs	marine sanitation devices
MTA	Maritime Transport Act 1994
nautical mile	1.15 miles or 1.85 kilometres
NGO	Non Governmental Organisation
NIWA	National Institute of Water and Atmospheric Research Ltd
NZCPS	New Zealand Coastal Policy Statement
OECD	Organisation for Economic Co-operation and Development
PAHs	polycyclic aromatic hydrocarbons
PERC	perchloroethylene
P&O	Peninsular and Oriental Steam Navigation Company
PCBs	polychlorinated biphenyls
PCE	Parliamentary Commissioner for the Environment
RMA	Resource Management Act 1991
rohe	geographical territory customarily occupied by an iwi or hapu
SMS	Safety Management System
tangata whenua	people of the land, Maori people
taonga	valued resources, assets, prized possessions both material and non-material
tapu	sacredness, spiritual power or protective force
tauranga waka	landing places of ancestral canoes
tikanga	customary correct ways of doing things, traditions
titi	muttonbird, shearwater

TNC	Trans-national Corporation
toroa	albatross
urupa	burial grounds
US	United States
wahi tapu	special and sacred places
whanau	family groups

Appendix A

The following is extracted from the Resource Management (Marine Pollution) Regulations 1998:

Grade A treated sewage means sewage discharged from a Grade A sewage treatment system listed in Schedule 5 or Schedule 6 (see below) that is maintained and operated in good working order and in accordance with any instructions of the system's manufacturer. Schedule 5 of the Regulations consists of a list of Grade A sewage treatment systems approved in accordance with International Maritime Organisation resolution MEPC.2(VI).

Schedule 6—Grade A sewage treatment systems
Any system that, when tested under International Maritime Organisation Resolution MEPC.2(VI), meets, or exceeds, the following standards:

(a) a faecal coliform standard where the geometric mean of the faecal coliform count does not exceed 250 faecal coliforms per 100 millilitres of water; and

(b) a suspended solids standard where the geometric mean of the total suspended solids content, when suspended solids are analysed by gravimetric methods, does not exceed—

  i) 50 milligrams per litre of water when analysed on shore; or

  ii) 100 milligrams per litre of water more than the suspended solids content of the ambient water used for flushing when analysed on-board a ship; and

(c) a biochemical oxygen demand count where the geometric mean of five-day biochemical oxygen demand of the samples of sewage does not exceed 50 milligrams per litre of water.

Grade B treated sewage means sewage discharged from a Grade B sewage treatment system listed in Schedule 7 that is maintained and operated in good working order and in accordance with any instructions of the system's manufacturer. Schedule 7 of the Regulations consists of a list of Grade B sewage treatment systems approved in accordance with the United States of America Environmental Protection Agency Federal Water Pollution Control Act (33 USC 1322, Part 159—Marine Sanitation Devices as Type 1).

Appendix B

Schedule Four from the deed of agreement between the New Zealand cruise ship industry and Environment Southland.

S.4 The cruise industry's coastal environment obligations

S4.1 As indicated previously, the provisions and exclusions provided for in this agreement do not exempt the parties from their ordinary duties and obligations under the RMA, or from their duties as good citizens.

S4.2 When operating cruise ships in the internal waters the cruise ship owners and/or operators, masters, crew and pilots shall observe the following:

S4.2.1 Discharges to air—while smokestack emissions are currently permitted,[153] all reasonable steps shall be taken to minimise smoke opacity levels while in the Southland CMA. Vessels operating under this agreement are encouraged to obtain and hold all relevant environmental protection certification such as those issued by Lloyd's Register and adhere to the International Council of Cruise Lines (ICCL) environmental monitoring policies.

S4.2.2 Discharges to water—take all reasonable steps to operate a 'zero discharge' regime while in the Southland CMA. Vessels operating under this agreement are encouraged to obtain and hold all relevant environmental protection certification such as those issued by Lloyd's Register and adhere to the International Council of Cruise Lines (ICCL) environmental monitoring policies.

S4.2.3 Cleaning and painting—all hull cleaning, painting, and hull scraping activities or any other hull maintenance are prohibited while the vessels are within internal waters. That prohibition includes the ship's other structures where the possible discharge of cleanings, rust, chemicals, detergents and/or paints may be dislodged and enter the internal waters.

S4.2.4 Navigational and safety issues—owners and/or operators shall take a pilot on board for the period of time that the vessel is in that part of the Southland CMA. No pilotage exemptions will be considered.

[153] These discharges are permitted under the Resource Management (Marine Pollution) Regulations 1998. These regulations came into force on 20 August 1998 and relate to the implementation of the International Convention for the Prevention of Pollution from Ships 1973, as modified by the Protocol of 1978 (MARPOL) and the 1996 Protocol to the Convention of Marine Pollution by Dumping of Wastes and Other Matter 1972 (The London Convention).

S4.2.5 Cruise ship speeds—the ship's master is to exercise judicious control over cruise ship speed when in the confines of the Fiords and Paterson Inlet. Apart from the obvious safety issue, this will ensure some degree of control over potential damage occurring from vessel wake. A maximum speed of five knots within 200 metres of shore and within 20 metres of any other vessel shall be maintained except where ship handling conditions make that inappropriate.

S4.2.6 Getting ashore—in most instances, going ashore at places other than existing wharf or jetty areas will mean landing in National Park areas. Department of Conservation (DOC) concession requirements may apply in these instances and applications are to be sought from the Department before any landings take place.

S4.2.7 Wildlife protection—comply with the requirements and directions of DOC in relation to stand-off distances from seal colonies and bird nesting areas including any seasonal restrictions reflecting breeding or similar periods. Fishing from any cruise ship or ancillary or incidental vessel is also prohibited.

S4.2.8 Shipboard noise—noise transmitted on outside decks of the ship travels readily over water and can interfere with the wilderness and remoteness values of the Fiords and Paterson Inlet. The provisions of the RCP with regard to noise shall be complied with.

S4.2.9 Underwater noise—radiated noise from cruise ships (as for all propeller driven vessels, particularly higher revolution/higher frequency vessels) can contribute to underwater sound levels in the CMA having the potential for inducing behavioural changes in marine mammals which may ultimately affect reproductive capability or survival. Owners and/or operators will make utmost endeavours to minimise levels of underwater noise. There is no current evidence that this is causing a significant adverse effect from cruise ship activity within Fiordland.

S4.2.10 Interpretation—for the purposes of interpretative services, operators should maximise the involvement of local interpreters either from DOC and/or other locals with extensive knowledge of the history, culture and wildlife of the areas being visited.

S4.2.11 Litter—particular effort must be made to ensure that rubbish and other materials are not discarded or blown from vessels. The 'green ship' concept applies.

S4.2.12 Helicopters—use of helicopters is not provided for by this agreement.

S4.2.13 Use of ancillary or incidental vessels—the launching, use and movement of vessels ancillary or incidental to the principal activity, such as kayaks, 'Zodiacs', and tender vessels for sightseeing purposes shall be kept to a minimum within the 'green' areas (refer to maps in Appendix B) on the following basis:

- the maximum number of vessels in any one area at any one time shall be four (4) in any combination (ie. 4 kayaks, 2 'Zodiacs' and 2 kayaks, etc).
- in the 'orange' areas (refer to maps in Appendix B) resource consent shall be sought for the activity.

S4.2.14 Anchorages and moorings—all anchoring and mooring activities shall only take place at recognised and/or agreed anchorages and moorings within the 'green' areas (refer to maps in Appendix B). This provision shall not apply to emergency situations or situations where the ship's master deems it necessary for the safety of the ship and its passengers and crew.

Note: Any anchoring in Poison Bay (see map 2 in Appendix B) is intended to be temporary anchorage only to effect shipboard duties. It is not to be used for cruising purposes. Entry is to be by pilot only and with prior arrangement from the fiords harbourmaster.

S4.2.15 Ballast water—the cruise ships will neither ballast nor deballast in internal waters.

S4.2.16 Emergency situations—in the event of any of the above obligations not being complied with, the master shall advise Environment Southland immediately. Contact addresses are set out in Appendix C to the agreement.

Appendix C

Extract from International Council of Cruise Lines (ICCL), 1999. Cruise Industry Waste Management Practices and Procedures. ICCL Standard E-1-01 (Revision 1).

Industry waste management standards
ICCL member cruise vessel operators have agreed to incorporate the following standards for waste stream management into their respective safety management systems.

1. **Photo processing, including x-ray development fluid waste**: Member lines have agreed to minimise the discharge of silver into the marine environment through the use of best available technology that will reduce the silver content of the waste stream below levels specified by prevailing regulations.

2. **Dry-cleaning waste fluids and contaminated materials**: Member lines have agreed to prevent the discharge of chlorinated dry-cleaning fluids, sludge, contaminated filter materials and other dry-cleaning waste byproducts into the environment.

3. **Print shop waste fluids**: Member lines have agreed to prevent the discharge of hazardous wastes from printing materials (inks) and cleaning chemicals into the environment.

4. **Photocopying and laser printer cartridges**: Member lines have agreed to initiate procedures so as to maximise the return of photocopying and laser printer cartridges for recycling. In any event, these cartridges will be landed ashore.

5. **Unused and outdated pharmaceuticals**: Member lines have agreed to ensure that unused and/or outdated pharmaceuticals are effectively and safely disposed of in accordance with legal and environmental requirements.

6. **Fluorescent and mercury vapor lamp bulbs**: Member lines have agreed to prevent the release of mercury into the environment from spent fluorescent and mercury vapor lamps by assuring proper recycling or by using other acceptable means of disposal.

7. **Batteries**: Member lines have agreed to prevent the discharge of spent batteries into the marine environment.

8. **Bilge and oily water residues**: Member lines have agreed to meet and exceed the international requirements for removing oil from bilge and wastewater prior to discharge.

9. **Glass, cardboard, aluminum and steel cans**: Member lines have agreed to eliminate, to the maximum extent possible, the disposal of MARPOL Annex V wastes into the marine environment through improved reuse and recycling opportunities.

They have further agreed that no waste will be discharged into the marine environment unless it has been properly processed and can be discharged in accordance with MARPOL and other prevailing requirements.

10. **Incinerator ash**: Member lines have agreed to reduce the production of incinerator ash by minimising the generation of waste and maximizing recycling opportunities.

11. **Graywater**: Member lines have agreed that graywater will be discharged only while the ship is underway and proceeding at a speed of not less than six knots; that graywater will not be discharged in port and will not be discharged within four nautical miles from shore or such other distance as agreed to with authorities having jurisdiction or provided for by local law except in an emergency, or where geographically limited. Member lines have further agreed that the discharge of graywater will comply with all applicable laws and regulations.

12. **Blackwater**: Member lines have agreed that blackwater will be discharged only while the ship is underway and proceeding at a speed of not less than six knots and in accordance with applicable regulations; and that treated blackwater will not be discharged in port and will not be discharged within four nautical miles from shore or such other distance as agreed to with authorities having jurisdiction or provided for by local law, except in an emergency, or where geographically limited. Member lines have further agreed that the discharge of blackwater will comply with all applicable laws and regulations.