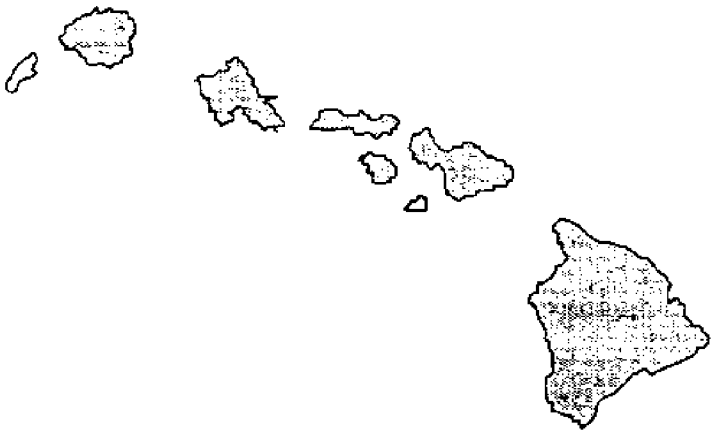
Hawaii's Readiness to Prevent and Respond to Oil Spills



APPENDICES

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Prepared for

Department of Health
State of Hawaii

by

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REVIEW OF CURRENT LITERATURE ON OIL SPILL PREVENTION, RESPONSE AND POLICY

Appendix 1

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INTRODUCTION

EXXON VALDEZ! Like Three Mile Island, Bhopol, and Love Canal, these two words have come to symbolize disaster. *Exxon Valdez* is the name of the tanker that on the night of March 23, 1989, crashed onto Bligh Reef, in Alaska's Prince William Sound and spilled an estimated 11 million gallons of crude into the surrounding waters. Like other disasters identified by their name alone, the *Exxon Valdez* not only impacted the surrounding environment but permanently changed the way we think about oil spills and the way the United States regulates them. In referring to congressional action, Grumbles (1990) states that debate on comprehensive federal legislation would never be the same after the *Exxon Valdez*. ".... the stalemate that had characterized previous congressional efforts seemed to disappear overnight."

The grounding and subsequent oil spill captured national attention for weeks and opened a rich vein of literature dealing with all aspects of oil spill management. However, it is important to note that there had been ongoing debate in Congress to pass comprehensive oil spill legislation long before the *Exxon Valdez* incident. Indeed, the subject of oil spills began working its way into the public conscience after the wreck of the *Torrey Canyon* off England in 1967. Oil spill legislation began to appear in the halls of Congress shortly after the oil spill in Santa Barbara, California, in 1969.

The *Exxon Valdez* proved to be a seminal event. Prior to it, U.S. oil spill legislation was insufficient and fragmented: The Federal Water Protection Control Act (FWPCA), Outer Continental Shelf Act (OCS) (Eaton 1985), Comprehensive Environment of Response Compensation Liability Act (CERCLA), and Deep Water Ports Acts (Eaton 1985). After the *Exxon Valdez* it was reported that "Congress concluded that the federal contemporary approach to oil spill prevention and response had to be changed and the national response system modified to enable government to respond quickly ... to catastrophic oil spills" (Luchun 1991). What the nation needed, reported Ruhl and Jewell (1991), is a "package of complementary international, national, and state laws that will adequately compensate victims of oil spills, provide quick efficient cleanup, minimize damage to fisheries, wildlife, and other natural resource and internalize those costs within the oil industry and its transportation sector."

Oil spill research and development were on the decline prior to the *Exxon Valdez* spill. *Scientific American* (1989) reported that EPA planned to close down its spill cleanup test facility in New Jersey in 1989, research funding from the Coast Guard fell from $6 million/year in 1980 to $300,000 in 1989, and the American Petroleum Institute decreased research funding from $600,000/year in the early 1980s to $100,000/year from 1985 to 1988. Thus, the *Exxon Valdez* oil spill gave new impetus to funding authorities, which in turn spurred the voluminous publications of research results.

This paper will review a sampling of the literature published on oil spill management. Because of the large number of publications in this area, especially in the past five years, this report will be limited to the review of reports concerning prevention, response and policy issues. The majority of literature reviewed was published after 1989; however, some works prior to that date were included as a means of comparing more recent policy development with pre-Oil Pollution Act of 1990 (OPA 90) policy, or to follow technical developments from their inception.

Important sources of information are the biennial international oil spill conferences sponsored by the American Petroleum Institute (API), the U.S. Coast Guard (USCG), and the U.S. Environmental Protection Agency (EPA). The conference proceedings, beside providing a written record of the conference, also summarize the latest oil spill response and prevention research and national and international oil spill management theory and practices. The proceedings of the 1995 conference held in Long Beach, California, were extensively reviewed for the preparation of this report. A number of articles from the 1993 conference held in Tampa, Florida, was also reviewed. *Oil and Gas Journal* provides a rich source of literature, but information was found in a wide variety of publications, from *Mother Jones* (Penenberg 1994) to *Advances in Microbial Ecology* (Marshall 1992).

Several general observations can be made based on a review of approximately 200 journal articles, books and news accounts. First, a large amount of the literature concerning oil pollution from crude or oil products deals with spills by tank vessels, although less than 50% of oil pollution comes from all types of tank vessel spills. Accidental spillage from tank vessels actually contributes a very small part to the total amount of oil pollution in the marine environment. The National Research Council (1991), in its study of double hulls for tankers, found that in 1981–1985 only 8% of oil pollution in the marine environment was from tanker accidents, and in 1990 about 13%. Operational spills, those that occur during the off-loading of oil at terminals, accounted for the largest amount of tank vessel oil pollution in those years. Municipal runoff and industrial waste disposal accounted for 35% of oil pollution in the marine environment. However, few articles examined the issue of oil pollution from municipal runoff, small scale spills from recreational vessels, or oil pollution from industrial waste disposal.

Second, oil spill response is the subject of more literature than is oil spill prevention. A great deal of the literature on oil pollution deals with research, evaluation and use of response gear. Case studies of oil spills evaluating human response form another important part of the oil pollution literature. Prevention is cited as the most important area of oil pollution management. However, prevention is the central issue of written articles less often than is the topic of response. Prevention is often featured as part of an article on response, especially if the response technique does not perform well. Both response and prevention will be dealt with in more detail in this report.

Finally, the difference between the U.S. oil pollution management regime and the rest of the world, especially in the area of tanker spillage has been the subject of many articles (Eaton 1985; de la Rue 1992; Jarashow 1992; Holt and Johnson 1995; Bovet 1995). The U.S. imposes much higher liability per incident, allows for a higher degree of compensation for those impacted by oil spills, and more closely regulates the vessels that are involved in the oil trade. Most other nations in the world follow the conventions worked out by the International Maritime Organization (IMO), the United Nations body that attempts to regulate international maritime commerce. The international regulatory regimes have little effect on Hawaii and will not be covered extensively in this report. However, any requirements the state may wish to place on international shipping will have limited impact because of the nature of regulatory maritime commerce. Regulations that may impact international shipping would have to be proposed by the U.S. government to the IMO before they can be enacted.

In the following pages, this report will deal with three issues: prevention, response and policy. The "Prevention" section of this report deals with measures that oil companies, shipping interests and government agencies have instituted to prevent oil spills from occurring. "Response" deals with equipment and techniques used to respond to oil spills, including vessels, oil removal devices, dispersants, in-situ burning, and methods of cleaning oily beach and treating oily debris. "Policy" deals with planning and preparation for responding to spills, past spill activities, and organizational issues.

A fourth and concluding section focuses on the implication for Hawaii of the topics discussed in the literature.

PREVENTION

In 1983 economist Henri Smets (1983) forecasted "repeated occurrences of highly costly oil spills and the inadequacy of existing compensation are two factors calling for consideration, if it is intended to reduce the frequency of oil spills." However, the U.S. authorities failed to address the adequacy of liability and compensation issues. The results were that oil spills continued, but the *Exxon Valdez* spill in Alaska helped push Congress into passing comprehensive oil spill legislation. One of the many prevention features set out in OPA 90 was to raise liability and compensation limits, making it costly to spill. The oil spill prevention section of OPA 90 is primarily covered in Title IV, which includes these topics (Luchun 1991):

- Changes seaman licensing procedures that allow the use of data from national driver registration
- Requires renewal of seaman licenses after five years instead of being issued for life
- Tests for drug and alcohol use
- Requires mandatory participation in vessel tracking system (VTS) and requires the Coast Guard to upgrade VTSs
- Regulates standards for plate thickness on vessels and calls for periodic gauging to assure that the standard is met.

The two most important preventive measures legislated in OPA 90 were the requirement for tankers to be built with double hulls and the increase in the amount a responsible party is liable for per oil spill. Another important prevention measure is the institution of the USCG Port State Control Program, which allows the Coast Guard to inspect foreign vessels calling at U.S. ports. According to McKenna (1993) the Coast Guard is aware of 99% of foreign vessels entering U.S. ports. The program has done a lot to keep foreign-flagged "rustbuckets" from entering our ports.

Prevention is an important part of spill management according to those involved in the petroleum industry. According to Stuart Horn (1989) of Mobil Oil Company, "Prevention must continue to be our first line of defense (*Scientific American* 1989)." Bob Reed, then CEO of Pacific Resources, Inc. (now BHP Hawaii, Inc.), said, "Prevention is the best method of not having oil spills ...We are working to try to reduce oil spills to zero" (Otagura 1991).

Can the risk of oil spills be reduced to zero? The answer seems to be both yes and no. Clarke (1990) points to the record of the liquified natural gas carrier. From 1964 to 1982, about 5,400 ocean voyages were completed by LNG carriers of which only 16 LNG incidents were reported, none involving fatalities and none involving the breach of the interior hull. Clarke points out that a LNG tanker explosion would be catastrophic, but if the oil industry treated spills as if they were catastrophic, a similar reduction in oil spills would occur.

The National Research Council (1991) seems to think otherwise:

> The threat of pollution exists wherever tank vessels travel and traffic in U.S. waters is increasing: Projections call for up to a 50% increase in imports of crude oil and petroleum products by the year 2000 ...one five-hundredth of 1% of the total amount of oil moving through the U.S. waters is spilled. The 9,000 tons (on average) of crude oil that is spilled annually in U.S. waters can be damaging from an environmental, economic, and social perspective.

The implication is that with so much oil moving through U.S. waters and so little of it being spilled, it is very difficult to reach a goal of zero oil spills. In addition, the Petroleum Economist (1992) reported that wafer-thin profit margins and doubts over the viability of large tankers have encouraged owners to extend the working lives of their ships rather than invest in new ones. Low operational standards, poorly trained crews, and substandard ships contribute to the problems of curbing oil spills (Crow 1993). The head of British Petroleum (BP), for example, admitted in 1992 that 40% of the world's current very large crude carriers (VLCC) fail to meet BP's own quality threshold (*Petroleum Economist* 1992).

If the occurrence of oil spills from tankers cannot be brought to zero, there are some methods which can lower the rate and severity of accidents. The National Research Council (1991) reported that use of double hull tankers should reduce pollution from grounding and collisions. They report that when the OPA 90 requirement is fully implemented, over the next 25 years, double hulls should save an estimated 3,000 to 5,000 tons of oil spillage per year in U.S. waters. The added cost reported would be more than $700 million per year or about one cent per gallon of petroleum transported.

Prevention measures have been implemented other places. Craik (1995), lists some of the prevention measures taken at ports near the Great Barrier Reef Marine Park in Australia:

1. Conventions and legislation which set a high liability amount for spilled oil
2. Reception facilities for boats to get rid of ballast
3. Navigation and routes that avoid bottlenecks in sensitive areas
4. Vessel condition inspections that will not allow substandard vessels into ports near the UBR Park
5. Pilotage required in waters inside the barrier reef

The Petroleum Industry Response Organization (PIRO), predecessor to the Marine Spill Response Corp. (MSRC) cited preventive measures that were needed to reduce oil spill (*Offshore* 1989):

1. Traffic vessel system where needed (to be determined by the Coast Guard at that time)
2. Higher quality standards for pilots
3. Tug assistance where major navigational hazard exists
4. Drug and alcohol testing as part of marine merchant licensing
5. Certification and training in spill response by seamen as part of the licensing procedure
6. Auto pilot alarms
7. Vessel configuration - double hulled and similar types should be studied

The Trans Alaskan Pipeline System (TAPS) has enhanced its prevention practices in the last five years in the wake of the *Exxon Valdez* oil spill. These include the following (Hillman et al. 1995):

1. Drug and alcohol screening and testing of personnel
2. At least one escort response vessel and one tug escort with the capacity to tow or push each laden tanker through Prince William Sound
3. Tanker position monitoring by U.S. Coast Guard automated dependent surveillance system
4. Traffic separation scheme
5. Ice navigation procedures
6. Transit speed limits
7. Reminder communications to question or alert tanker crews of atypical ship behavior
8. Forecasting wind condition parameters for outbound laden tankers

In addition, citizen participation through the Regional Citizen Advisory Councils (RCAC) helps identify other areas for improvement (Willis 1991). Willis (1991) provides a list of 30 items which are used at Sullom Voe Terminal in the Shetland Islands. Although too numerous to recount here, several are cited below:

1. Random aerial surveillance of all tankers entering and leaving port
2. No go areas for tankers and a 10 mile bottom area around sensitive areas
3. Wind limits imposed on loading
4. Computerized rogues' gallery of offending and substandard ships
5. Boarding and inspection of all tankers
6. Make pilots salaried employees of the port authority
7. Refuse berthing for tankers with even minor defects (such as a rung missing on a Jacob's ladder) until brought up to standards

Under California Comprehensive Oil Spill Law, oil spill prevention is recognized as the only real way to address oil spills. The prevention measures include the following (Boland and Bontadelli 1995):

1. Waterway management
2. More aids to navigation
3. Vessel traffic services (radio and radar)
4. Required pilotage
5. Tug escort in sensitive areas
6. Vessel and facilities inspection program
7. Voluntary 50-mile buffer zone around coast
8. Monitoring oil transfer

Not all preventive measures come in comprehensive packages; Newmann and Wright (1991) suggest the use of employee contracts as a means to reduce spills. Incentive clauses can be inserted into ship's officer contracts to reward voyages completed without incident. Ship personnel are more likely to follow safe operating procedures if incentives are dependent on preventing oil spills.

Prevention for plants and shoreside facilities have also been addressed in the literature (Goodier et al. 1983). Proper plant siting and layout at oil tank farms can prevent large scale spills from occurring. Things to consider for plant siting include these:

1. Existence of any flood, earthquake, hurricane and seismic wave hazards in the vicinity of tank farms
2. Spacing of tanks
3. Vapor reduction system installed in the tank
4. Tank design that takes into account prevailing weather conditions

In addition to plant layout, a number of other typical problems that occur in tank farms were also discussed and appropriate preventative measures proposed. Included among the many suggestions were these (Goodier et al. 1983):

1. Painting tanks white can reduce internal heat by 50%
2. Outside tank maintenance
   - repainting, cleaning, etc.
   - checking tank shell thickness
3. Liners to protect inner surfaces
4. Fixed/floating roof tanks reduce vapor loss (floating roofs have problems with drainage)
5. Vapor recovery systems (Edwards Engineering Systems) and vapor containment systems (lifter roofs, extended shells, etc.)
6. Liquid level monitors - many methods to prevent overfilling
7. Lightning protection - National Fire Protection Association, pub. #78 "Lightning Code, 1977" and API, pub. #RP2003-10/74 on lightning and grounding protection

Oil spills also occur during offloading, especially at night, and for this Goodier, Siclari, and Harrity (1983) suggest the following:

1. Use of butterfly valves in the hosing to cut off flow at the completion of offloading or bunkering
2. Revision of operation manuals for unloading procedure
3. Use of infrared detectors to detect oil spill during bunkering or offloading at night

For land-based facilities, the EPA requires the preparation of a Spill Prevention Control and Countermeasure (SPCC) plan under the FWPCA of 1970. OPA 90 amended the FWPCA to require tougher SPCC plans and expanded the number of facilities covered by the SPCC program (Weissman and Rave 1992). The new regulations promulgated by the EPA will require facilities to monitor potentially troublesome areas but will increase the costs of plant management.

Additional cost is one of the outcomes of a more stringent prevention regimen. Thus, cost benefit analysis must be part of the decision-making process for requiring new preventive measures. Cohen (1987) examined some of the Coast Guard oil spill prevention policies to determine optimal levels of enforcement. His conclusions follow:

1. Penalties for small spills were counterproductive
2. More inspection and monitoring at vessels leads to smaller spills for large vessels at low cost
3. Penalties for large spills were too low (prior to OPA 90)
4. Too few resources were being devoted to prevention of spills

OPA raised the ceiling on liability for onshore facilities from $50 million to $350 million. For tank vessels, the figure went from the greater of $150/gross ton or $250,000 to the greater of $1,200/gross ton or $10 million (Welch 1991; Wilkinson et al. 1992). The vast increase in liability (and unlimited liability in some cases) should help to make prevention measures look more reasonable.

Information plays a vital role in preventing spills. Accurate records about previous spills can help prevent future occurrences or at least help plan a better response (Stalcup et al. 1995). Studies of oil spill records can give unique insight on problem areas where multiple spills occur. When all spills are studied together they can sometimes point to trends that are taking place. This can lead to identifying and prohibiting practices that lead to spills.

The human dimension cannot be left out in oil spill prevention. A number of experts say that as many as 80% of oil spills occur due to human error (Mahapatra 1995; Moore and Roberts 1995). Even the most sophisticated, well respected company with the best thought out procedures and most precise contingency plan can be plunged into trouble by a neglectful or careless employee (Miller 1989). Better crew training, especially in the area of offloading procedures, and a better appreciation by tanker crews of the importance of preventing oil spills may be necessary to lower the human error problem. The Coast Guard, as reported by the BC/States task force is also examining human performance and how to reduce or eliminate error (Cameron 1995).

The "bottom line" on prevention is that it takes constant vigilance — an effort difficult to maintain even for government agencies and oil companies (Otaguro 1991). Though much has been done in this area, Sarah Chasis, an attorney for the Natural Resources Defense Council says, "On the response side, we are a lot better prepared, but on the prevention side, we still have a ways to go" (Kenworthy 1994).

RESPONSE

Hawaii has experienced only one spill of more than 100,000 gallons. That one occurred at a ruptured pipeline in an area of Pearl Harbor where the oil could not escape into the ocean (Pfund 1992). The closest the state has come to a large scale oil spill was in 1989 when the *Exxon Houston* drifted onto a reef near Barber's Point. The *Exxon Houston* was carrying three million gallons of oil at the time (*Pacific Magazine* 1989). Since the passage of OPA 90, a whole mechanism for planning, training, testing and evaluation have come into being. OPA's framer recognized that better preparedness for containment and cleanup is the key to minimizing impacts from an oil spill (Wilkinson et al. 1992). OPA 90 requires the President of the U.S. to ensure effective and immediate removal of discharged oil, thus providing clear lines of authority when spills occur. The Coast Guard, acting on behalf of the president, controls oil spills occurring in or near the waterways; the EPA represents the president in the control of land based spill (Grumbles 1990).

To assure an adequate response structure would be in place throughout the U.S. and its territories, OPA 90 amended the Federal Water Pollution Control Acts requirement for a National Contingency Plan to create a program that integrates local and regional response plans with a national response plan. The planning process will be discussed in greater detail in the next part of this review. This section will focus more closely on the types of equipment used for response and for port spill cleanup.

One of the more important developments of OPA 90 was the creation of two national response companies: the National Response Corporation (NRC) and the Marine Spill Response Corporation (MSRC), private organizations with the ability to marshal resources in response to large oil spills anywhere in the country (*Marine Log* 1994). Prior to the creation of these two response companies, the only organization with a capacity to respond to spills greater than six million gallons was Oil Spill Response, Limited, in Southampton, England (API 1989).

The NRC and the MSRC operate differently and the differences are worth noting. The NRC, headquartered in Calverton, New York, is a for-profit corporation offering a wide range of cleanup services nationwide. NRC has nine oil spill response vessels (OSRV) deployed at sites from Portland, Maine, to Corpus Christi, Texas (*Marine Log* 1994). The NRC capabilities are backed by the resources of 47 oil spill contractors in the Independent Contracting Network (ICN). Through the ICN, NRC can call upon the services of 3,300 to 3,400 contractors worldwide to respond to spills (*Marine Log* 1994). The NRC is financed by shipowners who pay a fee which allows them to cite the NRC as their cleanup contractor in the vessel contingency plan.

The MSRC is an independent, privately financed, non-profit oil spill response organization. It is funded by the Marine Preservation Association (MPA) made up of oil companies, large shippers and receivers of crude products (*Oil & Gas Journal* 1990b). MSRC has five regional centers and three to six prestaging areas in each region (Costello 1993). MSRC has 16 OSRV built specifically for oil spill response, one of which is home ported in Honolulu, Hawaii (*Marine Log* 1992). MSRC will respond to oil spills from any member of its association. It will also respond to non-member vessels on a cost reimbursable basis (Costello 1993). The MSRC had a research program that until July 1995 included research on these tools and techniques (Costello 1993, *Oil Spill* 1995):

- Remote sensing to develop day/night all-weather response capabilities
- In-situ burning — Assessment of technology and methodology
- Dispersants — Enhanced application methods
- Handling of recovered materials, including oily debris
- Shoreline countermeasures — Assessment of ecological effectiveness of shoreline spill countermeasures

The Department of Defense can also provide significant resources to assist the federal on-scene coordinator (FOSC) in cleanup operations. The Navy, for example, provides a number of ships and skimmers which could be called out by the FOSC during a spill (Ducey and Walker 1993). (Table 1 — List of available Navy equipment.)

TABLE 1. SUPSALV Oil Spill Response Equipment Inventory

Equipment Description	Location and Quantity			
	Williamsburg, VA	Stockton, CA	Anchorage, AK	Pearl Harbor, HI
Spilled Oil Recovery				
Skimmer Vessel System (36' Aluminum Hull)	10	10	2	2
Skimmer System (Sorbent Belt VOSS*)	1	0	1	0
Skimming System (Screw Pump VOSS*)	2	1	1	0
Skimmer, Sorbent Rope Mop (36")	1	2	0	0
Boom Van (18" x 350' Fire Boom)	1	0	0	0
Boom Van (42" x 1,980' Boom)	5	4	2	1
Boom Mooring System	31	28	12	4
Boom Handling Boats (24' 260 hp Diesel)	8	8	2	2
Boom Tending Boats (19' & 23' Inflatable)	2	1	1	1
Boom Tending Boats (18' Rigid Hull)	4	3	1	1
136K Oil Storage Bladder	6	4	1	0
26K Oil Storage Bladder	3	2	1	2
Casualty Offloading				
Pump System, POL 6" Submersible	7	5	2	4
Floating Hose (6" x 100')	58	0	0	0
Hot Tap System	1	1	0	1
Boarding Kit	1	0	1	1
Fender System (8' x 12' Foam)	7	4	0	0
Fender System (14' x 60' LP Air)	4	4	0	0
Fender System (10' x 50' LP Air)	8	15	1	0
Ancillary Equipment				
Command Trailer (40' Communications and Command Center)	1	1	0	0
Command Van (20' Communications and Command Center)	2	1	1	1
Shop Vans	1	1	1	1
Rigging Vans	2	1	1	1
Personnel Bunk Vans	2	0	0	0
Beach Transfer System (4-WD Vehicles)	1	0	0	0
Communication System (Satellite Phone, Land)	1	0	1	0
Communication System (Satellite Phone, Ship)	1	0	0	0
Oil/Water Separator (Parallel Plate 100 gpm)	1	2	0	0
Cleaning System	1	0	1	1

*VOSS: Vessel of Opportunity Skimmer System

Source: U.S. Navy Supervisor of Salvage (SUPSALVS Poltution Response Guide and Equipment Manual 1995)

The Coast Guard, the prime agency charged with responding to marine and coastal oil spills has an array of pre-positioned equipment and manpower. Included in the Coast Guard's arsenal, in addition to personnel in each of the Coast Guard district response groups, are a National Strike Force Coordination Center at Elizabeth City, North Carolina, a national laboratory for identifying the origins of crude oil, and a data base of oil spills, Marine Spill Information System (MSIS) in Washington, D.C.

In addition to the U.S. companies, Canada is also in the process of gearing up its spill response capability. Plans by the Canadian Petroleum Association and the Independent Petroleum Association of Canada (IPAC) are underway to improve Canada's oil spill response by pre-positioning cleanup and containment equipment, improving training throughout the industry for oil spill response, and providing for better communication with government agencies (*Oil & Gas Journal* 1990a).

An important aspect of response is notification. Federal law (33 USC 1321 section 311 [b][5]) requires that any person in charge of a vessel or facility shall notify the Coast Guard as soon as they have knowledge of an oil spill. The Coast Guard maintains a National Response Center (NRC) in Washington, D.C., to handle activities related to response action. The NRC acts as the single point of contact for all spills. The NRC notifies their regional office of spills in their areas.

Response equipment is the subject of many articles dealing with response. A comprehensive review of this literature could not be attempted, but a number of articles representative of the literature are reviewed and presented below.

Tsocalis et al. (1994) summarized all the major response methods into four categories (Table 2).

TABLE 2. Summary of Main Cleanup Methods

Mechanical methods	• not applicable in rough sea states, very sensitive to sea state • good from environmental point of view (do not add strange agents to the sea) • recovery and possible reuse of the oil • effort increases with the size of the spill more than other methods • there is much experience with their use
Dispersants	• suitable for large marine oil spills for efficiency must be applied during the first hours of the spill • not very efficient in calm seas • before use must check potential environmental damage caused by dispersants
In-situ burning	• suitable for large marine oil spills • for efficiency must be applied during the first hours of the spill • risk of explosion to the vessel causing the spill • environmental damage exists; there is a trade-off with air pollution
Bioremediation	• promising method since it is excellent from an environmental point of view • takes time to act, not suitable for fast response • there is not much experience with use because it is difficult to measure and control the marine environment

Source: Tsocalis et al. 1994

In addition, Tsocalis et al. (1994) examined four other methods:

- Gelling agents — Chemical applied to solidify oil
- Natural degradation — Evaporation and natural bacteria action
- Sinking — Placing agents on oil to make it sink
- Sorbent — Materials that soak up oil

These methods are employed less frequently due to cost or environmental consideration. The use of sinking agents is now discouraged for oil spills since it tends to concentrate oily waste at lethal levels in the ocean's benthos.

Skimmers have been the subject of research and development for several decades. A number of articles focused on discussion and testing of skimmer design and efficiency (Clauss and Kuhnlein 1991; *Sea Technology* 1991; Tsocalis et al. 1994; Bronnec 1995). Several articles examine the use of dredge or retrofit work vessels that can double as skimmers in times of oil spill (McDonnell 1992; Ouwerkerk et al. 1995). Though skimmers are the prime mechanical response, historically it has been unusual for skimmers to gather more than 10–15% of the spilled oil, although experts agree that this figure could reach as high as 30% under ideal conditions (Office of Technology Assessment 1990). It is doubtful they will do better in the near future. When operated properly or used in the designed manner, skimmers are the least environmentally damaging method of oil removal.

Booms go hand-in-hand with skimmer systems in the collection of oil. Booms are used to keep oil out of sensitive areas or to channel oil into skimming devices. Their efficiency decreases dramatically in high wind and waves, but under ideal conditions booms can produce adequate results (Nash 1991; Badesha et al. 1993). Wong and Guerrero (1995) studied boom design to discover a superior design or deployment configuration. Their test yielded better results when booms were deployed at angles to the shoreline. However, in these tests wave and wind conditions were a greater factor than the design in determining success.

Dispersants have generated the greatest amount of study and discussion of all spill-treating agents (Fingas et al. 1991). The use of chemical dispersants often arouses opposition because they are thought to be toxic. However, new types of dispersal contain chemicals that are less toxic. Another problem with dispersants is the release of the crude's toxicity over a wider area once the spill is dispersed (Perry 1995).

Non-toxic dispersants are found to be effective when used properly. Each type of dispersant seems to work best on particular types of crude, but none does well on all types. Further testing should prove where each will work best (Fingas et al. 1991). Longterm storage of dispersants may also prove problematic. Dispersants have been stored in many places for more than 10–15 years although it is not clear if they keep their quality. They should retain their quality if they are stored in the following manner (*Petroleum Review* 1990):

- Dispersant should be kept in the manufacturer's container
- Bulk storage in molded steel containers should be avoided
- Temperature and humidity should be controlled

Dispersants are an important tool in oil spill response when used with the right oceanographic conditions, where water depth and mixing characteristics are sufficient to rapidly dilute dispersed oil.

In-situ burning has been seriously considered as a method of removing spilled oil. The Canadian government recently conducted offshore experiments, burning 20,000 gallons of oil in a controlled experiment off the coast of Newfoundland (Lazes 1995). The researchers found that emissions from the burn were within allowable limits at 150 meters from the fire. They concluded that the benefits to the environment of burning oil outweigh the detriments. The cost they calculated was on the order of 20% of that for mechanical removal. In-situ burning has a short window of opportunity for the decision to use it, and pre-approval is a necessary condition for the application (Stacey 1995). Oil spill planners from Washington, Idaho and Oregon have developed a draft set of guidelines for the use of in-situ burning, setting out the conditions for when it is allowed (Northwest

Contingency Plan 1994). Other states, including Texas and Louisiana, have pre-approved conditions for the use of in-situ burning (Lazes 1995). Hawaii has recently entered into an agreement with the USCG and the EPA concerning the use of in-situ burning as a response method (FOSC 1995).

Bioremediation has become another major weapon in responding to oil spills. Bioremediation is the use of naturally occurring bacteria that consume hydrocarbon as a food source to clean oil spills at sea, oil soaked debris, and oil soaked soils from spills on land or from underground storage tanks. Atlas and Bartha (1992), have summarized the use of bioremediation on both land and marine spills. Their conclusion is that bioremediation can work in both media but at a very slow rate. Attempts to speed up the rate of absorption by aeration and fertilization have proved successful for land based bioremediation. The use of bioremediation for marine oil spills has proved more problematic due to the lack of nitrogen in the water, which slows the growth of bacteria, and also due to the low concentrations of the right type of bacteria to attack oil (Rosenberg et al. 1995).

Using bioremediation to clean oily debris was examined by Wahbeh (1990), who found that an economical and environmentally sound land cultivation project depends on several factors:

1. Availability of sufficient land area
2. Use of facilities that can control air pollution (odor)
3. Evaporation ponds to remove water from the land farm
4. Continuous analytical monitoring
5. Good engineering management on a day-to-day basis
6. Research and testing to improve efficiency
7. Proper permits for initial siting

Few, if any operators could meet these stringent conditions.

Bioremediation offers a way to use natural means to attack oil spills. Breakthroughs in genetic engineering may be needed to make bioremediation effective in the water. On land, bioremediation can eliminate the source of hydrocarbons so that land can again become productive.

A number of more exotic methods have been tested recently. *Sea Technology* (1993) reports that two researchers developed a non-polluting method for cleaning oil spills. Their technique is based on the use of lecithin, a by-product of edible oils from plants (soya, cotton seed, and canola). Lecithin forces oil to bead and remain floating until collected. Research on this method is being conducted at Hebrew University in Israel.

Raloff (1993) discusses two new methods to sop up oil: catalytic coated beads and waste cotton fiber. Beads coated with oleophilic materials that attract oils are introduced into a spill. The beads attract oil to their surface and then are collected. The beads are reusable and much easier to collect than oil itself. Waste cotton fiber act as a sponge to collect oil on the water's surface. It can be collected by skimming devices and is much easier to collect than oil.

Penenberg (1994) reports in *Mother Jones* magazine on five "goo gobblers" that are being developed, among them glass beads and chewing gum. The United Nation reported on sinking agents such as chalk and lime that can sink oil (U.N. 1993) but concluded they would do more harm than good. Basseres and Trameir (1995) report on products that reduce the adhesion of oil to rocks with promising results. This would enhance cleanup once the spill reached the shoreline.

Uses of the more exotic methods are still in the developing stages and may be years until they can be deployed in spill situations. Further research and testing will determine if these more exotic response tools are really effective in fighting oil spills, though many are beginning to show promise.

Another important aspect of response is pre-assigning areas that will be protected in the event of an oil spill and predetermining areas where oil can be collected for cleanup. Heimowitz (1995) describes Washington

state's geographic response plans (GRP). The GRP reduces the need to plot strategy for protecting high value resources during a spill by having pre-arranged plans for protecting high value resources. These areas are determined by a task force of federal, state, local agencies and citizen groups. Sensitivity mapping has been done as early as 1980 (Hayes et al. 1980) to identify coastal areas that are highly sensitive to oil pollution. These areas can be unique plant and animal habitats, recreational areas, or areas where low flushing and mixing slow the natural cleaning process.

Determining where oil may spread once it spills is an important part of response. Spaulding et al. (1992) report that there are between 30 and 50 trajectory and fate models available. However, most of these models survive only a short time because of new information as well as hardware and software improvements. Rigorous testing under simulated and real conditions may help sort out the field of trajectory models with several becoming dominant.

Finally, Larkin (1990) has developed a checklist, designed for homeowners and small fuel oil companies of things to do in case of a small-scale oil spill. The checklist contains steps for small spillers to protect themselves, to notify authorities, and to prevent the spill from getting worse until the response authorities arrive.

Response is an important part of oil spill management. Rapid response can prevent spills from becoming more damaging; this can be thought of as a preventive measure. Despite the shortcomings of existing countermeasures, each may have applications in certain situations. There is no one general solution to oil spill response. Many technologies can be effective in certain applications, but completely inappropriate in others. Regardless of the technique(s) employed, the effectiveness of the response will be enhanced greatly if there is rapid response by a professional response team that understands which techniques are best under which conditions (Office of Technology Assessment 1990). It may be wise to heed the words of Mobil Oil's Stuart Horn (1989): "The emphasis must remain on prevention because containment methods are often ineffective in the open sea."

POLICY ISSUES

Oil spill prevention and response do not take place in a vacuum. Legislation has to be enacted, regulations promulgated, communication among private and public organizations established, and a whole oil spill management program designed to diminish the impacts of oil spills. This is the realm of policy, deciding (negotiations) who will be in charge, who will be responsible, and who will do what when oil is spilled. This section of the report will examine some of the policy issues that go into managing oil spills.

Just after the *Exxon Valdez* accident, Lee Clarke (1990) wrote in the *Atlantic Monthly*:

> Although the sophistication of such [response] plans is ever increasing, they are no closer today to spelling out ways to fix oil spills then they were twenty-three years ago when the first major spill from a tanker occurred.

One of the criticisms of the *Exxon Valdez*, and other cleanups, had been the uncoordinated, unrealistic and overlapping nature of oil spill response (Randle 1991). Even if all the response equipment in the U.S. had been in Alaska when the *Exxon Valdez* spilled its oil, response would have been hampered by a lack of command structure and coordination of effort. No one seemed to be in charge (Keeble 1991). The *American Trader*, which spilled oil off the coast of Huntington Beach, California, in 1990, brought this point home. In spite of state response plans, no one in the city of Huntington Beach knew what they were supposed to do (Fischer and Martinet 1993). There needed to be one overriding framework to tie all those involved in oil spill management into a unit.

Similar conclusions were arrived at by the French government after the wreck of the *Amoco Cadiz* (*Business Week* 1978), and by Malaysia after examining its oil spill response capabilities (Alam Sekitar 1990). Esso Malaysia's conclusion of what was needed to combat an oil spill applies to the U.S. and many other countries:

1. Considerable amounts of equipment and well-trained response people are needed
2. Considerable communication and cooperation with government environmental authorities are needed
3. The oil industry as a whole needs to work together to set up some form of mutual aid and cooperation

OPA 90, signed into law August 1990, called for the creation of a national and regional planning and command structure to coordinate oil spill response (Randle 1991). OPA 90 called for all vessels and facilities to have oil spill response plans in place by 1993 and resubmit them for final approval in August 1995 (Irion 1993). The new statute completely revised the requirements of National Contingency Plan (NCP), making it responsive to national and regional needs (Randle 1991).

Section 4202 of OPA 90 formalizes the relationship between federal, state and local spill response agencies. It requires these agencies to cooperatively form an area committee and to develop a comprehensive area contingency plan (ACP) (Denby and Gauvin 1992) for oil spill response. The Area Contingency Plans in turn adopted some variant of the Incident Command Structure (ICS) as the backbone of its response command. The ICS is a method that brings all parties involved in spill responses under one umbrella during a spill. At the apex of command are the federal, state and responsible on-scene coordinators working together to direct the response effort. Other federal, state, and local officials, spillers, representatives of response organizations and volunteers are organized into working groups responsible for operations, planning, logistics and finance (Hunter 1993) to assist the unified command. Thus, as resources are needed, responsible personnel are ready to move them into action.

The ACP and the ICS response worked well in its first major test during a spill by the barge *Morris J. Berman* in Puerto Rico on January 7, 1994. Coast Guard Commander Robert Ross reported that the ICS-style unified command system was successfully, if not perfectly, implemented in this incident (Ross 1995). In a comparison of the planned response and the actual response Vlaun et al. (1995) praised the efficiency of the response, especially the ICS. Vlaun noted, however, that the unified command system was "operation oriented" and that response should have been broader by taking care of other areas, such as communicating with the public instead of pure response activities.

Hunter (1993) has pointed out that there are some problems with the ICS:

1. It is not responsive to public outcry since many decisions are pre-made
2. The spiller directs the cleanup
3. The government has a dual role of being a responder and an enforcer of laws and regulation

Even taking these criticisms into account, the ACP and the ICS makes oil spill management much more responsive. A more general criticism is that planning for large oil spills may make overall response less effective (Ott et al. 1993). Having equipment available and trained personnel prepared to respond may lull the response community into a false sense of security. Response outlook has to be realistic; large spills will cause large impacts even under ideal conditions. Oil spill prevention should remain the foremost goal of the area planners and oil spill management community (Clarke 1990).

The policies and programs mandated by OPA 90 differ significantly from those governing international law. OPA 90 will cost U.S. citizens more in terms of higher oil prices while not helping the environment in the long run, argues de la Rue (1991). Reputable shippers may refuse to transport products to the U.S. because of high insurance costs, leaving only marginal vessels to pickup the slack. Eaton (1985) argues that the U.S. should pass liability laws similar to those in the Civil Liability for Oil Spill Damage Convention (CLC) and the International Fund for Compensation for Oil Pollution Damage (IOPC) so that there will be only one oil spill management regime. Confusion caused by having two sets of oil spill regulations will drive shippers from the U.S. Few shipping companies, however, seem to be leaving the lucrative U.S. oil trade, which accounts for one-third of all oil shipped globally. Passage of OPA 90 may have spurred the international community through

the IMO to reevaluate their liability arrangements (Holt and Johnson 1995) and make changes that will bring it closer to U.S. law.

OPA 90 did not preempt state law. Several states have passed laws requiring actions beyond those in the federal law. The State of Alaska established a cultural resource working group in 1992 to advise the regional response team as to what areas should be protected in case of a spill (Bergmann 1995). The state also requires the use of the state coastal zone management program to allow communities to review vessel and facility contingency plans (Braley and Ballard 1993). The Alaska Department of Environmental Conservation sponsors workshops to train the public in review of contingency plans.

California's oil spill prevention and response act mandates state requirements for vessel and facility response plans and vessel inspection program separate from that of the Coast Guard (Boland and Bontadelli 1995). Four western states and a Canadian province have formed a task force to enhance spill coordination among West Coast states (Washington, Oregon, California and Alaska) and the province of British Columbia (Neel et al. 1993). Several states (Alaska, California, Connecticut and Florida) have established state requirements for financial responsibility beyond that of OPA 90 (Arbuckle 1991). Alaska has instituted a training course for its state on-scene coordinators. The three-day course is one-third lecture and two-thirds scenario resolution, and is conducted by the Coast Guard and state officials (Young et al. 1995).

State laws are not universally well received. The Western States Petroleum Association (WSPA), for example, criticizes California's state laws and regulations. WSPA claimed that the California spill program would be duplicative of the federal program and it would add to the price of fuel (*Oil & Gas Journal* 1989).

One area where state and federal policy must be made consistent is in the decision to end a cleanup operation. Federal law allows states to enact legislation that requires oil spill cleanup efforts beyond those mandated by the FOSC. However, states must pay for this cleanup with their own funds (Wilkinson et al. 1992). Federal law clearly puts the decision of declaring an end to cleanup in the hands of the FOSC. In some cases, state officials may disagree with the FOSC decision. In those cases Tebeau (1995) suggests a consensus of state, federal and expert opinions provide the decision.

Natural resource damage assessment and longterm mitigation of impacts are also policy areas where federal, state and representatives of the responsible party need clear guidelines. Research on longterm impacts of oil spills has shown in some instances that they may be less than originally thought (Maki 1991; *Consumer Research* 1991). Without a process to sort out claims by responsible parties, public interest groups and various experts' time may be wasted, while the issue of how much local resources were damaged remains unresolved. Texas has developed an innovative scheme for resolving this potentially contentious issue. State trustees have signed a Memorandum of Agreement that requires the responsible party, the public and federal natural resource trustees be involved in the damage assessment and that mediation will be used when trustees cannot agree (Hansen 1995). This process also requires a good assessment of state marine resources prior to the oil spill.

The best policies require proper adherence. Keeble (1991) reported on the gradual erosion of Alaska's capacity to respond to oil spills because of a state bureaucracy willing to allow it. As a result, when the big spill occurred, no one was ready.

IMPLICATION FOR THE STATE OF HAWAII

There exists a vast and rich literature dealing with oil spill management. Only a sampling is presented here. Its content provides some suggestions for oil spill management in the State of Hawaii. The implications of the literature on oil spill management in the State of Hawaii will be explored in this final section. What follows are not recommendations to changes in state laws or regulations, but ideas which the state may wish to pursue in greater detail.

Implications of Preventive Mechanisms

Many of the suggested preventive mechanisms are already in place in Hawaii. High liability for spillers, navigation routes that avoid bottlenecks, pilotage for port areas and offloading terminals, and a visual vessel traffic system at Honolulu Harbor are just some of the preventive measures in place. There are a number of areas the state may wish to pursue:

1. **Participation in vessel and plant inspection**

   Tanker fleet quality is on the decline until the new double-hulled tankers are operational. Keeping track of poor quality ships and poorly maintained oil facilities will become increasingly important as tanker fleet and production facilities age. The Coast Guard and EPA have inspection programs for vessels and oil production facilities. State officials should participate in on-site inspections of both. State oil spill manager(s) could learn more about vessel and plant problem areas and solutions by participating in these existing programs conducted by experts.

2. **Consolidated recordkeeping**

   Knowing where and what types of oil spills occur can be helpful in preventing future spills. Several states consolidate recordkeeping on the state level. Hawaii should consider this one of its roles.

3. **Navigation routes for interisland barges**

   Sensitive areas can be protected best by avoidance. The state could work with barge companies and the Coast Guard to determine safe routes for oil barges.

4. **Regulating ballast**

   Oily waste from ballast is one of the ways oil enters the marine environment. The State Department of Transportation (DOT) should examine its requirements for ballast disposal.

5. **Random helicopter overflights of offloading and/or bunkering**

   The terminal at Sullom Voe in the Shetland Islands initiates random aerial surveillance for ships entering the terminal. The state may consider using this technique on a small sampling of ships to detect small leaks from tankers offloading in Hawaii.

6. **Alarms, butterfly valves, and other warning devices**

   There are a number of devices available that alert tanker crews to potential spill situations, including auto-pilot alarms, butterfly valves in offloading and bunker lines, night oil detectors and backflow valves. The state should consult with Coast Guard, oil industry and experts on the use of this type of equipment.

7. **Stop/Go conditions for bunkering**

   Some terminals, including those in Hawaii, forbid offloading under certain conditions. This might be extended to any bunkering which occurs outside the protection of harbors.

Response

Hawaii is well represented in this area, with both a local, industry-supported cleanup cooperative called the Clean Islands Council (CIC) and the MSRC being well equipped. There are several areas the state may wish to consider.

1. **Response companies' ability to respond**

   The MSRC maintains a response capability in Honolulu and is fully integrated into the response structure. However, a number of vessels used in ocean transportation cite the National Response Corporation as their response contractor. The NRC has no facilities in the state. Hawaii could require NRC to demonstrate that it can respond to large oil spills in a timely manner.

2. **Shoreline countermeasure**

   Prearranged shoreline countermeasures can cut down the time required to respond to an oil spill. The Honolulu Area Planning Committee has instituted a pilot program for determining shoreline countermeasures along Waikiki. The methodology employed was pioneered here by Ed Owens, a noted shoreline expert. The Waikiki area survey was conducted by a team consisting of representatives of the USCG, NOAA, state, city and county, CIC, industry and oil spill cleanup contractors. The state should work to assure the completion of the shoreline countermeasures survey of high valued areas throughout the state.

3. **Sensitivity mapping**

   Accurate sensitivity maps are essential for predetermining what areas will be protected during an oil spill emergency. Hawaii should review and perhaps update these sensitivity maps utilizing a wider community input process than in the previous mapping exercise. The state may consider updating the maps as part of the Coastal Zone Management Program's coral reef initiative ecosystem assessment.

Policy

The State of Hawaii prepared the first acceptable Area Contingency Plan in the nation. The response from the community is well integrated and mutually supportive. The Coast Guard has clear authority in directing the response to oil spills in marine and coastal areas and by a Memorandum of Agreement with EPA on land until EPA arrives. Several policy issues still must be resolved:

1. **Determining the end of a spill cleanup**

   The federal on-scene coordinator has clear authority to end an oil spill cleanup effort. The state should clarify how that decision will take place and develop an MOA on the subject.

2. **Interaction with other states**

   Regional organizations help facilitate cooperation and stimulate new management ideas. The state should consider joining the States/BC Task Force. This group is made up of state and provincial oil spill directors and it grapples with some of the same problems as Hawaii. Working together with peers can make finding solutions to problems or introducing new practices much easier.

3. **Citizen involvement with planning/policy**

   Alaska and Washington are two states that profit by having citizen participation in the planning and policy formation process. Hawaii may wish to consider inviting citizens to participate in planning, perhaps initially using the statewide coastal zone management advisory panel or the State Emergency Response Committee (SERC).

4. **Personnel training**

   Several states have training programs for their spill response personnel. Hawaii may wish to send participants to these training programs.

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Hawaii's Readiness to Prevent and Respond to Oil Spills

THE LEGAL AUTHORITIES AND RESPONSIBILITIES

Appendix 2

David Kimo Frankel

February 1997

> Oil is oil and whether useable or not by industrial standards it has the same deleterious effect on waterways. In either case, its presence in our rivers and harbors is both a menace to navigation and a pollutant.[1]
>
> The organizations involved [in responding to the Exxon Valdez oil spill] were in fact inadequately (or ineptly) coordinated, and spent far too much time in the first critical hours and days figuring out who was to be in charge of what, and who was to blame. . . . A member of the Alaska Oil Spill Commission likened the organizations to the Keystone Cops.[2]

SCOPE OF WORK

If the State of Hawaii is to avoid the devastating consequence of oil spills, the various agencies need to clearly understand their roles. This report examines the authority, responsibilities, and roles of federal, state, and county departments in preventing, preparing for, and responding to oil spills in the State of Hawaii. It focuses on the legal responsibilities of various authorities rather than the roles the agencies may in fact be playing. It does not discuss the liability issue. Nor does it examine the role of potentially responsible parties.

After listing the relevant legal authorities, this report discusses the preeminent role of the federal government in responding to oil spills. It then describes the roles of the Coast Guard and the EPA in oil spill response. When the state becomes involved, the authority to prevent and respond to oil spills is divided among several state agencies. The role of the counties further complicates the picture. After outlining the role of the various federal, state, and county agencies in responding to an oil spill, the report concludes by noting issues that should be resolved.

AUTHORITIES

Federal, state, and county laws, regulations, policies, and plans pertaining to oil spills and emergency declarations were examined. Relevant authorities studied included the following:

U.S. Constitution
Federal Water Pollution Control Act
Oil Pollution Act of 1990
Solid Waste Disposal Act
Safe Drinking Water Act
Hazardous Materials Transportation Act
Executive Order No. 12777 of Oct. 18, 1991
40 CFR 300: The National Oil and Hazardous Substances Pollution Contingency Plan
49 CFR Subchapter B & C Oil Transportation and Hazardous Material Regulations
29 CFR 1910: Occupational Safety and Health Standards
Oceania Regional Contingency Plan (March 30, 1994 Draft)
Federal On-Scene Coordinator Honolulu Area Contingency Plan
Hawaii State Constitution

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[1] U.S. Supreme Court in *United States v. Standard Oil Co.* 384 U.S. 224, 226 (1966).
[2] *The Atlantic Monthly*, November 1990, 66.

Hawaii Revised Statutes §§ 121, 127, 128, 128D, 200, 266, 286, 342D, 342N, 462A
Hawaii Administrative Rules
The State of Hawaii Plan for Emergency Preparedness, Vol. III
State of Hawaii Administrative Directives, Memoranda, and Rules
County Charters and Ordinances
County Emergency Operation Plans

DISCUSSION

Supremacy of the Federal Government

The federal government has the ultimate authority in response actions to oil spills into — or which threaten — any body of water, adjoining shorelines, and natural resources belonging to, appertaining to or under the exclusive management of the federal government, or those from underground storage tanks.[3] The federal government's authority stems from the commerce clause of the U.S. Constitution.[4] This clause gives Congress the power to regulate local activities that in the aggregate might have a substantial effect on interstate commerce.[5]

The courts have upheld Congress' power to respond to pollution threats affecting both navigable and non-navigable waters since ultimately both may affect interstate commerce.[6]

This authority to regulate those activities with the potential to affect interstate commerce is superior to that of the states. As far back as 1926 the U.S. Supreme Court wrote the following:

> [T]he power to regulate interstate and foreign commerce, which the Constitution vests in Congress, includes the power to control, for the purposes of such commerce, all navigable waters which are accessible to it and within the United States, whether within or without the limits of a State, and to that end to adopt all appropriate measures to free such waters from obstructions to navigation and to preserve and even enlarge their navigable capacity; and . . . *the authority and rights of a State in respect of such waters within its limits, and in respect of the lands under them, are subordinate to this power of Congress.*[7]

Congress has exercised its authority by enacting the Federal Water Pollution Control Act, Oil Pollution Act of 1990, the Underground Storage Tank provisions of the Solid Waste Disposal Act, and the Safe Drinking Water Act. In addition, federal agencies have enacted rules to reduce the risk of oil spills. For example, the Department of Labor promulgated Occupational Safety and Health Standards,[8] and the Department of Transportation promulgated Oil Transportation and Hazardous Material Regulations.[9]

Many of these acts do not preempt the ability of state and local governments from enacting stricter standards. Generally, state and local governments may enact additional requirements so long as they do not conflict with federal requirements.[10] The Oil Pollution Act specifically provides that the states retain the authority to impose additional requirements with respect to any removal activities in connection with a discharge.[11] Nor does it

[3] 33 USC § 1321 (c), 42 USC § 300i, 42 USC § 6991b.
[4] Article I § 8.
[5] Wickard v. Filburn, 317 U.S. 111 (1942).
[6] United States v. Ashland Oil and Transportation Co., 504 F.2d 1317, 1325, 1326 (6th Cir. 1974).
[7] New Jersey v. Sargent, 269 U.S. 328, 337 (1926) (emphasis added).
[8] 29 CFR § 1910.
[9] 49 CFR subchapters B and C.
[10] Pacific Gas & Electric v. State Energy Resources Conservation Commission, 461 U.S. 190 (1983).
[11] 33 USC § 2718. Removal activities are the containment and clean up activities necessary to minimize or mitigate damage. 33 USC § 2701 (30)

appear to preempt state and local governments from implementing prevention programs. The Federal Water Pollution Control Act allows states to impose additional requirements in cleaning up oil spills.[12] The underground storage tank provisions of the Solid Waste Disposal Act likewise guarantee the states the ability to enact more stringent requirements.[13]

While allowing for stricter state standards, federal law provides that the federal government has the paramount role in preventing and responding to oil spills which may affect any water body or the government's natural resources and any spills from an underground storage tank. These laws do not appear to give the federal government the authority to respond to land-based spills which are not from underground storage tanks and which do not threaten water.

Coast Guard and EPA Responsibilities

Federal authority to respond to oil spills is shared by the U.S. Environmental Protection Agency (USEPA or EPA) and the U.S. Coast Guard (USCG). The National Oil and Hazardous Substances Pollution Contingency Plan (40 CFR 300), Executive Order No. 12777 of Oct. 18, 1991 (56 Fed. Reg. 54757) and the federal regional contingency plan (Oceania Regional Contingency Plan March 30, 1994) attempt to define the responsibilities of each agency. Essentially, the EPA is delegated the authority over events, facilities, and activities for the "inland zone," and the Coast Guard for the "coastal zone."[14] The "coastal zone" includes all tidal waters and the "land surface, land substrata, ground waters, and ambient air proximal to those waters." "Inland zone" means the environment inland of the coastal zone.[15]

The boundary between the inland and coastal zone is described in further detail in the Change 2 to the federal on-scene coordinator (FOSC) Honolulu Area Contingency Plan.

Nevertheless, a 1991 letter of agreement entered into by the Coast Guard and the EPA suggests that the Coast Guard will usually take the lead as the on-scene coordinator (OSC). (The OSC plans and coordinates response strategy to an oil spill at the scene.) The agreement specifies that for each pollution incident within the inland zone of the oceanic region, which includes Hawaii, if the EPA cannot respond quickly, the EPA "shall . . . request that a USCG OSC respond as an initial representative for the USEPA."

> Due to excessive travel times between USEPA Region 9 office in San Francisco, CA and the inland zones of the s Region, the USCG – Fourteenth District, Marine Safety Offices have agreed, resources permitting, to serve as the initial USEPA representative for emergency pollution response activities within the inland zones only when specifically requested by the USEPA Region 9 office and only in an interim capacity until the USEPA OSC arrives on scene.[16]

The OSC works with the state's on-scene coordinator[17] and the responsible party's incident manager as a part of a unified command structure in implementing response actions. But the federal OSC has the ultimate authority

[12] 33 USC § 1321 (o).

[13] 42 USC § 6991g.

[14] E.O. 12777.

[15] 40 CFR § 300.5.

[16] Attachment I to the State of Hawaii Oil and Hazardous Substances Emergency Response Plan, March 1992.

[17] Generally, a representative from the state Department of Health will be the state OSC, as discussed in the next section. But the federal on-scene coordinator Honolulu Area Contingency Plan (1993) is ambiguous as to whether the OSC actually represents the state in the unified command structure. Pages B-II-1 and B-II-2 refer to the state OSC as participating in the unified command structure in response actions. Yet, page A-V-8 refers to the state incident commander. The incident commander is the one individual in charge at any given time of an incident – and may in fact be the same person as the OSC (who is charged with coordinating government resources). But the incident commander may be a county official – particularly during the early stages of an emergency response and during stabilization and control of a spill.

in a response operation.[18] A National Response System supports the OSC in the event of a huge spill of national significance.[19]

The authority and responsibilities of other federal agencies in responding to an oil spill are explained in detail in the National Oil and Hazardous Substances Pollution Contingency Plan, 40 CFR 300 Subpart B. Regulations to prevent oil spills can be found in 29 CFR 1910, 33 CFR Subchapter O, 40 CFR 109-112, 46 CFR 162.050, 49 CFR Subchapters B, C, and D.

TABLE 1. EPA and Coast Guard Responsibilities

EPA	Coast Guard
appointment of Area Committee members, requiring of information for the Area Contingency Plans, and approval of the plans for the **inland** zone	appointment of Area Committee members, requiring of information for the Area Contingency Plans, and approval of the plans for the **coastal** zone
establishment of procedures for removal of oil, and criteria for local plans for the **inland** zone	establishment of procedures for removal of oil, and criteria for local plans for the **coastal** zone
issuance of regulations for response plans of **non-transportation** related onshore facilities and inspection authority	regulations for response plans of vessels and **transportation**-related onshore facilities and inspection authority[a]
drills of removal capability for onshore and offshore facilities in the **inland** zone	drills of removal capability for tanks, onshore, and offshore facilities in the **coastal** zone
direction of all activities in a removal action for the **inland** zone	directing all activities in a removal action for the **coastal** zone
	to be notified of all spills
establishes procedures to prevent and contain oil spills from non-transportation related facilities, including equipment requirements and inspections	establishment of procedures to prevent and contain oil spills from vessels carrying oil, including equipment requirement and inspection of vessels

Executive Order No. 12777, Oct. 18, 1991 and 49 CFR § 1.46

[a] But regulation for response plans of offshore facilities (including inspection authority) is delegated to Department of Interior.

[18] Oceania Regional Contingency Plan (March 30, 1994 Draft) p. A-5.

[19] A spill of national significance (SONS) is that rare catastrophic "spill which greatly exceeds the response capability at the local and regional levels, which, due to its size, location, and actual or potential for adverse impact on the environment is so complex, it requires extraordinary cooperation of federal, state, local, and private resources to contain and clean up. Only the Commandant of the Coast Guard or the Administrator of the EPA can declare a SONS." Federal On-Scene Coordinator Honolulu Area Contingency Plan (A-V-2).

Responsibilities of State Agencies

Both the Oceania Regional Contingency Plan (March 30, 1994 Draft, A-8) and the State of Hawaii Oil and Hazardous Substances Emergency Response Plan, a supplement to Volume III of the State of Hawaii Plan for Emergency Preparedness: Disaster Response and Assistance (p. 12) state that the Coast Guard will be the lead agency, incident commander, and first responder to oil spills threatening or occurring in navigable waters. Nevertheless, state agencies continue to play a role (although a subordinate one) in prevention and response to oil spills.

The state Department of Defense's Civil Defense Agency and the Department of Health share the primary state responsibility for responding to oil spills, with Civil Defense generally deferring to the Department of Health. Other agencies are charged with helping to prevent spills and may be involved in response activities.

Department of Defense

Civil Defense. Traditionally, the Department of Defense's (DOD) responsibility was to defend the state and its people from "mass violence, originating from either human or natural causes."[20] The DOD's Civil Defense Agency's responsibilities were limited to responding to enemy attack,[21] and actions to "minimize and repair injury and damage resulting from disasters caused by fire, flood, tidal wave, volcanic eruption, earthquake, or other natural causes."[22]

In 1971, the state legislature expanded the authority of the director of civil defense to include preparation for and response to manmade disasters, such as "massive oil spills."[23]

National Guard. The governor is authorized to use the national guard in the event of an oil spill. All provisions of law relating to disasters from enemy attack are applicable to massive oil spills.[24] The governor, therefore, is authorized in responding to an oil spill to order the national guard into disaster relief service.[25]

Department of Health

In 1988, the state legislature gave the Department of Health (DOH) similar authority to respond to oil spills by enacting the environmental emergency response law[26] — the state counterpart to the federal Comprehensive Environmental Response, Compensation, and Liability Act. This specific authority was made more explicit with the passage of the amended Environmental Response Law in 1991.[27] In 1993, the legislature authorized DOH to spend funds on oil spill planning, prevention, and preparedness.[28] The Environmental Response Law also gives the department the authority to adopt rules to implement the chapter. DOH could use this authority to require that vessels or facilities implement prevention strategies.[29]

The Environmental Response Law is not the only statute that gives DOH the authority to address oil spills.[30] The state's water pollution chapter authorizes the DOH director to adopt rules to prevent water pollution,

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[20] HRS § 26-21.
[21] HRS § 128-2.
[22] HRS § 127-10 (1968).
[23] Act 50 1971 Haw. Sess. Laws, HRS § 127-10.
[24] HRS § 127-10.
[25] HRS § 121-30.
[26] Act 148, 1988 Haw. Sess. Laws.
[27] Act 280, 1991 Sess. Laws, HRS § 128D (definitions of department, hazardous substance and 128D-4)
[28] Act 300, 1993 Sess. Laws, HRS § 128D-2(b).
[29] The Department of Transportation and Department of Land and Natural Resources also have this power in and around harbors and boating facilities.
[30] *See e.g.*, HRS §§ 342D-10 and 342L-9.

including oil spills.[31] The state's used oil chapter authorizes the DOH director to take any action to reduce or stop a discharge of new, used, or recycled oil that poses an imminent threat to public health and safety, including ordering any person to stop the discharge.[32] Similarly, the director can take such actions necessary to protect public health when an oil spill is likely to contaminate drinking water.[33]

DOH has been designated the state's natural resources trustee.[34] The trustee consults with response officials to minimize damage to natural resources during response activities. The trustee also assesses the damages to the state's natural resources, recovers costs, and implements a restoration or replacement program.[35]

DOH will play a major role in regulating the disposal of the cleaned-up oil and used oil spill equipment. Transportation of used oil requires a DOH permit.[36] DOH enforces the used oil statute which prohibits disposing used oil onto the ground — apparently including dumping into landfills.[37]

Department of Transportation

The Department of Transportation (DOT) is authorized to prevent oil spills in commercial harbors and during transport.

DOT's harbors division exercises control over commercial harbors.[38] The DOT director is empowered to adopt rules to "prevent the escape of fuel or other oils or substances into the waters in, near, or affecting commercial harbors from any source point, including, but not limited to, any vessel or pipes or storage tanks upon the land."[39] Pursuant to this authority, DOT has promulgated a number of rules.[40]

In order to prevent spills, DOT regulates the transport of oil, a "hazardous material."[41] The department is required to annually adopt the hazardous material regulations established by the U.S. Department of Transportation.[42]

Department of Commerce and Consumer Affairs

The Department of Commerce and Consumer Affairs (DCCA) licenses port pilots who help ships navigate into and out of the state's harbors and surrounding waters.[43] Licensing is intended to ensure that pilots are qualified to aid navigation.

Department of Land and Natural Resources

In 1991, the Legislature charged the Department of Land and Natural Resources (DLNR) with the authority to develop rules "to prevent the escape of fuel or other oils or substances into the waters, in, near, or affecting

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[31] HRS § 342D-4.

[32] HRS § 342N-7.

[33] HRS § 340E-4.

[34] The Governor designates the state trustee. No such designation is found in any executive order, administrative directive or memorandum. Reference to the designation is found in the Oceania Regional Contingency Plan (March 1994 draft) E-10.

[35] 33 USC § 2706 (c).

[36] HRS § 342N-32.

[37] HRS § 342N-30.

[38] HRS § 266-2. In 1991, the Legislature delegated the responsibility for administering other ocean areas, such as small boat harbors, to the Department of Land and Natural Resources.

[39] HRS § 266-3(b)(3.)

[40] See HAR § 19-42-106 - § 19-42-156; § 19-63-24 (regulating fueling procedures, prohibiting dumping etc.).

[41] 49 CFR Subchapter B. These federal regulations define petroleum oil as a hazardous material and regulate the manner of its transport. 49 CFR § 172.

[42] HRS § 286-222(b).

[43] HRS § 462A.

small boat harbors, launching ramps, or other boating facilities, and the ocean waters and navigable streams of the state from any source point, including, but not limited to, any vessel or from pipes or storage tanks upon land."[44] To date, it has not promulgated such rules.

In addition, DLNR may become involved in an oil spill response. It manages and administers the state's wildlife and wildlife resources which would be affected by an oil spill[45] (although DOH is the trustee for the state's natural resources for the purposes of the Oil Pollution Act). DLNR also manages, administers, and exercises control over the public lands, water resources, ocean waters, navigable streams, and coastal areas (excluding commercial harbor areas) which may be affected by an oil spill.[46]

Several of the statutes and rules DLNR enforces could affect oil spill response activities. Cleaning up an oil spill may require the removal of oil-coated sand and coral. DLNR enforces a statute which prohibits removal of sand and coral from the shoreline ("provided that the sand removed [for cleaning purposes] shall be placed on adjacent areas unless such placement would result in significant turbidity").[47] Its administrative rules also prohibit the removal of sand, earth, rocks, or coral from public land.[48] Use of motor vehicles to get to a shoreline spill site not near a road may be constrained by HAR § 13-221-26 which prohibits off-road uses on public land.

Department of Labor and Industrial Relations

The Department of Labor and Industrial Relations (DLIR) has promulgated rules to protect employees who may work with oil and other hazardous materials.[49] These rules prescribe procedures to prevent spills as well as addressing response activities.

Department of Taxation

The state Department of Taxation did not impose the use tax on oil spill equipment and vessels imported into the state in 1993.[50]

State Emergency Response Commission and Local Emergency Planning Committees

Like the Environmental Response Law, the Hawaii Emergency Planning and Community Right to Know Act, HRS § 128E, is broader than its federal counterpart. It allows for oil spill planning.

The state emergency response commission (SERC), made up of state and county officials, is charged with developing contingency plans and notification procedures. The local emergency planning committees (LEPCs), comprised of county officials and community members, prepare emergency response plans including procedures to be followed in responding to hazardous substance releases.

Nevertheless, the statute does not require the submission of plans regarding releases of oil. It does, however, give the committees and the commission the ability to require submission of information and plans from facilities handling oil. The SERC has not yet adopted rules to implement the chapter.

Lead Response Agency

The Hawaii State Legislature has given both the Department of Health (DOH) and the Department of Defense (DOD) the authority and responsibility to respond to oil spills — whether on land or on sea. The DOD's authority, however, appears to be paramount.

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[44] HRS § 200-4 (6). But commercial harbors are run by the state Department of Transportation.
[45] HRS § 183-2.
[46] HRS § 171-3.
[47] HRS § 171-58.5.
[48] HAR § 13-221-23.
[49] HAR § 12-74 and § 12-99.
[50] Act 184, 1992 Sess. Laws.

The primacy of DOD through its civil defense agency is found in HRS chapter 128. To begin with, the statute directs that

> Unless otherwise directed by the governor, all of the powers pertaining to civil defense, hereby authorized to be delegated by the governor shall be deemed to have been delegated by the governor to the director of civil defense, with the further authority to subdelegate the powers to any agency or person to whom the governor could delegate these powers."[51]

All laws inconsistent with civil defense's authority provided by chapter 128 "shall be suspended during the period of time and to the extent the conflict exists, and may be, by the governor, designated as so suspended."[52] Thus, should a natural disaster or enemy attack cause an oil spill, or should a massive oil spill occur for other reasons, civil defense is authorized to take the lead.

Civil defense's primacy may not even require the declaration of an emergency pursuant to HRS § 128-7. Irrespective of the existence of a civil defense emergency period, civil defense may "order and direct government agencies, officers and employees, state or local, to take such action and employ such measure . . . as may be necessary and utilize the services, materials, and facilities of the agencies and officers."[53]

In fact, Administrative Directive 87-8 declares that "every government worker is considered a civil defense worker and each department and agency a supportive extension of our established civil defense system." (December 11, 1987)

Nevertheless, civil defense appears to have delegated some of its authority to respond to oil spills back to DOH. Although without the same legal effect as a statute or rule, the State of Hawaii Plan for Emergency Preparedness, Volume III, Disaster Response and Assistance attempts to spell out the role of various government agencies. Governor Ariyoshi issued a memorandum declaring that the plan "establishes relationships among agencies, fixes responsibility and accountability, and sets forth the actions to be taken by departments and agencies of the State and County government."[54]

The *Oil and Hazardous Substances Emergency Response Plan*, a supplement to the Plan for Emergency Preparedness, Volume III, "identifies the roles and responsibilities of various government agencies" (p. i). This plan provides that civil defense will play a very limited role in any oil spill response. Civil defense provides hazardous materials training, 24-hour notification capability, notifies DOH, coordinates communication, and assesses damages. DOH, on the other hand, serves as the on-scene coordinator, supports first responders, performs emergency mitigation, clean up activities and damage assessment, coordinates resources, provides technical assistance, ensures clean up is done to specified standards, and enforces the law.

Civil defense, however, retains its authority to coordinate all disaster and emergency actions should the governor proclaim a state disaster (if the oil spill is massive or because of a related natural disaster or enemy attack).[55]

The specific roles of DOD, DOH, and other departments are spelled out in the plan.

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[51] HRS § 128-5.

[52] HRS § 128-34.

[53] HRS §§ 128-10, 128-5.

[54] Memo 1977-11.

[55] *Oil and Hazardous Substances Emergency Response Plan*, a supplement to the Plan for Emergency Preparedness, Volume III, p. 13.

TABLE 2. State and County Responsibilities

PRIVATE DOH	CIVIL DEFENSE	COUNTY
Preparation and planning for, and response to oil spills.	Preparation and planning for, and response to massive oil spills arising out of natural disasters.	County Civil Defense: preparation and planning for, and response to massive oil spills and spills arising out of natural disasters. Fire departments have no real oil pollution response posture.
Prevention of oil spills.		
Participates with Federal OSC in decision making discussions (unless civil defense takes over)	May take over DOH's role in decision making discussions with Federal OSC.	
	Coordination of all disaster and emergency actions when governor proclaims a state disaster	
Natural resources trustee		
Regulates disposal of waste		
		May be first responder. Fire, police, emergency medical services, etc. provide assistance to state and federal authorities.
		Fire department has the ability to inspect, but only for fire risk.

{PRIVATE}DLIR	DOT	DCCA	DLNR	SERC/LEPC
safety standards for workers	power to adopt rules to prevent oil spills for commercial harbors	regulates port pilots	power to adopt rules to prevent spills at small boating facilities	power to require oil spill plans
	transportation standards			

State and County Authority

In the event of an oil spill, the role of the counties is unclear. The Oceania Regional Contingency Plan (March 1994 draft) describes the limited role of county governments. Local governments do not participate in decision making discussions (p. A-5). Yet, according to the *Oil and Hazardous Substances Emergency Response Plan*, a supplement to the Plan for Emergency Preparedness, Volume III, the first response capability is focused at the county level (p. 5). Similarly, HRS § 128 authorizes the counties' civil defense agencies to take the lead in responding to oil spills. In an emergency, the roles of DOH and the counties may conflict.

The state constitution provides that the power of the counties is restricted to those powers granted by the state legislature.[56] The Hawaii Supreme Court has held that "on functions of statewide interest and concern, the general rule is that if the counties are not given specific authority to take over the function, the counties cannot thwart the state from performing its duty."[57] Generally, county actions that are inconsistent with or defeat the intent of any state statute are preempted.[58]

While the authority to prevent and respond to oil spills has been specifically delegated to the state DOH,[59] it is also shared by counties. The legislature has given the counties the authority to clean the shoreline of unsanitary conditions and public nuisances,[60] remove nuisances (arguably including oil spills),[61] and act to protect health, life, and property.[62] These delegations, however, are not so explicit or direct as to constitute a delegation to the counties to "take over" functions performed by the state. Rather, they supplement the state's activities.

On the other hand, the legislature has specifically delegated to the counties the authority to respond to massive oil spills.[63] The Civil Defense and Emergency Act provides the following:

> Each local organization for civil defense shall perform civil defense functions within the territorial limits of the subdivision within which it is organized, and in addition, shall conduct such functions outside of such territorial limits as may be required pursuant to this chapter.[64]

These civil defense functions include taking all necessary actions to prepare for and respond to massive oil spills.[65]

The deputy director of civil defense for each county — generally the mayor — directs civil defense operations. These county civil defense operations are subject to the direction of only the governor and the director of civil defense — not DOH:

> The deputy director for each political subdivision shall have direct responsibility for the organization, administration, and operation of the local organizations for civil defense, subject to the direction and control of the governor and director of civil defense, and subject to the assumption of direct operational control by the governor or the director as provided in this chapter.[66]

Thus, DOH's ability to respond to an oil spill pursuant to the Environmental Response Law may be constrained by county action in much the same way it is constrained by state civil defense. Should DOH disapprove of the

[56] Haw. Const. Art. VIII §§ 1, 2, 6.
[57] Kunimoto v. Kawakami, 56 Haw. 582, 585 (1976). *See also* Marsland v. First Hawaiian Bank, 70 Haw. 126 (1988).
[58] HRS § 46-1.5.
[59] HRS § 128D.
[60] HRS § 46-1.5(5).
[61] HRS § 46-1.5(12).
[62] HRS § 46-1.5(13).
[63] HRS §§ 127-10, 128-12.
[64] HRS § 128-12.
[65] HRS § 127-10.
[66] HRS § 128-12.

actions of a recalcitrant county acting pursuant to HRS § 128, it will need the governor's or civil defense's support in bringing the county into line.

County Responsibility

Should the counties play a role in addressing oil spills, the local fire departments would likely take the lead.

None of the county charters or ordinances specifically designate a lead agency to respond to oil spills.[67] HRS 128 authorizes the counties' civil defense agencies to take the lead in responding to oil spills. While the civil defense agencies provide overall response coordination, the *Oil and Hazardous Substances Emergency Response Plan* (p. 12) and the equivalent county emergency operation plans generally delegate authority to the fire department (or, in their absence, the first responder) to take charge at the incident site.

The county plans for oil spill response are in various stages of revision. In fact, DOH and state civil defense have different versions of these documents. This section may soon be outdated as the county plans are updated.

Honolulu

The charter and ordinances for the City and County of Honolulu suggest that four departments have the potential authority to respond to oil spills: the fire department,[68] civil defense,[69] the county health department,[70] and the public works' department.[71]

Honolulu's Hazardous Materials Response Plan, which does not address coastal oil spills, designates the Honolulu Fire Department as the incident command. The state DOH assumes responsibility for all follow-up activities after containment.

The Oahu Civil Defense Agency's Oil Pollution Standard Operating Procedures directs the county civil defense agency to assist the Coast Guard and the state in coordinating city assistance in the cleanup effort.

Maui

Maui's charter gives the Department of Fire Control the authority to respond to an oil spill. It provides "for mitigation and stabilization of hazardous materials and incidents relating to the same."[72] The June 10, 1994 draft of Maui's Hazardous Materials Emergency Response Plan reiterates that the fire department is the incident commander. Prior to the arrival of the fire department, the police are in charge. And if the police are not there, the senior emergency medical service member is the incident commander. While the incident commander is in charge of the incident site, the senior official at Maui civil defense at the Emergency Operations Center coordinates the response.

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[67] While no specific department is authorized, all four county charters provide that the mayor may assign new duties to any department. Honolulu Charter § 4-105(5), 4-201; Kauai County Charter § 6.02; Maui County Charter § 6-3(2); Hawaii County Charter § 4-2.

[68] The fire department is obliged to save lives and property from "emergencies arising on the sea." Honolulu Charter 6-503.

[69] The civil defense administrator is empowered to "develop, prepare and, under disaster or emergency situations, assist in the implementation of civil defense plans and programs to protect and promote the public health, safety, and welfare of the people of the city." Honolulu Charter 6-104.

[70] The city and county's physician is empowered to "administer and enforce all statutes, ordinances, and rules and regulations of any government agency, concurrently with the Department of Health of the State of Hawaii relating to public health and welfare within the city." Honolulu Ord. 2-10.1(b)

[71] The public works' department is responsible for developing and administering "solid waste collection, processing and disposal systems." Honolulu Charter 6-403. This authority extends to establishing a used oil recycling program. Honolulu Or. 2-8.2

[72] Maui Charter 8-7.3.

Hawaii

The fire department has the authority to respond to oil spills on the island of Hawaii. It is charged with protecting "life and property from fires, natural disasters, and other emergencies."[73] The Hazardous Materials Response Plan for the island of Hawaii designates the Fire Department as the incident commander until relieved by the Hawaii County Civil Defense Agency.

Kauai

Kauai's charter and ordinances are unclear as to which departments are charged with oil spill response. Its Hazardous Materials Emergency Response Plan does not specifically apply to oil, but provides a framework for response actions. The incident commander is the leader of the county hazardous materials emergency response team. In the absence of the team, the incident commander is the ranking fire fighter, then the police, then emergency medical services personnel, then the leader of the county hazardous materials emergency response team.

An Overview of the Response Authorities

It is almost impossible to outline the role of each government agency in the event of an oil spill because unique conditions will call for varying responses. The size of the spill, its location, and the response of federal officials all affect the role that state and local officials play. Furthermore, simply because an agency is statutorily authorized to play a certain role does not mean that it will actually fulfill that role in an emergency. Circumstances may not warrant Coast Guard or civil defense involvement.

The roles of various federal officials — particularly for massive oil spills — are detailed in the National Oil and Hazardous Substances Contingency Plan, the Oceania Regional Contingency Plan and the Federal On-Scene Coordinator Honolulu Area Contingency Plan. The plans also describe the relationship between state, county, and federal officials.

The on-scene coordinator (OSC) has the ultimate authority in a response operation. The OSC plans and coordinates response strategy to supply the needed trained personnel, equipment, and scientific support.

Coast Guard: The Coast Guard is the OSC, the lead agency with the authority to direct all federal, state, and county actions when spills threaten coastal waters, streams, the coastline, the deep ocean, or federal natural resources. It serves as the OSC for inland spills as well, until the EPA OSC arrives from the mainland.

DOH: DOH is the state OSC (unless civil defense takes over in an emergency). It advises the federal OSC in developing response strategy. It also serves as the state's natural resources trustee.

Civil Defense: In an emergency, civil defense may take over the OSC role from DOH. Otherwise, it provides support via its extensive communications infrastructure.

County: Generally, the counties do not maintain an oil spill response posture, but they may be the first responder through the fire department HAZMAT teams. The fire department (or other county first responder) may act as the incident commander until either (1) local resources are overtaxed, (2) state or federal agencies take control, or (3) upon completion of stabilization and control measures (prior to cleanup and restoration). If, however, the county civil defense is coordinating the response, DOH may not be able to take over control of the operation without the approval of the county or authorization of state civil defense or the governor. The counties provide support through the civil defense system as well.

Potential Issues

Before an oil spill occurs, the lines of authority should be as clear as possible. Government agencies may want to address a number of issues to ensure that oil spill prevention, preparedness, and response activities are protective of the environment and are cost-effective.

[73] Haw. County Code 2-15.

EPA and Coast Guard Responsibilities

Clarify the jurisdiction of the EPA and the Coast Guard — perhaps giving Coast Guard sole jurisdiction

The EPA and Coast Guard should define the precise boundary between the inland and coastal zone. The agreement between the Coast Guard and EPA leaves open the possibility of unnecessary delay while the Coast Guard waits for an EPA request to respond to a spill in the inland zone. As long as the boundary designation is unclear, the EPA and the Coast Guard may have jurisdictional disagreements while trying to address a crisis.

The EPA has no real presence in Hawaii and has already authorized the Coast Guard to act on its behalf (after a request) in the initial stages of an inland response. It may, therefore, be appropriate to declare that the coastal zone encompasses the entire state. Alternately, the MOU that currently defines the boundaries could be rewritten to ensure that the Coast Guard will always be the first responder to any oil spill, whether inland or in the coastal zone, without having to wait for EPA's request.

The State's Role Vis-a-Vis the Federal Government

Consider the state's appropriate role

Because the Coast Guard has the ultimate authority in addressing coastal oil spills, the state plays a relatively minor role in preventing, preparing for, and responding to oil spills. Compared to the resources of state government, the Coast Guard is much better equipped to respond to oil spills. In addition, the Coast Guard can rely on other federal agencies (including the military) and the private sector (including the Marine Spill Response Corporation's and the Clean Islands Council's ships and equipment).

In light of the Coast Guard's dominant role in oil spill response, what roles should the state play in addressing oil spills? Is it appropriate to spend monies (potentially redundantly) on activities that the Coast Guard may be better suited to perform? What is the Coast Guard not doing that the state should be doing? What resources does the Coast Guard not have that the state could provide to assist the Coast Guard in responding to an oil spill? Are the Coast Guard's prevention programs sufficiently protective of the state's environment?

Ensure that the Coast Guard notifies the state of all oil spills

If the state is to play a role, at the very least it should know what is happening. While the Coast Guard is required to notify the state immediately of all medium and major spills, it need not notify the state of minor spills not considered significant.[74] In some circumstances, the Coast Guard could decide either that a spill does not require a response – without consulting the state. It may be appropriate for the Coast Guard to notify the state of all oil spills so that the state can decide for itself whether response is necessary. The state may also want to play a role in decisionmaking over the cleanup of minor spills. The state should consider entering into a new agreement with the Coast Guard to ensure that it is notified of all spills.

Consider developing cleanup standards that all cleanups must meet

The state may not agree with the Coast Guard or private industry as to "how clean is clean." After all, the state is the steward of its own natural resources. It could develop cleanup standards and

[74] Agreement between the United States and the State of Hawaii concerning notification of discharges of oil and hazardous substances, August 1980, annex to the Oceania Regional Contingency Plan (March 30, 1994 draft). A minor spill is a discharge to inland waters of less than 1,000 gallons or to coastal waters of less than 10,000 gallons. A medium discharge is one of 1,000 to 10,000 gallons to inland waters or 10,000 to 100,000 gallons to coastal waters. Spills greater than 10,000 gallons to inland waters or more than 100,000 gallons to coastal waters are major discharges.

ensure that all oil spills are adequately cleaned up. If response actions supervised by the Coast Guard fail to meet those standards, the state (pursuant to its authority under HRS 128D) can either direct the responsible party to clean up a site more thoroughly, clean it up itself, or hire someone else to clean it up to state standards.

Develop state expertise in state natural resources and oil spill cleanup technology

Clearly, the state needs to fulfill its role as trustee of the state's natural resources. It needs to bring its unique perspective to decision making discussions with the federal OSC. State personnel could familiarize themselves with the state's natural resources. If state personnel develop expertise in oil spill cleanup technology and the best methods to protect various natural resources, the state's participation in discussions with the federal OSC becomes more meaningful.

DOH and Civil Defense Response Authorities

The flexibility that HRS 128 gives civil defense may cause DOH some concern. The *Oil and Hazardous Substances Emergency Response Plan*, a supplement to the Plan for Emergency Preparedness, Volume III, clarifies that DOH has the responsibility to coordinate state actions – but that Civil Defense can take over this function.

Should the laws be amended to clarify exactly when this transfer of authority should occur? Should DOH and civil defense enter into a memorandum of agreement to define the circumstances when this transition will occur? Or is the flexibility necessary because of the unpredictable nature of crises?

Is it appropriate for DOH to play any role in the first stages of response given civil defense's existing infrastructure and expertise in crisis management? On the other hand, does civil defense have sufficient familiarity with environmental issues to take the lead in oil spill issues?

State Prevention Activities

Designate a lead agency for prevention

If the state intends to adopt prevention strategies beyond that of the federal government, a lead agency needs to be designated. DOH, DOT, DLNR, DCCA, DLIR, SERC, and the LEPCs all have roles to play in preventing oil spills. Each agency has the authority to promulgate rules that reduce the possibility of an oil spill, although DOH has potentially the most sweeping authority. Enacting prevention requirements will require the promulgation of rules and close coordination with various agencies.

State and County Responsibilities

Clarify the roles of the state and counties

Because the potential of overlapping jurisdiction between DOH and county civil defense exists (albeit a slight one), their roles should be more clearly defined. This may require statutory changes or a memorandum of agreement between DOH, state civil defense, and county civil defense. In addition, the state should clarify the relationship between the on-scene coordinator and the incident commander.

The counties are improving their ability to address hazardous material releases. Should this role be expanded to include oil spill response?

Hawaii's Readiness to Prevent and Respond to Oil Spills

ANALYSIS OF STATES' OIL SPILL MANAGEMENT PROGRAMS

Appendix 3

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INTRODUCTION

In 1989, the *Exxon Valdez* oil spill in Alaska's Prince William Sound focused public attention on the problem of oil spills and their social, economic, and ecological costs. In response to the catastrophic spill the federal government enacted the Oil Pollution Act of 1990 (OPA 90) to regulate the oil industry and reduce the likelihood of another *Exxon Valdez* type disaster. The U.S. Coast Guard (USCG) and the U.S. Environmental Protection Agency (USEPA) are the lead federal agencies responsible for developing, implementing, and enforcing the regulations of OPA 90. In addition, many state governments recognized the risks associated with oil spills and instituted state policies supplementing OPA 90. These policies were designed to establish comprehensive state oil spill management programs to prevent oil spills and increase response preparedness. The development of new state oil spill management practices coincided with the establishment and funding of state lead agencies responsible for implementing oil spill management policies and programs.

The State of Hawaii also recognized the potential problems associated with a major oil spill. In 1991, the Hawaii State Department of Health contracted with the University of Hawaii Sea Grant College Program to assess the potential affects of a catastrophic oil spill at sea on the State of Hawaii. The Sea Grant study team reported that major oil spills in Hawaii . . . "could be more than sources of environmental pollution – their impact could cut across the social and economic fabric of Hawaii." Financial impact to the tourism industry alone was estimated to range from $640 million to $6.8 billion dollars depending on the type of oil released, weather conditions at the time of the spill, and its magnitude and location. Certainly if a spill should occur near the southern shores of Oahu where it could impact Waikiki Beach, the resulting impacts to the tourist industry and economy of the state would be devastating. The study concluded that the state was ill-prepared to respond quickly and effectively to any substantial oil spills. It recommended that the state government should make oil spill prevention its highest priority.

Following the results of the initial investigation, the Department of Health's Office of Hazard Evaluation and Emergency Response (HEER) requested that Sea Grant undertake a multi-tasked, comprehensive study of the State of Hawaii's oil spill management programs to see what policies, practices, prevention programs, and capabilities the state has or needs with regard to prevention or response to oil spills. Task One of this project was to examine state, county, and federal leadership responsibilities in Hawaii. Task Two focused on an analysis of the actual capabilities and programs of the various agencies involved. Task Three of the study stressed the importance of examining what is being done in other states with regard to oil spill prevention and response (so as not to reinvent the proverbial wheel), and included provisions for an interstate survey and review of oil spill policies, prevention programs, response plans, and interstate compacts throughout the coastal states of the nation and Puerto Rico. These policies were then compared to those currently in place in the State of Hawaii. Task Four included recommendations for the development of an oil spill management program in Hawaii based on the survey and review of other state oil spill management policies and programs. Task Five was the review of Hawaii's existing Oil and Hazardous Substance Emergency Response Plan. The findings from each of these five tasks will be used by the Sea Grant coordinators in preparing their final report. It should be stressed that each of the Task reports reflects the findings on a specific topic or area of concentration by a specific team of researchers. This approach was intended to broaden the base and source of information and minimize individual bias in compiling or evaluating the data. The final report will synthesize the materials prepared by the individuals and teams and provide specific recommendations to the HEER office for procedures that can be implemented to improve the state's abilities to prevent or respond to oil spills.

Sea Grant has contracted with the Environmental Center of the University of Hawaii to carry out Tasks Three and Four of the study. The Task Three report represents the results of the survey of other states' oil spill management programs and identifies various options for oil spill response and prevention. Task Four evaluated the findings from the Task Three report and developed certain recommendations for the improvement of the state's oil spill management program and coordination efforts. These recommendations were developed for consideration by the Sea Grant Specialists in the preparation of the final report on their comprehensive study of oil spill management programs in Hawaii.

ANALYSIS OF OIL SPILL MANAGEMENT PROGRAMS

Diverse policies and administrative programs have been established by the various states surveyed to address the problem of oil pollution. These policies and programs act to supplement and in many cases strengthen the minimum management requirements established by the federal Oil Pollution Act of 1990 (OPA 90) and other regulatory provisions for the management of oil spill pollution set forth under Department of Transportation and Marine Minerals Service statutes.

OPA 90 comprises nine titles and has elements related to various other federal laws including the Federal Water Pollution Control Act (the Clean Water Act), the Deepwater Port Act of 1974, the Trans-Alaska Pipeline Authorization Act of 1973, the Outer Continental Shelf Lands Act Amendments of 1978, and the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA).[1]

The act provides a comprehensive liability scheme that addresses all discharges of oil to navigable waters, coastal areas, and the exclusive economic zone. OPA 90 defines responsible parties and makes it easier for the government to establish liability against a party for discharging oil.[1] Definitions of responsible parties closely follow those of the Clean Water Act and CERCLA. The act also provides defenses and exclusions to liability, and establishes liability for damage to natural resources.

OPA 90 established the $1 billion federal Oil Spill Liability Trust Fund to pay for federal cleanup costs and oil spill response. The fund consolidates overlapping federal oil spill liability funds. States may pursue claims against the fund for costs incurred during cleanup and response operations.

The federal government is given explicit authority to halt discharges, force a responsible party to remove discharged oil, or remove the oil itself. The act also established revised spill prevention control and countermeasure plan requirements for vessels, offshore facilities, and onshore facilities. OPA 90 sought to rectify many of the problems associated with overlapping and uncoordinated oil spill contingency plans by establishing an elaborate system of contingency planning comprising a national response unit (NRU), Coast Guard strike teams, Coast Guard district response groups, area committees, area contingency plans, and individual vessel and facility response plans.[1] A major portion of the planning process focused on incorporating private response organizations like the Marine Spill Response Corporation (MSRC).

New civil and administrative penalties for discharges of oil were also established under OPA 90. These coincided with the setting of tighter standards for licensing tank vessel personnel and equipment.[1] Double hulled tankers were also required to be phased in by 2010 for tankers over 5,000 gross tons.

The long Congressional debate on the Oil Pollution Act of 1990 and prior attempts to establish federal oil spill management legislation highlighted the controversy concerning the preemption of state law by federal legislation.[1] Federal oil spill legislation had languished in Congress for years partly because of the political debate concerning states' rights and federal preemption of state law. Most importantly for this study, OPA 90 does not preempt state law and international standards. It specifically recognizes the individual needs of certain areas like Prince William Sound by setting specific requirements for planning and operations in the area. And it leaves room for states to enact specific legislation to meet their particular oil spill management needs based on their economic, social, geographical, and environmental circumstances.

Consequently, many states have enacted specific oil spill management legislation to meet their particular needs. This report reflects the State of Hawaii's continued desire to investigate its appropriate role in oil spill management in cooperation with federal and local agencies and with private response organizations.

[1] Randle, R.V. The Oil Pollution Act of 1990: Its Provisions, Intent, and Effects, Environmental. *Law Reporter* 21(3):10119–10135.

While OPA 90 provides minimum requirements for oil pollution management and leaves room for states to develop their own specific policies and programs, it does not provide clear guidance on the methods and terminology to be used by the individual states. Hence, an array of methods and terms have developed throughout the state that make comparison and evaluation of oil pollution management methods difficult. For the purposes of this study, we will be using the following format and set of terms for the analysis of the components of the individual state oil pollution management policies and programs. We will be using "Oil Spill Management Program" (OSMP) as an umbrella term incorporating any and all of the diverse methods that states employ to address oil pollution management. While the specific OSMP of each state may be different, they do possess common elements directed toward prevention, funding, and response. Consequently, after discussing the various types and levels of state "Oil Spill Management Programs," we will examine the specific components of the various OSMPs in three sections devoted to Prevention, Funding, and Response.

To aid in the development of a state-of-the-art oil spill prevention and response program for the State of Hawaii, information was collected on equipment, personnel, policies, programs, laws, and procedures used in other states. A questionnaire was designed to gather information on a broad assemblage of management programs pertinent to oil production, transport, storage, or handling. The states surveyed were chosen by reviewing the various state oil spill programs and legislation as published in the *Environmental Reporter.* Thirty states and the Territory of Puerto Rico were selected as having some type of oil spill legislation. These states and the territory included all sea coast states as well as states having substantial freshwater shipping/ transportation activities. An appropriate contact person within the lead agency responsible for administering the oil spill management programs in each state was contacted by telephone and asked to complete a questionnaire on their state's policies. This initial telephone survey was met with virtually unanimous support. The details are included as an addendum to this report.

The following section will discuss the policies, programs, and plans mandated by the states surveyed and explain the specific components required in the various regulatory programs and plans. Much of the discussion focuses on the administrative requirements for prevention plans, contingency plans for response, and their funding mechanisms. The methods and components of Hawaii's OSMP also are compared to those in other states. The second section provides conclusions and recommendations for the development of a comprehensive oil spill management program in Hawaii on the basis of the analysis of other state programs. The third section is an addendum describing the survey and details of the responses state by state.

Oil Spill Management Programs

As indicated above, states use various approaches to address the problem of oil pollution management. There is a broad spectrum of regulation and state involvement ranging from states with centralized, specific oil spill management policies and programs that supplement OPA 90 to states which have adopted only limited roles in oil pollution management and established few policies and programs.

States with minimal involvement in oil spill management, such as New Hampshire and Illinois, rely on processes required by OPA 90, the U.S. Coast Guard (USCG), and the USEPA, without additional state requirements to manage oil spill pollution. However, many of these states are developing new policies and programs to supplement OPA 90 and augment the activities of the USCG and USEPA in oil spill management.

A number of states including South Carolina and Missouri rely on the process set up by OPA 90 for the USCG and the USEPA to take the lead role in oil spill management, but also have related state policies and programs. In many of these cases, programs for oil pollution management are included in legislation and policies devoted to funding emergency response to hazardous waste. For the most part, these states focus oil spill management policies toward the development of state programs and funding for response preparedness and clean-up with little attention devoted to prevention.

In such states as Oregon, Massachusetts, Alaska, Texas, Louisiana, California, Maine, and Washington oil pollution management policies are established in separate legislation with funds being appropriated directly to oil spill management offices in their respective lead agencies. In these states "Oil Spill Management Programs" are designed to supplement the policies and programs established by OPA 90 and facilitate coordination between the state's lead agency and the federal on-scene coordinators. For example, Washington has established a Spill Management Program in the Department of Ecology and Louisiana has established the Oil Spill Coordinator within the office of the Governor. These "programs" coordinate state efforts for prevention and response in conjunction with the federal agencies. Other states such as Oregon, Alaska, and California also have comprehensive programs and lead agencies that administer their specific policies and programs.

The development of specific state oil spill management programs has enabled state governments to establish themselves as equal partners in oil spill management with the federal agencies and safeguard their social, economic, and ecological interests. To avoid duplication with federal oil spill provisions found in OPA 90 and the regulatory programs of the federal agencies many states have adopted laws and regulations that mirror federal laws for facilities and vessels. For example, a state may require facilities and vessels to prepare prevention and response plans that comply with federal regulations, while adding supplemental regulations and programs to meet specific state needs. States like California and Washington also have established inspection programs to ensure state involvement in oil spill management.

The state of Hawaii has not developed a comprehensive OSMP and relies on the USCG to fulfill its federal mandate to manage off-shore/coastal oil spill pollution. The Honolulu Marine Safety Office (MSO) of the USCG as the federal on-scene coordinator coordinated the development of the first comprehensive area contingency plan for oil spill management in the country. The *Federal On-Scene Coordinator (FOSC) Honolulu Area Contingency Plan* (Area Plan) was prepared pursuant to OPA 90 in cooperation with the oil industry, other federal agencies, and the state and county agencies that form the Area Committee.[2] The plan forms the basis for coastal oil spill management in the state and coordinates the various individual industry oil spill contingency plans with the State of Hawaii Contingency Plan. The USCG coordinates the continuous planning efforts and drills of the various organizations involved in the Area Plan.

The Area Plan focuses on coastal and marine oil spill management and is not intended to regulate on-shore facilities and pipelines pursuant to OPA 90. (There are separate federal regulations for vessels, facilities, pipelines, tank trucks, etc., which were not recognized in this survey.) The USEPA and the U.S. Department of Transportation are responsible for regulating on-shore facilities and pipelines. The USEPA is also responsible under federal law for the coordination of oil spill response on land. The USEPA regulates on-shore oil storage and transfer facilities in Hawaii through its Region 9 office in San Francisco and keeps only a small staff in Hawaii. Consequently, inspections of federally required facility Spill, Prevention, Containment and Countermeasure (SPCC) plans are contracted to private firms by the USEPA Region 9 office. In addition, the USEPA and the USCG have a Memorandum of Understanding that states the USCG will act as the FOSC on behalf of the USEPA for on-land spills, until a representative from the USEPA office arrives on scene in Hawaii. However, the state HEER office functionally handles most on-shore and inland oil spill response coordination in the state.

Funding

Funding mechanisms for oil spill management vary among the states surveyed. Some states like South Carolina have included the funding for oil spill management with programs related to hazardous materials. In these

[2] Official members of the Area Committee include the USCG; State of Hawaii Department of Health (HEER office); Transportation; Business and Economic Development and Tourism; Defense (Civil Defense Division); Land and Natural Resources; Office of State Planning (Coastal Zone Management Program); City and County Civil Defense Agencies; U.S. Army; U.S. Navy; U.S. Departments.

states, funds for oil spill management are usually devoted to the clean-up of oil spills. Other states such as Washington, Oregon, and Texas, allocate funds to oil spill management and its specific programs. In these states a portion of the funding is typically allocated between oil spill response and administration of oil spill management programs. In some cases there are separate and distinct funding mechanisms for response and administration, and in many cases the funding for administration includes the development and implementation of prevention programs and educational campaigns.

Different states have various caps for their oil spill funds. Washington's Oil Spill Response Account is intended to be maintained at $25 million, but currently is at $8 million. Hawaii's Emergency Response Revolving Fund is capped at $7 million and can be used for oil spill management planning, response, administration, training, clean-up, prevention, county used oil recycling, and underground storage tank programs.

Oil spill funds to some degree may reflect the perceived risk-of-spill by the various states. Certainly those states with highest traffic may be at greatest risk. We say "may" because traffic alone is not necessarily the determining risk factor. Nature of traffic, its distribution in daylight or dark, the configuration of the harbor, and size and frequency of other ship traffic may all present a significant modification to the "risk."

Many different methods are used to generate OSMP funds. The following represent the range of funding mechanisms reported in the survey responses.

Policy

Tax or Fee per Barrel on Imported or Produced Oil

Various states generate funds for oil spill management by placing a fee or tax on all oil either produced, imported, or distributed in their states. The amount varies from state to state but usually ranges from $0.02 to $0.05 per barrel with a certain percentage of the amount collected designated for oil spill response and administration. For example, Alaska attaches a $0.05 per barrel charge on all crude oil produced in the state with $0.03 per barrel allocated for the prevention account and $0.02 for response. This type of fee or tax assures state lead agencies of funding for administrative programs and appears to be the most reliable method for establishing and sustaining oil spill management programs.

Hawaii collects $0.05 per barrel on petroleum products sold by distributors and places these funds in the state's Emergency Response Revolving Fund. Funds collected through this fee were originally intended for use in oil spill management. However, the 1994 Hawaii State Legislature amended Chapter 128D, which established the Emergency Response Revolving Fund and the $0.05 tax, to authorize the funding of the state's safe drinking water program. The use of oil spill management funds for the safe drinking water program has reduced the available funds for state oil spill management programs.

Fee or Tax on Hazardous Waste Generated or Transported

Many states collect a fee from hazardous waste generating facilities based on the amount of hazardous waste they generate. The collected fees are placed in a fund to support emergency response. This type of funding usually is mandated in states which include oil spill management programs with other hazardous waste programs. Other states like New Jersey, fund their emergency response programs through a tax on all hazardous waste transported in the state.

Fee per Vessel per Trip

Some states collect fees from vessels and facilities performing transfer operations. In these cases a fee is collected for every trip a tanker makes to a regulated facility. Oregon uses this funding mechanism for its Oil Spill Prevention Fund.

Fees, Fines, and Penalties

Many states place permitting fees and penalties or fines into their state funds for oil spill management or hazardous waste management. For example, Florida's Coastal Protection Trust Fund is credited with all penalties, fees, recovered damages, and excise tax revenues from oil and is used for response, administration, prevention, and restoration. A unique component of Florida's funding mechanism is the allocation of any money above the trust fund limit of $30 million to the state's Environmental Education Fund.

Hawaii places penalties and fines collected for violation of environmental laws in its Emergency Response Revolving Fund (ERRF), along with the $0.05 fee collected on petroleum products distributed in the state. In the past, Hawaii relied on fines and penalties to support the ERRF, but that system proved to be an unreliable mechanism for funding the ERRF because of problems associated with the levy and collection of fines.

Federal Funding

In addition to state funding of oil spill management, the federal government provides for state use of the Oil Spill Liability Trust Fund as part of OPA 90. In September 1993, over $1.1 million had been allocated to states for response and clean-up of spill sites.

Hawaii does not have specific state mechanisms for acquiring federal funds from the Oil Spill Liability Trust Fund. Such mechanisms should not be necessary since procedures for tapping the Oil Spill Liability Trust Fund are in place under the Technical Operation Procedures of OPA 90.

Cost Recovery

A vital portion of many states' OSMPs is cost recovery. Washington, Delaware, Alaska, and New Jersey have well defined programs and procedures for recovering the cost of oil spill response and clean-up. The federal government under OPA 90 also has mechanisms for recovering costs from responsible parties. Strict definitions of responsible parties and heavy fines for inaction during spills have allowed many states to recover nearly 100% of all costs incurred during the clean-up of spills. Cost recovery for small spills has been less effective because of the difficulty in finding responsible parties. Cost recovery ensures that state and federal funds for response and prevention will not be depleted by a costly spill.

Hawaii's policy for recovering funds from responsible parties is included in Chapter 128D, Hawaii Revised Statutes. However, the state does not have regulations facilitating cost recovery.

PREVENTION

Prevention has become the focus of oil spill management in most states because of the technical limitations involved with even the most advanced response techniques and equipment. Many states, including New Jersey and Oregon have either recently or are in the process of updating their Oil Spill Management Programs to reflect an emphasis on prevention, while states like Washington and Alaska have instituted prevention policies and programs in their OSMPs in addition to the requirements of OPA 90. However, most states, including Hawaii, have developed a small number of prevention programs to supplement the requirements of OPA 90.

For the purposes of analysis, the various methods and components of oil spill prevention found in the state OSMPs are divided into three areas: Policy/Planning, Education, and Implementation. These reflect the major areas of prevention management in the states surveyed.

Policy and Planning

Mandated Prevention Plans and Reviews

Various states have recognized the need to emphasize prevention in their OSMPs and have mandated the development of specific prevention programs and plans. Many states including Washington, Louisiana, Maine, Alaska, and Rhode Island, mandate that prevention plans be developed pursuant to specific legislation or administrative rules.

States with prevention policies typically require lead agencies to develop prevention programs which include the regulation of individual oil facilities and vessels. Facilities and/or vessels storing or transporting oil above an established capacity must prepare, and submit for approval, oil spill prevention plans which meet the requirements established by state policy. For example, Oregon requires that prevention plans be prepared for all vessels over 300 gross tons and for terminal facilities. Alaska has more specific requirements which mandate that prevention plans be completed by all crude oil storage facilities with a capacity greater than 5,000 barrels; non-crude-oil facilities with capacities greater than 10,000 barrels; on and off-shore exploration and production facilities; and pipelines. As part of the prevention programs the individual prevention plans of facilities and vessels are reviewed and approved by the lead agencies.

Hawaii's Emergency Response Law (Chapter 128) does give the Department of Health the mandate to prevent oil spills, but the state has not developed a comprehensive prevention program. Hawaii also does not require facility and vessel prevention plans above or beyond that required by OPA 90. The Department of Transportation (DOT) is required to prevent oil spills in harbors and during transport operations. The Department of Land and Natural Resources (DLNR) is responsible for developing rules to prevent the discharge of oil into waters, harbors, navigable streams, and launching facilities of the state. The DOT has developed some rules for prevention that deal with the transportation of oil in the state, while the DLNR has not promulgated any rules specific to oil spill prevention. The Department of Labor and Industrial Relations has also developed oil spill prevention and response rules to protect employees who respond to oil spills.

Alternative Energy Development/Energy Conservation

Various states including Washington have implemented programs to support the development of alternative energy sources to lessen the dependence on oil and other fossil fuels. Alternative energy supplies including solar, hydroelectric, geothermal, and wind are being developed in many areas to reduce the dependence on oil and thus reduce the risks of oil spills. Many states also have programs that promote energy conservation.

Hawaii has instituted few policies and programs for alternative energy development. Ocean Thermal Energy Conversion (OTEC), geothermal, solar, and wind generation projects have been implemented in Hawaii. In addition, the state has subsidized the development of private energy saving products like electric cars. However, the state remains heavily dependent on fossil fuels, and energy conservation programs are minimal.

Education

Education for the prevention of oil spills is a major component of state prevention programs in Washington, California, Oregon, and Alaska. These states have recognized the need to educate the public about oil spills, provide assistance and training to oil industry personnel, and increase the training of lead agency personnel. Education programs assist in the elimination of smaller oil spills in areas such as recreational boat marinas and harbors.

Training and Certification

Under OPA 90, potentially responsible parties are required to train for oil spill response. The USCG in Hawaii has also had an ongoing involvement in this type of training, as has the Clean Islands Council (CIC) and Marine Spill Response Corporation (MSRC). The State of Hawaii is invited to participate in this training. It has been suggested that a more active participatory role in the training would be fostered if the state had formal requirements of training and certification of personnel.

In states requiring prevention programs and plans, training and certification of personnel is usually required as part of the individual oil facility and vessel prevention plans. State prevention plan requirements mandate minimum training levels and schedule refresher training for all individuals involved in transporting, transferring, and producing oil. Training is designed to increase employee knowledge of oil operations and reduce the likelihood of oil spills caused by human error. Most states with prevention programs also require documentation of employee training in order to ensure compliance.

Training also includes prevention training for state personnel involved in oil spill management. In Washington, Oregon, California, and many Great Lakes states, oil spill management personnel in the lead agencies regularly receive training in prevention and attend conferences on oil spill management. These trainings and conferences provide lead agencies with current information on oil spill prevention and response techniques. The oil spill management conferences of the States/B.C. Task Force (Washington, Alaska, Oregon, California, British Columbia) are excellent examples of coordinated professional training for oil spill management.

Oil industry personnel in Hawaii are required by federal law to have certain training, but the state does not require any training to supplement federal requirements. Staff members from Hawaii's lead agency for oil spill management, the DOH's Hazard Evaluation and Emergency Response office, participate in a limited number of oil spill training conferences with other states.

Technical Assistance

Education for prevention also includes technical assistance from the lead agencies and environmental consultants to the various oil facilities and vessels. States with comprehensive prevention policies and well staffed lead agencies regularly provide technical information on the best available technology for oil spill prevention including equipment and training programs. For example, the Department of Ecology in Washington prepared a guide for local oil industries on how to meet new state requirements for prevention plans and conducted workshops to give hands-on assistance. In addition, the U.S. Coast Guard, the USEPA, and the states of Washington and Oregon held workshops to assist industries in developing one set of plans to meet all state and federal requirements.

Hawaii's HEER office is in the process of developing its oil spill management staff and program to better assist local industry.

Public Awareness Campaigns

Public awareness campaigns are also an integral part of oil spill prevention in many states. This includes campaigns to fight against dumping of used oil on land and at sea by vehicle owners and private boat owners. For example, the Pacific Oil Spill Prevention Education Team, including members of the States/B.C. Task Force, develops and shares prevention strategies, provides public education, and fosters public involvement in oil spill prevention. In addition, Washington, California, Oregon, and British Columbia implemented the "Spills Aren't Slick" campaign targeted at the commercial fishing industry. This included a brochure with oil spill prevention and cleanup tips, a sign available for use at commercial fuel docks, and a toll free 1-800 oil spill reporting telephone number.

In addition to the Spills Aren't Slick! Prevention as Education campaign, Pacific States Marine Fisheries Commission (PSMFC) has been working with some fueling stations in the region to test automatic shut-off fuel nozzles. According to the survey responses, the nozzles have been effective and their use will be encouraged by the PSMFC. A number of Atlantic states and Gulf states are now working to extend the campaign into a uniform national outreach effort and the PSMFC plans to use the 1-800 number nationwide.

Oil spill prevention newsletters, oil spill information hotlines, and public review of oil spill policies and programs are also important components in other state prevention programs. Many state lead agencies have joined with industry to promote public awareness about oil spills and used engine oil recycling. In Washington, advisory committees and working groups, including federal and state government officials, industry representatives, environmental groups, and local indigenous tribes, regularly confer on the development and amendment of oil spill prevention policies, rules, programs, and plans.

Hawaii has a few programs for public education and awareness of oil spill prevention. The City and County of Honolulu has a program for disposal of used engine oil, but it does not include a large public awareness campaign. In addition, the Department of Land and Natural Resources sponsors a manhole and storm-drain stenciling program that warns people not to dispose of used oil in storm drains.

Educational Coordination

Some states like Florida mandate that the lead agency should promote the development of classes and educational materials for oil spill prevention in local universities, vocational schools, and private institutions. The Hawaii Department of Health has commissioned various studies on oil spill management, including this one, which are intended to spur oil spill research and improve state management practices. In Hawaii, the USCG has published pollution brochures and conducts a USCG reserve program that includes slide shows to school children. Some 10,000 school children have seen the slide presentation in Hawaii.

Implementation

States have developed many methods to implement oil spill prevention management policies. These methods include the various components of the state prevention programs and the mandated facility and vessel prevention plans. Implementation includes administrative oversight and regulation as well as physical requirements for equipment and drills.

Description of Facilities and Vessels

Federal law requires facilities and vessels to provide prevention plans and has a comprehensive program to update and exercise these plans. Individual states may also have prevention plans that include a physical description of the regulated facility or vessel and the personnel involved in oil transfer and emergency operations. In many states, plans must include descriptions of security and fire protection systems for the facility or vessel.

Hawaii state law does not require facilities and vessels to provide prevention plans beyond those required under federal statutes.

Inspections

In most states with mandated prevention programs and plans, inspections required under federal statutes (USCG, EPA, and DOT) titled Declaration of Inspection are augmented by state inspections used to verify the adequacy and accuracy of the plans at regulated facilities. States use announced and unannounced on-site inspections in addition to periodic review of permits and certificates. For example, Alaska has an inspection program and also uses the various requests for prevention plan amendments to review and inspect facilities and vessels. Washington's Office of Marine Safety also conducts inspections of vessels.

The HEER office does not conduct inspections to assess the prevention techniques of facilities and vessels.

Alcohol and Drug Testing/Medical Monitoring

Most states require alcohol/drug testing and rehabilitation programs as part of facility and vessel prevention plans. This is intended to reduce the percentage of spills arising from human error. Alaska holds the operators of facilities or vessels responsible for taking all appropriate measures to ensure that personnel responsible for any activity that might result in a spill are free from substance-abuse problems. Alaska requires some form of either random or scheduled testing or a combination of both. In addition, some states establish standards of physical ability for some positions and mandate the monitoring of employee medical health including routine checkups.

Hawaii does not have requirements for a drug and alcohol testing program for oil facilities and vessels augmenting the requirements established in OPA 90.

Drills

Drills are a regular part of most states' prevention programs and are typically included in facility and vessel prevention programs. Drills regularly include announced and unannounced exercises to test the oil spill management plans and preparedness of facilities and vessels. Currently, federal policy on the frequency, scope,

and evaluation of drills is being rewritten and many states including Washington have provided input to the development of standardized drill requirements. Currently, California requires quarterly drills for notification procedures and yearly drills for emergency field response under the National Preparedness for Response Exercise Program (NPREP).

The State of Hawaii does not require facilities and vessels to conduct drills by state statutes; however, the state participates with the USCG, local industry, and other Area Plan members in federally mandated drills under NPREP.

Risk Reduction Incentive Programs

As part of the requirements for prevention plans, facilities and vessels in California are required to include information on risk reduction programs. These include programs intended to reduce factors leading to technical and human error such as employee awards for accident free periods of time.

The State of Hawaii does not sponsor a risk reduction incentive program for the oil industry.

Leak Detection and Monitoring Programs

Some states require leak detection programs which include monitoring equipment and personnel in addition to the leak detection and monitoring program requirements under OPA 90 and federal DOT requirements under the Research and Special Programs Administration. For example, New Jersey mandates that on-site monitoring personnel be present at facilities and certified in oil spill prevention. Maine and Rhode Island require that all connections and equipment be monitored by personnel during transfer operations. Similarly, Alaska requires all operators to monitor pipelines and take all steps possible to minimize corrosion and other hazards as part of its leak detection program.

The State of Hawaii does not have additional standards for leak detection equipment or monitoring programs at facilities and vessels above those required by OPA 90. The USCG verifies that these leak detection inspections have taken place.

Equipment

In addition to the federal requirements for certain types of equipment to reduce the risk of oil spills, certain states have complementary statutes. Prevention plans in various states including Washington, Texas, Maine, Rhode Island, Oregon, and Alaska mandate that facilities and vessels must use certain equipment to reduce the risks associated with equipment failure. Drip pans under all pipeline connections, oil hose supports, check valves, and pipeline backflow valves are regularly required in facility prevention plans. In addition, prevention plans also include requirements for equipment tests and scheduled upgrades of equipment with the best technology available. Communication equipment also is required to be tested prior to every transfer operation in Maine and Rhode Island to ensure a rapid response if a spill occurs.

States also require that emergency towing equipment and escorts be available for oil transport vessels and tow cables are required to undergo routine maintenance and upgrading. Some states like Alaska also require the pre-deployment of tow cables from tanker vessels to facilitate towing during emergency operations in poor weather conditions.

Federal regulations require that vessels have the best technology available in on-board navigation equipment, auto pilot alarms, and global positioning systems.

Hawaii does not specifically require any oil spill prevention equipment to be installed or to be available at facilities or on vessels beyond that required by federal statutes.

Storage Tanks

Most states, including those without specific prevention programs, have structural requirements for above ground and below ground storage facilities. Integrity testing of storage tanks is regularly mandated to prevent

storage tank spills, while most states also require the establishment of secondary containment facilities to handle any potential leaks or spills. Facilities are required to handle the original capacity plus some added amount. New Jersey requires that secondary storage systems must be able to accommodate the entire capacity of the original tank plus an added six inches of rainwater. Other states require 110% of storage capacity.

Many states, including Alaska and New Jersey, also require impermeable bases and liners for all storage tanks. Alaska requires extensive geographic plan descriptions of the areas surrounding storage tanks including permeability data on the containment area.

Ballast tanks of vessels also are subject to certain mechanical requirements in some states. Rhode Island requires that valves be installed in ship boiler-room drains to avoid spills during loading and off-loading of ballast.

Hawaii has a comprehensive underground storage tank program administered through the Department of Health. However, this does not cover ballast tanks of vessels or above ground storage tanks.

Transfer Procedures

Specific transfer procedures are mandated under USCG regulations. A "declaration of inspection" is completed prior to any transfer taking place, and industry procedures for fuel transfer and inventory control are in existence and regularly audited. States have also instituted requirements for transferring of oil to and from vessels and facilities. Many states surveyed, including Maine, Connecticut, New Jersey, and Oregon, require that facilities and vessels follow established transfer procedures including the deployment of containment booming equipment around vessels during transfer operations. California and Rhode Island also require the use of variable loading rates. In California, loading operations must be reduced to 25% of normal operations during the first and last 10% of the anticipated volume. Maine also requires that facility personnel conduct visual inspections of waters during transfer operations and that all connecting devices be drained upon completion of transfer operations. Maine also requires that all hatch covers and tank tops be closed and that the area have sufficient illumination during night transfers. Hoses are also required to be semi-annually pressure tested above normal levels. Some states, including Maine, require strict accounting of product inventory before, during, and following transfer operations. Inventory control is also mandated for storage facilities to monitor for possible leaks and spills.

Hawaii state policies do not mandate specific transfer procedures such as inventory control for facilities and vessels or bunkering outside of Honolulu harbor, but they do have state laws and regulations regarding transferring of fuels inside of the harbor at certain specified piers. In addition, the Coast Guard is proposing to require "booming" during fuel transfers. This proposed policy is currently under review. The state also has certain specific requirements for offloading of fuels at the deep water mooring sites. Specifically, tug boats are required during berthing and standby boats are in attendance at all times while a vessel is in the mooring. At the single point mooring, a tug is required to remain attached to the stern of the tanker during off-loading.

Tug Assistance, Pilotage, Vessel Routing

Many states, including Alaska and Maine, require vessels over a certain volume, gross tonnage, or drawing a certain depth to be accompanied by a tugboat and/or guided by a certified pilot. Some states have individual certification and licensing of pilots in addition to federal piloting requirements.

Other states, including Alaska and California, have vessel routing requirements. These requirements bar tankers from certain waterways which have either been identified as high risk areas for tanker traffic and/or as areas containing economically or ecologically sensitive places or wildlife. In California, a voluntary agreement between the state and the oil importing industry stipulates that tankers carrying crude oil will remain 50 miles off-shore unless engaged in transfer operations. Many states including Alaska have instituted tanker tracking systems in cooperation with the USCG to monitor tanker traffic with global positioning systems.

Hawaii does have requirements for pilotage of ships coming in and out of Hawaii's ports. In addition, there is a voluntary agreement between the U.S. Coast Guard and the oil shipping industry to eliminate tanker traffic in the Kaiwi Channel which represented the area for Hawaii's worst case scenario spill prior to the voluntary agreement. The state and the USCG do not have a tracking system for vessels in Hawaiian waters, however, the state Department of Transportation (DOT) manages traffic in Honolulu Harbor from the Aloha Tower. The state allows only one vessel to maneuver in or out of the harbor at one time.

Risk Assessment and Spill History Database

Many states with prevention programs mandate the development of risk assessment programs for facilities and vessels in addition to the risk assessments and spill history records required under OPA 90. They are required to analyze and document their individual risks for oil spills and identify where potential problems could occur. This includes identification of the risks of natural hazards as well as possible equipment failures and human error. Most states have developed (with USCG assistance) maps specifically marking economically and ecologically sensitive areas which are targeted for priority response.

Facilities and vessels are also required to document their discharge histories for spills. In Alaska, facilities and vessels must document any spill over 55 gallons, while Oregon sets the level at 25 gallons. These regulations are intended to identify problems that have historically caused oil spills at the individual oil facilities and vessels.

Other states require all near-miss accidents and spills to be reported through a statewide reporting program. This provides valuable information to the USCG, state agencies, and oil industries as to potential hazards and allows them to mitigate risks associated with these demonstrated hazards. In addition to this, California also requires vessels to prepare a navigational hazard analysis that includes a description of the vessel's normal routes of travel, a list of hazards along their routes, and a situational assessment of potential grounding areas, losses of power, collisions, or explosions. This leads to the development of the "Reasonable Worst Case Spill" scenario.

Facilities and vessels in Hawaii are not required by state law to develop risk assessments and spill histories for their individual operations. The U.S. Coast Guard has established a worst case scenario for the state in the Area Plan. They have also developed area sensitivity maps for the state that are used in the response mechanisms in the event of a spill. These maps are highly useful in developing risk assessments.

Used Engine Oil Recycling

Prevention in most states includes some form of used oil recycling program to alleviate risks from individual oil spills on land and sea. Many states have curb-side pickup and in most states there are at least procedures for the drop-off of used oil at designated sites. For example, New Jersey mandates the acceptance of used oil at all stations giving motor vehicle inspections. California has started a collection system where consumers are offered $0.04 per quart at 42 Unocal service stations with a 20 gallon limit per day. States have also sought to alleviate spills at sea by promoting used engine oil programs at marinas and commercial fishing facilities.

The State of Hawaii, DOT, Harbors Division, has a modest used oil recycling program for the state and decentralizes responsibility to the counties. Honolulu county promotes the use of oil change boxes for household use, while some gas stations and private firms accept used oil for recycling. Each county has a waste oil collection facility. Presently, $180,000 of the state's Emergency Response Revolving Fund is allocated to the counties for oil recycling programs by the state Department of Health; however, only Maui county has availed itself of the fund to date.

Certification of Environmental Professionals and Companies

The USCG has a voluntary Oil Spill Response Organization. This includes inspections of equipment and personnel capabilities by the USCG strike teams. Several states require the certification and listing of

environmental professionals and companies with the lead agencies to ensure that the individuals who respond to oil spills are trained and qualified in proper oil spill response procedures. The identification and listing of trained professionals reduces the time needed to implement response measures and possibly prevents the worsening of spill conditions over time. It also enables potentially responsible parties to identify certified private contractors and arrange a response contract prior to any accident or emergency. In some cases, states require regulated facilities or vessels to have standing letters of intent-to-respond from certified environmental companies as a condition of permitting.

Environmental companies and their personnel are not required by Hawaii state law or regulation to be certified, but they must meet certain federal requirements, under the USCG oil spill response organization certification program, to be rated by the national strike force team. However, some companies like Marine Logistics (ML), Pacific Environmental (PEN), Clean Islands Council (CIC), and the Marine Spill Response Corporation (MSRC) are identified in the State of Hawaii Contingency Plan as potential contractors for oil spill response.

Research Coordination

Some states also support oil spill prevention and response research through their prevention programs. In many states lead agencies support coordinated oil prevention studies between universities, other states, the U.S. Coast Guard, the USEPA, and other state agencies in order to develop the best prevention and response techniques.

To encourage oil spill prevention, Maine and New Hampshire conducted a Port Safety Forum in which marine pilots were asked to make recommendations concerning navigation safety. This resulted in new rules for towing, speed, and tug escorts.

The HEER office in Hawaii promotes research activities related to oil spill management. A portion of the Emergency Response Revolving Fund is used to support research in planning and prevention. In general, research conducted at the state level that involves oil spill management and prevention should be coordinated with the USCG.

Land Farming

To help prevent oil pollution, land farming of waste oil has been implemented in some states like North Carolina. This process, known as bioremediation, involves the spreading of waste oil in fields where it is naturally degraded by bacteria. Bioremediation services are available in Hawaii through private companies.

Prevention Credits

The USCG under OPA 90 requirements determines the requisite level of response equipment and response times for vessels and facilities. However, some states have instituted measures complementary to or beyond the OPA 90 requirements to meet perceived individual state needs. Alaska's OSMP mandates that facilities must maintain a certain level of preparedness depending on their Response Planning Standard (RPS) (see the next section on "Response"). Individual facilities may lower their RPS and reduce their level of required response preparedness by implementing various approved prevention measures and accumulating "prevention credits."

RESPONSE

The third major component of state OSMPs is oil spill response. Many states have developed oil spill or hazardous waste response policies and programs which supplement those of OPA 90. For the purposes of this report, the methods and components of "Response" found in the various state OSMPs are divided into two sections: Policy and Programming, and Implementation. The section on Implementation is divided into Contingency Plan Requirements, Emergency Response, Enforcement, and Education.

Policy and Programming

Most states surveyed have various policies which establish administrative programs in the lead agencies for oil spill response and clean-up. These programs cover a broad spectrum of activities ranging from those specifically directed toward oil spill response to those including oil with other hazardous materials. Some states have minimal involvement in response, while others have established active roles in cooperation with federal agencies.

Definition of Responsible Parties, Vessels, and Facilities

States with comprehensive programs for oil spill management such as Washington, Oregon, and Alaska have established definitions of "responsible parties," "vessels," and "facilities." These usually are consistent with OPA 90 definitions for regulated "vessels" and oil "facilities," but sometimes broaden the definition to extend responsibility to more vessels and facilities than OPA 90. Texas, for example, extends responsibility and regulation to all vessels carrying 10,000 gallons of fuel or more.

Strict definitions of "responsible parties" and a system of fines for parties unwilling to accept responsibility allow states to avoid confusion and delays in emergency response and to recover state oil spill management funds used for oil spill response and clean-up. Washington fines responsible parties up to $100,000 a day if they do not claim responsibility for a spill.

Hawaii relies on OPA 90 definitions of "responsible parties," "vessels," and "facilities."

Registration of Facilities and Vessels

Most states with response plans require certain oil transfer or production facilities, pipeline facilities, and vessels to be registered with the lead agencies. These facilities then become certified regulated facilities pursuant to various state policies.

Proof of Financial Responsibility/Liability Limits

Many states have established policies that require facilities and vessels to show proof of financial responsibility for oil spill response and clean-up. This usually involves showing proof of insurance to cover liability limits established by either OPA 90 or individual state law. The Oil Pollution Act of 1990 set limits of financial liability for tank vessels at the greater of $1,200 per gross ton or $10 million for tank vessels over 3,000 gross tons. All other vessels have liability for the greater of $600 per gross ton or $500,000. Offshore facilities are responsible for all removal costs plus up to $75 million. Onshore facilities and deepwater ports are liable to $350 million. Oregon holds the product owner liable for damages if the owner of the oil facility or vessel is unable to meet the financial responsibility. Connecticut requires vessels to post a $50,000 bond prior to transfer operations.

Some states have levels of financial responsibility above those of OPA 90 due to the costs associated with clean-up of major oil spills and damage to the natural environment and economy. Alaska sets financial responsibility for tank vessels or barges carrying crude oil at the greater of $300 per incident, for each barrel of storage capacity or $100 million. Alaska holds all other tankers carrying non-crude oil responsible for the greater of $100, per incident, for each barrel of storage capacity or $35 million. Florida's financial responsibility regulations also exceed those of OPA 90. Florida sets its limits at the greater of $625 per gross ton of vessel or $50 million. However, owners and operators of vessels and facilities in Florida also have unlimited liability for damages to natural resources. Washington has unlimited liability and financial responsibility in all cases.

Hawaii has unlimited liability except for a special liability cap of $700 million for inter-island barges carrying fuel oil #6. Hawaii does not extend liability to the product owners.

Mandated Contingency/Action Plans

A major portion of state policies and programs for response relate to Contingency/Action plans. The lead agencies in most states have established, or are in the process of establishing, state contingency plans for oil spill response which are consistent with OPA 90. State plans in Washington, Texas, Oregon, and Alaska require individual facilities, pipelines, and vessels to prepare their own response plans. Texas requirements exceed OPA 90 requirements by mandating that all vessels carrying over 10,000 gallons of oil or fuel cargo must prepare response plans, while Washington includes vessels over 300 gross tons.

Hawaii developed the State of Hawaii Contingency Plan as part of the Emergency Response Law Chapter 128D; however, it does not require individual vessels and facilities to prepare plans other than those required by OPA 90. The plan delineates the responsibilities of the various state and county agencies in the event of an oil spill. However, the plan does not provide mechanisms which facilitate coordination between the various agencies and the HEER office.

Notification/Response Command Structure/Coordination Agreements

Most states through their lead agencies have established systems of notification and command for response to all oil spills and include flow charts of their systems in the state oil spill contingency plans. This requires coordination with federal agencies, local governments and departments, oil industries, other states, and oil spill response organizations. Many states, including Delaware, Oregon, California, Alaska, and Washington, have extensive agreements with the federal agencies, other local departments and agencies, as well as with other states, for the coordinated response to oil spills.

The west coast states are actively involved in three different and extensive coordination efforts: the States/B.C. Oil Spill Task Force, the Northwest Area Contingency Plan, and the Pacific States Marine Fisheries Commission (PSMFC).

The States/B.C. Oil Spill Task Force was formally created by a Memorandum of Cooperation signed in 1989 by Alaska, British Columbia, California, Oregon, and Washington. Two significant spills, the *Nestucca* barge off the coast of Washington and the *Exxon Valdez* in Alaska highlighted the common concerns shared by west coast states and British Columbia as related to oil spill risks. In 1990, the task force published a report which included 46 recommendations for oil spill prevention and response. Most of those recommendations have been incorporated into federal law under OPA 90, or into state statutes, rules or programs. The continuing focus of the Task Force is on fostering regulatory consistency throughout the region, sharing information and resources, and coordinating the development and implementation of new policies and programs, especially in the area of spill prevention.

The Northwest Area Contingency Plan is a consolidation of efforts by the USEPA, USCG, Oregon, Idaho, and Washington. Rather than have each agency develop individual plans, the decision was made to consolidate efforts. Under the plan, all federal and state response plans will be consolidated into a single unified plan. The plan is currently in the process of being finalized.

In 1947, Congress established the Pacific States Marine Fisheries Commission, headquartered in Portland, Oregon. It is one of three interstate commissions dedicated to resolving fishery issues. The PSMFC represents Alaska, California, Idaho, Oregon, and Washington, and coordinates with the States/B.C. Oil Spill Task Force on oil spill issues.

Oil spill reporting has been simplified through coast-wide cooperation to establish a uniform and easy to remember reporting number. Fishermen or boaters on the West Coast can now report any spills by calling 1-800-OILS-911. This system has proved to be effective, because all fishermen traveling along the Pacific coast can use the same number for reporting spills. According to our survey responses, fishermen and port authorities have responded very positively to the campaign.

Lead agencies also establish rules for coordinating response and clean-up activities with responsible parties and make the determination when a clean-up is completed in consultation with the On-Scene Coordinator of the U.S. Coast Guard or USEPA. Lead agencies also coordinate the activities of other local departments at the state and county levels. In New Jersey the lead agency has standing agreements with the various counties for oil spill response to decrease county response time.

The development of unified plans concerning oil spill response allows for consistency between state and federal policy and for the formal agreement between the federal agencies and the states on consultation during an oil spill. In this manner, states ensure their ability to participate in decisions concerning their state, particularly in relation to finalization of oil spill clean-up.

In Hawaii, coordination and command of oil spill response is officially in the hands of the federal on-scene coordinator of the U.S. Coast Guard or the U.S. EPA. Hawaii is a member of the federal Oceania Regional Response Team (RRT) consisting of 36 members from Hawaii, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. The Area Plan serves as the coordinating response plan for coastal and marine oil spill response, and is lead by the Area Committee. The Department of Health and the state Civil Defense are responsible for state command of oil spill response and coordination of the other agencies, counties, and Local Emergency Planning Committees (LEPC). In the event of an oil spill at sea the USCG, the state HEER office, and the responsible party would be coordinating response actions. However, the state has not always been represented during some activities of the Area Committee. In addition, the chain of command and responsibilities of the state and local departments and agencies are not well defined. While the Department of Health's HEER office is the state's lead agency for oil spill management, the Civil Defense is authorized to take command of the state's response if a "state of emergency" is declared by the Governor. In addition, there are no guidelines for consultation with the federal On-Scene Coordinator (OSC) on determining when a clean-up is complete. The state HEER office acts as the state's trustee for natural resources and is responsible for conducting the state's portion of the Natural Resource Damage Assessment (NRDA). However, the HEER office does not have expertise in natural resource management.

Registration of Environmental Professionals

Many states, including Delaware and Washington, have established systems for registering and certifying environmental professionals with the lead agency. The registration of environmental professionals provides potentially responsible parties with a list of qualified oil spill response contractors, which eliminates delays in responding to oil spills and assures competent action. Massachusetts also has established the licensing of site professionals including a site professional for oil spill response and clean-up. Site professionals are certified environmental experts who oversee clean-up actions and verify compliance with state plan requirements. Hawaii does not have a system for certifying environmental professionals and companies, but does recognize some companies and organizations in the State Contingency Plan such as Unitek, Clean Islands Council (CIC), and PENCO.

Rules for In-Situ Burning and Use of Dispersants

As part of their programs for response many states like Florida, Texas, Alaska, and Washington have established policies for the use of dispersants and in-situ burning to contain oil spills. In Texas the determination of the use of dispersants is left up to the on-scene coordinator for a decision on a case by case basis, while Oregon does not permit the use of dispersants except under extreme danger from fire or other hazardous circumstances.

Hawaii has an agreement with the U.S. Coast Guard in the Area Plan governing the use of dispersants in Hawaiian waters, which are subject to various guidelines. The agreement states that pre-approvals of dispersants are not given in these areas:

- where the water is less than 60 feet deep
- in any location where the dispersed oil may reach a shoreline, marine sanctuary, national or state wildlife refuge, state marine life conservation district, or estuarine sanctuary
- over shellfish propagation or harvesting waters
- waters over reefs
- waters designated as aquatic preserves
- waters over nursery areas of indigenous aquatic species
- waters in coastal marshes or waters in mangrove forests

This agreement and its conditions bar immediate dispersant use, but approval for its use could still be obtained after consultation with the OSC, the Regional Response Team, and the state.

A letter of agreement concerning the use of in-situ burning between the USCG, EPA, and State of Hawaii was signed in June of 1994.

State Hotlines

Many states including Washington, Missouri, Oregon, California, and Alaska have hotlines for the reporting of any oil spill. Washington, for example, has four 24-hour oil and hazardous materials spill reporting numbers for each of the northwest, central, eastern, and southwestern sections of the state. They also have a 24-hour reporting number for the Department of Emergency Management and another 24-hour number for the EPA and USCG reporting. This includes the "Spills Aren't Slick" campaign in the Pacific Northwest that includes a toll free 1-800 number for spill reports. In the Pacific Northwest the various states and federal agencies and commissions like the Marine Fisheries Commission collaborate on oil spill hotlines.

Hawaii has state and USCG hotlines for oil spill reporting, but the state numbers are listed under the Department of Health and are difficult to locate in the telephone book. The 24-hour numbers have been found to be unmanned on some occasions. The USCG has a somewhat confusing 1-800 number for reporting "Toxic Chemical/Oil Spills." A clearly labeled "Oil Spill" hotline in the list of emergency numbers on the reverse of the front cover of the telephone book that lists both the USCG and appropriate agency would be preferable.

Voluntary Clean-up Program

The State of New Jersey has a Voluntary Clean-up Program for hazardous waste sites. Qualified responsible parties are encouraged to undertake clean-up of a waste site or spill by entering into a Memorandum of Agreement with the lead agency. This expedites the clean-up process by eliminating some of the bureaucratic obstacles in the lead agency.

Hawaii does not have a formal voluntary clean-up program. There are, however, private organizations, such as the Hawaii Audubon Society, that are developing special oiled bird rescue programs.

Implementation

Contingency Plan Requirements

Many of the states surveyed require oil production or transfer facilities, pipelines, and tanker vessels to prepare individual contingency plans for response to oil spill. Plans in states such as Texas, Oregon, and Alaska, require various components to be included in the facility/vessel/pipeline contingency plans for response.

Description of Facility and Vessel/Worst Case Assessment

Under OPA 90, and augmented by several states such as Texas, Oregon, and Alaska, basic components of contingency plans for response include descriptions of the facility or vessel, its capacity, physical plan,

personnel, safety equipment, security, and so forth. The facilities and vessels are also required to document the worst case scenario for its individual capacity, location, climatic conditions, and characteristics of the oil (i.e., emulsification).

The development of a worst case scenario includes the documentation of individual casualty histories by facilities and vessels. Many states, including California and Alaska, require regulated facilities and vessels to prepare detailed descriptions of their oil spill casualty history. This involves the description of past spills, why they occurred, and how the spill was contained. The documentation of spill histories provides valuable information which increases the effectiveness of future responses to oil spills.

Alaska has a system incorporating prevention and response planning into a rating system that forms the benchmark for facility and vessel regulation. The Response Planning Standard (RPS) establishes certain spill volumes and specified time frames applicable to response planning for each class of regulated vessels and facility operations in the state. Different RPSs require different levels of response preparedness. Facilities and vessels are required to determine their RPS, prepare plans based on their RPS level, and show a specified minimum level of response preparedness. A facility's RPS can be reduced by the application of "prevention credits" which are certain prevention measures that have been recognized by the state. If prevention measures are implemented the facility's or vessels RPS will be reduced as well as the required level of preparedness.

The State of Hawaii has no requirements for individual facility or vessel oil spill response contingency plans. The state does not require vessels and facilities to register spill and casualty histories with the HEER office.

Protection Plan and Identification of Economically and Environmentally Sensitive Areas

States also require vessels and facilities to document their plans for all types of oil recovery on water and land. Plans include methods and equipment for tracking spills, proposed use of dispersants, in-situ burning, bioremediants, coagulants, or use of other chemical agents.

All states, including Hawaii, have recognized the problems involved in oil spill response technology and have delineated areas for priority protection during an oil spill. This process involved the detailed mapping of sensitive, coastal areas by NOAA in cooperation with the USCG and planning priority response procedures for these areas, but did not involve specific, on-site field investigations. Protection plans also include geographic information and the mapping of archeological/historical sites. Periodic updating of the sensitivity maps produced in these investigations should be included in the oil spill prevention plans for the state.

Some states also require the lead agencies as well as the regulated facilities and vessels to have completed plans showing the countermeasures that will be taken to keep oil from reaching shore. These plans also must include a description of shore clean-up procedures if the oil is not contained at sea. Delaware completed a three phase Shoreline Countermeasures Program with the on-scene coordinator (OSC). A team of trained personnel assesses oil spills and makes recommendations to the on-scene coordinator for the proper response depending on the existing conditions. The Delaware plan includes the use of a desktop computer system which provides specific information on remediation of 10 different shoreline types. The USCG in Hawaii also has a computer spill tracking system as do the private oil spill response companies. Unfortunately, their findings do not necessarily agree with each other.

Hawaii state law does not require individual facilities and vessels to develop response and protection plans. However, the local oil industries have established oil spill response plans and contracted with private oil spill response companies and organizations, such as MSRC and the Clean Islands Council (CIC), for the implementation of these plans.

Letters of Intent to Respond

Some states, including Florida and Oregon, require oil facilities to have signed letters of intent to respond from certified contractors. This is intended to speed response by responsible parties and their private contractors. California requires information on contractual arrangements between potentially responsible parties and

environmental response professionals to be included as part of facility and vessel contingency plans. Primary response contractors in California are required to provide information on their response preparedness, including descriptions of equipment and personnel. The administrator of the California OSMP determines if the private primary response contractor's proposed response plan is appropriate and complete.

Federal law requires both facilities and vessels to have contractual agreements with private contractors and cooperatives to respond to a "worst case discharge." In accordance with the provisions of OPA 90, the USCG requires a contract or other approved means to confirm that the state has met the required provisions. Approval of contractors is subject to review by the lead agency every five years.

Hawaii does not require facilities or vessels to have contractual agreements for response to spills with environmental contractors. However, Hawaii's major oil transporters, refiners, and distributors, including BHP and Chevron, have agreements with established oil response companies and organizations including CIC, MRSC, and PENCO.

Wildlife Rescue

Plans for wildlife rescue also are required in some states like Alaska, California, and Washington. This includes planning of coordination efforts for wildlife cleaning and disposal of effected animals.

The state Department of Land and Natural Resources is responsible for wildlife rescue and clean-up and Sea Life Park Hawaii has been identified as an additional facility capable of conducting wildlife rescue and clean-up. However, the state has undertaken minimal efforts with regard to wildlife rescue planning. The state does participate in the Oiled Wildlife Subcommittee of the Area Committee which is tasked with addressing these issues.

Response Notification Plan

Response Notification Plans are a federal requirement in all OPA 90 vessel and facility plans. These plans must be exercised and documented on a regular basis. In addition to the federal requirements, most states require individual regulated facilities and vessels to establish chains of command and notification procedures and to document these procedures in their respective contingency plans. These notification procedures involve listing of responsible facility and vessel personnel and their telephone numbers.

The State of Hawaii does not require vessels and facilities to develop notification procedures beyond those required under OPA 90.

List of Procedures for Halting Discharge

Under OPA 90 all facilities, pipeline systems, and vessels are also required to document a list of procedures which will be followed to stop the discharge of oil. California requires a description of automatic controls for safety or emergency shutdowns including descriptions of rapid pump and valve shutdown and anti-surge measures.

Hawaii's HEER office and the USCG have the authority to order the halting of a release of oil or other hazardous substances, and have the authority to order the emergency closing of facilities.

Emergency Response

Many states, including Alaska, Texas, Oregon, and California, have established various programs and actions to be implemented during an oil spill emergency.

Lead Agency Response

In some states such as Washington, the lead agency has the authority to hire a contractor for clean-up of oil spills if the responsible parties do not take action and/or claim responsibility. Clean-up is usually, but not always, completed after consultation with the on-scene coordinator (OSC) according to predetermined

guidelines under a Memorandum of Understanding. This reduces delays in emergency response associated with establishing responsible parties at the time of a spill. In these cases the state takes steps to recover all costs and impose fines on responsible parties.

In Hawaii, at-sea response is left to the federal on-scene coordinator (FOSC) who makes a determination of the severity of the spill. If the legally responsible party does not take action, the FOSC can federalize the spill and notify the Oceania Regional Response Team for action. The State of Hawaii has provisions for contracting emergency response companies, but usually defers to the USCG. Under state law (Chapter 128D), the state HEER office must respond to both marine and terrestrial oil spills. Under OPA 90, the USEPA has the federal authority for response to oil spills on land. However, EPA does not have oil-spill response personnel stationed in Hawaii. Therefore, the EPA has authorized the USCG to act on their behalf until EPA personnel arrive on the scene.

Equipment/Personnel

Under OPA 90, comprehensive oil spill response equipment and personnel requirements are required as part of state and facility, vessels, and pipeline response plans. In general, states require a certain amount of booms, skimmers, and sorbents to be kept available for emergency oil spill response on vessels and at facilities depending on their capacities and worst-case scenarios. Many states like Washington also require the remote placement of response equipment to increase rapid deployment in geographically remote areas. (OPA 90 requires this indirectly based on equipment available within two hours.) States also require the use of spill detection equipment to increase the chances of early detection and response. In addition, Delaware and NOAA have developed a computerized response program to enhance oil spill response. As oil spills occur, the computer programs model various response scenarios depending on the conditions of the spill and its location. This program has been reproduced in various states, including Texas, Oregon, and Florida.

States also regularly require the listing of certified response personnel in their contingency plans. This includes a description of the duties and levels of certified training. Lead agencies in various states also have trained oil spill response personnel available 24 hours. In Washington, each regional office is staffed with at least two full time responders who are fully trained in environmental emergency response. In 1993, the Washington spill responders received 3,767 reports and conducted 953 field responses.

The State of Hawaii does not require facilities or vessels to have any specific equipment or personnel available for oil spill response beyond the levels established by OPA 90. The state's Hazard Evaluation and Emergency Response (HEER) office does retain four permanent oil spill response personnel on Oahu, but does not have oil spill response personnel on the other major islands. CIC has spill response packages including boom, skimmers, and small boats located at all commercial harbors in Hawaii. These response packages are designed for spills of up to 50 barrels and deployment within the first two hours. The Coast Guard also has boom trailers located at each of the major commercial harbors, and the U.S. Navy has some response equipment staged at Midway Island.

Program for Oily Waste Disposal

A major problem following oil spills is the disposition of oily waste and many states require the development of plans for its disposal. These plans also require that provisions be made for the interim storage of waste oil and debris if it cannot be disposed of promptly. In Hawaii, oily waste can be disposed of at the H-Power facility, but arrangements for that disposal have not been finalized and are made on a case-by-case basis at present. Landfilling is also considered an option in Hawaii for non-combustible oily waste. However, rules for the disposal of oily waste in landfills have not been established. A major problem revolves around the disposal of sand waste after it has been covered by oil. There are many private commercial soil remediation contractors in the state and some of these offer incineration services. While these companies could handle small volumes of oily waste, they are not equipped to remediate large volumes, as might be produced by a major spill.

Volunteer Programs

Many states have plans for the coordination of volunteer clean-up activities so that volunteers can be organized and used effectively during oil spill emergencies. This includes wildlife rescue and remedial clean-up activities. Washington's Department of Ecology has a volunteer coordination program as part of its OSMP. Oregon has a training program for volunteers involved in clean-up and wildlife rehabilitation. Approximately 300 volunteers have been trained in this program.

There is no state sponsored volunteer training and registration system, however, the Hawaii Audubon Society and Area Plan Committee have an oiled wildlife recovery team.

Plans for Public Information

Many states, like Washington and California, retain personnel for public information in their lead agencies. They provide information to the press and the public during oil spill emergencies, and in some cases they also coordinate public education campaigns for oil spill management. The State of Hawaii participates in a Joint Information Center (JIC), which is established at the time of a spill on an as-needed basis to provide information to the press and the public.

Motor-Vehicle Accident Clean-Up

New Jersey has mandated a Motor Vehicle Accident Generated Waste Program that requires vehicle owners to be responsible for any oil or other hazardous waste remediation stemming from an accident. Hawaii does not have a specific motor-vehicle accident clean-up statute, but owners of motor-vehicles can be held responsible for costs of clean-up under the general provisions of Hawaii's Environmental Response Law (HRS 128D-5).

Enforcement

Enforcement of contingency plan requirements is a vital part of many state response plans and OSMPs. A federal program of inspections by USCG, DOT, and EPA is comprehensive and regularly performed by competent, trained personnel.

Inspections

Most states, including California and Washington, require lead agencies to complete inspections of regulated facilities, pipelines, and vessels to test for regulatory compliance with the various policies and plans. This is usually coordinated with the federal agencies. In California, wardens from the Department of Fish and Game conduct announced and unannounced inspections of regulated facilities. The Office of Marine Safety in Washington conducts vessel inspections.

Hawaii's state government does not perform inspections of oil facilities or vessels, and relies on the federal agencies' regulations and inspections.

Plan Reviews/Certification, Re-Certification

The Federal Plan Review/Certification, Re-certification program is comprehensive. USCG, EPA, and DOT contingency plans all require "description of training and what they include." As part of state OSMPs, contingency plans for response are reviewed and certified by the various lead agencies. Individual facility and vessel response plans are reviewed for comprehensiveness and re-certified periodically. Alaska re-certifies plans after vessels or facilities propose amendments to their plans. In New Jersey, Discharge Cleanup and Removal Plans are initially reviewed for 60 days by the lead agency and subsequently technically reviewed for another 180 days. State contingency plans for response are also reviewed on an in-house basis by the various lead agencies. Florida's plan undergoes a review annually. Washington's program and policies for oil spill management are routinely reviewed by the public through various committees established by the state. These

committees include representatives from the state lead agency, federal agencies, local governments, environmental groups, and industry officials.

Hawaii does not have a mandated review of its contingency plan, but does have input from the community through the Local Emergency Planning Committees. However, these meet infrequently, do not include interest groups and industry representatives, and do not focus on oil spill management issues.

Education

Education for oil spill response is included in many state OSMPs. Education includes training and drills for oil industry personnel and lead agencies.

Training, Certification, and Refresher Training

In addition to the requirements under OPA 90 and OSHA, some states mandate that certain levels of training be provided to facility and vessel personnel who work in the industry and respond to oil spills. This is intended to reduce the incidence of spills arising from human error and improve response performance. Washington, for example, established the Facility Personnel Oil Handling Training and Certification rule. This requires that oil handling personnel be trained and certified in a minimum number of hours in its core training topics. The training program must be certified every three years to ensure its comprehensiveness. Illinois has instituted a training program which requires employees to receive 40 hours of off-site instruction and three days of actual field experience. Managers and supervisors also receive the training plus an additional eight hours of oil spill management classes. Refresher training includes a mandatory eight hours for employees as well as managers. Topics include spill containment, protective gear, and health hazard monitoring. California mandates that vessel or facility owners are responsible for planning and conducting training according to state and federal standards. Facility and vessel contingency plans must include descriptions of training and what they include.

Hawaii does not have regulations requiring levels or types of training supplementing or exceeding those requirements found in OPA 90.

Drills

Drills and exercises are mandated under federal law for all plan holders. There is a comprehensive program under the PREP guidelines. Drills for response are an integral part of state contingency planning. States require facilities and vessels to perform exercises testing oil spill response procedures. California requires vessel and facility owners to plan, conduct, and document drills as often as is needed to ensure that their plans function in an emergency. In addition, California requires quarterly drills for manned and unmanned, on-board emergency procedures, and individual notification procedures for vessels and barges. It also requires yearly drills for shore-based, spill management teams, and the inspection of field equipment used for oil spill response.

Drills also include state and local exercises to test the administrative chain of command structure to determine if the notification and command structures are functioning as planned. Drills also test the coordination between response teams, local lead agencies, the federal government, and the various state departments.

The Department of Health Hazard Evaluation and Emergency Response (HEER) office participates in all local exercises to test the notification and command system in Hawaii. It also participates in some drills conducted as part of the Area Plan with the USCG, the oil industry, CIC, and MSRC. However, the HEER office has limited involvement in some drills.

Educational Coordination

Florida mandates that the lead agency work with local universities, vocational schools, and private institutions to develop and promote classes and educational material for oil spill prevention and response. This includes research on response technology and procedures. Washington State requests the involvement of the Washington Sea Grant Program to coordinate oil spill education.

RECOMMENDATIONS

Despite Hawaii's near total dependence on imported oil and the potential for ecological and economic catastrophe from a large oil spill, the State of Hawaii's policies and programs for oil spill management are less comprehensive than those of other coastal states. From the survey and analysis of the various state "Oil Spill Management Programs," it is apparent that state programs for oil spill management in Hawaii could be updated and strengthened, particularly in the area of prevention.

This section provides a series of recommendations and the rationale on which they are based, for the improvement of Hawaii's "Oil Spill Management Program" based on the diverse components of oil spill management identified in the states surveyed. Our intention is to provide specific policy and programming recommendations that will not only increase the State of Hawaii's preparedness for oil spill response, but decrease the probability of a spill occurring. It is not our intention to critique and make suggestions for the improvement of the existing oil spill management programs of the federal agencies in Hawaii. While it could be argued that oil spill management should be the sole responsibility of the federal government under OPA 90, the financial and ecological risks associated with oil spills in Hawaii necessitate state involvement. In addition, the State of Hawaii has a lead role in the Federal Area Plan as an On-Scene Coordinator and is responsible for working with the federal agencies and the responsible parties in case of a coastal oil spill. It is also responsible for majority of oil spill management activities on-land and in the harbors, because of the absence of an USEPA office in Hawaii.

Therefore, our primary recommendation is that the state should develop a comprehensive approach to oil spill management encompassing policy and programming consistent with OPA 90 and fosters coordination of policies and programs between federal, state, and local agencies. The specific programs should coordinate state participation in the federal Area Plan for coastal oil spill management and update its role as a lead agency for on-land oil spill management under OPA 90.

Our recommendations for the administration and direction of an Oil Spill Management Program do not necessarily require that the State of Hawaii adopt sweeping new legislation. It appears that much of the regulatory structure necessary for comprehensive oil spill management can be developed under Hawaii Revised Statutes (HRS) Chapter 128D. We suggest that the State of Hawaii should develop policies for oil spill management in the state Legislature to complement and refine those established in HRS Chapter 128D, and OPA 90, and focus much of its attention on the establishment of administrative rules for the development of prevention programs and coordination planning.

Lead Agency

The survey and analysis of the various states showed that there are an array of approaches to oil spill management that appear to have been successful. Most of these approaches are based on the foundation of a strong lead agency which is funded and empowered to develop and implement administrative rules for oil spill management. In states with comprehensive OSMPs like Washington, Oregon, Alaska, and California, the lead agencies perform a variety of functions for oil spill management. These lead agencies typically have well staffed oil spill management offices. Washington's Spill Management Program has at least 25 full-time staff members in the Department of Ecology, as well as inspectors and planners in the state Office of Marine Safety.

The centralization of oil spill management under one lead agency has many advantages. Primarily, it provides for the coordination of state and local activities for oil spill prevention and response programs in one agency, and allows for the elimination of duplication of efforts by diverse local agencies. It can also oversee the development of a comprehensive OSMP and direct local agencies to fulfill certain roles. The state also can more easily develop coordination efforts through Memorandums of Understanding with federal agencies.

In light of this, Hawaii should develop a strong lead agency to coordinate a comprehensive OSMP that encompasses prevention and response. It appears that the HEER office is in the best place administratively to

develop and implement a comprehensive oil spill management program, particularly since it has existing funding from the Emergency Response Revolving Fund and recognition in HRS Chapter 128D, as the lead agency. The HEER office is in the best position to develop rules and Memoranda of Understanding between the federal agencies and the state if and when new state laws and programs for oil spill management are developed to augment OPA 90 and the existing Federal Area Plan. The HEER office also appears to be the appropriate agency for the development of new agreements with local governments, the coordination of public awareness campaigns, and the development of comprehensive prevention and response programs.

The strengthening of the state's OSMP necessitates the clarification of the roles of the HEER office and the State Civil Defense so as to eliminate any confusion during an oil spill emergency as to which agency represents the state. State Civil Defense has the expertise to handle emergency situations including command and communication systems, particularly in the case of multiple emergencies, and has worked with the USCG under the Area Plan. Therefore, it appears that the HEER office should play a cooperative role with state Civil Defense and develop specific rules and guidelines for coordination of the two offices during an oil spill emergency, particularly for on-land situations.

In addition, oil spill management personnel staffing in the HEER office should be expanded through funding from the Emergency Response Revolving Fund. The state needs to develop a well-trained, technically advanced staff of oil spill managers to plan, implement, and coordinate oil spill management programs. Training of the HEER staff should include regular participation in oil spill management conferences, exercises and training, which is currently being offered by industry, the USCG, and cooperatives as well as with other state and federal oil spill managers. A well trained and staffed HEER office would allow for the state's increased involvement in the federal Area Plan and regulation of on-land oil spill programs and improve effectiveness of response to spills.

Coordination

The HEER office generally should develop strong program coordination with the U.S. Coast Guard, the USEPA, the county agencies and departments, and other state agencies involved in oil spill management. An integral part of coordination efforts should be increased state involvement in the federal Area Plan. The state could also facilitate the coordination of on-land oil spill management programs with programs for coastal oil spill management included in the federal Area Plan. This would involve the coordination of regulations for oil spill prevention and response preparedness for on-land facilities and pipelines with the procedures set forth in the Area Plan.

The state should establish a state inter-agency council to coordinate state and local oil spill management activities. The "Inter-Agency Council for Oil Spill Management" should include all state and county departments and agencies that have oil spill related activities such as the state Civil Defense, state Departments of Land and Natural Resources and Transportation, Office of State Planning, the Local Emergency Planning Committees, and the city and county fire departments. The HEER office should lead the council and provide any necessary funding from the Emergency Response Revolving Fund.

The HEER office also should specifically increase coordination with the state Department of Transportation (DOT), Harbors Division, because of its responsibility to regulate activities in the state's harbors. This includes vessel traffic regulation, vessel fuel bunkering activities, and oil and fuel transferring operations. Coordination could be facilitated through the inter-agency council.

State of Hawaii oil spill management personnel should attend conferences with other states such as "The International Oil Spill Conference" and examine the feasibility of joining established oil spill management task forces like the State/B.C. Task Force. Such participation will permit the HEER office to keep abreast of current information on recent advances in oil spill prevention and response and to coordinate their efforts with other

experts in other states and countries with similar interests, problems, and potential solutions. Public involvement also should be encouraged and mandated as part of any coordination efforts.

Funding

The State of Hawaii's funding mechanisms for oil spill management appear to be as comprehensive as those of other states. However, the funding of other non-oil spill management programs (such as the state's safe drinking water program) with the Emergency Response Revolving Fund potentially jeopardizes the reliability and sustainability of state oil spill management funding and program development. The state should limit the use of the funds to oil spill management activities including oil spill response, prevention planning, and administration of the HEER office. The state should work with the USCG and the industry to determine the best use of the monies available from this fund in a coordinated effort to identify which projects and initiatives will best serve the prevention and response community in Hawaii. HRS Chapter 128D, should also be amended to explicitly establish what percentage of the Emergency Response Revolving Fund will be allocated for response, prevention, and administration. This would alleviate any confusion concerning the appropriation of oil spill management funds by the lead agency.

Cost Recovery

Cost recovery policies in states such as Washington and New Jersey are integral components in comprehensive oil spill management programs. Without established definitions of responsible parties and policies for cost recovery, lead agencies are constrained from taking an active role in oil spill response and prevention due to the risk of depleting state funds. Therefore, after definitions for responsible parties have been established, the state should develop specific procedures and rules for recovering costs associated with an oil spill. Policies and mechanisms for obtaining reimbursement from the federal Oil Spill Liability Trust Fund should also be established by the state. Effective cost recovery would allow the HEER office to actively involve itself in oil spill response in cooperation with federal agencies and local departments without fear of depleting funds needed for administration and prevention programs.

Fines

Cost recovery for clean-up and damages is a lengthy process involving years of litigation, which would not assist Hawaii in dealing with the immediate economic problems associated with loss of tourism, should a catastrophic oil spill occur in Hawaii. The state should review its system of fines and implement new enforcement procedures for inaction or delays by responsible parties. This is particularly important with regard to the smaller fishing boat fleet that is outside the aegis of the oil industry, but nevertheless can wreak havoc if their fuel is spilled near shore. This would force potentially responsible parties to act faster, possibly reduce the spread of oil, and curb extensive ecological and economic damage. Washington's system of charging $100,000 per day for inaction has been effective in driving responsible parties to act in a timely manner when spills occur. Harsh fines and effective enforcement procedures have reduced the need for cost recovery and more importantly reduced the delays in oil spill response by responsible parties.

Prevention

Because of the technical limitations of oil spill response, the HEER office should develop a comprehensive state oil spill prevention program under HRS Chapter 128D. The state prevention program should encompass a variety of areas ranging from used oil recycling and public awareness campaigns to mandated facility and vessel oil spill prevention plans.

Prevention Plans

Hawaii Revised Statutes (HRS) Chapter 128D, gives the HEER office the ability to promote all aspects of oil spill management, but fails to provide strict requirements, beyond those required under OPA 90, for facility and vessel prevention plans. Therefore, policies should be developed as part of HRS Chapter 128D, that mandate the development of prevention plans by regulated facilities and vessels. The HEER office also should be mandated to develop rules and specific requirements for facility and vessel plans that are consistent with and complementary to OPA 90.

Prevention plans should be required to include (1) a state mandated alcohol and drug testing program for personnel at on-land facilities; (2) semi-annual drills; (3) risk reduction programs and incentives for facilities and vessels; (4) leak detection and monitoring program requirements; (5) storage tank burning requirements; (6) risk assessments and spill database histories; (7) personnel training schedules and certifications; and (8) ballast tank requirements. Individual facilities and vessels should also be required to employ a variety of equipment that match the best available technology including backflow valves, drip pans, hose supports, and state-of-the-art navigational equipment, and communication equipment. Emergency communication equipment at oil transfer facilities also should be required to be tested on a regular basis. In addition, a tow cable maintenance and review system should be developed to regulate Hawaii's inter-island tug and barge transportation system.

A Response Planning Standard system encompassing "prevention credits" and the facility's or vessel's worst-case scenario like that in Alaska should be considered for development in Hawaii. This comprehensive approach would combine regulatory requirements and cost saving incentives for facilities and vessels.

Alternative Energy

The State of Hawaii's near total dependence on imported oil for its energy requirements increases its risks for oil spills. Consequently, the state should adopt more aggressive policies that give incentives for the development of alternative energy supplies and programs for energy conservation. This includes renewable energy sources such as solar, OTEC, and geothermal, as well as alcohol based fuels.

Inspections/Plan Review

Inspections and review of prevention plans and facilities should be included as part of the lead agency's plan for prevention. Lead agency personnel should conduct announced and unannounced inspections in cooperation with federal and local agencies. Vessel inspections could be facilitated by the development of a cooperative inspection program between the state and USCG under the Area Plan. State involvement in the inspection of on-land facilities could be coordinated with the USEPA. State involvement with the inspection and review procedures would improve state awareness of local readiness and prevention programs, provide continuity to periodic turnover of military inspectors, and improve understanding and communications between facilities, federal inspectors, and the state for planning purposes.

In addition, to the regular review of facility and vessel plans, the state prevention program and plans should come under regular public and agency review. A program for community grassroots involvement in plan reviews should be coordinated by the HEER office and include the oil industries. This would increase public awareness concerning oil spill management and improve cooperative compliance with oil spill prevention programs.

Administrative Drills

The state should hold regular drills to test its administrative notification and command structure. The federal and county agencies and personnel involved in oil spill management should be regularly tested to ensure their preparedness. This should be coordinated between the HEER office, state and county civil defense, and the federal agencies.

Transfer Procedures

Specific transfer procedures and protocols for on-land facilities and vessels should be required by the State of Hawaii. This is particularly important for on-land oil production and transfer facilities, and harbor activities, because of the absence of a USEPA office in Hawaii. The state should develop strict procedures and guidelines for transfer operations at facilities regulated. These requirements would reduce the potential occurrence of oil spills resulting from human error or mechanical failure at oil transfer facilities and fueling stations. This includes mandated monitoring of oil transfer operations, weather restrictions on bunkering and transfer operations, as well as requirements for variable loading rates like those in Rhode Island and California. Bunkering practices are of particular concern since weather and current conditions at the fuel transfer anchorages pose a significant risk to the southern coastline (Waikiki) of Oahu.

Specific procedural rules for transfer operations should include requirements for the visual inspection of oil equipment, pipelines, and surrounding waters during transfer operations. Facilities should also be required to drain all connecting devices upon completion of transfer operations, close hatches and tank tops, test communications equipment prior to transfer operations, and pressure test hoses on a semi-annual basis. As part of these regulations, the state should require strict inventory controls for facilities storing oil on a long-term or interim basis.

Requirements for inter-island transfer procedures should be developed after consultation with the USCG, the marine pilots, the state DOT Harbors Division, and the industry.

Tanker Routing/Pilotage

While there have been discussions and voluntary agreements concerning tanker routes in Hawaii, the state should regularly consult with pilots and crews on their perceptions of the casualty and traffic risks in Hawaii. This includes discussions on harbor safety and transfer operations.

Used Oil Recycling

The State of Hawaii should pursue a campaign for used oil recycling and public awareness as part of its OSMP. A comprehensive and well-funded program at the city and county level, like those found in other states, would reduce the number of oil spills occurring from illegal dumping and accidents. The current system in Hawaii should be updated to include a system of curbside pick-up or drop-off at official sites. This would expedite the collection of small, abundant quantities of oil that are currently not being recycled. A program for used oil recycling and spill awareness should also be focused on the state's marinas and recreational boating sites in order to reduce oil spills in the harbor and marina areas. The state "Inter-Agency Council for Oil Spill Management" could coordinate with the state DOT and county efforts in oil collection and recycling.

Certification of Environmental Response Professionals for Oil Spills

The state lacks a large pool of certified environmental response professionals to call on in case of a major spill. Environmental response professionals should be certified and registered with the state's lead agency under strict guidelines requiring a certain amount of experience and training in oil spill management. This could reduce the possibility of further environmental damage caused by negligence, inexperience, or lack of training.

Education and Training

A comprehensive state education campaign should be developed in the HEER office, which includes training of state and county employees, lead agency staff members, public awareness campaigns, industry personnel training, hotlines, and technical assistance. Certified training and refresher training should be mandatory for key personnel at all regulated facilities and vessels. Training program curriculum should also be reviewed on a regular basis by the HEER office in cooperation with the federal agencies.

Following the development of new policies, programs, and rules for oil spill management, the HEER office should provide assistance to regulated facilities and vessels on the development of prevention plans. This should be done in coordination with the federal agencies so as to avoid duplication of efforts.

RESPONSE

It is apparent from our study that the HEER office and the state in general, should play a greater, cooperative role with the federal agencies in oil spill response. It appears that states that are actively involved in response have the most successful programs. The HEER office staff should be expanded so that its personnel can more fully participate with the USCG and other Area Plan members in coastal oil spill management. The HEER office should also expand its staffing to deal with the increasing requirements of on-land oil spill response and the regulation of facilities pursuant to OPA 90.

Definition of Responsible Parties

It has been important for other states to institute strict definitions of responsible parties as part of their OSMPs. The State of Hawaii should establish its own definitions for vessels, facilities, and responsible parties which enhance those found in OPA 90 and coincide with state policies for financial liability. This would permit more precise supervision of facilities and vessels and could eliminate some from unnecessary regulation.

Response Command Structure

The state should periodically test its notification and response command structure with the federal agencies and other local agencies and departments. Specific personnel and their jobs should be identified in the state response plan and tested to verify that state and local personnel are aware of their responsibilities during an oil spill.

Facility and Vessel Response Plans

The state should require individual regulated facilities and vessels to prepare response plans pursuant to the basic requirements of OPA 90 and a response planning program that supplements OPA 90 requirements to compensate for Hawaii's specific needs. A Response Planning System like the one in Alaska appears to be an effective method of regulating facilities and vessels while giving financial incentives for the implementation of preventative methods. This would require facilities and vessels to establish their worst-case scenario for an oil spill based on the specific characteristics and location of the facility or vessel. Planning for facility and vessel response plans should be coordinated with the federal agencies to improve regulatory consistency.

Response plans for facilities and vessels should also be required to include site specific details pertinent to the Hawaiian geographic location, environment, availability of personnel, equipment, and technical capabilities with regard to (1) plans for protecting environmentally and economically sensitive areas, (2) wildlife rescue procedures, (3) procedures for halting of discharges, (4) a list of certified response personnel and their telephone numbers, (5) scheduled drills, and (6) regularly scheduled training programs.

Plan Review/Certification/Inspections

The State Contingency Plan and the individual facility and vessel response plans should be reviewed regularly. Public involvement in the review process should be encouraged and mandated by the HEER office. The certification process should include announced and unannounced inspections to test response procedures and preparedness at facilities and vessels.

Equipment

The HEER office also should develop requirements for oil spill response equipment at facilities and vessels throughout the state. This includes the remote placement and regular inspection of booms, skimmers, and

sorbents on the outer islands by potentially responsible parties. Remote placement in other states like Washington has proved effective in reducing delays in oil spill response. Consideration should be given to the development of common oil connection fittings, similar to the standardized fire suppression equipment practices, that could be used for emergency lightering operations. Pre-deployed emergency tow lines should also be required on all OPA 90 regulated vessels to facilitate emergency rescue of disabled, grounded, or wrecked vessels.

Trusteeship/Natural Resource Damage Assessment/Wildlife Rescue

The HEER office needs to clarify procedures for determining when a spill has been sufficiently cleaned-up and remediated. It also should establish procedures for participating in the Natural Resource Damage Assessment process with the other federal, local, and private parties involved in oil spill. To enhance the HEER office's ability to fulfill its responsibilities as the state's trustee, it should expand its staff to include a natural resource specialist and establish cooperative memorandums of agreement with the state Department of Land and Natural Resources (DLNR).

The state should also investigate the procedures for wildlife rescue and response in coordination with the National Marine Fisheries Service, the Fish and Wildlife Service, the DLNR, and the USCG. Currently, planning for wildlife rescue is being planned by the USCG under the Area Plan with little input from the state.

Oil Spill History and Casualty Database

The state should also establish a database for individual facility and vessel oil spill histories and casualties for the State of Hawaii and its coastal waters. This information can be used for the improvement of oil spill management regulations and techniques. The database should also attempt to incorporate near-miss accidents in the coastal waters. The development of the state oil spill database could be initially based on USCG and USEPA records and inspection reports until the state developed its own program.

Computer Simulation Models

The HEER office should also establish a state desktop computer program for oil spill response in cooperation with the Area Plan and the USCG. A computerized response system would reduce delays in oil spill response and facilitate the coordination of federal, state, and local response personnel. Such a system could permit modeling of the trajectory of the oil spill over time and facilitate the coordination of emergency response operations. Another model, such as the General Purpose Simulation System (GPSS), would permit the optimization of response times and coordination of equipment and personnel in the event of an emergency.

Oily Waste

The problem of disposal of oily waste should also be addressed by the HEER office and be included in the State Contingency Plan. Environmentally responsible disposal of waste engine oil should also be a priority issue with the HEER office and waste oil turn-in programs should be facilitated on all the islands to reduce sources of non-point oil pollution. An agreement with the county solid waste management divisions on oily waste disposal should be developed by the "Inter-Agency Oil Spill Management Council" to reduce delays and confusion during an oil spill emergency.

Public Information

A public information plan should be developed that coordinates media coverage and official state announcements during emergency oil spill situations. A position should be established in the HEER office, similar to that in Washington, which is responsible for public awareness campaigns, education, and public information during oil spills. Any public information plan should include coordination with the Hawaii Visitor Bureau, the federal agencies, responsible parties, and the local governments.

Training

The HEER office should continue to upgrade the capabilities of its staff by training in oil spill response. Training should be certified by the lead agency and require a certain number of hours and refresher training on a regular basis. This would improve preparedness and assure that staff are current with upcoming technologies.

Volunteer Program

A program for training and coordinating the actions of local volunteers during an oil spill emergency should be developed by the state HEER office in coordination with the USCG, other federal agencies, local governments, and the private oil spill response companies. The USCG has initiated action on this issue and has already identified various roles for volunteers.

CONCLUSION

The establishment of oil spill management programs has become increasingly important for coastal states, because of the substantial economic and ecological risks associated with even small releases of oil. This is extremely apparent in the case of Hawaii where its tourist economy is squarely based on the beauty of the natural environment. Safeguards for the protection of Hawaii from oil pollution are in the interests of every resident.

The recommendations presented above have been developed on the basis of results of our survey of other states' Oil Spill Management Programs and reflect our interpretation of the appropriateness of those programs to conditions in Hawaii. The recommendations are hereby provided to the Sea Grant Coordinators of this project for use in developing the final recommendations regarding oil spill prevention and response in the State of Hawaii. It is our belief that our recommendations provide policymakers in Hawaii with various methods and options the state can adopt to improve its oil spill management programs and reduce the likelihood of oil spills in the state. These options should be implemented to accommodate the particular needs of the unique Hawaiian environment and its regulatory structure, in coordination with the federal agencies, the public, and the oil industry. The public also needs to take steps to increase its involvement in oil spill management simultaneously with the state.

ADDENDUM

Survey of State Oil Spill Management Programs

SUMMARY

Individual coastal states were surveyed as to their oil spill management programs and a wide variety of responses were generated. Many of the states that responded indicated that they have individual state policies and programs either beyond or duplicative of those required by OPA 90. Others indicated both in the telephone conversations that preceded all the survey questionnaires and in the questionnaire responses, that their particular state did not have oil spill management programs beyond those required under OPA 90. Those with individual state legislation that either complemented or expanded on OPA 90 cited a number of reasons for the duplicative approach. First and foremost was to assure that state agency personnel and the governor were kept informed of the results of various inspections and procedures undertaken under OPA 90 with regard to oil spill management programs. Certainly the governor has a major responsibility to protect the lives and property of his constituents. By having state statutes in concert with OPA 90, the state is assured of receiving the information and recommendations provided by the federal agencies. This does not usually entail a separate monitoring or inspection program, only coordination and communication with appropriate federal authorities. Secondly, OPA 90 is designed to provide nationwide guidance. The level of detail required to assure individual state protection may not be appropriate for all states. Hence, individual states have developed statutory language to better meet their specific environmental needs. Similar statutory processes are found in most of the federal environmental laws, for example, the National Environmental Policy Act requiring environmental assessment at the federal level is matched at the state level in Hawaii by HRS 343, the Environmental Impact Statement Law. Other examples include federal and state water quality standards, air pollution controls, and solid waste management statutes, to cite but a few. And finally, consistency of personnel was one other benefit of complementary statutory language. While many of the responders fully recognized the leadership efforts and competence of the U.S. Coast Guard and other federal agencies in oil spill response and prevention, the factor that military teams are rotated in and out of areas on a regular basis led to apprehension as to the ability of newly arrived personnel to understand the idiosyncrasies (environmental sensitivities!) of a particular location sufficiently to make appropriate decisions in the event of an emergency. The presence of permanent state staff with responsibilities for oil spill management activities that can work with the changing staffs of the USCG lends stability to the system.

The individual state oil spill management programs presented below include a wide range of policies and programs. State laws can be equally or more stringent than OPA 90, but it is the level of detail in the regulations associated with those laws that actually differentiates the policies. A summary of the individual state responses to selected survey questions is presented in Table 1. In general, the number of "yes" and "no" answers is an indication of the level of comprehensiveness of the various state oil spill management programs. For example, there are a high number of "yes" answers under Washington, Alaska, California, and Oregon, and it can be concluded that these states have some of the most progressive oil spill prevention and response programs. Arkansas, Wyoming, Hawaii, Illinois, and South Carolina only have a few "yes" answers, and it can additionally be concluded that these states have minimal oil spill related policies and programs.

TABLE 1. Comparison of State Oil Spill Response and Prevention Methods

	Alaska	Arkansas	California	Connecticut	Delaware	Florida	**HAWAII**	Illinois	Louisiana	Maine	Maryland	Massachusetts	Michigan	Missouri	New Hampshire	New Jersey	North Carolina	Oregon	Rhode Island	South Carolina	Texas	Washington	Wisconsin	Wyoming
Issue 1: State Laws																								
Provisions more strict than OPA 90	yes	no	yes	no	no	no	**no**	no	no	yes	no	no	no	no	no	no	no	yes	no	no	no	yes	no	no
More specific management since OPA 90	yes	no	yes	no	yes	yes	**no**	yes	yes	yes	no	no	yes	yes	no	yes	yes	yes	no	no	no	yes	no	no
Issue 2: Prevention																								
Prevention plans required	yes	no	yes	yes	no	no	**no**	no	yes	yes	no	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	no	no
Prevention regulations monitored	yes	no	yes	yes	no	yes	**no**	no	yes	yes	yes	yes	yes	yes	yes	yes	no	yes	yes	no	yes	yes	yes	no
Issue 3: Response																								
Training required for key response personnel	yes	no	yes	no	no	yes	**no**	no	no	no	no	yes	no	no	no	yes	yes	yes	no	yes	yes	yes	no	no
Issue 4: Funding																								
State Contingency Fund	yes	yes	yes	yes	yes	yes	**yes**	no	yes	yes	yes	yes	no	yes	yes	yes	yes	yes	no	yes	yes	yes	yes	no
Issue 5: Coordination Efforts																								
Inter-state compact	yes	no	yes	yes	yes	no	**no**	yes	no	no	no	no	yes	yes	no	yes	no	yes	yes	no	no	yes	no	no
Memorandum of Agreement with USCG	yes	no	yes	no	no	no	**yes**	no	yes	yes	yes	no	no	yes	no	yes	yes	yes	no	no	yes	yes	yes	no
Issue 6: Review Process																								
Review process for related policies	yes	no	yes	yes	yes	yes	**no**	no	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	no	no	no	yes	no	yes
Number of yes responses	9	1	9	5	4	5	**2**	2	6	7	4	5	5	7	3	8	6	9	3	3	5	9	3	1

KEY ISSUES

A copy of the survey is attached at the end of this addendum. The draft of the survey was initially circulated to four local individuals with experience in oil spill management for their critique prior to finalization and out-of-state distribution. The survey was designed to gather information on six key issues:

1. State Legislation - How do individual state laws, regulations, and/or ordinances relate to the Oil Pollution Act of 1990? Are they very similar, more stringent, more or less specific?
   Questions 1, 2, 3, and 13
2. Prevention - What oil spill prevention policies or programs exist at the state level?
   Questions 3, 4, 5, 15, 16, and 17
3. Response - What oil spill response policies/mechanisms exist at the state level?
   Questions 3, 8, 16, and 17
4. Funding - What is the source of funds for state programs related to oil spill response and prevention?
   Question 9
5. Coordination of Efforts - How do different agencies involved in oil spill prevention and response coordinate efforts and work together?
   Questions 6, 7, and 10
6. Policy Review and Citizen Participation - What methods are used to review policies relating to oil spills, and what mechanisms, if any, are used to encourage citizen participation?
   Questions 12 and 14

The survey also incorporated two questions (8 and 11) designed to collect background or supporting data. For example, in an attempt to estimate the level of direct experience with oil spills, information was requested on the number and size of reported spills occurring on land and at sea, and the type and location of response equipment. While this information was relevant to this study, most of the states did not have the information readily available. The few responses that were received did not provide a consistent level of detail, therefore, quantitative analysis was not feasible.

STATE SURVEY RESULTS

Responses were received from 24 of the queried 30 states and the Territory of Puerto Rico.

Survey Responses Compiled for Coastal States:

Alaska	Massachusetts
Arkansas	New Hampshire
California	New Jersey
Connecticut	North Carolina
Delaware	Oregon
Florida	Rhode Island
Hawaii	South Carolina
Louisiana	Texas
Maine	Washington
Maryland	

Survey Responses Compiled for Great Lakes and Major River States:

Illinois	Wisconsin
Michigan	Wyoming
Missouri	

The following is a discussion of the individual state policies in the context of the six key issues. The results are based on survey responses and any supplementary information provided by the state respondents. Many of the survey responses cited state statutory provisions that are similar to those required under OPA 90. However, in cases where actual state statutory or regulatory information was provided, such as for the State of Rhode Island, it appeared that the provisions in the state requirements expanded on the provisions in OPA 90 and provided greater details specific to address individual state needs.

It should be noted that the states that responded to our survey questionnaire varied widely in their physical geographic realms, their experiences with oil spills, climatic or weather conditions (ice, fog, etc.), vessel traffic, routing, and any number of other factors. As a result, individual state management policies for oil spill prevention and response may not be appropriate for all states. Because of Hawaii's unique geographic location, economic dependence on clean beaches (for the tourist industry), and energy dependence on sea transport of oil, the management practices may require even more stringent policies than those presented by some mainland states.

ALASKA

State Legislation

Alaska's management strategies have become increasingly more comprehensive regarding oil spill response and prevention, but not in response to OPA 90. Immediately following the *Exxon Valdez*[1] spill and prior to the development of OPA 90, Alaska passed laws specifying response planning standards that opposed the previous rule that allowed affected parties to plan for the "most probable release." Additionally, facility and vessel prevention plans were required, and financial responsibility requirements became more strict.

The lead agency for oil spill management in Alaska is the Department of Conservation (DOC), Division of Spill Prevention and Response. It is staffed by approximately 40 full-time oil spill management professionals. The division is responsible for implementing the Selected Oil and Hazardous Substance Pollution Control Statutes and Regulations. In addition, the state DOC is completing the review of industry contingency plans prepared pursuant to these regulations, and will begin development of a comprehensive inspection and spill response simulation program designed to verify compliance by the end of 1994.

Prevention

Alaska state law requires a contingency plan for all vessels carrying oil as cargo, crude oil storage facilities with capacities greater than 5,000 barrels, non-crude oil storage facilities with capacities greater than 10,000 barrels, on and offshore exploration and production facilities, and pipelines. Prevention plans are one part of the mandated contingency plan which uses a Response Planning Standard (RPS). Minimum requirements for a contingency plan include training of key personnel, substance abuse testing, personnel medical monitoring, a description of security systems, established transfer procedures, requirements for secondary tank containment systems, leak detection programs, vessel and barge maintenance programs, and a tug escort program.

A facility and vessel inspection program has been started, but is not yet well developed. Compliance with prevention plan requirements is monitored when requests are made for prevention plan amendments.

[1] In March 1989, the supertanker *Exxon Valdez* spilled an estimated 11 million gallons of Alaskan North Slope crude oil into Prince William Sound. Approximately 1,500 miles of Alaskan coastline was covered with oil while thousands of birds, marine mammals, and fish were killed. In addition, the spill impacted the local fishing industry which served as the social and economic base of the local community.

Response

A response action plan is also required as part of the mandated contingency plan. Individual plans must include an emergency action checklist that describes the initial sequence of notification and response actions to be taken in the event of a discharge. Descriptions of safety procedures, communications equipment, deployment and response strategies, procedures for halting discharges, notification of contractors, cleanup and protection of environmentally sensitive areas, protection of wildlife, and oil containment and recovery mechanisms must also be included in the plan.

Funding

Alaska attaches a $0.05 per barrel surcharge on all crude oil produced in the state. Of that surcharge, $0.02 per barrel goes into the response account and $0.03 per barrel goes into the prevention account that is used to fund ongoing state programs for oil spill prevention and preparedness. The current total balance is $38 million.

Coordination of Efforts

Memorandums of Agreement (MOA) exist between Alaska and Canada and with the former Soviet Union regarding the coordination of response efforts. Alaska is also a member of the States/B.C. Oil Spill Task Force jointly funded by Alaska, British Columbia, California, Oregon, and Washington. The state has also participated in the development of a Unified Plan for preparedness planning and response that describes the strategy for coordinating the response efforts of the federal Regional Response Team (RRT), the U.S. Coast Guard (USCG), the U.S. Environmental Protection Agency (USEPA), and the state.

Policy Review and Citizen Participation

All regulations require public review, and many policies were formed based on input from working groups consisting of federal, state, and local agencies, industry and environmental groups, and regional Citizen's Advisory Councils. Alaska's Unified Plan is reviewed annually by the USEPA, USCG, the RRT, and the State Emergency Response Commission. According to the responses received, this planning effort has worked well. The DOC also is completing the review of industry contingency plans prepared pursuant to state regulations and began development of a comprehensive inspection and spill simulation compliance program at the end of 1994.

ARKANSAS

State Legislation

The Department of Pollution Control and Ecology is the lead agency responsible for administering the Arkansas Emergency Response Fund Act that includes oil spills.

Prevention

No oil spill prevention requirements exist at the state level. News articles, environmental meetings, and workshops are used to make the public aware of the appropriate disposal methods of used engine oil.

Response

No information on response policies or procedures was provided in the reply to our survey.

Funding

There is a $150,000 contingency fund for the cleanup of hazardous chemical spills including oil, but it is not solely allocated for oil spill cleanup. Funding is derived from fines collected under the Arkansas Hazardous Waste Management Act.

Coordination Efforts

Arkansas has not entered into any interstate compacts or MOAs.

Policy Review and Citizen Participation

Information is provided to the public upon request. Monthly meetings are also held by the lead agency to provide public information on oil spill management.

CALIFORNIA

State Legislation

Title 14 of the California Code of Regulations establishes the state's rules and regulations for oil spill management under the administration of the Office of Oil Spill Prevention and Response (OSPR) in the Department of Fish and Game. State contingency plan requirements have been updated to reflect an emphasis on prevention planning.

Prevention

A voluntary compliance agreement exists between the state and any party importing crude oil. The agreement stipulates that tankers carrying crude oil will remain 50 miles off the California coastline unless engaged in transferring operations.

California contingency plan regulations specify that when transferring oil, the loading rate must be reduced to 25% of the normal rate during the first and last 10% of anticipated volume; alcohol and drug awareness programs, treatment opportunities, and provisions for screening key employees must also be described; tug escorts for some vessels are required, however, information on the conditions under which tug escorts are required was not provided. All regulated oil facilities and vessels that are required to submit a contingency plan must also conduct full scale drills and exercises every three years. A state representative must also conduct an on-site inspection every three years.

The first citywide used engine oil collection program in California began in Los Angeles in May 1994. The program was established by a $1.1 million grant from the Integrated Waste Management Board. Consumers are offered $0.04 per quart at 42 Unocal service stations throughout the city with a limit of 20 gallons per day per customer.

Response

Contingency plans for vessels and marine facilities must be submitted to the Planning Branch of the Office of Oil Spill Prevention and Response within the Department of Fish and Game. The following components must be submitted as part of a contingency plan: (1) availability of response equipment, (2) booming strategies, (3) disposition plans for spilled material, (4) a schedule of drills and exercises, (5) maps showing the location of economically and environmentally sensitive areas, (6) information on contractual arrangements for response and cleanup, (7) an incident command structure, (8) maps and proposed shoreline countermeasure plans, (9) notification procedures, (10) guidance for oiled wildlife care providers to meet requirements, (11) plans to provide public information, (12) a list of qualified individuals, (13) work force safety training plans, and (14) information on the type and location of vessels of opportunity used to meet minimum equipment requirements.

As of January 1, 1992, marine terminals and facilities were required to demonstrate financial ability to pay for any damages resulting from the operations of the facility during a "reasonable worst-case oil spill."

Funding

The Oil Spill Response Trust Fund is supported by a $0.25 per barrel fee on all petroleum products received via marine terminals. Currently this fund is at capacity ($15 million) and therefore the fee is not being collected.

Coordination Efforts

There are over 25 MOAs between the state and counties that have oil spill response capabilities. There also are MOAs between the California OSPR and counterpart agencies in surrounding states. MOAs between the USCG and the USEPA currently exist, and agreements with two other federal agencies are in the process of being established. In addition, the USCG has also taken on the role of monitoring compliance with the voluntary agreement that all tankers will remain a minimum of 50 miles off the California coast when transporting crude oil.

Wardens of the Department of Fish and Game conduct announced and unannounced inspections of regulated facilities to monitor compliance with rules and regulations, while the oil industry also is monitored by the general public. It also is not uncommon for private citizens to report an act of non-compliance.

The Registered Environmental Assessor Program also establishes a program for voluntary registration of environmental professionals. The listing provides potentially responsible parties with a pool of certified professionals who possess various specialties for oil spill response. Certified professionals are required to have a minimum of five years full-time experience in the field of environmental emergency response.

Policy Review and Citizen Participation

Volunteer and educational outreach programs exist in California, although no details were provided in the survey responses.

CONNECTICUT

State Legislation

The Water Pollution Control Act governs oil spill response and prevention in Connecticut, and it is administered by the Department of Environmental Protection (DEP), Division of Oil and Chemical Spill Response.

Prevention

All facilities that load or unload petroleum products are required to register with the DEP. Criteria for registration include the submission of an operating manual and a specific prevention plan prior to licensing approval. Failure to comply with all requirements under the law is grounds for refusing license renewal.

All commercial vessels off-loading oil or chemicals in Connecticut are required to file a $50,000 bond prior to off-loading. There also is a mandatory booming policy that requires all off-loading vessels to surround the vessel with a containment device during the transfer. Owners/operators are liable for damages should a spill occur regardless of who is at fault. According to the survey response, this policy has worked well.

Used engine oil is collected for recycling by service stations and specified collection centers. Individual towns may also have a specified household hazardous waste collection day. A hotline has been set up to answer any questions the public may have regarding the appropriate disposal method for used engine oil. The state has provided printed information to local governments and towns for local distribution.

Response

A list of available response equipment is required as part of the facility licensing application. All state response organizations are required to be licensed by the state.

Funding

Connecticut collects $0.10 per gallon on all hazardous waste generated to support the Emergency Spill Response Fund. The fund capacity is $20 million; however, the fund limit has yet to be reached. As of July, 1994 there was approximately $10 million in the fund.

Coordination Efforts

The Long Island Sound Multi Agency Response Group is funded by New York, Connecticut, Rhode Island, the USCG, the USEPA, the National Oceanic and Atmospheric Administration (NOAA), and the Regional Response Team. The state also participates in the Long Island Sound Area Committee.

Policy Review and Citizen Participation

The Department of Environmental Protection is the coordinating agency for all policy reviews for the state and its agencies.

DELAWARE

State Legislation

The Department of Natural Resources and Environmental Control (DNREC) is responsible for implementing the state's Oil Pollution Liability Code and has jurisdiction over all oil spill prevention and response activities.

Prevention

Used engine oil is collected at recycling centers and selected service stations. The DNREC and the Solid Waste Authority promote used engine oil recycling in the local press.

Response

The Delaware Oil Spill Response Contingency Plan is used by the state and any other organization responding to an oil spill. Appendices to the contingency plan includes lists of contacts to notify during a spill, oil removal contractors; information on tide gates, archaeological sites, water intakes, topographical maps, and other logistical support information required during a spill.

Delaware and the National Oceanic and Atmospheric Administration (NOAA) completed a desktop computer oil spill response management program in July of 1994. The program is used to map sensitive areas, plot booming strategies, monitor current weather patterns and keep data sets current during oil spill emergencies. NOAA subsequently has assisted Texas, Florida, and Oregon in the development of similar computer systems. In Delaware's case, the program was funded by the local oil spill cooperative.

A highlight in the response and preparedness program has been the Shoreline Countermeasures Management Study, which identifies 10 major shoreline types and provides a framework for remediation decisions when oil has affected a shoreline environment. One outcome of the study was the development of a three phase shoreline evaluation and response model for the On-Scene Coordinator (OSC). In the first phase, a group of trained personnel is sent to the site to determine the extent of oil released on the shoreline and recommend possible countermeasures. In phase two a quality assurance team double checks the outcome of phase one to ensure that the information is accurate and gathered consistently. In phase three the quality assurance team recommends treatment and specific countermeasures to the OSC.

Funding

Delaware collects a 0.9% tax on petroleum products (about $3.9 million per year) that goes into the Hazardous Substance Cleanup Fund (the Delaware Superfund Program). The fund is used to clean up all hazardous waste

sites, as well as pay for administrative costs. A cost recovery fund, which currently holds $300,000, is also supplied by reimbursements from previous spills.

Coordination Efforts

One of the more impressive parts of Delaware's oil spill response and prevention strategy has been the extensive level of coordination between neighboring states as well as with federal agencies. A recently developed MOA for response is pending final approval between the USCG, USEPA, NOAA, Department of the Interior, New Jersey, Pennsylvania, and Delaware. Delaware also is in the process of rewriting an intergovernmental MOA with local governments and agencies.

Policy Review and Citizen Participation

A self-critique of incidents is conducted by the Department of Natural Resources and Environmental Control, and multi-agency critiques are done on an incident-specific basis. When a spill occurs, information is provided to the public through the Unified Command Joint Information Center which is made up of the USCG, states affected by the spill, and the responsible party. Daily oil spill information is available through the DNREC Office of Information and Education.

The Department of Natural Resources and Environmental Control in conjunction with the USEPA is conducting an oil spill bioremediation study along the Delaware Bay. In the study, crude oil was applied to test plots to evaluate how the environment remediates itself under varying conditions. The study was scheduled for completion in October 1994.

FLORIDA

State Legislation

The Department of Natural Resources is responsible for implementing the requirements of the Pollutant Discharge Prevention and Control Act. The act was previously called the Pollutant Discharge Prevention and Removal Act and was revised in 1991 following OPA 90.

Prevention

Training programs are encouraged for personnel involved in pollution prevention and cleanup activities. The Department of Natural Resources is working with community colleges, technical centers, universities, and private institutions to develop educational materials. Those materials will then be made available for training personnel involved in pollution prevention and cleanup activities. In addition to the development of training programs, all new and/or reconstructed above and below ground storage tanks must be made of corrosive resistant materials, and must have secondary containment systems.

Response

A prevention and response certificate is required for all operating facilities. Information on the capacity of the terminal, availability of response equipment, and existing agreements with approved cleanup organization(s) must be submitted in order to receive a certificate. Proof of immediate access to containment equipment five times the length of the largest vessel at the facility is also required by the state. All facilities must register with the Department of Natural Resources. Vessels carrying 10,000 gallons or more of fuel must maintain an adequate written ship specific discharge prevention and control contingency plan.

Funding

The Florida Coastal Protection Trust Fund is credited with all fees, penalties, judgments, and recovered damages as well as excise tax revenues. Monies from the fund can be used for administrative expenses, prevention, cleanup, and restoration. When the balance of the fund exceeds $30 million, the interest is

transferred to the Save Our State Environmental Education Trust Fund. Transferred funds cannot exceed $1.5 million annually. Up to $1 million per year may also be spent to acquire, design, train, and maintain emergency cleanup response teams and equipment.

Coordination Efforts

Florida is not involved in any formal interstate compacts. However, Florida participates in the Gulf States Working Group which consists of lead agency managers from the states of Texas, Louisiana, Alabama, Mississippi, and Florida. This ad hoc group meets informally 2–3 times a year to discuss issues relevant to their respective states and the Gulf area as a whole.

Policy Review and Citizen Participation

A Spill Response Task Force was created in 1989 by the legislature to determine the need for a coordinated prevention plan. Task force members include representatives from the Department of Natural Resources, Department of Environmental Regulation, USCG, Florida Ports and Spillage Cooperatives, the petroleum industry, and various other environmental groups.

HAWAII

State Legislation

Act 50 of the 1971 Hawaii State Legislature authorized the state's Civil Defense to prepare for and respond to manmade disasters such as "massive oil spills." In 1988, the Legislature also gave oil spill response authority to the Department of Health (DOH) by enacting the Environmental Emergency Response Law, Hawaii Revised Statutes (HRS) Chapter 128D. DOH's authority was made more explicit with the passage of amended versions of the Environmental Response Law in 1991 and 1993. In these amended versions the Legislature specifically granted the Department of Health the authority to prepare for and prevent oil spills. The Department of Health's Office of Hazard Evaluation and Emergency Response (HEER) is the state's lead agency for oil spill management under HRS Chapter 128D.

HRS Chapter 128D also subjects those who spill oil to unlimited and strict liability, although Act 130, 1991 Session Laws caps liability for inter-island tankers carrying not more than 60,000 barrels of heavy fuel oil to $700 million. Cost recovery mechanisms are also included under HRS Chapter 128D, but have been ineffective due to problems with regulations and enforcement.

Prevention

In 1993, the Legislature explicitly gave the HEER office the authority to prepare for and prevent oil spills. This also included the mandate to develop a used oil recycling program through the counties. Funding has only recently allowed DOH to begin its prevention activities including the commissioning of this study. In addition, the DOH is attempting to address releases from underground storage tanks with new regulations and inspections.

Oil facilities at all states are required by federal law (OPA 90) to prepare a Spill Prevention, Containment and Countermeasure plan (SPCC). Inland facilities and plans are inspected by the USEPA through its Region 9 office in San Francisco. The State of Hawaii does not have any additional requirements for prevention plans beyond those required by federal law.

Response

The U.S. Coast Guard and the USEPA are the lead federal agencies responsible for coordinating oil spill response, and are mandated to act as the Federal On-Scene Coordinators (FOSC). The USEPA is legally responsible for coordinating responses to oil spills on land under OPA 90, but does not have adequate staffing

in Hawaii to coordinate response actions. A Memorandum of Understanding between the U.S. Coast Guard and the USEPA states that the U.S. Coast Guard will act as the FOSC on behalf of the USEPA in the event of a major oil spill until response personnel arrive from the USEPA Region 9 office in San Francisco. However, for most on-land oil spills and other hazardous releases, the state HEER office assumes responsibility for coordinating the response. For coastal/marine oil spills, the state usually defers the coordination of response to the U.S. Coast Guard's federal on-scene coordinator (FOSC), but shares the lead responsibility for oil spills that occur in harbors or on the shoreline.

The state has an emergency contingency plan that calls for the HEER office to coordinate state and local activities with the Civil Defense in case of a major oil spill. The state employs four full-time emergency responders who act as the state's On-Scene Coordinators (OSC) during oil spills on land and at sea. These positions are funded from state general funds. State OSCs coordinate oil spill response to marine oil spills with the federal OSC of the USCG under the *Federal On-Scene Coordinator (FOSC) Honolulu Area Contingency Plan*, otherwise known as the Area Plan. Since the USEPA does not have an oil spill response coordinator in Hawaii and the U.S. Coast Guard defers to the state for spills on land that are not likely to reach the coastal waters, the state OSC is in charge of coordinating response to oil spills on land. The state has the authority to hire private oil spill response contractors for marine and on-land spills if responsible parties do not take immediate action in response to an oil spill. The State of Hawaii does not have additional regulations for facilities and vessels beyond those established by federal law.

Funding

The state's hazard evaluation and emergency response program and the underground storage tank program receive general revenues. In addition, the 1988 state legislature created the Emergency Response Revolving Fund (ERRF) to clean up releases of hazardous substances that implicitly included oil. Initially undercapitalized, the fund is now supplemented with the penalties collected from those who violate various environmental laws. In addition, a $0.05 tax is imposed on every barrel of petroleum product sold by a distributor. The ERRF is capped and collection of the tax stops at $7 million. Collection of the tax resumes after the fund is depleted to $3 million.

The ERRF monies generated from the tax also can be used for oil spill planning, prevention, preparedness, education, research, training, removal and remediation, county used oil recycling programs, and underground storage tank programs. In 1994, the state legislature further amended HRS Chapter 128D by authorizing the funding of the state's safe drinking water program with monies from the Emergency Response Revolving Fund. The funding of non-oil programs like the safe drinking water program has threatened the reliability of state funds for oil spill management.

Authority for cost recovery of ERRF monies are included in HRS Chapter 128D; however, the HEER office has only attempted to recover costs in a few cases. The costs associated with investigating and filing cost recovery suits for smaller spills has precluded the HEER office from aggressively pursuing all responsible parties. In the event of a major spill, the HEER office would work with the state attorney general to recover any ERRF monies used for oil spill response.

Coordination Efforts

The state has a MOA establishing cooperative arrangements for oil spill management with the U.S. Coast Guard under the Area Plan and the Regional Response Team. The state Contingency Plan also stipulates that there should be coordination between the state Civil Defense, the DOH, the Department of Land and Natural Resources, and the county governments. However, there are no specific and formal coordination agreements exceeding those mandated in the state plan. County involvement is also coordinated through the Local Emergency Planning Committees (LEPCs).

Policy Review and Citizen Participation

There are no mechanisms for public review of state plans for oil spill management. There are, however, mechanisms for public participation in the area planning process in which the State of Hawaii is also a participant.

ILLINOIS

State Legislation

There is no specific state law that addresses oil spill response or prevention, but the Water Pollutant Discharge Act does establish some policies for oil spill regulation. The Water Pollutant Discharge Act sets general liability limits, defines responsible parties, and establishes general policies for cost recovery. The Illinois Environmental Protection Agency, Office of Chemical Safety and Emergency Response Unit coordinates state response to environmental emergencies including oil spills, while the state Department of Mines and Minerals regulates oil production sites.

Illinois is in the process of drafting laws that will require a state oil spill contingency fund. The current initiative is a result of a federal law that requires states seeking reimbursement from the OPA fund to have a state oil spill contingency fund.

Prevention

No specific prevention plans for oil pollution are required by the state. Used engine oil is collected by many service stations, and public service messages promote the state household hazardous waste collection program.

Response

Since OPA 90, Illinois has established policies to improve oil spill response and preparedness. Contingency plans have become more specific for individual waterways as more detailed geographic information has become available. This has enabled the state to plan the exact types and locations of response equipment along the Mississippi River, Ohio River, and Lake Michigan. The remote placement of oil sorbents also has improved the potential for rapid response.

Training is required for employees engaged in hazardous substance removal. All employees must receive a minimum of 40 hours of classroom instruction. In addition, workers must receive a minimum of three days of actual field experience under the direct supervision of a trained, experienced supervisor. Managers and supervisors must receive the same amount of training as the employees, plus at least eight additional hours of specialized management training. Eight hours of annual refresher training are also required for employees, managers and supervisors. Topics covered include personal protective equipment, spill containment, and health hazard monitoring procedures and techniques.

Funding

See above discussion regarding state legislation.

Coordination Efforts

Interstate spill response coordination has been developed for the Illinois Boundary Waters area, which includes the Mississippi River, Ohio River, and Lake Michigan. Immediate notification and contingency plans have also been agreed upon between the states sharing responsibility for those waterways.

Policy Review and Citizen Participation

There is no review process or specific public outreach program. For specific spills, public meetings may be held, and press releases or fact sheets may be released.

LOUISIANA

State Legislation

Following the approval of OPA 90, the Louisiana Oil Spill Prevention and Response Act of 1991 (LOSPRA) was approved by the legislature specifically to "support and complement" OPA 90. With 26% of the nation's commercial fisheries, significant wetland environments along the coast, and 15% of the U.S. crude oil imports received at Louisiana Offshore Oil Port, the Louisiana state legislature determined that significant state involvement in oil spill prevention and response activities was necessary. LOSPRA is administered by the Oil Spill Coordinator's Office within the office of the governor. The primary responsibilities of the Coordinator's Office include developing a statewide oil spill prevention and response plan; providing a coordinated response effort among appropriate agencies; providing clear delineation of jurisdictional authorities; implementation and maintenance of an oil spill prevention program; and administration of funding activities.

Generally, the LOSPRA follows OPA 90 closely, but authorization exists for the coordinator to adopt requirements that are different from OPA 90 provided "the state interests served by the requirements substantially outweigh the burdens imposed on those subject to the requirements."

Prevention

A facility or vessel prevention plan is required to be submitted to state and federal agencies under both OPA 90 and LOSPRA. All terminal facilities operating in the state must have discharge prevention and response certificates. Certificate applicants must provide information on the capacity of the vessels, terminals or storage facilities handling oil; the type of oil stored, handled or transferred, and a discharge prevention plan. The regulations for prevention plans require information on the type of available response equipment, the necessary deployment time, available personnel, preventative measures employed, terms of cleanup plans, and financial conditions relating to cleanup.

The recycling of used engine oil is encouraged throughout the state. Service stations and garages collect used engine oil, and one county has a curbside collection program. A few of the large employers in the state also have employee collection programs. As of January 1, 1995, funding is expected to be available for a public awareness campaign. Upon receipt of funding, the state will sponsor local government programs to provide collection services. Bumper stickers and lists of public facilities collecting used engine oil will also be distributed. Collected engine oil is either re-refined, or reprocessed into a high grade marine diesel fuel. Since some of Louisiana's drinking water comes from surface waters, there is great incentive to keep used engine oil from being dumped into streams and rivers.

Response

Response plans are required by state law and must include an inventory of public and private oil spill response equipment, command structure, plans for practice drills, determination of environmental and other priority zones for response and cleanup, plans for volunteer coordination and training, and procedures for disposal of hazardous wastes.

Funding

A fee of $0.02 per barrel is collected on crude oil transferred from a vessel to a marine terminal within Louisiana until the fund reaches $15 million. If the fund's balance falls below $8 million, fee collection resumes at a rate of $0.04 per barrel until the fund is restored to $15 million. The actual limit of the Oil Spill Contingency Fund is $30 million. Additional monies may be in the fund above $15 million as a result of other income sources including penalties, reimbursements, interest, and federal funds. The fund may be used to cover administrative and personnel expenses, removal costs and damages, protection or restoration of natural resources, research grants, and operating costs for response and prevention. As of August 10, 1994, the fund contained $17 million.

Coordination Efforts

LOSPRA gives the Oil Spill Coordinator's Office the authority to enter into interstate compacts or MOAs that support or facilitate oil spill response and prevention activities. Currently, Mississippi, Texas, Louisiana, Alabama, and Florida have formed a working group to share information on geographic information systems and their application in oil spill management. The state is also in the process of formulating a MOA with all state natural resource trustees, the USCG and the U.S. Minerals Management Services.

Policy Review and Citizen Participation

The formation of the Interagency Council and the appointment of its members is mandated by LOSPRA. Nine members are representatives from specified state agencies, and four members are appointed (one each) by the chairman of the Senate Committee on Natural Resources and Environmental Quality, the House Committee on Natural Resources, and the House Committee on Appropriations. The only stipulation is that the four appointees must not be legislators. The task of the council is to assist in the development of a statewide oil spill prevention and contingency plan, preparation and approval of an annual work plan, development of recommendations for additional legislation, and preparation and approval of a budget. LOSPRA also provides for audits, inspections, and drills to be conducted with assistance from the USCG. And, a development program is currently funding an Oil Spill Education Curriculum Development Project to increase public participation.

MAINE

State Legislation

The Department of Environmental Protection is responsible for implementing the Maine Oil Pollution Control and Damage Claims Regulations. There are no limits to liability in the event of an oil spill from either an oil terminal facility or vessel in state waters. In addition, terminal operator/owners are deemed vicariously responsible for spill from tanker vessels coming from or going to their facility.

Prevention

Rules governing terminals, vessels, and transfer activities are not expected to be promulgated in the near future, although they are currently being updated. Maine requires a pre-transfer conference between vessels and shore personnel that identifies responsible personnel, establishes the handling rate, and confirms the use of a specific communication system. Maine also requires testing of communication equipment, visual inspections of oil transfer equipment and pipelines, semi-annual pressure testing of hoses, use of drip pans, hose rigging to compensate for ship movements, hose protection, use of check valves to prevent overflow of oil, inspection of waters during transfer operations, draining of connecting devices upon completion of transfer operations, adequate illumination of transfer areas at night, closing of tank tops and hatch covers, and booming of vessels.

In the future when double-hulled tankers are required by federal law, Maine plans to require secondary containment systems for all existing facilities. New facilities are required to install secondary containment systems. Automatic closing valves as opposed to manual valves will also be required under the new rules.

Oil terminals and marine facilities with a capacity greater than 1,500 barrels that are receiving oil from tankers are required to have prevention plans. Monitoring is done through regular licensing inspection, and some random inspections are conducted. Violations are handled through the Attorney General's office.

The state has compulsory pilotage for all vessels drawing nine feet or more except fishing vessels, vessels powered by sail, or military and commercial ships navigating the Kennebec River to and from Bath Iron Works.

The state has limited public education programs on the appropriate disposal of used engine oil. Recent county recycling programs have encouraged individuals to deposit used oil for recycling. Most oil is reprocessed or burned.

Response

Maine requires that tank vessels, as defined in federal law, submit to the state a copy of their contingency plan prepared pursuant to OPA 90.

Funding

Maine collects a $0.03 per barrel transfer fee. The fee is collected until the fund reaches $6 million.

Coordination Efforts

The Department of Environmental Protection has a MOA with the U.S. Coast Guard (USCG) concerning oil spill response.

Policy Review and Citizen Participation

A State Oil Spill Advisory Committee and the Maine/New Hampshire Port Safety Forum participate in the policy review process. Low levels of citizen participation make it difficult for the Department of Environmental Protection to gain support and approval for updating and increasing oil spill related policies.

In 1992, a port safety forum asked pilots to identify navigation hazards and develop recommendations to promote marine safety. The recommendations were useful and included visibility and speed restrictions, rules for towing under bridges, and early tug escorts for crude carrying vessels. Compliance has been voluntary.

MARYLAND

State Legislation

Statutory provisions concerning oil discharge and cleanup are located in the Water Pollution Control and Abatement section (Subtitle 4) of the Environment Code. The law sets up a license requirement and fee for oil transfers, and a prerequisite for obtaining a license is a showing that the applicant has implemented or is implementing state and federal plans and regulations to control oil pollution. The state's Hazardous Substance Response Plan, a subchapter of the Code of Maryland Regulations, is administered by the Department of the Environment and establishes guidelines for the state's response to spills, although the state does not consider oil a hazardous substance.

Prevention

The state does not require specific prevention plans for oil facilities or vessels. However, oil storage facilities over 10,000 gallons must obtain a permit from the state. The state also employs 19 enforcement inspectors in its oil program, who conduct announced and unannounced facility inspections.

Information on the appropriate methods of disposing of used engine oil is provided through an 800 telephone number and informational handouts. County governments also are empowered to establish their own used engine oil disposal programs to prevent small scale oil releases.

Response

The state has formally promulgated rules requiring vessel response plans. These rules are expected to be adopted by the end of 1995. Inland facilities are already required to have spill containment measures and cleanup plans in place as part of the state license procedures.

The Department of the Environment responds to oil spills depending on the size and location of the spill. It is also empowered to contract with private environmental response contractors, while it serves in a technical and administrative oversight role.

Funding

Maryland collects $0.0075 per barrel for all petroleum products brought into the state. The state Department of the Environment administers the Maryland Oil Disaster Containment, Cleanup, and Contingency Fund. This fund can be used for the contracting of oil spill responders and reimbursement of county emergency response assistance.

Coordination Efforts

While no formal interstate compacts are in place, Maryland spill response teams have responded to all requests for assistance from neighboring states and Washington, DC.

The Department of the Environment has a MOA with the USCG covering notification of oil and hazardous substance spills, and establishing guidelines for reimbursement from the Federal Oil Spill Liability Trust Fund. It also has an agreement with the Board of County Commissioners in Washington County setting conditions under which the Board may seek reimbursement from the state Hazardous Substance Control Fund.

Policy Review and Citizen Participation

Review committees are formed as needed and no formal public information system is in place.

MASSACHUSETTS

State Legislation

The Massachusetts Oil and Hazardous Material Release Prevention and Response Act (Chapter 21E) is administered by the Department of Environmental Protection (DEP). In accordance with Chapter 21E, the DEP has established regulations for assessing and cleaning of oil and hazardous material releases. These regulations are set forth in the Massachusetts Contingency Plan. The Massachusetts Plan is not specifically targeted at oil spill management, but includes oil along with other hazardous materials.

Prevention

Contingency plans are required of facilities to prevent the release of oil or other hazardous materials. These plans are maintained by the State Emergency Response Commission, which is a coalition of state agencies including the DEP, state Police, Public Health, Civil Defense, and the Fire Department.

Permits are required for all regulated oil facilities. Inspections are conducted to ensure compliance upon renewal of each permit.

Massachusetts law requires all retailers selling motor oil to collect used engine oil in containers for recycling. Retailers usually require customers to present a store receipt in order to deposit used oil. A hotline also was established by the state to answer any questions regarding used engine oil disposal.

Response

The Massachusetts Contingency Plan (MCP)[2] was revised in 1993 to reflect the growing responsibilities of the DEP. The new plan establishes a program for the licensing of expert site professionals who are responsible for the assessment and clean-up of the many hazardous spill sites around the state. Licensed Site Professionals (LSPs) oversee response and cleanup activities to ensure that actions are performed in compliance with the Massachusetts Contingency Plan. The program also includes the certification of a LSP for oil spill cleanup and response. Twenty percent of the cleanup sites administered by the LSPs must be audited by the staff of the DEP. DEP staff also oversee state funded sites, state Superfund sites and Tier I (severely contaminated) sites.

[2] The MCP has been significantly modified as of February 1995. The changes are not reflected in this report.

The MCP also was amended to include the addition of a Best Response Action Management Approach that sets performance standard requirements for response actions. Under this program, response actions are required to adequately protect public health and the environment and must use standard professional engineering and scientific practices.

Funding

The Massachusetts Underground Storage Petroleum Product Cleanup Fund is supported by a $50 fee for each delivery of petroleum products at a dispensing facility. The fee is no longer collected after the fund reaches $30 million, and collection is resumed after it is depleted to $10 million.

Coordination Efforts

Massachusetts has not entered into any interstate compacts or MOA at this time.

Policy Review and Citizen Participation

Regulations regarding prevention and response were developed with the assistance of an advisory committee composed of industry representatives, consultants, attorneys, environmentalists, public health advocates, and local officials. All proposed changes to the MCP are reviewed by the Waste Site Cleanup Program Advisory Committee and comments are welcomed from any interested party.

MICHIGAN

State Legislation

The State of Michigan has few policies and programs directly related to oil spill management and is in the process of evaluating its role under OPA 90. The Michigan Department of Natural Resources (MDNR) is the state's lead agency for oil spill management.

Prevention

Oil spill prevention plans are not required by state law. State level prevention efforts include training, participation in federal Regional Response Team meetings, and other oil spill related conferences and meetings.

Response

The MDNR primarily relies on the responsible party for remedial response action and is empowered to contract private response companies. MDNR conducts environmental assessments of resource injuries following spills.

Funding

No state level contingency fund exists for oil spill cleanup.

Coordination Efforts

A response coordination agreement exists between Michigan and Ontario, Canada. The Great Lakes Spill Protection Initiative and Regional Response Team are the only coordinated interstate response groups.

The MDNR also coordinates the actions of other state agencies and departments during an emergency spill under the Pollution Emergency Alert System.

Policy Review and Citizen Participation

A public policy analyst assigned to the Executive Division of the Office of the Great Lakes is currently conducting a policy review.

MISSOURI

State Legislation

Missouri "Spill Bill" regulations are implemented by the Department of Natural Resources. Since OPA 90, Missouri passed the Emergency Planning and Community Right-to-Know Act, as well as regulations requiring contingency plans for all facilities handling hazardous waste.

Prevention

Prevention plans are required for commercial above ground storage tanks with capacities greater than 600 gallons and underground storage tanks with capacities greater than 110 gallons. Spot checks by field personnel and inspections in response to public complaints are used to monitor compliance. Thus far, the state-initiated program on prevention has focused on pipelines; however, few details were provided to our survey questionnaire concerning prevention measures.

Response

Spill Bill regulations require the development of an emergency response plan that outlines the respective responsibilities of each agency. As a result of this requirement, a statewide telephone number was established for oil spill notification.

Funding

Missouri's Hazardous Waste Remediation Fund currently holds approximately $1 million. Funding is derived from registration fees collected on pipelines, storage, and retail facilities. If the annual collection of fees is over $1 million, the portion above $1 million is credited to the following year's fees. A regulated company can not be charged over $10,000 per year in fees.

Coordination Efforts

The Metropolitan Statistical area (e.g., St. Louis Metropolitan area) response plans are developed and maintained by local officials from Missouri and Illinois with the support of Region VII and V Regional Response Teams.

Policy Review and Citizen Participation

A USEPA representative for Region VII of the Regional Response Team is responsible for reviewing policies.

NEW HAMPSHIRE

State Legislation

The New Hampshire Department of Environmental Services is responsible for coordinating oil spill response and prevention programs at the state level. However, New Hampshire primarily relies on OPA 90 and the USCG and USEPA.

Prevention

The Underground Storage Tank Compliance Program monitors compliance for new and existing underground storage tanks. All facilities are tracked on a database and inspected when information appears inadequate or incomplete. New facilities under construction are also inspected to ensure compliance. No prevention plans are required by the state.

Response

No information on response policies or procedures was provided in the reply to the survey.

Funding

The state contingency fund is supplied by a fee on all imported oil and is approximately $5 million.

Coordination Efforts

New Hampshire is not involved in any interstate compacts or MOAs.

Policy Review and Citizen Participation

The Public Information Office within the Department of Environmental Services coordinates reviews.

NEW JERSEY

State Legislation

In response to a noted escalation in the frequency of oil spills worldwide, New Jersey enacted a number of amendments to the Spill Compensation and Control Act of 1980. Effective September 12, 1991, the Department of Environmental Protection and Energy (DEPE) adopted rules that set standards for discharge prevention and emergency response. The additional rules relate to facility discharge prevention and control, registration and contingency plan requirements, and pipeline regulations. The 1991 amendments to the Spill Compensation and Control Act also contain a schedule of financial penalties for non-compliance with the act or for causing a discharge.

Prevention

There are a number of requirements designed to reduce the probability of an oil spill and mitigate its potential impacts. New and reconstructed storage tanks are required to have an impermeable base and secondary containment system that can accommodate the entire storage capacity plus six inches of rainwater. Integrity testing must also be conducted every five years depending on the age of the tank, proximity to surface water, and leak record. Marine transfer facilities are required to deploy a containment device sufficient to totally enclose a vessel while engaging in the transfer of material from vessel to facility, or vice versa.

Leak detection and monitoring regulations mandate visual inspections of equipment, facilities, and containment systems pursuant to a predetermined schedule. Training also is required for all employees handling hazardous substances. Minimum training requirements include a general orientation, as well as classroom, on the job, and annual refresher training.

All response or cleanup organizations must register with the DEPE to enable the department to have a clear understanding of the purpose and capabilities of all companies or organizations operating within the state. Potentially responsible parties are provided with an inventory of registered organizations and environmental professionals.

According to federal and state law, oil handling facilities must submit a Discharge Prevention, Containment and Countermeasure (DPCC) plan. The plan must include historical information about the facility, a site plan, a drainage and land use map, a topographical map as well as information on storage areas, loading/unloading areas, secondary containment systems, flood hazard areas, leak detection procedures, personnel training, security, and equipment upgrade scheduling. Maps submitted as part of a plan must also adhere to the specific criteria established through legislation.

All stations performing motor vehicle inspections are required to accept used engine oil for recycling.

Response

In addition to the DPCC plans, the state mandates the development of Discharge Cleanup and Removal (DCR) plans that outline facility actions in response to a discharge. The DCR plan must include a summary of the facility's action plans, a list of available equipment and personnel, a protection plan for environmentally sensitive areas, an agreement with the local emergency planning committee, and proof of financial responsibility. Both the DPCC and the DCR plans must be submitted to the Department of Environmental Protection and Energy, which has 60 days to review them for comprehensiveness. If the plans are determined to be complete, the DEPE has 180 days to conduct a technical review of their plans and determine their acceptability.

The state also sponsors a Voluntary Cleanup Program for hazardous waste sites, because of the large number of such sites across the state. The DEPE focuses its cleanup efforts on high priority hazardous waste sites and encourages responsible parties to undertake remedial action on lower priority sites. The Voluntary Cleanup Program allows for the establishment of a MOA between the party requesting cleanup approval and the DEPE that stipulates the terms of the cleanup process. This program removes some of the bureaucratic barriers inhibiting responsible parties from initiating the cleanup process. The Voluntary Cleanup program is currently used in about 50% of the incidents. The voluntary program has been effective, according to the director of the DEPE.

The New Jersey Motor Vehicle Accident Generated Waste Program is designed to address issues of remediation, storage, disposal, and any community financial burdens associated with waste discharges from motor vehicle accidents. This program established rules governing the discharge of oil and other wastes from motor vehicles involved in accidents. It places all responsibility on the discharger for remediation and outlines distinctions between privately owned vehicles, in-state, or out-of-state trucks and tractors. These rules are generally enforced by police officers who frequently are the first responders to an accident.

Funding

New Jersey established a $50 million Emergency Spill Fund to support the Emergency Response program. The fund is financed by a tax on the transportation of hazardous materials through the state and is used to clean-up unreported spills, abandoned drums of potentially hazardous materials or fuels, and spills that have not been remediated by responsible parties.

New Jersey has also availed itself of OPA 90's Oil Spill Liability Trust Fund. Between 1991 and 1993, over $1.1 million was allocated from the federal fund to different states with New Jersey receiving approximately half.

Coordination Efforts

The DEPE's Emergency Response Program works in cooperation with the police and Office of Emergency Management through a memorandum of agreement. MOAs also have been established with the Regional Response Team, the federal Multi Agency Local Response Team, and the counties through the County Environmental Health Act (CEHA). According to the survey responses, the CEHA is effective in promoting improved and more rapid county response to oil spills.

Policy Review and Citizen Participation

DPCC plans are reviewed annually by the Bureau of Emergency Response (BER). The BER also inspects all facilities where an incident occurred. The DEPE Office of Emergency Response Preparedness also coordinates personnel training and establishes incident response procedures with industry and volunteers from the American Red Cross, the New Jersey State Safety Council, the New Jersey Fire College, and the New Jersey First Aid Council.

Public involvement also is solicited through county meetings. Meetings include discussions on the Emergency Response Program and state assistance during emergency spill situations. Bumper stickers with a 24-hour hotline telephone number are distributed to the public at the county meetings.

NORTH CAROLINA

State Legislation

The Department of Environment, Health and Natural Resources is responsible for implementing the Oil Pollution and Hazardous Substances Control Act, which prohibits the discharge of oil or other hazardous substances into or upon any waters, tidal flats, beaches, or land. The Department is mandated to establish an oil pollution control program under the provisions of the law.

Prevention

Contingency plans are being developed within government and by private industry for oil spill prevention and response. While the state is authorized to inspect facilities, the local office of the USEPA assumes responsibility for performing inspections.

Used engine oil collected for recycling is land farmed by private contractors or used to make bricks. Land farming entails plowing the oil into the soil to allow bacteria to naturally break down the material.

Response

All oil spills and hazardous waste spills are required to be reported to the Division of Environmental Management (DEM), while the regional offices of DEM monitor the cleanup process.

Funding

North Carolina's Oil or Other Hazardous Substances Pollution Protection Fund is used on an emergency basis only. Funding is derived from oil spill enforcement fines and civil penalties. Responsible parties are required to assume all costs for remedial action.

Coordination Efforts

North Carolina is in the process of revising its inter-governmental MOAs. Previous MOAs included an agreement with the Department of Transportation and the USCG. The agreement with the state Department of Transportation addressed the use of vehicles for spill response, whereas the agreement with the USCG covered marine environmental protection and response to marine pollution.

The Board of Transportation, the Wildlife Resources Commission, the Division of Marine Fisheries, and any other state or local agency may be called upon at any time to provide assistance in the response effort.

Policy Review and Citizen Participation

Interdepartmental reviews, interagency reviews, public notices, and appointed commissioners are all part of the review process.

OREGON

State Legislation

Oregon's Department of Environmental Quality (DEQ) is the lead agency for oil spill management. The Regulations Pertaining to Oil Spills into Public Waters were updated in January 1993 to establish requirements for spill response, use of dispersants, disposal of cleanup waste, administration fees, prevention, and mitigation. The state holds both the transporter and owner of oil liable in comparison to most states that only extend liability to the party transporting oil.

Prevention

State regulations require contingency plans for all cargo and passenger vessels over 300 gross tons. Tank vessels and oil facilities are required to have response equipment in excess of that required at the federal level.

Prevention rules for oil facilities have been completed, while more specific prevention rules for pipelines and vessels are currently being developed. Facility prevention plans are required to include the following information: (1) the types and frequency of spill prevention personnel training, (2) evidence of a facility operations manual, (3) a description of a drug and alcohol awareness program which provides training and information to all employees, (4) a summary of the frequency and type of inspections and preventative maintenance procedures, (5) a description of the use of containment booms during the transfer of heavy oil, (6) identification of spill prevention technology currently in use, (7) a description of facility security systems, (8) a history of discharges exceeding 25 barrels over the last five year period, and (9) a detailed risk assessment analysis.

The DEQ is responsible for evaluating the plan, and all parties interested in reviewing the plans are given the opportunity to comment within 30 days. This includes the general public as well as concerned interest groups. The DEQ may approve a plan conditionally by requiring a facility or vessel to operate with specific precautionary measures until unacceptable components of the plan are resubmitted and approved. Any plan holder may be required to participate in one unannounced full or limited deployment drill annually.

Collection of used engine oil is done through curbside pick-up and community drop off facilities. The collected oil is reprocessed and reused.

Response

Prevention and response plans are required for facilities and pipelines, while response plans are required for vessels and agencies handling oil. All plans must include (1) a list of equipment and personnel available, (2) a description of spill detection procedures, (3) a signed letter of intent from a spill response contractor, (4) a description of containment methods, (5) estimated response times for certain volumes, (6) guidelines under which in-situ burning will be used, (7) an environmental protection plan, (8) methods for interim storage of cleanup waste, and, (9) a schedule of drills and exercises. Use of chemical dispersants is not permitted except when extreme fire danger or other hazardous circumstances warrant their use.

Response plans for specific geographic areas have been developed outlining exact equipment requirements and booming strategies. This response strategy has worked well, according to the responses from the survey.

Funding

Oregon's Hazardous Substance Remedial Action Fund currently holds approximately $8 million. Permitting fees are collected from all facilities on an annual basis, and from each tank vessel on a per trip basis. Those fees are deposited in the Oil Spill Prevention Fund and are used by the DEQ to fund reviews of prevention plans, and to conduct compliance inspections, exercises, and training.

Coordination Efforts

The States/B.C. Oil Spill Task Force is jointly funded by Alaska, Washington, British Columbia, California, and Oregon. Oregon also has interagency agreements with the USCG for the use of volunteers and with the Office of Marine Safety regarding a joint inspection office.

Policy Review and Citizen Participation

Advisory committees are created to review all policy developments. With input from local governments and grass-roots organizations throughout the state, the DEQ has developed an education and promotion handbook for local governments and educators on waste reduction and recycling programs entitled, "Getting the Word Out." The book is a step-by-step outline of how to promote recycling at the community level based on a

calendar of suggested events. It also includes advice on fund raising, public relations, school recycling programs, household hazardous waste collection events, composting demonstrations, and holiday specific events. Oregon also has a training program for volunteers interested in performing cleanup and rehabilitation of wildlife following oil spills. Approximately 300 volunteers have been trained.

RHODE ISLAND

State Legislation

The Rhode Island Department of Environmental Management (DEM) is the lead agency for oil spill response and implements the state's Oil Pollution Control Regulations. The regulations are intended to "prevent the discharge, escape or release of oil into the waters of the state."

Prevention

Facilities are required to prepare contingency plans according to a number of specific rules designed to prevent oil spills. These rules specifically govern the transfer of oil between vessels and terminals and require that (1) the pressure in hoses be tested above the expected use, (2) drip pans be placed under all connections, (3) hoses be supported so that they cannot be crushed or dislodged, (4) a person must monitor each connection throughout the transfer operation, (5) communication equipment must be tested prior to transfer operations, (6) loading must be started at a slow rate and inspected before increasing to desired rate, and (7) backflow valves must be located in the discharge line. Safety precautions for on-loading and off-loading of ballast water and requirements for boiler room oil traps or drain valves are also outlined in the regulations.

Storage tanks with capacities greater than 500 gallons are required to have spill containment around the fill areas, dispensers with backflow valves, volume gauges, and secondary containment systems capable of handling 110% of the tank capacity. All newly constructed tanks are subject to different standards including regulation of construction materials and the requirement for an underlying impervious barrier.

Monthly facility inspections and more detailed 10 year inspections are required to be conducted by the owner/operator. A report must be made available to the DEM on each monthly and 10 year inspection. Furthermore, the local Emergency Planning Commission also conducts spill simulations.

Individuals can dispose of used engine oil at town designated drop-off sites. The Office of Environmental Coordination answers questions by phone and provides packets of information upon request.

Response

Most of the oil spill response is handled by the Coast Guard with assistance from the DEM.

Funding

There is no state level contingency fund.

Coordination Efforts

Rhode Island has not entered into any interstate compacts or MOAs.

Policy Review and Citizen Participation

State files are available for public review at any time, and no formal public outreach program exists.

SOUTH CAROLINA

State Legislation

The South Carolina Department of Health and Environmental Control (DHEC) is the state's lead agency and administers the South Carolina Hazardous Waste Management Act and the Pollution Control Act.

Prevention

Oil and gas terminal facilities are required to have spill prevention plans, and plans generally follow federal guidelines. Terminal facilities are required to obtain registration certificates. To obtain certification, a facility is required to provide proof of compliance with federal requirements, information of the type and location of response equipment, copies of all agreements with cleanup organizations, and a registration fee.

Oil spill prevention programs in South Carolina have been limited to participation with the USEPA in the Spill Prevention Containment and Countermeasure (SPCC) Program. DHEC personnel are responsible, through a mutual voluntary agreement, for the inspection of bulk terminals, wholesale and retail petroleum distributors, and industries that meet SPCC requirements in South Carolina.

Although this program involves a limited universe of petroleum handlers/processors, participation in the program has left the state better prepared for preventing petroleum releases from potentially large reservoirs of products. Active inspection of petroleum storage facilities has made the department more cognizant of the location and condition of petroleum facilities and has made the regulated public aware of local and state resources for emergency assistance.

In 1992 the Used Oil Partnership, comprised of the electric utility, the Department of Transportation, and the South Carolina Petroleum Council, was formed to promote public awareness of the proper disposal of used oil. In South Carolina used oil can only be legally disposed of at one of the 320 collection sites throughout the state. Information regarding the location of these drop-off sites is made available through a toll free number. As of January 1, 1994, the DHEC has made $600,000 available to local governments for public relations programs and used oil collection sites. Brochures, posters, newsletters, radio, television, and billboard announcements are used to educate the public about oil spill prevention and recycling. Presentations are also made to schools and local governments using a video, while the state has also developed a six lesson activity-based curriculum. This program has been very effective, according to the survey responses.

Response

DHEC routinely coordinates with commercial response teams on petroleum spills that range from small vehicle tank ruptures to large petroleum pipeline ruptures. In general, spill response contractors that are associated with larger diversified organizations are more reliable and prepared for a rapid response, according to the survey. Smaller, locally owned companies have not had the fiscal ability to withstand periods of inactivity between spills.

The South Carolina Contingency Plan requires emergency response personnel to undergo continuous training to stay abreast of new methods of containment, neutralization, decontamination, cleanup, and removal.

Funding

Funding for oil spill response and waste management research is derived from two primary sources: a $25 fee for each ton of hazardous waste generated, and registration fees for facilities handling any hazardous materials. South Carolina's contingency fund currently holds approximately $12 million.

Coordination Efforts

South Carolina is not involved in any interstate compacts, but is in the process of establishing a MOA with the USCG offices in Savannah, Georgia and Charleston, South Carolina on the pre-approved use of dispersants and in-situ burning.

The Department of Highways and Public Transportation, the Water Resources Commission, and the Wildlife and Marine Resources Department have agreed to cooperate with the DHEC and lend assistance in the event of an oil spill.

Policy Review and Citizen Participation

There is no established review process for policies regarding oil spill prevention and response. All contingency plans are required to include detailed guidelines concerning media relations and the availability of factual public information. The on-scene coordinator is responsible for coordinating with special interest groups interested in oil spill prevention and response planning under provisions in the State Contingency Plan.

TEXAS

State Legislation

The Texas General Land Office (GLO), Texas Natural Resource Conservation Commission (TNRCC), and the Railroad Commission (RRC) have jurisdiction over oil spills as stated in the state's Oil Spill Prevention and Response Act (OSPRA). The GLO is the lead agency for oil spill response, with TNRCC and the RRC holding supportive authority. The legislature restructured the program in 1991 in response to criticism that oil spill response systems were inadequate.

Mandates under OSPRA include the formation of an Interagency Council, a state level response effort, registration of terminal facilities, contingency plans for vessels, audits, inspections or drills, penalty schedules, cost recovery, the ability to enter into interstate compacts, support for related research, the establishment of an Oil Spill Oversight Council, and the development of an education program.

Prevention

Oil spill prevention plans are not required in Texas. The GLO is in the process of reviewing spill files for 1992 and 1993 to ascertain root causes of discharges. Upon completion of this task, if it is determined that regulations are needed for specific industries and/or operations, additional regulations may be drafted. According to the survey response, the current consensus is that there are probably enough regulations.

The state's focus presently is on heightening awareness of the rules and regulations for both personnel and management. It appears that the best achievable management practices need to be updated and further stressed. This has been facilitated through a requirement for documented discharge incidence reports. The reports must identify the cause of the spill and identify remedial actions to stem a reoccurrence. Response officers verify that the corrective actions have been taken once the report is received by the GLO.

As of January 1, 1993, all facilities involved in the storage or transfer of oil must have a discharge prevention and response certificate. The application for the certificate requires (1) information on the type, location, and capacity of the facility; (2) a site plan; (3) aerial photos; (4) information on personnel qualifications; (5) a copy of the prevention and response plan; (6) proof of financial responsibility; (7) evidence of an agreement with a discharge cleanup organization; (8) the estimated worst case discharge; (9) a list of all discharges occurring at the facility the previous year; and (10) a copy of all necessary environmental permits. After all the information is received by the GLO, a certificate is issued unless there is evidence that the applicant lacks the ability to respond adequately to a worst case discharge. Certificates are issued for a period of five to 10 years.

Training of personnel is required under OSPRA. The GLO interprets this to be completion of an oil spill training program, participation in drills and exercises, and an appropriate level of on the job training.

Used engine oil is collected through curbside recycling programs, designated drop-off facilities, and some gas stations. A toll free number was also set up to provide information on the location of the nearest drop-off center. Most used engine oil in Texas is re-refined into lubricants, asphalt extenders, and flotation oils. The oil spill division is currently looking into used oil reception sites for commercial fishing and shrimping fleets.

Response

State liability limits are more stringent than those required by OPA 90. While OPA 90 liability limits for response costs, damages, and natural resource damages are all covered under one amount, these amounts are cumulative in Texas depending on the size of the vessel or facility. While the liability limits may be different, the GLO can only require financial responsibility to the amount established by federal law. The GLO accepts federal response plans as meeting state requirements, and no separate prevention plan is required.

Vessel response plan requirements under state law are more stringent than OPA 90 because Texas requires response plans from any vessel capable of carrying 10,000 gallons or more of oil as fuel or cargo. OPA 90 requires response plans from tank vessels only.

All discharge cleanup organizations must be certified by the GLO. Owners and operators are required to list their certified discharge contractor in their prevention and response certificate application.

Funding

The Oil Spill Prevention and Response Act (OSPRA) provides for funding through the Coastal Protection Fund. Funding is provided by a $0.02 per barrel tax on all crude oil loaded or off-loaded by vessel in the state. A maximum of $25 million is deposited into the fund at which time the tax is suspended until the fund falls below $14 million. If an incident occurs that is expected to substantially deplete the fund, and if a discharge in excess of 10,000 gallons has occurred within the previous 30 days, the tax may be raised to $0.04 per gallon. Currently, the tax has been suspended since November 1, 1993. Other fees, penalties, judgments, and reimbursements are also credited to the fund with an overall fund limit of $50 million. The Coastal Protection Fund may be used for administrative expenses, response related costs, restoration or mitigation, related research ($1.25 million annually), and other costs or damages upon authorization.

Coordination Efforts

Texas has not entered into any formal interstate compacts; however, it does participate in the Gulf States Working Group. The group consists of pollution division heads from the states of Texas, Louisiana, Alabama, Mississippi, and Florida. This ad hoc group meets informally 2–3 times a year to discuss issues relevant to their respective states and the Gulf area as a whole. Recently, staff members attended meetings of the States/B.C. Task Force. Based on those meetings, the GLO intends to remain active with the States/B.C. Task Force.

A MOA is currently being drawn up between the GLO and the USCG concerning many spill prevention and response issues. In May 1994, a MOA with the U.S. Department of Interior's Minerals Management Service was signed, which covers cooperation for spill response drills, investigations, development of requirements for offshore facility financial responsibility, facility inspection, training of personnel, technology transfer, and research. In addition, a working group is being established to address royalty management. The working group will identify the potential for new coordinated approaches to maximize benefits from the mineral resources of both federal and state agencies.

Policy Review and Citizen Participation

OSRPA created the Interagency Council which is chaired by the GLO. The Council includes representatives from the Department of Health, the Division of Emergency Management, Department of Parks and Wildlife,

Natural Resource Conservation Commission, Department of Transportation, Office of the Attorney General, and the Higher Education Coordinating Board. A Governor's Oversight Council was created to provide general oversight of the Oil Spill Program. There also is a five person commission that studies the relative operational and environmental risks posed by the transportation of oil by vessels and the handling of oil at terminal facilities.

A period for public review and comment is allowed for any new regulatory proposals. All proposed regulations are published in the Texas Register. Any comments received must be addressed in the adoption of the new rule. A tri-annual OSPRA newsletter is also published describing current initiatives and activities within the Oil Spill Division of the GLO. The names of individuals or groups interested in specific information can also be included on a distribution list for available information.

WASHINGTON

State Legislation

The Department of Ecology (DOE) manages spill prevention and response activities for oil handling facilities and is the lead agency for response to environmental emergencies statewide. The state Office of Marine Safety (OMS) is responsible for oil spill planning and prevention. These responsibilities are mandated by the 1990 Oil and Hazardous Substance Spills Act and the 1991 Oil Prevention and Response Act. The Office of Marine Safety will be merged within the Department of Ecology in 1996.

In addition to federal requirements under OPA 90, Washington state laws include the following requirements for vessels and facilities: (1) oil spill prevention training and certification of all operations personnel; (2) preparation of an operations manual documenting procedures for oil transfer, storage, and monitoring; and (3) development of a definition of "best achievable protection" from oil spills that establishes minimum planning standards for facility transfer, storage, and monitoring. The state also established adequacy standards for prevention plans and minimum standards for facility oil spill contingency plans and spill response capabilities. Rules for primary response contracting were developed by the DOE, as well as rules for the documentation of financial responsibility for oil spill cleanup costs and damages (originally scheduled to become effective April 30, 1993, but currently on hold indefinitely).

Prevention

Washington requires prevention plans from all facilities involved in the transfer of oil to or from a pipeline. Plans must include: a comprehensive analysis of facility spill risk; information on alcohol and drug awareness programs; maintenance and inspection programs; spill prevention technology currently in use; measures taken to ensure facility security; a description of any spills over 25 barrels; and plans to incorporate measures for the best achievable protection. Facility plans initially are reviewed by the Department of Ecology for completeness and subsequently are distributed for a 65 day public review. Every five years the plan must undergo a full review by the department. Announced and unannounced site inspections are used to verify compliance.

The state Office of Marine Safety (OMS) has established progressive safety standards for oil tankers and barges in state waters and has a screening program for other ships, including container ships, bulk carriers, fishing boats, and passenger vessels. The OMS conducts inspections of vessels and identifies high-risk carriers with a computer matrix. Vessels are notified by the OMS of their safety deficiencies.

Response

Contingency plans are required that establish criteria for primary oil spill response contractors in Washington. The Department of Ecology is authorized to require oil spill contingency plan holders to conduct oil spill drills. Enforcement policies also allow for fines of up to $100,000 per day for operating without a contingency plan or for the reckless/intentional discharge of oil.

A Facility Personnel Oil Handling Training and Certification rule was included as a requirement under the 1991 Oil Spill Prevention and Response Act to reduce the probability of human error contributing to the occurrence of spills. A minimum number of hours of classroom instruction, on-the-job training, and a continuing education program are required in facility plans. Certain core training topics must be covered specific to management, supervisory, maintenance, and indirect operations personnel. In addition, the training program must be certified every three years with on-site inspections by the Department of Ecology.

Funding

Washington charges a $0.05 per barrel tax on all oil delivered to terminals on state navigable waters. Of that $0.05, $0.02 is allocated to the Oil Spill Response Account (OSRA) to pay for cleanup and response efforts above $50,000. The OSRA is intended to be maintained at $25 million, but currently contains $8 million. The remaining $0.03 is put into the Oil Spill Administration Account.

Coordination Efforts

The States/B.C. Oil Spill Task Force is jointly funded by Alaska, British Columbia, Washington, California, and Oregon. The Department of Ecology has a MOA with the Office of Marine Safety and is working on an agreement with the USCG. Washington is also involved in the Northwest Area Contingency Plan which consolidates the efforts of the USEPA, USCG, and the states of Oregon, Idaho, and Washington.

Policy Review and Citizen Participation

The five-member Marine Oversight Board provides independent oversight of the actions of the federal government, industry, and state agencies regarding oil spill prevention and response on the navigable waters of Washington. Oversight is extended to vessels and onshore and offshore facilities as defined by statute.

In 1993, the Department of Ecology held a public forum to discuss the use of volunteers during oil spills and plans were established for the development of a two phase Statewide Volunteer Management Plan. Phase one was developed by the Wildlife Rescue Coalition and completed in January of 1994. The Department of Ecology is responsible for the development of phase two by April 1994, which addresses the use of volunteers in non-wildlife rescue activities. A work group was formed to review the completed work and make recommendations to the Department of Ecology. Following completion, the Statewide Volunteer Management Plan will be incorporated into the Northwest Area Contingency Plan.

A number of education efforts have been implemented to increase public awareness about oil spill prevention. Those programs include spill prevention educational campaigns, coordination with the Washington Sea Grant Program's spill prevention education program, a bimonthly newsletter entitled *Spill News*, public involvement and outreach strategies, and educational presentations to community organizations. Public involvement is also solicited for different advisory committees. In 1993, these committees included an oil spill prevention work group, a technical subcommittee, a scientific advisory board, an in-situ burning working group, and a volunteer management work group.

WISCONSIN

State Legislation

The Wisconsin Department of Natural Resources (WDNR) is the primary response authority for all hazardous substance spills. State laws and regulations have not been changed in response to OPA 90.

Prevention

The Petroleum Tank Inspection Program is conducted by the Department of Industry Labor and Human Relations. Monitoring is geared more towards fire prevention strategies than environmental protection.

Response

Wisconsin requires a state level contingency plan that addresses cleanup procedures, provides for environmental restoration, establishes maintenance and procurement procedures for necessary equipment, and divides specific responsibilities among state and local agencies.

Funding

Wisconsin has an oil spill contingency fund, however, no details as to the source or amount of the fund were provided.

Coordination Efforts

Wisconsin is not involved in any interstate compacts.

Policy Review and Citizen Participation

There is no formal review process for policies relating to oil spill response and prevention.

WYOMING

State Legislation

The Department of Environmental Quality and the Wyoming Oil and Gas Conservation Commission have jurisdiction over oil spill response and prevention.

Prevention

No spill prevention program exists and prevention plans are not required.

Response

Minimal spill response plans exist in Wyoming. Existing plans are based on protecting surface and ground waters.

Funding

Wyoming does not have a state level oil spill contingency fund.

Coordination Efforts

Wyoming has not entered into any interstate compacts or MOAs at this time.

Policy Review and Citizen Participation

The Water Quality Advisory Board is responsible for reviewing policies regarding oil spill response.

OIL SPILL PREVENTION AND RESPONSE SURVEY

Agency: _____

Address: _____

Contact Person: _____

Phone Number: _____ Fax Number: _____

1. Does your state, county, or municipal government have any regulations or ordinances regarding oil spill response or prevention? Please circle the ones that apply:

   state **county** **municipal** **none**

   If state, county or municipal regulations exist, please include a copy(s) with the completed response, or the name of the agency from which copies can be obtained. Within your state, what agency(s) has jurisdiction regarding oil spill prevention or response regulations?

2. Does your state have Oil Pollution Act (OPA) type provisions which are more strict than OPA? What are those provisions?

3. Since OPA 90, have your management strategies become more focused regarding oil spill response or prevention (e.g. additional training requirements, back-flow valve installation requirements)? **Yes** **No**

   Please list major strategies.

4. Are oil spill prevention plans required in your state? **Yes** **No**

   If so, please list all government agencies, types of corporations or other groups or individuals required to submit prevention plans, as well as those involved in the planning process (use a separate page if necessary).

5. If oil spill prevention standards or regulations exist, are they monitored to confirm compliance? **Yes** **No**

   If yes, how are they monitored? How are they enforced?

6. Is your state involved in any interstate compacts related to oil spill response or prevention? **Yes** **No**

   If yes, please provide information on the nature of the compact, the states and agencies involved, and the source(s) of funding.

7. Are there any memorandums of agreement regarding oil spill response within your state (e.g. between the Coast Guard and state or county agencies)? **Yes** **No**

   If yes, please list cooperating agencies or departments and include a copy of the agreement.

8. Please provide information on the specific types and locations of equipment and facilities available to respond to an oil spill occurring in the state (use a separate page if necessary).

9. Is a state-created contingency fund available for oil spill clean-up? **Yes** **No**

   If yes, how is it funded and how much is in the fund?

10. If state laws or compacts apply to oil spill response plans, how are they triggered? Is there a minimum size spill that triggers a response? If so, what is that minimum?

11. Over the past five years, how many oil spills has your office been involved in?

	On Land	**At Sea**
Small Spills (<10,000 gallons)		
Medium Spills (10,000-100,000 gallons)		
Large Spills (>100,000 gallons)		

12. Is there a review process for policies regarding oil spill prevention or response?

Yes **No**

If yes, please provide names and affiliations of all parties involved in the review process, including any citizen oversight or advisory groups.

13. Is proof of insurance required above or beyond the levels established by OPA 90? **Yes** **No**

If so, please provide a description of the policy.

14. Regarding public involvement related to oil spills, what type of information is available to the public and what mechanisms exist to make that information available?

15. Please provide information on the appropriate method for disposing of used engine oil. How is that information conveyed to the public?

16. Please provide a description of the general concerns and experiences your office has had with oil spill prevention and response programs. What policies or programs have you found it difficult to monitor or achieve compliance with? What programs have worked well?

17. Have there been any state funded studies on oil spill prevention or response? If so, please list the titles and provide information on where a copy of the document(s) may be obtained.

Hawaii's Readiness to Prevent
and Respond to Oil Spills

EVALUATION OF SPILL PREVENTION AND RESPONSE PREPAREDNESS IN HAWAII

Appendix 4

Rick Steiner
University of Alaska Marine Advisory Program
Cordova, Alaska
and
Richard Townsend
Townsend Environmental
Otis, Oregon

February 1997

EVALUATION OF SPILL PREVENTION AND RESPONSE PREPAREDNESS IN HAWAII

At the request of the University of Hawaii Sea Grant Program, the authors visited Hawaii in December 1994 in order to conduct a general, independent assessment of oil spill prevention and response preparedness in Hawaii. Our assessment was part of a larger study being conducted by Hawaii Sea Grant under contract to the State of Hawaii Hazard Evaluation and Emergency Response (HEER) office. We were asked to make a brief assessment of the spill prevention and response system and identify concerns that the State of Hawaii should address in order to further improve the system. We decided that, although there are numerous, small spills occurring from fishing vessels, and recreational vessels, clearly the greatest risk to Hawaii was from a catastrophic loss of cargo from a tanker or tank barge. It is the large spill — over 100,000 gallons — that could most seriously impact the ecology and economy of Hawaii, and thus we focused on the prevention and response preparedness for such an incident.

In observing an oil transport and spill response system for a few weeks, it is clearly impossible to provide a detailed evaluation. Our focus, thus, became one of forming a general impression of the system and paying attention to symptoms of problems that might pre-dispose the system to failure. The product of our observations — this report — is intended simply to be a constructive guide for the state in improving the safety of the oil transport system in Hawaii.

We simultaneously used three methods of data and information gathering for this project. The first consisted of numerous interviews with individuals responsible for some aspects of oil spill prevention and response. These included federal, state, and local governmental officials, petroleum industry personnel, and maritime industry personnel.

The second involved both planned and opportunistic observations of facilities, equipment, and operations at various sites. This included observations at both offshore moorings off Barbers Point, Barbers Point Harbor, Honolulu Harbor, Kahului Harbor, and offshore observations of inter-island barges.

The third involved a review of relevant documents. These included the State of Hawaii's oil spill contingency plan, the Coast Guard's area contingency plan, official and unofficial reports on past spills, and a host of other documents. Where relevant, these are referenced in the body of the report.

Can Spills Occur in Hawaii?

In the closing of his book *Tankers Full of Trouble*, Eric Nalder (1994) relates a brief conversation with a seasoned tanker crewman as follows:

> "He says it doesn't much matter whether you build ships with double hulls, put in more steel, stick on double propellers, and install 'all kinds of other good stuff.' It doesn't matter whether the sun is shining or the wind is blowing. The difference between an uneventful trip and a disaster is *attitude*. 'Our real enemy isn't the elements or anything like that. It's *complacency, indifference,* and *arrogance.*'"

We detected all three of these problems — complacency, indifference, and arrogance — among some government regulators, the public, and oil industry officials in Hawaii.

In fact, the predominant attitude toward spill prevention and response in Hawaii at present reminds us to some extent of the attitude that existed in Alaska prior to the disastrous *Exxon Valdez* spill in 1989. For instance, while discussing the possibility of a catastrophic spill with an oil industry official, the official stated that "*it's just never going to happen here.*" This view was echoed by an official with the Coast Guard who stated, "*there is just not a problem here.*" Another industry official pleaded that "*there is no need for more regulations.*" This was precisely the attitude of government, industry, and much of the public that led to the *Exxon Valdez* spill.

By way of background, Addendum 1 gives the case histories of five famous tanker disasters – *Torrey Canyon, Argo Merchant, Amoco Cadiz, Exxon Valdez,* and *Braer.* All of these disasters occurred in what had previously been thought of as relatively fail-safe systems. They all resulted from a cascade of relatively simple errors and/or equipment failure. They are, in a very real sense, symptomatic of the increasing tendency for certain complex technological systems whose failure can be caused quite easily by one or two very simple mistakes and can have enormous consequences – the Space Shuttle Challenger, Chernobyl, Bhopal, etc. Such disasters are usually considered to be aberrations.

A recent statistical projection of spill risk in Hawaii put the risk of an *Exxon Valdez*-size spill at once in 135 years (Lee 1992). Similarly, the pre-*Exxon Valdez* statistical risk of such a spill in Alaska was put at once in 241 years – it took only12 years.

The current Area Contingency Plan for the Captain of the Port (COTP) Hawaii Zones — Hawaiian Islands, American Samoa, Midway Island, Wake Island, Johnson Island, Howland Island, Baker Island, and Palmyra Atoll — states that "there have been no historical catastrophic discharges in the COTP Hawaii Zones since the Japanese attack on Pearl Harbor December 7, 1941." This is not true. On January 17, 1977, the *Irenes Challenge* lost 237,600 barrels of crude oil 50 miles north of Lisianski Island, and on February 25 the same year, the *Hawaiian Patriot* exploded and became a total loss with 715,000 barrels of crude oil 120 miles south of Necker Island (*Honolulu Advertiser*).

Other significant tanker casualties that could have resulted in catastrophic discharges include the following:

- *Austin* – grounding February 6, 1976 on approach to Honolulu Harbor after losing power, carrying 9.5 million gallons product on board – spilled only "a small amount."
- *Omni Yukon* – explosion and loss October 28, 1986 southeast of Midway after having just offloaded 550,000 barrels at Barbers Point three days before.
- *Exxon Houston* – grounding March 2, 1989, off Barbers Point when it broke from the SPM during heavy weather. While it only spilled 16,800 gallons of crude from the damaged SPM hose and 8,400 gallons of fuel from a ruptured fuel tank, it easily could have lost its remaining cargo.
- *Star Connecticut* – grounding November 6, 1990, one mile off Barbers Point Light loaded with 250,000 barrels of product. The vessel was refloated without spilling any of its cargo.

A more detailed history of spills in Hawaii is included in the Response Preparedness section.

The *Irenes Challenge* and the *Hawaiian Patriot* caused major spills. The *Austin,* the *Omni Yukon,* the *Exxon Houston,* and the *Star Connecticut* could have easily caused major spills also. Within the past 20 years, there have been at least six serious tanker casualties in Hawaii resulting in two major spills and four very close calls. Clearly, estimates that this will occur "once in 135 years" are not only worthless, they also contribute to complacency by creating a very false sense of security.

Many of the people we spoke with in Hawaii told us they felt the oil transport system was presently as safe as it needs to be. This is an understandable attitude among people who have never directly experienced a major spill.

In reviewing the system, we agree that substantial progress has been made by industry/government since 1989. Safety conditions at the Barbers Point Marine Terminal (BPMT) have been improved, tankers now avoid the Kaiwi Channel, and there is more spill response equipment available. Both the *Exxon Houston* incident in Hawaii and the catastrophic *Exxon Valdez* oil spill in Alaska served as a potent wake-up call for industry, government, and the public as to the potential magnitude of ecological, economic, and social upheaval that can result from a major spill. The Oil Pollution Act of 1990 (OPA 90), particularly its liability provisions, has been an obvious motivation to improve safety. However, as is typical after technological and natural disasters, once the political outcry is quelled by some amount of reform, then government, industry, and "we, the people" often simply lose interest until the next occurrence. As we discuss in this report, significant problems still exist in the spill prevention and response preparedness system in Hawaii. It worries us a great deal that industry and

government seem far more interested in preserving the status quo than they do in dedicating the resources and vigilance necessary to continually improve the safety of the oil transport system.

We consider this an extremely dangerous attitude. As NUMAST (1993), the United Kingdom's Seafarer's Union said concerning the standards in today's shipping industry:

> "We cannot expect acceptable safety records when the industry is still governed by archaic rules and ways of thinking. As the 21st century approaches, it is time to shed these 19th century shackles."

In this spirit, we appreciate the State of Hawaii's request for an outside evaluation of the present system and we look forward to working with government, industry, and the public in improving it.

It should be acknowledged that there are several significant factors inherent to oil transport in Hawaii, relative to other oil ports, that could reduce the risk and impact of major marine spills. They include the following:

- The deep water, open ocean approach to Barbers Point Marine Terminal (BPMT) where most of the crude is delivered allows less chance of a navigational error leading to grounding
- The weather and sea conditions are generally moderate, with good visibility
- Shoreline extent and configuration and ocean current dynamics could reduce shoreline oiling. A large spill in Hawaii would probably encounter fewer miles of shoreline than a comparable spill, for instance, in Prince William Sound, Alaska, where the Gulf of Alaska coastal current vectors directly along and into several thousand miles of shoreline before spreading away from shore, or in other, more enclosed waterbodies, such as Puget Sound, San Francisco Bay, or Chesapeake Bay.
- Tidal variation is relatively small in Hawaii, (3.5 feet maximum) which could reduce the hydrostatic oil outflow in a grounding situation
- Warm air and sea temperatures and high solar insolation in tropical climates are much more conducive to oil degradation than in colder climates
- Some harbors (i.e., Barbers Point, Pearl, and Honolulu), have relatively narrow entrances that might make it easier to contain spills within them.

However, as is discussed below, the risk of a major spill in Hawaii is very real, its *probable* consequence would be catastrophic, and thus this risk *must* be treated seriously (see Pfund et. al. 1992).

PREVENTION

The Key to Environmental Protection

By looking into the case histories of major oil spills at sea, it can be concluded that in virtually all cases, once the oil is in the water, it is difficult, if not impossible, to

- contain
- recover
- clean shorelines effectively
- prevent injury to wildlife
- rehabilitate injured wildlife
- restore spill-injured ecosystems, or
- stabilize spill-injured social and economic systems

There has been a dangerously false impression perpetrated that human technology can effectively respond to catastrophic oil spills. This has never occurred and perhaps never will. While it is clearly in the public interest to be as prepared as possible to respond to such events, prevention is the key to protecting ecosystems, economies, and society from the extraordinary damage possible in catastrophic spills. It is frustrating that while most discussions of oil spills correctly acknowledge the overriding importance of prevention, they then invariably proceed to devote the vast majority of the remaining discussion to response planning.

Likely Scenarios for Major Spills in Hawaii

The likely situations for major marine spills in Hawaii are as follows:

- **Collision** between a loaded tanker or tank barge with another vessel – cruise ship, cargo ship, naval vessel, another tanker, fishing vessel
- **Grounding** of a disabled (power/steering failure) fully laden tanker en route to Barbers Point Marine Terminal, carried by wind and current onto the south or west shore of Oahu, or the south or east shore of Kauai
- **Grounding** of a disabled "Vessel of Innocent Passage" while transiting the Hawaiian Islands
- **Grounding** of tank barge either en route to or on approach to inter-island harbors, caused either by navigational error, power/steering failure, or losing tow
- **Human error, mechanical failure, or weather-induced casualty** while bunkering offshore or within Honolulu Harbor
- **Grounding** of product tanker on approach to Barbers Point Harbor or Honolulu Harbor
- **Grounding or collision** of container vessel (carrying up to one million gallons of fuel in double bottom) off south Oahu or on approach to Honolulu Harbor
- **Fire/explosion** of tanker or tank barge while loading/offloading, such as through an IGS failure
- **Grounding** of product tanker after anchor failure off Honolulu Harbor, drifting onto reef off Reef Runway
- **Rupture** of pipeline at BPMT or product pipeline to Honolulu Harbor or Barbers Point Harbor
- **Collision** between product tanker or tank barge with pier

Vessel Casualty Risk

U.S. Coast Guard Tanker Safety Study Group

After the *Exxon Valdez* spill in 1989, the U.S. Coast Guard convened the Tanker Safety Study Group to assess the principal factors that predispose tankers to casualty risk. Regarding the material/structural condition of tankers, the study group found the following factors to be significant: age, length, classification society, quality of surveys and inspections, operating routes, maintenance policies, and economic/scheduling pressures exerted by owners/charterers. Some salient conclusions of their study (U.S. Coast Guard 1989) are as follows:

Age – All other things being equal, the older a tanker is, the more likely it is to suffer a structural casualty. Over its years of service, a tanker is subjected to a variety of forces acting cumulatively to fatigue the steel hull, primarily corrosion and bending and flexing of its hull at sea and while loading and off-loading cargo. Worldwide, more than three-fourths of all tanker accidents involve ships over 15 years of age (Numast 1993). However, TransAlaska Pipeline Service (TAPS) tankers were found to have three times more failures in vessels built since the mid 70s, which is when classification societies began reducing the thickness of steel, or "scantlings," used in tankers constructed with high tensile steel. Because of the oversupply of world shipping tonnage, its consequent depression of charter markets, and the escalating cost of new construction, there is increasing incentive to extend the service of existing vessels beyond their designed life expectancy. Proper maintenance is critical to ensure structural adequacy of these older vessels.

Flag, Classification Society – Vessels not classed by one of the recognized societies (International Association of Classification Societies - IACS) such as DNV, NKK, ABS, Lloyd's, and flagged in an open registry nation, should be viewed with more caution.

Length, Economic Pressures – An analysis of TransAlaska Pipeline System (TAPS) tankers found that vessels in the 700–900 foot range have more reported structural failures than those of shorter length. And while this could be related to reduced scantlings used in these larger, younger ships, or to stresses caused by improper loading/unloading procedures, it was concluded to be more likely a result of the masters driving the ships too

hard, exceeding the design stress levels. These larger ships don't respond to seas in familiar ways (vibration, shuddering, pounding) that alert the master to the need to take corrective action — speed/heading change — to relieve the working or strain of the hull. And, even when a master detects the need to slow down, the scheduled ETA imposed by owners/charterers and threats of penalties for being late may contribute to masters maintaining maximum speed, vessels being driven too hard, and consequently, more structural failures.

Quality of Construction – It was concluded that the overall quality of workmanship in U.S. shipyards has declined dramatically during the last 20 years primarily because so few ships are built here. Stress fractures were found to result mostly from improper design, welding, fit-up, edge preparation, workmanship, discontinuities, and so forth.

Tanker Advisory Center – McKenzie Ratings

Another system that attempts to assess tanker casualty risk is Art McKenzie's (1995) at the Tanker Advisory Center in New York. The Tanker Advisory Center's annual *Guide for the Selection of Tankers*, now in its 13th year of publication, is designed to give tanker charterers, cargo owners, and insurers, information to assist them in selecting tankers over 10,000 DWT to minimize potential casualties. The rating system includes information on a vessel's casualty history, age, detentions, name and/or management changes, owner's total losses and oil spills, owner's length of time in ship owning, number of tankers owned by owner, fleet average rating, and time in lay-up. The general accuracy of the ratings as predictors of casualties is shown below:

TABLE 1. Casualties as % of Tanker Ratings at Start of Year

Year	5 - High	4-Very Good	3 - Good	2 - Fair	1 - Low	Average Overall	Total # of Casualties	Total # of Tankers
1994	6.8	5.7	6.3	10.7	15.3	7.9	270	3,428
1993	6.2	7.5	9.8	9.4	15.0	9.2	314	3,426
1992	5.9	8.0	10.1	13.1	28.2	11.6	396	3,422
1991	5.1	11.4	14.3	14.5	38.6	15.0	507	3,379
1990	7.5	11.6	12.9	19.0	40.5	16.4	541	3,305

Source: *1995 Guide for the Selection of Tankers*

The reason the total number of *reported* tanker casualties has declined is due primarily, says McKenzie, to the fact that "the Salvage Association, responding to owner's requests, has been reporting to Lloyd's fewer and fewer casualties in recent years" and recently the Association announced that they would no longer report casualties to Lloyd's. It does not, then, reflect an actual reduction in casualties.

Washington State Vessel Casualty Risk Matrix

Building upon the Tanker Safety Study Group findings and the Tanker Advisory Center's rating system, a general conceptual model for vessel casualty and spill risk was developed by the Washington State Office of Marine Safety (OMS) as a collaborative project with the National Ports and Waterways Institute, the George Washington University, Rensselaer Polytechnic University, Louisiana State University, and other maritime experts representing the Coast Guard, pilots, the shippers, towboat industry, and environmental groups (Herman 1995). As a backdrop to our discussion of risk in Hawaii, it should be helpful to provide a short summary, from Herman 1995, of the risk matrix that they developed and use in screening oil, cargo, and passenger vessels over 300 tons in Washington waters.

The OMS risk matrix consists of 11 statistically weighted risk elements. These elements were chosen by the experts as relevant indicators of risk. The elements were also chosen because the data required are available in maritime publications and existing databases.

1. Vessel Age

Vessel age is divided into three increments: 0–15 years, 16–25 years, and 25 years or older. Older ships are assigned higher weights. The 16–25 year increment coincides closely with protection and indemnity (P&I) club data indicating ships in the 15–20 year age range generally submit a disproportionate number of structural failure claims. Beyond 15 years, even well maintained ships begin to suffer from metal fatigue and the cumulative effects of shear and bending stresses on the hull. Beyond 25 years an increasingly heavy maintenance burden increases risk.

2. Vessel Type

Vessel type is divided into six subcategories: (1) uninspected vessel, (2) tug with tank barge, (3) ferry, (4) tanker, (5) dry/log carrier, and (6) container. OMS regulates cargo and passenger vessels of 300 gross tons or greater, so most private yachts, small fishing boats, and other small craft are not represented in the vessel type category. According to expert opinion, uninspected vessels, which include fishing vessels, pose the greatest risk and accordingly receive the highest weighting. American flag fishing vessels are often uninspected and are exempt from pilotage.

Oil tankers receive the third highest risk weight due to the potential for a catastrophic spill. Bulk carriers, general cargo ships, and log carriers are allocated the fourth highest level of risk. P&I club data shows a relatively high percentage of structural failure and pollution claims for these vessels.

Container ships, car carriers, and roll-on/roll-off ships are in the lowest risk group. These ships tend to be more professionally operated, cleaner, and newer than other vessel types. Container ships and car carriers are in the business of transporting high value cargo and are almost always in the liner trade. These and other favorable factors contribute to a low risk weight.

3. Redundancy of Systems

Redundancy of mechanical, navigation, and electrical generation systems on board ships is divided into three subcategories: (1) no redundant system, (2) partial, and (3) total. Total redundancy receives the lowest risk weighting. To qualify for total redundancy, a ship must have twin screws, two independent sources of electrical generation, two steering systems, and two radars. With the exception of many passenger vessels, most vessels receive the partial redundancy risk weight due to being a single screw vessel. A vessel with no redundancy is rarely encountered and usually involves a ship with impairments.

4. Class Society

Class society has three subgroups: (1) International Association of Classification Societies (IACS), (2) IACS/ associate, and (3) non-IACS. A vessel which is classed by a classification society that belongs to IACS receives the lowest risk weight due to high standards required by IACS. Eleven classification societies are IACS members. Four classification societies hold IACS associate status, which receives the next highest risk weight. Classification societies that are neither IACS nor IACS associates are labeled "other" and receive the highest risk weight. Approximately 30 other classification societies worldwide fall in the "other" group. Unclassed vessels such as fishing and ferry boats receive the "other" risk weight as a default value.

5. Owner Type

Owner type lists four owner subcategories: (1) shipping companies, (2) operating companies, (3) governments, and (4) single ship owners. The experts concluded that a ship owned by a shipping company poses the least risk. Shipping companies are generally well organized and staffed by maritime professionals. A shipping company is in the primary business of owning and operating ships. An operating company may be a bank or other financial institution with limited expertise as a ship owner or operator and is considered a higher risk.

Ships owned by governments receive the second lowest risk weight. National governments tend to be strongly regulatory and generally conscientious in shipboard management practices. The highest risk weight accrues to

single ship owners. Single ship owners historically hire lower paid crews, spend less on maintenance, and rely on minimal shoreside staffing.

Determining ship ownership can be difficult. Vessel ownership is often heavily veiled for legal or financial reasons. Because ownership type is a valid risk indicator, increased access to ownership information would improve screening capability.

6. Pilotage

The matrix assigns zero risk weight to vessels with a pilot on board and very high risk weight to vessels with no pilot. U.S. flag vessels of less than 1,600 gross tons do not require a pilot in Washington State. The "no pilot" risk weight is the highest single risk value in the matrix. The experts clearly view presence of a pilot as a major marine safety factor.

7. Changes in Status

The following are viewed as significant risk factors: (1) changes in ownership, (2) changes in flag, and (3) changes in classification society. The highest risk weight in this category is assigned to vessels with a recent ownership change. Changes of ownership almost always imply risk. When a ship changes owner, an array of unknowns is introduced. Management practices change, new crews are often hired, and organization can falter. For similar reasons, a change of flag receives the second highest risk weight in the change category.

Changes of class receives slightly lower risk weight than change of flag. When a ship changes from a non-IACS classification society, like the Croatian Classification Society, to an IACS member like Det Norske Veritas (the Norwegian Classification Society) or the American Bureau of Shipping, the class upgrade is not considered a "change" and no values are assessed. A switch between two IACS classification societies is similarly not considered a change. Class changes which are valued include changes from an IACS or IACS associate member to a non-IACS class society, changes between two non-IACS members, and multiple changes in a short time period even if the ship ultimately is classed by IACS class society.

8. Flag

Flag has five subcategories: (1) U.S./Canadian flag, (2) traditional maritime, (3) flag of convenience, (4) new offshore, and (5) other. The experts assigned low risk weightings to U.S./Canadian flags and traditional maritime flags (Japan, United Kingdom, Norway, Sweden, Denmark, France, Germany, Italy, Netherlands, and Finland). The flags listed in the three other groups each received similar and higher risk weights. The remaining categories are traditional flags of convenience (Liberia, Panama, Malta, Bermuda, Bahamas, Cyprus, Singapore, and Hong Kong); new offshore registries (Vanuatu, Marshall Islands, Cayman Islands, Honduras, Isle of Mann, Netherlands Antilles, Madeira, and Gibraltar); and "other," which receives the highest risk weighting and includes all other flags.

9. Violation History

Violation history assigns weights to reportable marine violations: (1) no violation, (2) recent major violation, (3) recent minor violation, (4) repeated major violation, and (5) repeated minor violation. The highest risk weight is assigned to "repeated major violations" followed by "repeated minor violations" followed by "recent major violation" with the lowest risk assigned to "recent minor violation."

10. Vessel Casualty History

Vessel casualty history refers to marine casualties including collisions, groundings, fires, and other accidents that result in damage to the vessel. Matrix subcategories are the same as for violation history and rely largely upon Coast Guard definitions of major and minor events: (1) no casualty, (2) recent major vessel, (3) recent minor vessel, (4) repeated major vessel, and (5) repeated minor vessel. Other casualties include serious injuries and loss of life.

11. Key Personnel History

Key personnel history lists personnel violations of senior officers on board the vessel, including the master, chief mate, chief engineer, and first assistant engineer. Subcategories are the same as those found under violation history: (1) no violation or casualty, (2) recent minor personnel, (3) recent major personnel, (4) repeated minor personnel, and (5) repeated major personnel. This human factors information is second only to "no pilot" as a high valued risk score. The difficulty of accessing reliable key personnel history is the single most significant obstacle to effective vessel screening.

Hawaii Tanker Fleet Analysis

With this as background, we attempted to compile information that would have allowed a thorough understanding of the trends in the quality of vessels used to haul crude oil to Hawaii. We asked the two companies that import crude to Hawaii — BHP and Chevron — in letters dated December 12, 1994, to provide the following information on all vessels they used in Hawaii since January 1989:

1. Vessel name
2. Age and where built
3. Length, beam, cargo capacity
4. Hull design (i.e., double hull, double bottom, segregated ballast, etc.)
5. Classification society and changes
6. Most recent status of class report
7. Flag and changes in flag
8. Owner and operator
9. Complete casualty history, with detailed investigation reports
10. Pollution history
11. Crew complement, nationalities, any alcohol or drug violations
12. Ports-of-call of vessel
13. Maintenance schedule, major repairs completed
14. History of any deficiencies and violations found by class society, flag state, and/or port state (i.e., USCG) inspections/examinations
15. History of detentions and/or refusals to enter port in vessel's history
16. Any other information assessed in your vetting process that might give us a better idea of the structural integrity, crew competence, and safe navigation of these vessels in Hawaii
17. Any future plans you have for your Hawaii fleet

Of this requested information, we received only the names of vessels calling at BPMT in 1993 and 1994 from BHP, and in 1994 from Chevron. We also requested from the U.S. Coast Guard MSO Honolulu in a letter dated December 5, 1994, information on violations and deficiencies found during tank vessel inspections, suspension and revocation actions issued to crew, casualty investigation reports, pollution incidents, detentions, etc. over the past 10 years, but were unable to obtain the information without submitting a Freedom of Information Act Request to Coast Guard Headquarters, a lengthy and costly process.

To construct a general characterization of the Hawaii tanker fleet, we gathered information on those vessels that visited Barbers Point Marine Terminal in 1994 from the U.S. Coast Guard Marine Safety Information System (MSIS) through Marine Safety Office (MSO) Anchorage, the U.S. Coast Guard Port State Information Exchange (PSIX) through Prince William Sound Regional Citizens Advisory Council, Clarkson's Tanker Register (1994), and the American Bureau of Shipping Register both provided by Arco Marine in Anchorage, the Tanker Advisory Center Ratings provided by Art McKenzie (1995), and information provided directly by Teekay Shipping in Vancouver B.C.

The results of our tanker fleet analysis compiled in Figure 1 and Table 1 indicate that *the overall quality of the Hawaii tanker fleet is above world averages*. The Hawaii fleet is: generally newer than the world fleet average; are classed by one of the four most reputable IACS Classification Societies; are mostly operated by just two shipping companies (Chevron and Teekay Canada); have a higher percentage of double hulls than world average; and are rated substantially higher than world average in the McKenzie Ratings. This quality standard in the Hawaii fleet is almost certainly a recent — post OPA 90 — phenomenon, and probably results from owner/charterer concerns about OPA 90 liability provisions. The *owners/charterers deserve credit* for the quality of most of the vessels they are using in Hawaii. Commenting on his ratings of the list of vessels we provided him, Art McKenzie said, "They're doing a good job selecting vessels there." (Art McKenzie, pers. comm. 1995)

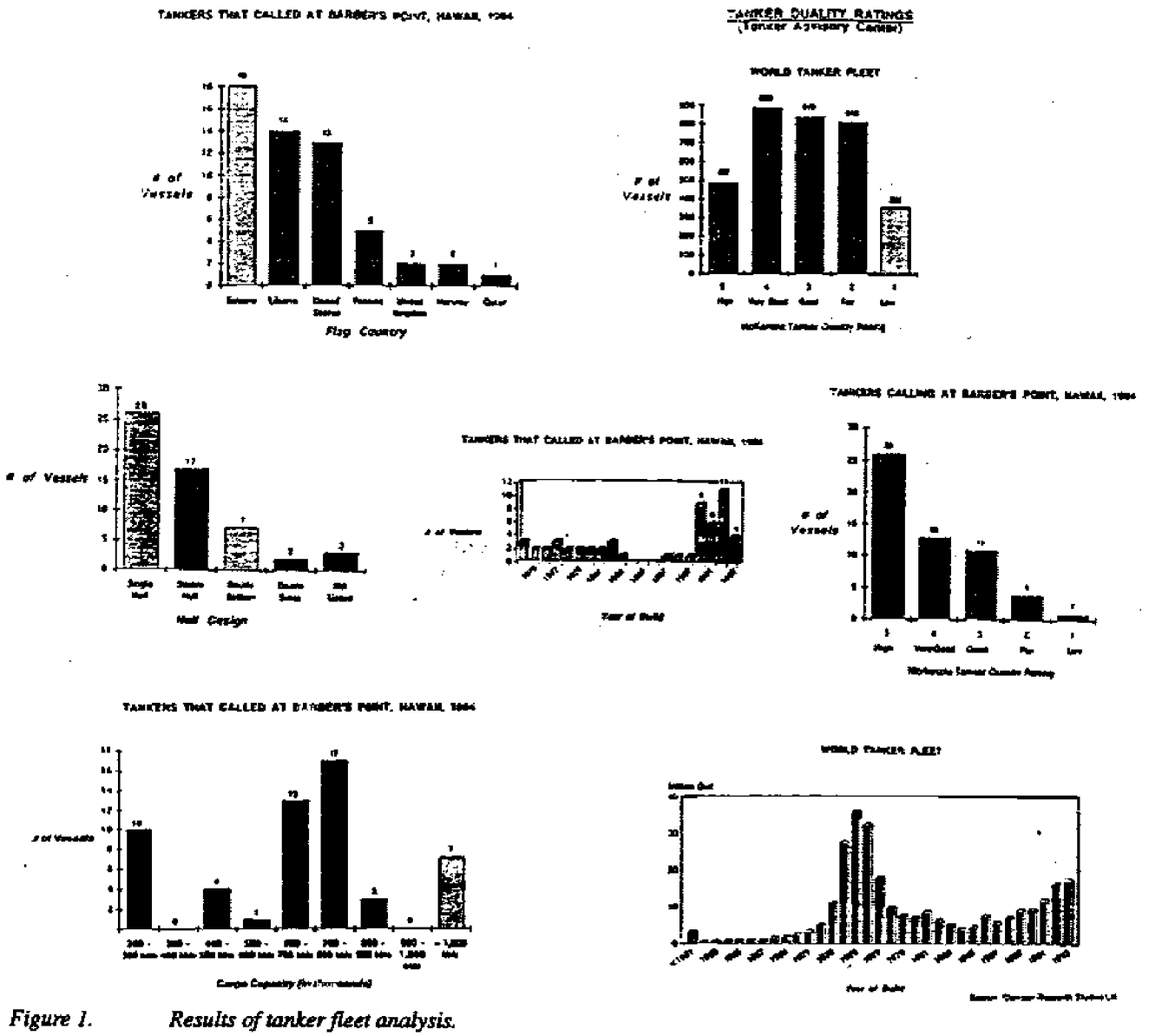

Figure 1. *Results of tanker fleet analysis.*

TABLE 1. Tanker Fleet Profile - Tankers That Called at Barber's Point, Hawaii, 1994

TANKER	FLAG	DWT	CARGO BBLS.	OWNER/OPERATOR	BUILDER	YR BUILT	LOA (FT.)	BEAM (FT)	DRAFT (FT.)	HULL TYPE	CLASS SOCIETY	# CENTER TANKS	# WING TANKS	# CARGO PUMPS	TOTAL PUMP CAP TONS/HR.	TONS BUNKERS
Alden W. Clausen	Lib.	35,588	270,000	Chevron Transport	Mitsubishi H.I.	1981	588	99	36	Single	ABS	9	6	6	4,600	1,877
Carla A. Hills	Lib.	35,597	270,000	Chevron Transport	Mitsubishi H.I.	1981	588	99	36	Single	ABS	9	6	6	4,600	1,877
Chevron Atlantic	Bah.	149,748	1,032,000	A/S Det Ostasiatiske	Mitsui S/B	1992	883	150	55	Double	DNV		12	3	11,810	3,931
Chevron California	US	71,340	447,000	Chevron/First Interstate Bank	Bethlehem S.B.	1972	810	105	43	Single	ABS	5	8	3	6,186	2,282
Chevron Colorado	US	39,842	264,000	Chevron/First Interstate Bank	Fmc Corp.	1976	651	96	37	Double	ABS		16	8	3,850	1,495
Chevron Mississippi	US	71,340	447,000	Chevron/First Interstate Bank	Bethlehem S.B.	1972	810	105	43	Single	ABS	5	8	3	6,186	2,282
Chevron Oregon	US	39,847	264,000	Chevron/First Interstate Bank	Fmc Corp.	1975	651	96	37	Double	ABS		16	8	3,850	1,495
Chevron Pacific	Lib.	35,596	270,000	Chevron/First Interstate Bank	Mitsubishi H.I.	1983	588	99	36	Single	ABS	9	6	6	4,600	1,877
Chevron Washington	US	39,796	264,000	Chevron/First Interstate Bank	Fmc Corp.	1976	651	96	37	Double	ABS		16	8	3,850	1,495
Chiba Spirit	Bah.	60,875	445,000	Chiba Spirit Inc./Teekay/Canada	Mitsui S.B.	1980	664	124	38	D/Bottom	NKK	5	10	2	2,500	2,175
Frontier Spirit	Lib.	114,201	781,000	VSSI Sun Inc./Teekay/Canada	Hyundai H.I.	1987	803	140	48	Single	Lloyd's			3	3,000	2,743
Hawaiian Express	Pan.	29,998	277,000	Asatank Int. S.A./Thome	Minami Nippon	1990	548	89	33	Single	NKK	5	5			
Hawaiian Prince	Pan.	97,078	700,000*	Seto Bride		1992										
J. Dennis Bonney	Lib	155,103	1,094,000	Chevron Transport	I.H.I. Brasil	1991	901	164	55	Single	ABS	5	6	3	12,573	4,811
John Young	Lib.	155,547	1,094,000	Chevron Transport	I.H.I.	1990	901	164	55	Single	ABS	5	6	3	10,316	4,638
Kenai	US	125,089	843,000	Keystone	Sun SB&DD	1979	869	136	55	D/Bottom	ABS	7	6	3	12,060	5,397
Kenneth E. Hill	Bah.	81,274	604,000	Chevron Transport	Mitsubishi H.I.	1979	763	144	39	Single	ABS	4	6	3	6,000	5,336
Kenneth T. Derr	Bah.	35,588	270,000	Chevron Transport	Mitsubishi H.I.	1982	588	99	36	Single	ABS	9	6	6	4,600	1,877
Keystone Canyon	US	125,000	1,189,000	The Connecticut Bank/Keystone	Avondale SY	1978	856	173	47	D/Bottom	ABS	5	6	3	15,000	5,322
Kyushu Spirit	Bah.	94,700	704,000	Kyuchi Spirit, Inc./Teekay/Canada	Mitsubishi H.I.	1991	764	137	45	D/Sides	NKK	7	-	3	2,500	2,230
Leyte Spirit	Bah.	98,744	739,000	Pampas Corp./Teekay/Canada	Onomichi	1992	803	135	47	Double	NKK	8	-	3	2,700	2,700
London Pride	UK	149,686	1,030,000	London&O/Seas Frt	Mitsui S.B.	1993		150	54	Double	Lloyd's					
London Spirit	UK	62,097	415,000	London&O/Seas Frt	Mitsui S.B.	1982	717	105	42	Single	Lloyd's	5	6	3	5,900	3,725
Mayon Spirit	Bah.	98,508	748,000	VSSI Appian/Teekay/Canada	Onomichi	1992	803	135	47	Double	NKK			3		
Minas Leo	Pan.	41,476	280,000*	Teamwork Universal	Imabari S.B.	1992		98	38		NKK			4	3,740	
Onozo Spirit	Bah.	98,466	731,000	Flora Tankers, Inc./Teekay/Canada	Onomichi	1990	803	135	47	Single	NKK	5	4	3	8,120	2,432
Overseas Chicago	US	92,091	667,000	1st Shipmor	National Steel	1977	894	105	49	D/Bottom	ABS	6	12	2	6,870	5,994
Overseas Juneau	US	122,409	535,000	Juneau Tanker Corp.	Bethlehem S.B.	1973	883	138	51		ABS	5	10			
Overseas New York	US	91,844	667,000	3rd Shipmor	National Steel	1977	894	105	49	D/Bottom	ABS	6	12	2	6,870	5,994
Overseas Ohio	US	92,017	667,000	2nd Shipmor	National Steel	1977	894	105	49	D/Bottom	ABS	6	12	2	6,870	5,994
Pacific Wave	Pan.	93,942	680,000*	Perennial Transport/Asahi Tanker	Namura Zosensho	1992	137	66	44	D/Sides	NKK					
Palmstar Lotus	Bah.	100,000	755,000	Volar Spirit, Inc./Teekay/Canada	Onomichi	1991	803	135	47	Double	NKK	5	4	3	2,700	2,697
Palmstar Orchid	Bah.	97,500	762,000	Paolownia Ship/Teekay/Canada	Onomichi	1989	803	135	46	Single		5	4	3	2,700	2,388
Palmstar Poppy	Bah.	100,031	762,000	Flora Tankers/Teekay/Canada	Onomichi	1990	803	135	47	Single	NKK	5	4	3	8,120	2,509
Palmstar Rose	Bah.	100,202	730,000	Noisette Ship/Teekay/Canada	Onomichi	1990	803	135	47	Single	NKK	5	4	3	2,700	2,240
Palmstar Thistle	Bah.	100,202	762,000	Noisette Ship/Teekay/Canada	Onomichi	1991	803	135	47	Single	NKK	5	4	3	2,700	2,509
Pioneer Spirit	Lib.	104,984	781,000	VSSI Star, Inc./Teekay/Canada	Hyundai H.I.	1988	801	140	48	Single	Lloyd's	5	4	3	3,000	2,500
Prince William Sound	US	125,925	852,000	Shipco 66, Inc.7/Keystone	Sun SB&DD	1975	869	136	55	Double	ABS	12	6	3	11,924	5,500
SKS Banner	Nor.	96,027	700,000*	Scanobo Banner Ship/Westfleet	Hyundai H.I.	1992	797	124	47	Double	DNV			10	8,267	
Samar Spirit	Bah.	97,295	739,000	Bell Flower Corp/Teekay/Canada	Onomichi	1992	803	135	47	Double	NKK	8	-	3	3,000	2,500
Samuel Ginn	Lib.	156,835	1,094,000	Chevron Transport	I.H.I.	1993	901	164	56	Double	ABS	14		3	10,500	4,433
Samuel H. Annacost	Bah.	35,607	270,000	Chevron Transport	Mitsubishi H.I.	1982	588	99	36	Single	ABS	9	6	6	4,600	1,877
Seafalcon	Lib.	97,114	660,000	Transfuel Ltd/Valles SS	Koyo Dock KK	1991	810	137	44	Single	NKK	8		4	7,382	2,987
Seamaster	Lib.	101,138	669,000	Marion Ship Ltd/Valles SS	Namura Zosensho	1990	793	137	46	Single	NKK	5	4	3	7,382	2,517
Sebarok Spirit	Lib.	95,700	680,000	Sebarok Spirit, Inc./Teekay/Canada	Imabari S.B.	1993	809	137	42	Double	NKK	10	-	3	2,500	3,144
Shilla Spirit	Lib.	104,994	793,000	VSSI Tokyo, Inc./Teekay/Canada	Hyundai H.I.	1990	801	137	51	Single	Lloyd's	5	4	3	3,000	2,721
Tagasan	Pan.	81,220	648,000	Mitsui O.SK. Lines	Oshu SB Co.	1980	797	137	39	Single	NKK	4	8	3	7,811	4,102
Teekay Spirit	Bah.	100,000	762,000	Shouten Spirit, Inc./Teekay/Canada	Onomichi	1991	803	135	47	Double	NKK	5	4	3	2,700	2,697
Tonsina	US	124,751	843,000	The Connecticut Bank/Keystone	Sun SB&DD	1978	869	136	55	D/Bottom	ABS	7	6	3	12,060	5,367
Torinita	Nor.	108,683	712,000	Torinita Ship, Ltd./Ugland	Tsuneishi Zosen	1992	800	138	49	Double	DNV	7		3	7,382	2,798
Ulsan Spirit	Lib.	105,000	793,000	VSSI Ulsan, Ltd./Teekay/Canada	Hyundai H.I.	1990	801	140	48	Single	Lloyd's	5	4	3	3,000	2,639
UMM Said	Qatar	91,500	697,000	AMPTC	Imabari S.B.	1990	810	139	42	Single		8		3	7,382	3,170
Vancouver Spirit	Bah.	103,203	777,000	Vancouver Spirit/Teekay/Canada	Hyundai H.I.	1992	799	137	48	Double	DNV	7	-	3	3,000	3,396
Victoria Spirit	Bah.	104,995	777,000	Elcano Spirit/Teekay/Canada	Hyundai H.I.	1993	799	137	48	Double	DNV	7	-	3	3,000	3,396
William E. Crain	Lib.	155,127	1,145,000	Chevron Transport	I.H.I.Brasil	1992	901	164	55	Single	ABS	5	6	3	12,573	4,724

(*estimate)

That being acknowledged, it cannot be concluded that the quality of the Hawaii fleet is as high as it should be. Our results point to several risk factors. Of the 55 vessels that called at Barbers Point in 1994, most are flagged by Flag of Convenience countries, most are in the size range of 700'–900' that the Coast Guard's Tanker Safety Study Group found to have more reported structural failures than other sized vessels, most are single hulled, five are rated below average by McKenzie's rating system, 16 are 15 years old or older, and many appear to be owned by single vessel companies and banks. Additionally, we were constrained by lack of adequate information to independently assess the quality of the fleet. Lastly, it must be remembered that this analysis pertains just to the tanker fleet in the Barbers Point trade. We made no attempt to identify and/or assess the general quality of other large vessels, particularly cargo vessels or oil tankers that are "vessels of innocent passage" through more remote island waters.

The most important limitation in concluding much from this information concerning casualty/spill risk is that all these analyses capture only a few easily quantifiable aspects of spill risk. The most poignant example of this is that the *Exxon Valdez* was considered to be one of the lowest risk vessels in the world. At the time of its grounding, the *Exxon Valdez* was only three years old, built by a reputable shipyard, owned by a large shipping company with a long history in the business, had no history of casualties or other violations, had state-of-the-art electronics, was flagged in the U.S. and classed by ABS, was under VTS surveillance, had never changed ownership or status, and had the highest McKenzie Rating. It was, in essence, the "Star of the Fleet."

Casualty History for Lower Rated Vessels

The following is some limited casualty history information for some of the lower rated (McKenzie Ratings) tankers in the Hawaii trade as reported in the Coast Guard's Port State Information Exchange (PSIX). It is by no means a complete casualty history. For instance, the *Prince William Sound* lost engine power in Prince William Sound in 1977 and drifted in a gale for 16 hours with over 850,000 barrels of crude on board. Tugs were unable to take the disabled vessel in tow because of the weather, and it is only because the tanker regained her own engine power within minutes of grounding that Alaska's first catastrophic spill did not occur then. That this important incident is not reflected on this casualty list is indicative of the limited utility of such presently available casualty databases. It is interesting to note that all of the below average tankers calling at BPMT are those that are also in the Alaska (TAPS) trade and thus U.S. flagged. Also, three of the four vessels owned by Keystone Shipping in the Hawaii trade are rated below average. This company has a very low overall McKenzie rating for its fleet – 1.3 (Nalder 1994).

Chevron Mississippi McKenzie Rating 3

2/73 Boiler trouble, return port, San Francisco, no details
1/74 Bad weather Gulf of Alaska, three dead
10/91 Casualty, equipment failure
1/92 Casualty, equipment failure
5/92 Casualty, equipment failure
11/92 Casualty, minor pollution
4/93 Casualty, structural failure

Overseas New York McKenzie Rating 2

9/88 Hit dock while berthing, Long Beach, one skin plate damaged, repaired Tampa, FL
12/88 Hit bottom ladened, Mississippi River, repaired Tampa Bay
2/89 Hit bottom Sabine River, two plates and propeller damaged
1/90 Bad weather damage, repaired Tampa Bay
8/90 Hit bottom Mississippi River, repaired Tampa, FL 11/91
12/90 Sustained heavy weather damage while on voyage from Valdez, surveyed and repaired in Tampa, FL 11/91
11/91 Main Engine, high and low turbine, damage repaired Tampa, FL

Overseas Ohio McKenzie Rating 2

4/78 Hit lock Panama Canal which damaged lock
1/92 Grounded Sabine Pass, TX, 10 hours, refloated with assistance, ladened, no damage or spill reported
7/92 Main engine high pressure and low pressure turbines and generator turbine damaged, repaired Tampa, FL
1/94 Struck ice approximately five miles west of Bligh Island, escorted to Valdez, tear in hull secured, bow ruptured and ballast tank holed, repaired Portland, OR

Prince William Sound McKenzie Rating 2

4/77 Collision with bulk carrier "Ariana" while lightering in outer harbor at Alexandria, due to swell prevailing and rolling ships together, other ship damaged.
5/86 Engine room flooded due to valve misfunction in the cooling system, towed to Los Angeles, damage $3,000, repaired in Portland, OR
10/86 Main engine reduction gears damaged in Willamette River, damage $1,000,000
1/88 Tank cracks, repaired Victoria
5/93 Collision with tug "Hunter" while being escorted, San Francisco, CA

Tonsina McKenzie Rating 2

10/87 Collision with tanker "Jussara" while on voyage to Chiriqui Grande, 1 skin plate damaged, $26,000
11/91 Bottom fractures repaired Portland, OR

Kenai McKenzie Rating 2

10/88 Generator rotor and bearings damaged, repaired Tampa, FL 4/89
12/88 Sustained damage to No. 2 after turbo alternator off Chiriqui Grande
5/89 Stern tube bearing damage requiring replacement
6/89 Main engine high pressure turbine rotor damage on trials, towed back and repaired Tampa, FL
10/92 Sustained steering gear trouble in the Valdez Narrows, pushed back on course by "Sea Voyager" and proceeded to safe anchorage in Prince William Sound where repairs were made

Keystone Canyon McKenzie Rating 1

7/88 Rudder stock and bearings damage, reported from Portland, OR
12/90 Surveyed afloat and on dry dock at Portland, OR in respect of shell plate fracture, repaired.
4/91 Propeller damage while on voyage from Valdez to Los Angeles, diverted to Anacortes for discharge, repairs in Portland, OR.
6/92 Caught fire while under repairs at Swan Island, Portland, OR, repaired
6/93 Put in Portland, OR for 24 days for repairs, tank fractures.
10/94 Struck bridge and grounded at Astoria, OR after breaking moorings in heavy weather, sustained 4' gash, 15–20 feet above the water line and a 3' fracture below the water line in No. 2 cargo hold. Water ingress pumped out. Refloated and repaired.

Overseas Chicago McKenzie Rating 3

2/87 Sustained main switchboard damage at Tampa, FL while changing over from ship to shore power, minor explosion and fire, extinguished by crew, repaired.
12/91 Heavy weather damage while on voyage from Valdez to Long Beach, damage repaired Portland, OR 4/92

Overseas Juneau McKenzie Rating 3

2/84 Rudder damage found at San Pedro, damage $20,000
8/89 Rudder arrangement damage found in drydock at Portland, OR

Crews and Human Factors

"All is Not Well on the Crewing Front" (NUMAST 1993)

Without question, the single most important factor in the prevention of large oil spills in Hawaii is the competency, vigilance, and alertness of the crews operating tankers, tank barges, and other large vessels. Although it was impossible within the scope of our evaluation to characterize the adequacy of these crews, some general observations can be made.

The U.S. Coast Guard Tanker Safety Study Group identified the most significant factors adversely affecting the operational safety of oil tankers. As human factors have been found to contribute to 90% of all groundings and collisions and about 75% of all fires and explosions, the Study Group reaffirmed the conventional wisdom in the merchant marine community that "the primary emphasis in preventing marine casualties should be on improving the ability of human beings to function effectively in the shipboard environment" (U.S. Coast Guard 1989).

The study group found that errors in ship control and operation resulting from human factors include the following:

- poor decision making due to lack of experience, practical skill, or procedural competence
- inaccurate use of radar and collision avoidance systems
- improper weighting or disregard of important information or unpredictable elements
- lack of adequate bridge information systems
- unfamiliarity with equipment
- ineffective or inadequate bridge system warning signals
- inadequate number of watchstanding personnel
- inadequate navigation charts and publications
- information overload, distractions, and confusion
- failure to make use of VHF-FM radio to confirm passing agreements
- faulty position keeping
- physical impairment, including drug and alcohol abuse
- inattention to duty
- inaccurate prediction of another vessel's action
- misunderstood or improper execution of orders
- excessive risk taking due to technological advances and management profit pressures

Errors resulting from human factors occur not only with the bridge crew, but also with the engine room and deck crews. Not examined by the TSSG, but consistent with its findings, is an extensive body of research on human performance in stressful/boring situations, such as that on the bridge of an oil tanker. Sleep deficit can cause irritability, impaired reasoning during complex decision making, over-confidence, attention lapses resulting in errors of omission (such as forgetting that the ship is on autopilot), and overall reduction in situational awareness. Adding to this, the other stressors in the shipboard environment such as noise, vibration, temperature and humidity extremes, heavy seas, boredom from low workload, and erratic performance during high workload periods. As a result, attention, vigilance, and performance all suffer. Mistakes made in reading charts, taking position fixes, reading intentions of other vessels, operating the autopilot, trimming a ship during loading or unloading, inerting the cargo holds, operating cargo valves, connecting loading/offloading arms, monitoring mooring lines, and tank cleaning, all could have and have had disastrous consequences.

To a real extent, all of this is symptomatic of a technological society in which we have built and become dependent upon automated systems that were designed for fairly simple operation by humans, provided no mistakes are made – 747s, nuclear plants, chemical plants, oil tankers. The problem, of course, is that humans

make mistakes, and when a mistake is made in operating one of these relatively new human-machine systems, enormous consequences can ensue.

Human Factors

In interviews concerning human factors with 40 members of the Alaska maritime community — tanker masters, chief engineers, chief mates, other deck and engine crew, company management, pilots, escort vessel personnel, etc. — Grabowski and Sanquist (1994) identified nine significant human factor concerns. Because each of these factors is important in assessing oil spill risk, a brief summary of the concerns expressed by mariners in the interviews follows:

1. **Personnel Skills, Resources, and Certification** – whether adequate crew resources were deployed on vessels, what manning levels, training, technical support, and certification would enhance safety
2. **Fatigue** – the impacts of seasonal variation in daylight, multiple time-zone crossings, and sleep disruption has on work patterns, and appropriate matching of skills/tasks to watch standing schedules
3. **Automation and Technology** – considerable concern about the utility and additional workload created by new technology – whether certain automated systems such as ECDIS, ADSS, automatic docking equipment, integrated bridge systems, and others actually enhance safety by reducing error-prone, repetitive tasks or place new and greater demands on crew that overload human abilities to process information
4. **Training** – concerns about the adequacy of training on automated systems (much of the training on new computer and automated systems is "on-the-job" while at sea), and desire for more team training for bridge resource management
5. **Changes in the Maritime Industry** – concern for the rapidity and direction of recent changes in the industry, new regulations and requirements, and the "brain-drain" as individuals leave for other employment and concern for migration of individuals within the industry and its effect on crew continuity, morale, decision making, etc.
6. **Individual and Organizational Behavior** – concerns about individual and organizational communication, information sharing, effective decision making, interfaces and interaction between ship management, officers, terminal operators, state and federal regulators, VTSs, escort vessels, pilots, the public, etc.
7. **Policies and Regulations** – concerns about overall system safety and system effectiveness – does increased regulation make the system safer?
8. **Facilities and Inland Marine Transport** – concerns about interfaces between terminals and vessels, about barge traffic safety, and about storage facilities
9. **Oil Spill Response** – interest in the contribution of aviation resources to spill exercises and response (i.e., decision making, communication, information sharing, and more user-friendly decision support systems)

NUMAST reports that "during the past two decades intense competition has dominated international shipping. Cost-cutting policies have produced the retrograde results of dramatically reduced seafarer training, cuts in crew numbers, increased use of flags of convenience, widespread use of low-cost seafarers from non-traditional maritime nations and severely curtailed investment programmes for new ships." In 1989, the Institute of London Underwriters (ILU) issued the following warning: "Manning levels, and the quality and skills of officers and crew need the most careful monitoring – particularly where flagging out has taken place." NUMAST goes on to say, "What is certain is that there is now a recognition within the international shipping industry that all is not well on the crewing front." In addition to language problems, the increasing use of mixed nationality crews (as in Hawaii) probably has psychological and social implications for safe vessel operation. The state should conduct a thorough analysis of crew competency in the Hawaii fleet and develop a crew monitoring and enhancement program.

Flags and Crews of Convenience

Most of the oil hauled to Hawaii is on flag of convenience vessels. A 1993 report by NUMAST, the U.K. Seafarer's Union, discusses the seriousness of the growing reliance on flag of convenience (i.e., open registry nations) vessels manned with crews of convenience for hauling oil in global trades.

Their analysis showed that of the 68 largest oil spills between 1967 and 1984, 66% involved flag of convenience or Greek registered tonnage. They reported that flags of convenience were among the fastest growing in the world. For instance, in the five-year period from 1987–92, Liberia grew by 7%, Panama by 15% (these two countries already flag about 1/3 of the world's tanker fleet), Cyprus by 30%, the Bahamas by 120%, and Malta by 487%.

Many of these flags bear little real relationship to the country ostensibly represented (the Liberian register is an incorporated company in New York) and St. Vincent, which has the world's worst safety record, some 40 times worse than the U.K.'s – operates from Geneva.

The advantage to "flagging out" a tanker for the owner/operator is obvious – daily operating costs can be cut in half or more. The problem, however, is equally obvious – as NUMAST states, many flags of convenience simply lack the resources to enforce standards, even the minimal IMO standards such as MARPOL and SOLAS. For instance, the Bahamas, the predominant flag flown by Hawaii tankers, had, in 1991, 973 ships on its register, but only 15 full-time surveyors (op. cit.). Both the Panama and Bahamas registers have over twice the average casualty rate of U.S. vessels historically.

Likewise, most flags of convenience vessels employ multi-national "crews of convenience," which have been proven to be a contributory factor in a number of shipping disasters.

As the human element is found to be a contributing factor in 80% of all accidents at sea and 90% in collisions and groundings (NUMAST), it should be instructive to hear what the officers of vessels have to say about crew competence. The following are extracts of comments received by NUMAST during December 1992 and January 1993 from British officers on foreign flag ships. We should expect similar conditions on ships hauling oil to Hawaii.

1. "Foreign crews and officers often eager to please – will answer 'Yes' to any question. Particularly misleading when answering to 'do you understand;' when they don't have a clue." (Chief Engineer on Liberian flag container ship)
2. "Chinese, Korean, and Filipino ratings say they understand but do not" (Chief Engineer, Liberian flag tanker.
3. "Inability to operate basic safety equipment is now very common amongst new crew joining." (2nd Engineer, Bahamian flag tanker)
4. "Filipino officers and ratings when under pressure converse between themselves in Filipino, which makes my position as Master difficult."

   "I have to handle all routine ship avoidance myself, due to navigating officer's lack of understanding of collision regulations."

   "Collision avoidance rules are ignored by other vessels around the UK, resulting in 'near miss' situations." (Master, Bahamian flag tanker)
5. "Crew say that they understand instructions and then go and do the opposite!"

   "Reduced manning = increased workload. This means spreading yourself more thinly to keep the job going." (Master, NIS, flag chemical tanker)
6. "We have Filipino seamen – fewer of which seem to be comfortable with English. Since losing our British crew, general standards of seamanship have definitely deteriorated. Some Filipino crew have no idea of their duties, even to the extent of being unable to steer." (2nd Officer, Hong Kong flag tanker)

7. "My last ship had seven nationalities on ship at the same time – not a good idea" (Master, Liberian flag bulk carrier.
8. "The difference in national certification between countries is glaringly obvious at times. Serving on a tanker which is sailing on minimum manning means that we are stretched at the best of times." (ETO, Bermuda flag tanker)
9. "Reduced manning has occurred on all vessels in my experience. This coupled with long hours at very low pay results in a great deal of 'Let's take a chance'" (1st Engineer, Liberian flag tanker)
10. "General misunderstandings occur frequently. Lack of basic training (of Filipino crew) necessitates checking all aspects of work carried out on every occasion...lack of basic training of third world officers and crews who now make up a significant proportion of seafarers." (Master, Liberian flag container ship)
11. "Telephone conversations are impossible with both officers and crew, because you need to see their facial expression to know whether they understand. We have Polish junior officers who have no basic safety training, cannot read or understand statutory notices. Practical skills in firefighting are inadequate. We are receiving staff who cannot steer and officers who have little or no prior safety training who would turn a serious incident into a fatality." (Chief Engineer, Bahamian flag tanker)
12. "I returned to sea in 1991 after 10 years away and was very shocked by the standard of foreign crews compared to British crews." (Engineer, Bahamian tanker)
13. "Reductions in manning coupled with 'cheaper' staff is escalating the chances of a catastrophe." (Master, Panamanian flag tanker)
14. "The English of the Polish crew is very poor...would seem that Filipino and Polish certificates are of poor quality."(Master, Maltese flag tanker)
15. "Many Filipino officers and ratings have very poor command of English; they have to be given orders via another crew member. Filipino officers have been supplied without even the basic watchkeeping training." (Engineer, Bahamian flag vessel)
16. "Shipowners must adopt an improved recruitment and training scheme and stick with officers/ crew from one country rather than mixed officers. This will give a better cohesion, trust, and understanding." (Engineer, Bahamian flag tanker)
17. "The most frequent problem being officers and ratings who state that they understand orders or instructions and do not. They then proceed to do the wrong thing at the wrong time and place." (Master, Liberian flag tanker)
18. "The standard of English of agency-supplied Indian and Filipino crews is so poor that orders 'passed down' lose sense." (Chief Engineer, Hong Kong flag vessel)
19. "Polish officers and Filipino crew may be satisfactory in English language for routine matters, but rapidly revert to native tongue when excited or stressed (i.e., in emergencies)." (Master, Bermudan flag tanker)
20. "Communications with Polish crew is a problem. The Filipino officers often have the correct paper qualifications, but little idea of what they are doing. I have come across Filipino officers with no idea of the regulations for prevention of collisions at sea." (Master, Liberian flag tanker)
21. "Inability of junior officers to comprehend routine instructions given in plain simple English." (Master, Liberian tankers)

In the two tanker boardings we participated in at BPMT, we observed problems consistent with the ship officer recitations above – primarily communication barriers of multi-national crews and inability to operate certain emergency equipment such as the back-up generator and back-up steering gear. This is a very serious concern.

Vessel Inspection and Vetting

An important means of identifying potential safety problems on oil tankers is their periodic inspection conducted by Classification Societies, Shipping Company Vetting Departments, and the U.S. Coast Guard Marine Inspection Program.

Classification Societies

Classification societies, such as ABS, DNV, NKK, and Lloyd's, establish criteria for the design, construction, and inspection of ships. The Coast Guard's Tanker Safety Study group found that, while IACS members do "a reasonable job," the societies are paid by and working for the vessel owner and are in competition with each other to attract more vessels. Thus, their surveys should not be relied on by government. The U.S. Coast Guard concluded that "generally, classification societies are overrated." Indeed, even the American Bureau of Shipping (ABS) inspections can fail to detect significant safety problems. As Eric Nalder (1994) reports, "London insurers recently sent their own inspectors to check some questionable tankers and found that only six of the first 28 were safe, although [ABS] classification society inspectors had stamped all of them okay."

Ship Company Vetting

Both BHP and Chevron have vetting procedures that establish minimum standards that tankers must meet in order to be considered for charter. BHP provided us with general information on their vetting procedures. They currently employ seven dedicated inspectors conducting vetting of tankships – three in Singapore, two in Australia, and two on the U.S. West Coast.

For the Hawaii trade, BHP transport officers conduct riding inspections (although we were not told how often) to assess shipboard operational procedures and equipment operation. Their vetting standards include the following:

1. Condition of equipment/structure and operational procedures must comply with certain IMO conventions.
2. If vessel is not classed by an IACS member or is over 15 years old, express approval by the General Group Manager must be obtained.
3. Vessel must have a drug and alcohol policy in place consistent with Oil Companies International Marine Forum (OCIMF) 1990 policy.

The vetting inspection includes an itemized checklist for the Designated Screening Officer to examine, including the following elements:

1. **General Ship Particulars** – name, owner, hull type, manager/operator, flag, age, class society, date and reason for last dry dock, date of next special survey
2. **Certification, Documentation and Information** – Certificate of Registry, SOLAS, Loadline, MARPOL, COFR, TOVALOP, and other USCG and international documents
3. **Crew Management** – minimum manning certificate, common language among officers, qualifications of senior officers – years in company, years of tanker experience, endorsements and certificates held - training, non-company employees, and source of their certificates
4. **Safety Management** – smoking regulations, emergency procedure displays, fire control plan, lighting, ear and eye protection, pump room ventilation, toxic gas indicators, etc.
5. **Pollution Prevention** – oil discharge monitoring and control system for ballast and slops discharge, cargo/ballast/crude oil washing plan agreed between ship and shore, spill contingency plan, sea valves/overboard valves sealed/locked/marked, antipollution notices posted, free of leakages, scuppers plugged, visual condition of cargo/bunker piping satisfactory, containment under cargo manifold, garbage and sewage plan, etc.

6. **Lifesaving Equipment** – liferafts, lifebuoys and lights, signals, survival suits, resuscitation equipment, gangways and pilot ladders in good shape, etc.
7. **Firefighting Equipment** – fire mains, pumps, hoses, nozzles all operational, deck foam system, portable extinguishers, breathing apparatus sets, alarms, vent fire flaps, fan stops, etc.
8. **Cargo/Ballast System** – pipeline diagrams in cargo control room, pumps, stability information (particularly for double-hull vessels), cargo pump controls, alarms, and trips, pumproom bilge alarm, manifold backpressure gauge, valves, unauthorized interconnections between cargo/ballast/bunker system, high level alarms, stress finders, cargo record maintenance, ballast inspection procedures, etc.
9. **Inert Gas System** – operational condition of system, logs, instrumentation, alarms, trips, pressure and oxygen content indicators, tanks maintained at positive pressure, oxygen analyzer calibration, isolation of tanks from I.G. main overpressure prevention in event of failure of shore system, I.G. emergency policies
10. **Crude Oil Washing System** – crude oil washing checklist, plan, pressure testing, portable oxygen testing prior to crude oil washing, line pressure gauges, records maintenance
11. **Mooring Equipment and Practices** – procedures, ropes and wires, deck winches and windlasses, brakes, fairleads and rollers, anchor and cables, anchor cable stoppers, emergency towing wires, bow chain stoppers, bitter end secured, etc.
12. **Bridge Equipment and Procedures** – navigational equipment including compass, radar plotting, ARPA, Loran C, Sat/Nav, echosounder, rudderangle indicator, rate-of-turn indicators, charts, radios, logs, auto/manual steering changeover and emergency steering procedures posted
13. **Radio Equipment** – equipment operational, aerials, telex, weatherfax, emergency transmitters, redundancy, maintenance
14. **Engine Room and Steering Gear** – main and auxiliary machinery, alarms, duty cycles, electrical diagrams, engine room emergency stops/shutoffs, boiler operation, emergency escape routes, bilge alarms, emergency generator, hydraulic line integrity, emergency steering gear tested, engine room-to-bridge communications, rudder angle indicator at emergency steering station, etc.
15. **Loading Items** – load lines correctly marked, deck openings watertight, portholes and windows, vests and airpipes on freeboard deck, guardrails, sufficient scuppers/freeing ports on main deck.
16. **General Appearance** – general hull and deck condition, superstructure, engine room and pumproom clean, accommodations, cargo pipelines, food service and storage areas, hydraulic lines, overall cosmetic condition.

We were told by Chevron Shipping that their vetting procedures are at least comparable to BHP's. While such a vetting process appears thorough on paper, it was impossible to determine the actual extent to which the inspectors examine each aspect (i.e., how rigorous the actual inspections are). For instance, while we participated in a Coast Guard inspection of the product tanker *Minas Leo* at the BHP single point mooring, vessel officers had a very difficult time trying to start the emergency generator and getting the emergency steering gear to work. It took a couple of hours for the crew to accomplish each emergency procedure. In a real emergency situation, this could have been disastrous. Yet, the BHP vetting policy asserts that it certifies the operating condition of and ability of crew to operate both the emergency steering gear and the emergency generator. If this vessel was passed by a BHP vetting inspection, the company vetting inspection failed, and the problem was caught by the Coast Guard inspection at the SPM. Vetting inspections that fail to adequately detect potential problems might predispose a vessel to casualty risk.

Coast Guard Inspection

The Coast Guard MSO in Honolulu regularly inspects tank vessels. When an advanced notice of arrival of a tanker is received, MSO personnel review the vessel's history either through MSIS or the vessel's agent, and

determine its priority for boarding. The following are Coast Guard instructions to its personnel regarding Vessel Boarding Determinations (MSO Honolulu Instruction 16600.3, June 1991):

> "If a vessel is not high priority, it should not be boarded. A high priority vessel is a vessel targeted for a boarding under any of the following criteria:
>
> 1. foreign non-tankship (e.g., freight, container, or passenger ships), no PES examination for a period of 12 months;
> 2. tankship or oceangoing tank barge, no monitoring for a period of six months;
> 3. vessel carrying cargoes of particular hazard (COPH) listed in 33 CFR 126.10(d), no cargo monitoring for a period of three months;
> 4. vessel carrying certain bulk dangerous cargoes and packaged hazardous materials, no monitoring for a period of six months;
> 5. non-oceangoing tank barge, when the COTP designates the barge as high priority for reasons such as personnel or company safety and discrepancy records, transfers at infrequently used facilities, new operations, or adverse weather;
> 6. recent history (within two years) of pollution prevention dangerous cargo, navigation or vessel safety violations with no corrective actions indicated by the MSIS, the vessel's agent, or the previous MSO;
> 7. recent history (within two years) of cargo related accidents (oil spills or leaking hazardous material containers); or
> 8. a situation at any facility or any vessel or other factors such as personnel or company safety and discrepancy records, transfers at infrequently used facilities, new operations, or adverse weather, which cause the COTP extra concern for the safety of the vessel or facility or the transfer operation."

The Tank Vessel Examination typically consists of the following elements:

- bridge equipment, charts, pubs
- main deck walk around
- main and emergency fire pumps (1 hose fwd, 1 hose aft, water through foam monitor)
- emergency cargo shutdown
- pumproom
- steering gear (local control P/S pump, low level in hydraulic tank, emergency control, power failure)
- sewage treatment plant
- oily water separator
- ventilation shutdown for engine room
- emergency generator
- FO valve shutdown in engine room
- fire safety outfits and equipment
- hospital
- galley
- crew accommodations
- oil transfer procedures
- flame screens on deck
- portable oxygen meters, portable combustible gas meter

- paint locker
- lifeboats and liferafts – last servicing
- IGS shutdowns and alarms, oxygen analyzer (high oxygen alarm, low inert gas pressure, low water to scrubber alarm and shutdown, low water to deck seal alarm and shutdown)
- portable hoses – last tested
- cargo piping – last tested
- international shore connection
- last foam analysis
- last fixed and portable firefighting service (Halon, CO_2, dry chemical)
- vessel diagram
- fire control plan
- vessel survey report, last drydocking, last tank entry
- cargo gear certificates
- Marpol V requirements – waste disposal plan, placards, incinerator

A more detailed review of the Tank Vessel Exam is included as Addendum 2.

Adequacy of Inspection

Perhaps the most significant finding of the Coast Guard's Tanker Safety Study Group was that "increased vessel size, sophisticated automation systems, quick in-port turn-arounds, and limited Coast Guard inspection resources create formidable problems impacting the Coast Guard's ability to reasonably ensure that U.S. ports are not exposed to a high degree of risk from tank vessel operations." One inspector said: "To put it bluntly, the job being done is barely adequate and not anywhere near as good as it should be." The Coast Guard's tanker inspection program was described as "a system in overload." Inspection adequacy was found to have decreased dangerously since 1982. Problems identified in the tanker inspection program include the following:

- internal inspection of large tanks is virtually impossible, particularly the upper sections
- excessive workload on inspectors
- too little time to conduct adequate inspections, caused by extremely tight schedules desired by owners/operators
- high turnover in field offices
- inadequate training of inspectors
- poor morale of inspectors, low interest in tanker inspection as an attractive career path
- inspector ship-riding programs are inadequate to evaluate the automation systems on board

With regard to foreign vessels, such as the majority of the Hawaii tanker fleet, the Study Group found that hull structural examinations done are "at best minimal." One of the main reasons of course is the sheer magnitude of the task. For instance, statistics provided by Exxon (*Large Oil Tanker Structural Survey Experience* 1982) indicate that to thoroughly inspect a 250,000 DWT tanker, an inspector would have to accomplish the following:

- vertical height to climb – 35,000 ft.
- tank section area to inspect – 74 acres
- total length of welding – 750 miles (240 miles hand-weld)
- total length of longitudinal stiffeners – 36 miles
- flat bottom area – 2.6 acres

The Study Group also found casualty investigations to be inadequate, due primarily to an insufficient number of trained investigators with seagoing experience. This makes it extremely difficult to assess culpability and to assess human factors contributing to casualties.

MSIS - The Marine Safety Information System (MSIS) used by the Coast Guard to maintain information on tank vessels was concluded by the TSSG to be "user-unfriendly," to have increased the administrative burden on field personnel without any real benefit, and to have limited or no management capabilities. When we mentioned MSIS in Coast Guard MSO one afternoon, a passing Coast Guard official offered, in no uncertain terms, his profound displeasure with MSIS.

The TSSG recommended accessing Lloyd's Sea Data to provide a more reliable history of vessels, but now that the Salvage Association is no longer reporting casualties to Lloyd's (McKenzie 1995), obtaining reliable real-time vessel casualty information seems to be virtually impossible.

Considering the present and probable future budget climate in the U.S. Congress, it is probable that the Coast Guard's ability to inspect tank vessels will decline rather than improve. Indeed, the U.S. Coast Guard recently agreed to allow owners of U.S. flag vessels to hire American Bureau of Shipping inspections in lieu of Coast Guard inspection (NVIC 2-95).

We view the present situation with regard to vessel screening and inspection as inadequate and in immediate need of attention by the state. Industry inspections should not be relied on and the Coast Guard inspections are, by their own admission, inadequate. The State of Hawaii needs to develop a vessel casualty risk matrix similar to Washington's and initiate a rigorous system of vessel screening and inspection.

Vessel Traffic

One of the principal tools in minimizing vessel groundings and collisions is the implementation and vigilant operation of various Vessel Traffic Systems (VTS). OPA 90 required the Coast Guard to conduct a Port Needs (VTS Benefits) Study (1993). The study, conducted by the Volpe Transportation Systems Center in Cambridge, involved the following components:

1. defined 23 study zones nationwide;
2. analyzed historical vessel casualties;
3. forecasted avoidable future vessel casualties in each zone;
4. estimated avoidable consequences in terms of physical losses and dollar values;
5. estimated the cost of a state-of-the-art VTS design for each zone;
6. compared benefits and cost estimates for each zone; and,
7. analyzed effect of uncertainty in input variables on net benefits of a VTS

The Port Needs Study estimated potential VTS Benefits as the product of the following variables:

a. forecasted vessel transits x
b. probability of a vessel casualty x
c. VTS effectiveness x
d. probability of a consequence x
e. probability of consequence severity x
f. unit dollar value of the consequence

[(a) x (b) x (c) x (d) x (e) x (f) = estimated VTS benefits]

The study staff selected 23 zones for analysis based on consultation with Captains of the Port, Regional Offices, and headquarters personnel. Based largely on recommendations at the time from the Commanding Officer (CO), Honolulu MSO, the team chose NOT to study the vessel traffic situation in Hawaii. In his memo dated, 25 August 1989, the CO outlined his reasoning as to why a VTS, and thus a traffic study, was unnecessary in Hawaii:

1. Low frequency of major ship traffic off southern Oahu – estimated an average of approximately three large vessels (over 1,600 GRT) per day entering the waters between Barbers Point and Diamond Head.
2. Approaches to Honolulu Harbor and BPMT moorings are relatively simple by world port standards (i.e., no bends, blind areas, obstructions, etc.)
3. The area with the highest traffic — Honolulu Harbor — is sufficiently monitored by Aloha Tower.
4. No casualty history to suggest a VTS would have been helpful.
5. Fair weather most of the year; light winds, little fog, etc.
6. Capital costs of an effective VTS would be too high.

However, significant risk factors off south Oahu, that are itemized in general as VTS addressable by the Volpe Study, are the potential for open water collisions between vessels caused by simple miscalculations on the bridge, certain overtaking situations, and some casualties involving vessels at anchorage (Figure 2). Although the volume of large vessel traffic is still relatively low off Oahu, it is comparable to that in Prince William Sound, Alaska where the failure of the Coast Guard's VTS surveillance contributed to the grounding of the *Exxon Valdez*. At present, with comparable vessel traffic, PWS has one of the most sophisticated VTSs in the world, although after the fact!

The PWS VTS now employs, in addition to enhanced radar capability, an Automated Dependent Surveillance System (ADSS) allowing Coast Guard watchstanders to monitor vessel movements over a large area more precisely. This system, which is the first of its kind in the world, automatically transmits vessel GPS positions to the Coast Guard VTS in Valdez, and these positions are automatically plotted both at the VTS and back on the vessel. Also, the ADSS automatically polls the vessel's equipment using Digital Select Calling on VHF radio to verify its position. An array of alarms (audio and visual) alert watchstanders to potential problems – straying, dragging anchor, etc. And, the PWS VTS still relies on enhanced radar capability to confirm positions.

We believe that a thorough Vessel Traffic Pattern Analysis should be conducted for Hawaii, including for vessels of innocent passage, and it should recommend whether and what sort of vessel traffic system might enhance the safety of oil transport in Hawaii. As an interim measure, a traffic separation scheme and additional ATBAs should be considered for large vessels, and Aloha Tower should be enhanced with radar capability.

Tanker Navigation Safety Study

The U.S. Coast Guard is in the final stages of completing the most comprehensive analysis of Tanker Navigation Safety it has ever conducted (available September 1995). The study on tanker navigation safety standards, mandated by OPA 90 Sec. 4111, will include the following sections:

1. Appropriate crew size
2. Crew training and qualifications
3. Ability of crew members to take emergency action
4. Adequacy of navigational equipment and systems
5. Evaluate and test electronic means of position reporting and identification
6. Evaluate adequacy of navigation procedure under different operating conditions
7. Evaluate whether areas of navigable waters in EEZ should be designated tanker-free zones
8. Evaluate adequacy of inspection standards
9. Review of past studies
10. Evaluate the use of computer simulator courses to train bridge officers and pilots
11. Tanker fleet and oil spill analysis
12. Evaluate and test a program for remote alcohol testing

Results of this study should be thoroughly reviewed by the state as it applies to tanker safety in Hawaii.

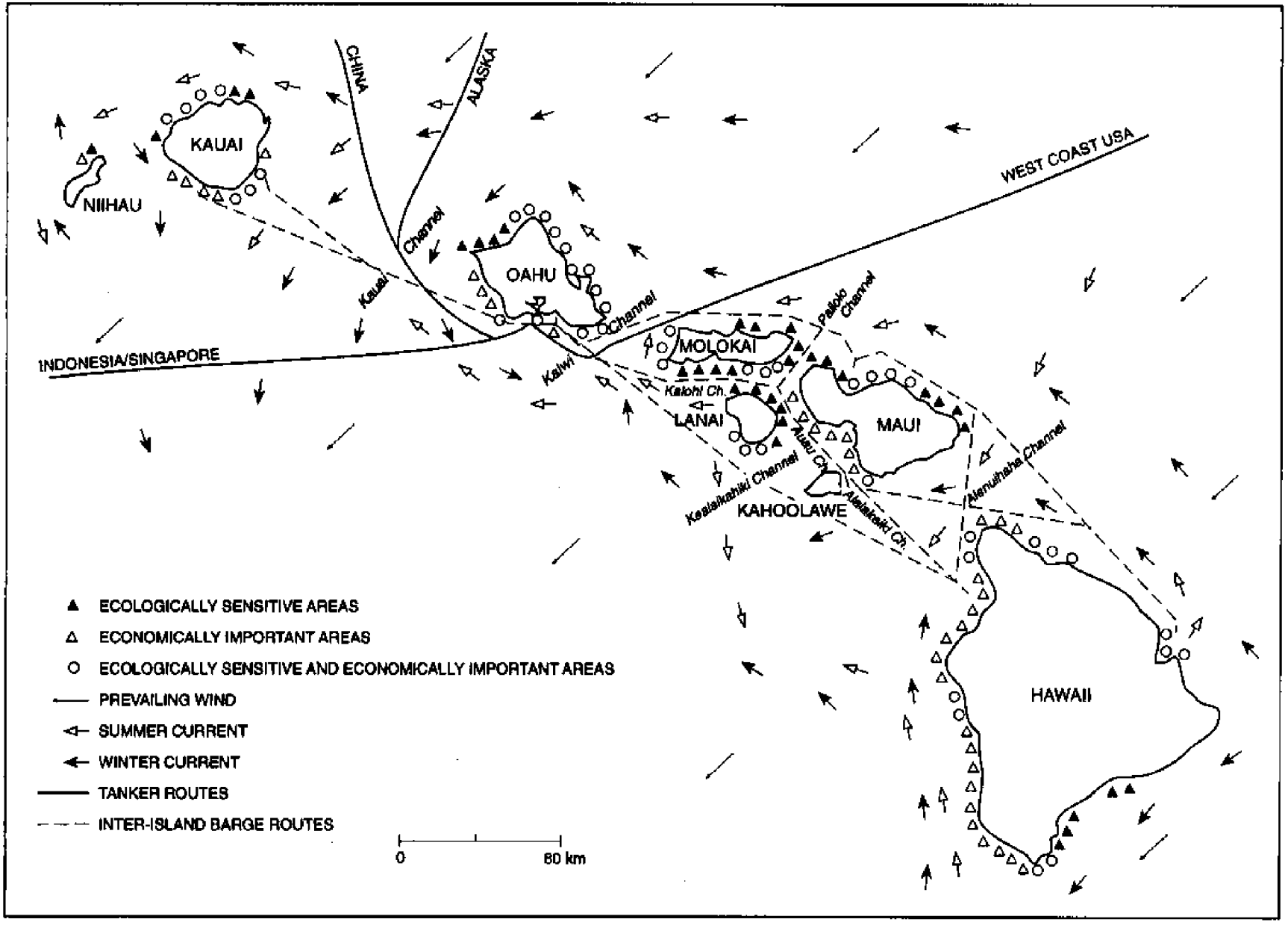

Figure 2. *Tanker and tank barge routes and harbors in Hawaii. (adapted from Pfund 1992)*

Offshore Marine Terminal

The four principal means of waterborne delivery of crude oil into the U.S. as reported in the Coast Guard's Deepwater Ports Study are as follows:

1. **Direct vessel deliveries** – by tankers small enough to enter port directly – generally less than 80,000 DWT to U.S. Atlantic and Gulf of Mexico posts, and up to 180,000 DWT to some Pacific ports.
2. **Offshore lightering** – from tankers too large to enter port onto small tankers or barges – mainly in Gulf of Mexico, some in Delaware Bay, and California.
3. **Deepwater ports** – offshore terminals in deep enough water for VLCCs ("very large crude carriers" over 200,000 DWT) and ULCCs ("ultra large crude carriers"). Pumps on the terminal platform pump the cargo ashore via seafloor pipeline. The only such port in the U.S. is the Louisiana Offshore Oil Platform (LOOP), 18 miles off the Louisiana coast.
4. **Offshore moorings** – moorings (such as BPMT) within 1–2 miles of shore that can accommodate tankers too large to enter local ports, but not VLCCs or ULCCs. The tanker's own cargo pumps transfer oil ashore via seafloor pipeline. There are about a dozen of these in the U.S., mostly in California and Hawaii.

Because of the volume of crude oil and product transferred at the offshore Marine Terminal at Barbers Point, its exposure to winds, seas, and currents, and its close proximity to shore and shallow depth, we consider the offshore terminal to be a significant risk for a major spill. Despite the well-intended precautions of vessel operators, tugs, and terminal operators, human error or mechanical failure could easily lead to disastrous consequences at the terminal.

The BHP single point mooring (SPM) (Figure 3) and the Chevron multi-point mooring (Figure 4) are only .8 miles apart (Figure 5). Despite its relatively sophisticated safety system, BHP terminal owners will give "no warranty, guarantee, or representation (express or implied) as to the safety or suitability of the terminal" (BHP Terminal Manual). Weather and sea conditions at the offshore mooring, while not severe by global standards, can indeed present a significant risk to mooring and transfer operations.

> "During winter months (October to March) storms with strong southerly winds (locally called Kona winds) may render the berth unusable.
>
> During these storms, heavy rainfall and cloudiness can be expected and visibility can be reduced by rain.
>
> During Kona storms, large swells build in short periods of time due to the unsheltered position of the mooring during these southerly storms.
>
> Other violent winds may occur with passing frontal systems but they are usually short-lived. These are more localized and can occur from either the north or the south with little warning."
>
> (BHP Terminal Manual)

Both BHP and Chevron have established green/yellow/red (go/caution/stop) weather conditions for operating at the offshore moorings. BHP's are as follows:

Green: Normal operations

- northerly wind less than 35 knots, seas less than 8 feet
- 25 knots wind, 8 foot sea from the south

Yellow: Weather deteriorating – tanker to begin securing operations and disconnecting hoses

- when winds exceed 35 knots from northerly vector and wave heights exceed 8 feet
- when winds exceed 25 knots from southerly vector directions and waves exceed 8 feet

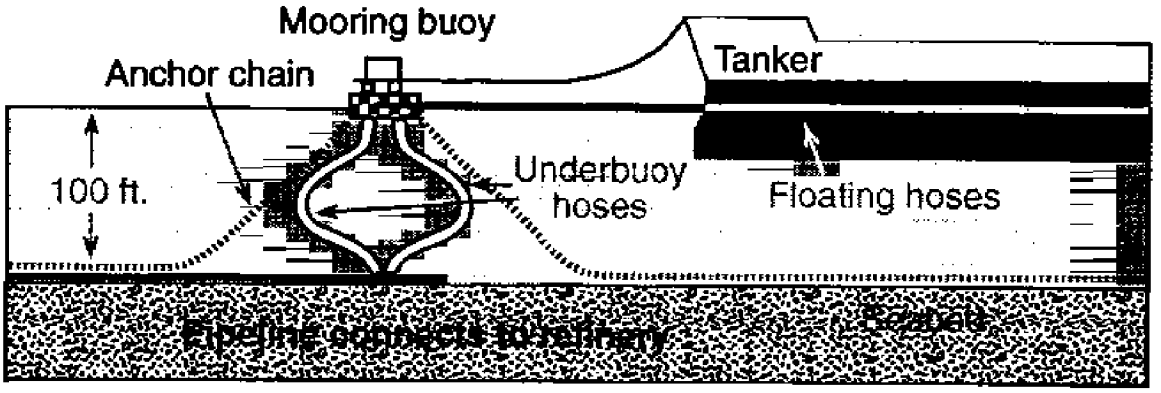

Figure 3. *BHP single point mooring. (Graphic courtesy of* The Honolulu Advertiser*)*

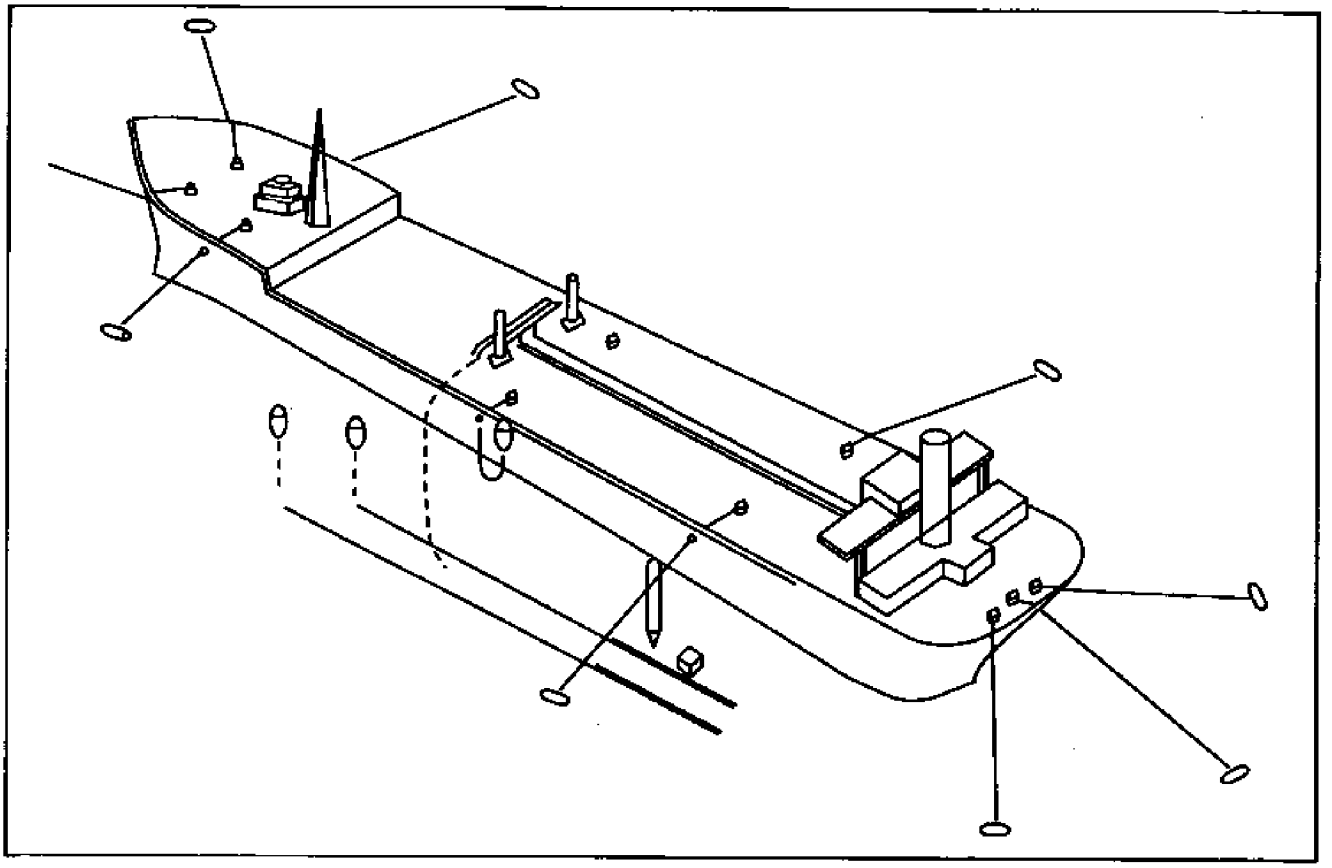

Figure 4. *Illustration of the Chevron multi-point mooring. (Graphic courtesy of Chevron Oil Company)*

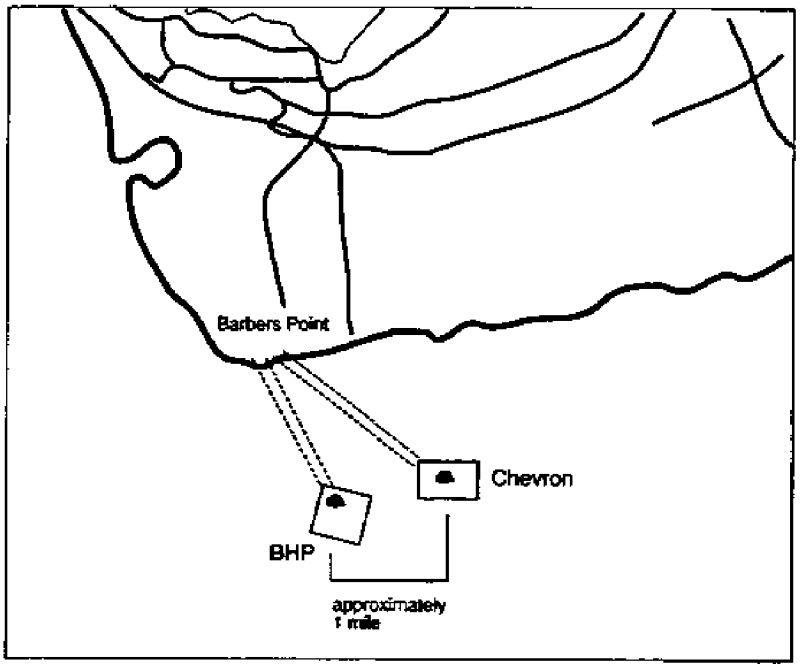

Figure 5. *Distance between the BHP single point mooring and the Chevron multi-point mooring.*

Red: Operations shall be secured and tanker will leave mooring

- when sustained winds from the north are 35 knots or greater and seas are 10 feet
- when southerly vector winds are 25 knots and seas 10 feet

Also, if the tension monitor on the SPM hawser indicates a strain over 70 tons, or the vessel yaws excessively about the buoy, the tanker must take immediate corrective action. Chevron has established slightly lower wind tolerances for their multi-point mooring, as their vessels are unable to swing with the wind and current. However, while we were aboard the *John Young* at Chevron's multi-point mooring, the winds periodically exceeded company tolerances and no effort was made to secure from offloading. There is an obvious need for enforcement of stop/go conditions at the terminal.

Other industry safety standards at the offshore mooring apply to the following:

- standards of acceptance for vessels
- pilotage
- anchoring conditions
- approach and mooring conditions – approach, mooring, hose connection, oil transfer, and hose disconnect procedures
- communications
- requirements for moored vessels – engines and crews on standby, bow lookout, etc.
- hose connections
- oil transfer operations – pre-transfer conference, verification of IGS operation, maximum discharge rate and pressure
- unmooring and departure – pre-departure conference, procedures, etc.
- safety – compliance with international (ISGOTT) protocols
- Declaration of Inspection
- Pollution Control
- Pollution Response preparedness
- Crude Oil Washing and IGS operation

Both BHP and Chevron present the appearance of adequately monitoring the safety of the offshore terminal, and it is certainly in their interest to do so. We question whether the State of Hawaii should accept industry assurances that the terminal is as safe as it can and should be; state oversight of the offshore marine terminal should be increased.

Disabled Vessel Assistance

We consider the potential loss of power or steering on tankers, tugs with fuel barges in tow, and cargo vessels as a very serious oil spill risk factor. As these vessels operate close to shore along some routes and in confined waterways on their approach to harbors, either the loss of their main engines or rudder or both could easily lead to grounding or collision and a catastrophic spill.

The ability to render immediate, effective assistance to disabled vessels is an important safeguard against vessel casualty and consequent environmental damage. Disabled tanker contingencies generally consist of either tug escorts, tugs on standby, or a combination of both. After the *Exxon Valdez* spill in Alaska, tug escorts for laden tankers were mandated in Prince William Sound (PWS) and in Puget Sound, Washington. These escorts have three primary responsibilities:

1. verify that the tankers remain in prescribed shipping lanes
2. render assistance in event of disabling – tow or push tanker away from grounding situation
3. provide immediate response in event of an oil spill

The Ship Escort and Response Vessel System (SERVS) in PWS provides an escort to every outbound tanker to the open ocean entrance by one Emergency Response Vessel and one tug.

In response to the concerns about the adequacy of these vessels to take control of a fully loaded tanker in certain failure scenarios, industry funded the PWS Disabled Tanker Towing Study (DTTS). The study was conducted in collaboration with the state, the Coast Guard, and the PWS Regional Citizen's Advisory Council and the PWS Tanker Association. Part I of the study — an evaluation of the existing tugs, emergency towing equipment and practices — was conducted by a senior salvage master with Smit Tak BV based in Rotterdam, widely regarded as the world's leading marine salvage company. Part II — an evaluation of various alternative equipment and deployments to improve the safety of the system — was conducted by the Glosten Associates in collaboration with the Marine Simulation Centre in the Netherlands. Through the study's rigorous analysis, computer modeling, and full-scale sea trials, the inadequacies in the current tug complement in PWS became evident. The study assessed various characteristics of the effectiveness of existing and potential alternative tug types as follows:

- force-producing capability of the propulsion system
- hydrodynamically induced forces on the hull and appendages
- stability of the tugs
- seakeeping qualities
- maneuvering characteristics
- point of application of the tug forces on the tanker
- time delays for positioning and line handling
- time delays associated with escort positions
- time delays associated with standby deployments
- deterioration in capability with increasing severity of weather
- expertise and alertness of the crew

No such analysis exists for Hawaii, and thus the adequacy of the existing tug fleet is unclear.

We strongly suspect that the existing tug capability is inadequate. We question whether the *Nunui* — the 185', 4,000 hp tug tethered astern to tankers at the SPM — would be capable of preventing another *Exxon Houston-*

type grounding in certain mooring failure or other disabling scenarios. Similarly, tugs involved in mooring at the multi-point offshore mooring are small line-handling tugs. An engine or rudder failure of a laden vessel approaching the buoy spread could easily lead to disaster. Clearly, tug capability needs to be enhanced at BPMT.

Of equal concern is the potential for grounding of a product tanker or inter-island tug/barge on approach to a harbor, such as the grounding of the 619' product tanker *Austin* on approach to Honolulu Harbor in February 1976. Additionally, there is concern over the disabling and grounding of "vessels of innocent passage" that are not bound for Hawaii, but simply routing through the islands, such as the *Braer* off Shetland in 1993. It is clear to us that a much more sophisticated system of disabled vessel contingencies needs to be developed in Hawaii. The tug fleet should be evaluated and upgraded to a Best Available Technology (BAT) Standard.

Tractor Tugs

A stern driven vessel is jeopardized when taking the bowline of a moving ship and is not as capable of controlling disabled vessels as certain other tugs (Edison Choest Offshore 1992). As an alternative to conventional tugs, with propulsion and steering aft, tractor tugs with propulsion and steering forward have been found to be far superior for ship handling because of their omni-directional propulsion. They are also safer (more stable) when tethered to a tanker (op. cit.). Such a vessel should be on standby at the offshore mooring whenever a laden tanker is within the pilotage area. A rescue vessel in harbor — Barbers Point, Pearl, Honolulu — is simply too far away to respond quickly enough to a casualty at Barbers Point Marine Terminal.

The standby rescue vessel should be of the Lindsay Foss class — Voith Schneider Propulsion (VSP), 7,600 hp - such as the two presently dedicated to tanker escort in Puget Sound. Other vessels that could be considered include a Z-drive (azimuthing propeller or "reverse tractor") tractor tug or a 22,000 ihp deep sea salvage tug. The emergency vessel should also be equipped with BAT firefighting capability (see Firefighting Capabilities section on page 44).

Protocols for responding to a tanker emergency at the offshore terminal need to be agreed upon and clearly established between tanker masters and the emergency vessel, and full-scale sea-trials should be conducted. Failure recognition time needs to be evaluated and minimized, particularly with regard to laden product tankers and cargo vessels in confined waterways such as harbor entrances. The DTTS found that a delay in rudder failure recognition of just 30 seconds may result in a significant turning moment of the vessel and a consequent grounding or collision. Tugs in escort of tank and cargo vessels transiting harbor entrances should probably be VSP tractor tugs.

Emergency Tow Packages

To expedite hookup in emergencies, all tankers and tank barges should be fitted with emergency tow packages on both bow and stern. For tankers, the PWS tow package constitutes an acceptable model. This consists of 400' 2-1/4 diameter XIPS grade wire rope, made fast to the tanker with a short section of chain as chafing protection, and fastened to a "Smit Bracket" on the foredeck. The tug end of the wire is a 2-1/4" D shackle. The package also consists of a messenger line assembly of 720 feet of 6" circumference polypropylene floating line and 30" buoy.

A similar package should be required on all tankers calling in Hawaii. They should be stored in a manner — such as on reels — that allows deployment within 15 minutes, without power, and with a crew of only two. Such systems now exist on Arco and Exxon vessels in the TAPS trade. In addition to rapid deployment, another advantage in this system over using just the tug's gear or the tanker's conventional mooring wires, is that connection can be made without compromising strength and thus the full power of the tug can be used.

Salvage

Hawaii is fortunate to have two ARS Class Salvage vessels - *USS Safeguard* and *USS Salvor* — based at Pearl Harbor. Another ARS class salvage vessel, the *USS Reclaimer*, was decommissioned in September 1994. These

ships are capable of rescue towing, salvage, and firefighting. However, we feel these vessels are underequipped for certain tanker towing scenarios and firefighting contingencies. For instance, these Navy salvage vessels are designed to exert approximately 62 tons Bollard pull, whereas true deep-sea salvage vessels can exert 168 tons Bollard pull, over 2-1/2 times as much.

Also, we were not provided with the scheduling of these vessels (i.e., the in-port time) and need to point out the potential for neither vessel to be available in the event of an emergency. The FOSC for the *Exxon Houston* incident suggested that a dedicated salvage vessel should be on standby for BPMT. With the amount of shipping into and through the Hawaiian Islands, an adequate salvage vessel should be available at all times. The naval vessels are most likely inadequate.

Further, the salvage posture in Hawaii needs to be thoroughly assessed. This assessment should include the following:

- Salvage assets available
- Deficiencies in salvage capabilities
- Compensation criteria and arrangements
- Salvage protocols for "vessels of innocent passage"
- Specific roles of U.S. Navy and Coast Guard, in relation to private sector
- Response time to disabled tankers in NW Hawaiian Islands
- Salvage readiness of vessel and crew (training/qualifications)
- Protocols for decisions as to whether intentional jettisoning of oil cargo to extract a grounded vessel would be authorized

Inter-Island Tug and Barge Transport

Another significant risk of major spills in Hawaii is from the inter-island barge transport of petroleum products. Inter-island product barges range in cargo capacity from 30,000–67,000 barrels (1.2–2.8 million gallons). Each year they carry approximately 153 million gallons of petroleum products — primarily gasoline, fuel oil, and jet fuel — to other island harbors (Kaunakakai, Port Allen, Nawiliwili, Kahului, Kawaihae, and Hilo) (Pfund 1992). We see the greatest risk for a major spill from one of these barges to be as follows:

1. **Collision with harbor breakwater** – caused by navigational error by towboat operator on harbor approach
2. **Collision** with other vessel – caused by navigational error by either vessel
3. **Grounding** – en route, caused by either navigational error or by towboat losing tow and not being able to regain it, due to adverse weather, equipment failure, etc.
4. **Grounding or Collision** – caused by towboat steering/propulsion failure
5. **Collision** with pier while mooring

Apparently there have been near collisions between tug/fuel barges and recreational vessels in the relatively narrow Kalohi, Auau, and Pailolo channels (Pfund 1992).

Alaska requires barge owner/operators to use double tow lines and bridles, to inspect towing equipment every two months, and to have a barge recovery plan for adverse weather to include a reliable means of snagging the tow bridle, buoyant trailing lines, or other measures as appropriate. Also, the States/B.C. Task Force recommends establishment of a mandatory set of guidelines for tow cable size and material specifications, cable maintenance and inspection, cable handling equipment specifications, and barge recovery plans.

The tugboats used to tow fuel barges are uninspected vessels; this increases the risk of structural/mechanical failure or navigational errors that could cause a large spill. The 1994 Coast Guard study "Review of Marine Safety Issues Related to Uninspected Towing Vessels" found, by analyzing towing vessel casualty statistics, that the majority were directly attributable to human error. The study made 19 recommendations concerning

improvements in licensing and qualifications, training, casualty reporting, obstruction fendering systems and lighting, adequacy of navigation equipment, and adequacy of aids to navigation for towboats. Based on these recommendations, the "Towing Safety Act" was introduced into Congress in 1993 to improve the safety of these uninspected towing vessels, but it died in committee. We recommend that Hawaii institute programs to improve the safety of its towboats.

RESPONSE PREPAREDNESS

What Happens When Prevention Does Not Work

We mentioned above that experience shows in almost all cases, once oil is spilled on the ocean, it is almost impossible to clean up. The truth of this has been so firmly established that the statement itself has become trite. Clearly, oil spill prevention is the key to protecting Hawaii from the effects of oil spills.

One of the best spill responses ever mounted in this country, the *American Trader* cleanup in Huntington Beach, California in 1990, saw just 25% of the spilled oil recovered. (Another 44% is estimated to have evaporated or been naturally dispersed into the water column.) That was a case when the weather cooperated, winds were calm, and extensive inventories of spill response equipment were immediately at hand. As we show in the following parts of this report, Hawaii is not likely to be as fortunate as Huntington Beach. But Hawaii can and must be prepared to mount a response to a major oil spill. Effective response can reduce or even minimize the effects of oil spills. Being prepared is the best antidote for failed prevention.

Spill History

According to the Coast Guard's 1993 contingency plan (covering the Hawaiian Islands, American Samoa, Midway, Wake, Johnson, Howland, Baker Islands, and Palmyra Atoll), there have been no catastrophic oil spills in the area since 1941 (FOSC Area Contingency Plan 1993). The plan then goes on to briefly describe four major incidents:

- the January 20, 1987, tank barge *Hana* spill between Oahu and Maui, in which an estimated 42,000 gallons was spilled
- the May 13, 1987, Chevron pipeline spill at Pearl Harbor in which 104,500 gallons of jet fuel was spilled
- the March 2, 1989, *Exxon Houston* spill at Barbers Point, in which about 25,000 gallons of crude oil was spilled
- the November 16, 1990, *Star Connecticut* grounding, also at Barbers Point, in which no oil was spilled

It then says a statistical analysis of Coast Guard data showed the average spill was about 200.72 gallons, and that due to skewing from 10 spills of more than 10,000 gallons, this figure is inflated (Area Contingency Plan 1993). It says the "actual daily working average" is between 25 and 100 gallons.

This sketchy spill history contains a major misstatement of fact and leaves out a great deal of spill information. Also, by minimizing the area's spill history, the plan tries to paint a picture showing there is little or nothing to be concerned about (i.e., that Hawaii really only gets little spills). In Hawaii, like almost everywhere else in the world, little spills do occur much more often than big or catastrophic spills. But it is the big spills, as unusual as they are, that threaten the islands' economy and environment.

In order to gain a more complete overview of Hawaii's spill history, we reviewed newspaper indices going back to 1975 and identified the following 26 spills as newsworthy enough to be reported in the Honolulu papers:

- March 7, 1975: Container ship *Hawaiian Legislature* spills about 400 gallons of fuel oil from a fuel line into Honolulu Harbor, when a crane broke the line (*Honolulu Advertiser* 3/3/75).

- October 28, 1975: Container ship *Lurline* (U.S.) hits Pier 40 in Honolulu Harbor while attempting to dock at Pier 51, breaking oil line that spilled about 400 gallons, and sinking moored 45-foot charter boat (*Honolulu Advertiser* 10/30/75).
- February 6, 1976: Tanker *Austin* grounds off entrance to Honolulu Harbor after losing power, spills "small amount" of aviation gas and bunker fuel; carrying 9,500,000 gallons of gasoline, oil, and other petrochemicals (*Honolulu Advertiser* 2/7/76).
- April 25, 1976: Mystery spill south of Oahu, linked to tanker seen traveling between Barbers Point and Diamond Head (*Honolulu Star-Bulletin* 5/3/76).
- May 5, 1976: Merchant ship *Edinburgh Clipper* spills 4,000 gallons of black fuel oil in Honolulu Harbor after a heating coil ruptures (*Honolulu Star-Bulletin* 5/5/76).
- September 17, 1976: Mystery spill sends tar balls onto beaches at Kauai (*Honolulu Advertiser* 9/18/76).
- January 17, 1977: Tanker *Irenes Challenge* (Liberia) breaks its back and sinks 200 miles southeast of Midway, spilling its load of 10.4 million gallons of crude oil (*Honolulu Advertiser* 1/18/77).
- February 24, 1977: Tanker *Hawaiian Patriot* (Liberia) explodes, burns, and sinks 370 miles west of Honolulu en route to Barbers Point with 30,000,000 gallons (715,000 barrels) of crude oil; hull had cracked and a large hole developed in the ship's side (*Honolulu Advertiser* 2/25/77).
- May 5, 1981: Tanker *Majestic Pride* (Liberia) leaked small amounts of light crude oil through hull crack or hole at anchor off reef runway while waiting to offload at Barbers Point (*Honolulu Advertiser* 5/5/81).
- May 2, 1984: Pipeline leak off Barbers Point puts 1,200 gallons into the ocean; slick washed up nine days later at Kauai (*Honolulu Advertiser* 5/12/84).
- October 29, 1984: Navy tanker *U.S.S. Roanoke* grounds off Honolulu's reef runway after losing steering while departing Pearl Harbor, spills 107,000 gallons of jet fuel through hole in tank, carrying 7 million gallons (175,000 barrels) (*Honolulu Advertiser* 10/30/84).
- November 23, 1984: Oil spill fouls beaches on east side of Kauai (*Honolulu Advertiser* 11/28/84).
- November 27, 1984: Pipeline break in Aiea spills 4,200 gallons of fuel oil into Waimalu Stream and Pearl Harbor (*Honolulu Star-Bulletin* 11/28/84).
- October 28, 1986: Tanker *Omi Yukon* explodes, burns, and sinks 1,000 miles west of Honolulu (300 miles southeast of Midway); four lives lost; had delivered 550,000 barrels of crude oil to Barbers Point three days before and was en route to a Korean shipyard for repairs (*Honolulu Advertiser* 10/30/86).
- January 20, 1987: Tanker barge *Hana*, en route from Oahu to Maui, spills 1,000 gallons of heavy fuel oil east of Oahu; oil washes ashore at Sea Life Park and Waimanalo (*Honolulu Advertiser* 1/22/87).
- July 6, 1987: Tanker spills 4,000 gallons at Barbers Point; oil spreads to Kauai (*Honolulu Advertiser* 7/8/87.
- October 27, 1987: Mystery spill; tar balls reported at Hanauma Bay, Waimanalo, Bellows Beach, and Diamond Head; possible link to passing tanker (*Honolulu Star-Bulletin* 10/27/87).
- March 2, 1989: Tanker *Exxon Houston* (U.S.) grounds at Barbers Point after breaking free SPM; two hoses broken; 90,000 barrels of crude oil (3.8 million gallons) on board (*Honolulu Advertiser* 3/3/89).
- March 25, 1989: Mystery spill off Molokai; slick six to eight miles long and one mile wide, tar balls reported coming ashore on Molokai and Lanai (*Honolulu Advertiser* 3/27/89).
- August 3, 1989: Mystery spill five miles off Maile Point on Oahu's west shore; less than 100 gallons of bunker or heavy crude oil (*Honolulu Advertiser* 8/4/89)

- January 29, 1990: Tanker *Texaco Connecticut* (U.S.) spills diesel oil at Barbers Point SPM through a 10-inch hole in its hull as winds and currents push it into the mooring (*Honolulu Advertiser* 2/14/90).
- June 9, 1990: Mystery spill coats beaches at Kona on Big Island (Honolulu Advertiser 6/10/90).
- March 22, 1991: Tug *Nahoa* grounds at Diamond Head and spills fuel oil (*Honolulu Star-Bulletin* 3/23/91).
- March 24, 1991: Barge spills 400 gallons of fuel oil at Barbers Point SPM due to overfilling tank (*Honolulu Advertiser* 3/25/91).
- June 14, 1991: Fishing vessel *Hui Feng No. 1* grounds at Palmyra Atoll, 1,000 nautical miles southwest of Honolulu, spills small amount of diesel fuel; 7,600 gallons offloaded to another vessel (*Honolulu Advertiser* 6/20/91).
- November 20, 1991: Tanker *Yupex* (Panama) spills "several thousand gallons" of diesel fuel into Honolulu Harbor at Pier 35 (*Honolulu Advertiser* 11/21/91).

Obviously, four of these spills occurred far from the main Hawaiian Islands. Two of them, involving the *Irenes Challenge* and the *Hui Feng No. 1* probably have little relevance for Hawaii. The other two, involving the *Omi Yukon* and the *Hawaiian Patriot*, are important because, in the former case, the ship had delivered oil to Barbers Point only three days before, and in the latter, because the ship was only one day away from delivering its cargo of crude oil to Barbers Point. The 1977 *Hawaiian Patriot* spill is particularly significant since it numbers among the 20 worst spills ever, anywhere in the world.

These spills demonstrate that Hawaii is not immune to large spills. In fact, some of these spills, most of which were not of such a size as to be called catastrophic, could have been much worse. Consider the following:

- The tanker *Austin* spilled only a small amount of oil when it grounded at the entrance to Honolulu Harbor. It was carrying over 9.5 million gallons of oil; the *Exxon Valdez* spilled something like 10.8 million gallons.
- The *Hawaiian Patriot* spill happened when the ship was just one day's sailing from Barbers Point. Had the explosion not occurred until several hours after it did, the 30 million gallon spill would have happened off Kauai or Oahu.
- The Navy tanker *U.S.S. Roanoke* grounded at the entrance to Pearl Harbor after losing steering while carrying seven million gallons of oil. Had conditions been worse, it could have lost much more than the 107,000 gallons it did lose.
- The *Exxon Houston* grounded near Barbers Point. Through a combination of hard work and luck, the ship did not break up and lose the remainder of the oil it was carrying. The Federal On-Scene Coordinator observed that "we were all fortunate that the T/V *Exxon Houston* did not lose the remaining 90,000 barrels [3.8 million gallons] of crude oil and 2,000 barrels [84,000 gallons] of Bunker C fuel oil."

Not only is Hawaii not immune to large spills, it may even attract them. Owing to geography, Hawaii, and more particularly Honolulu, is a port of refuge for ships in trouble. In our interviews and document reviews we learned of ships, bound elsewhere, experiencing all natures of problems and diverting to Hawaii to deal with them. These included ships with mechanical problems and at least one ship with an out-of-control fire on board. Thus, it is prudent for Hawaii to prepare as best it can to respond as effectively as it can to major and catastrophic oil spills.

Response Organization

Federal law establishes a rather complex structure for spill response organization, called the National Response System. At the planning stage, it starts with the National Response Team (NRT), and goes through the Regional Response Team (RRT) to the Area Committee. During a major spill response, the NRT and RRT may provide

advice and coordination, and the federal On-Scene Coordinator, state On-Scene Coordinator, and Responsible Party Incident Manager provide direction for the actual response.

The State of Hawaii has responsibilities during both the planning and response stages. Specifically, because of its responsibilities to its residents and to visitors, and because of its role as trustee for certain natural resources, the State of Hawaii should take an active role in oil spill response planning and operations. Our interviews, document reviews, and observations demonstrated that there is a widespread perception that the state has not been able to carry out some of these responsibilities as fully as could be desired. In particular, we repeatedly heard that the state could participate more fully in oil spill drills and actual responses to even relatively minor spills. Through the interactions that this type of involvement would create, better working relationships with the Coast Guard and industry could be established. Showing up at spills and drills is only one factor in the equation. Presently, the state is perceived as well-intentioned but unskilled in the nuances (and sometimes even the basics) of oil spills and oil spill response. The state will have to develop expertise in spill response operations in order to be a credible presence.

The state should provide the Department of Health's Office of Hazard Evaluation and Emergency Response (HEER) with the resources it needs to carry out its responsibilities effectively. Specifically, the state should provide HEER the financial resources needed to hire personnel with suitable training and experience in marine and coastal oil spill response operations. The HEER personnel should actively participate in all oil spill response planning efforts undertaken in the state. HEER should be represented on, and take a proactive role in the Area Committee established under OPA 90. In addition, HEER should be present at all oil spill response drills, either as a participant in appropriate cases, or as an observer. HEER, as the responsible state agency, should be integrated into any unified command structure established during drills, and, of course, during actual oil spill response. Finally, HEER should promulgate any needed regulations regarding oil spill response.

A key piece of the overall state effort in spill response preparedness will be the establishment of goals for the state's response activities. This would give specific basis and standard for any actions a state or local agency may wish to take. The goals should be incorporated into the state's contingency plan. In order for the state to get up to speed quickly, and in order to avoid the process of reinventing or simultaneously inventing the wheel that many states went through in the early 1990s, Hawaii should look to other states for expertise and experience in setting up its own response (and prevention) programs. One excellent source is the *States/British Columbia Oil Spill Task Force*.

In January 1989, the governor of Washington and the premier of British Columbia announced the formation of a joint oil spill task force. This was a response to the December 22, 1988 oil spill resulting from the collision of the tug *Ocean Service* with its tow, the tank barge *Nestucca*, while attempting to reattach a broken tow line in rough seas. The task force's first meeting was held on March 23, 1989. The next day, the *Exxon Valdez* spill occurred. This accident prompted interest in cooperative work on common oil spill issues among other Pacific ocean states. Oregon joined the task force in July of that year, followed the next month by Alaska and California in September.

The expanded task force was given the mandate to investigate ways and means of preventing oil spills, to review oil spill response capability, to document and assess the mechanisms for handling compensation claims, and to develop a coordinated contingency plan for preventing and responding to oil spills in the future. The task force has carried out numerous studies and prepared various technical reports relating to spill prevention and response. Importantly, the States/B.C. task force meets regularly and has excellent means for information exchange. Participation in the task force and its committees would give Hawaii an immediate base of experience and expertise upon which to draw.

State of Hawaii Oil and Hazardous Substances Emergency Response Plan

The State of Hawaii currently operates under the *Oil and Hazardous Substances Emergency Response Plan* (the state's oil spill contingency plan), which is a supplement to the state's overall emergency preparedness plan. The contingency plan, prepared in March of 1992, is a good basic plan that could be improved in certain ways.

For example, the state has oil spill response resources within its control that should be expressly acknowledged and listed within the context of the state's contingency plan. Moreover, the state has responsibilities for natural and economic resources within its jurisdiction. These important state interests may or may not be adequately represented by the Coast Guard, responsible parties, and other spill responders. The state is the trustee for certain ecologically sensitive areas. Ensuring their protection is the responsibility of the state. Additionally, the state's relationship with local governments make it the natural focus of local spill response efforts. All these areas should be fully addressed in the state's plan.

Specific areas that the plan should focus on include the following:

1. **A description of the state's goals for oil spill response.** This would cover such subjects as what the state wishes to accomplish via spill response (e.g., priorities for protection of specific economic and environmental resources), what level of involvement the state wishes to undertake (e.g., how deep to get in), what tools the state wishes to use or not use (e.g., the state's priorities regarding mechanical and non-mechanical open-water cleanup, specific shoreline cleanup techniques such as hot water wash or bioremediation). In essence, the goals are the policies that the state has established to drive spill response.
2. **Detailed descriptions of specific roles and responsibilities within the state's response for each state agency and local government agencies.** Existing state law gives authority to both the Department of Health and the Department of Defense's Civil Defense Division to carry out the state's responsibilities in oil spill response (see the report by D.K. Frankel, *Appendix Report 2: Oil Spill Prevention, Preparedness, and Response in Hawaii: The Legal Authorities and Responsibilities*). Other state agencies (and local governmental agencies) have statutory oil spill response duties as well.

   The existing organizational plan contains a matrix and brief description of the roles and responsibilities of various agencies. These duties should be more fully spelled out and organized functionally in the state's contingency plan so that there will be no confusion among the agencies as to what their roles are. This also will benefit others such as the Coast Guard and industry in that they will have a clear delineation of exactly what responsibilities are vested where. Additionally, the listing of duties should, where appropriate, describe what carrying out that duty entails.

   For example, the paramount function for state personnel during a spill response is that of the state On-Scene Coordinator (SOSC). This function is carried out by the Department of Health and has a host of actions that come along with it, including passing on the use of dispersants and in situ burning. These and the other actions should be spelled out.

   The initial definition of these duties might best be accomplished through a workshop or series of workshops involving representatives of all the relevant agencies. This will allow all the involved parties to hash out any disputes and to reach an expressed consensus through direct involvement and give and take.
3. **Response operations.** This should cover exactly what actions state and local agencies would take in a spill response. It should include containment and control to the extent that state and local agencies are charged with carrying out these actions.

   It also should contain a detailed description of internal communications (i.e., among state forces, perhaps via specified radio frequencies distinct from those used by federal and private response

organizations, via cellular telephone, via fax, etc.) as well as communications within the larger response effort. A good communications system and good communications procedures are essential to the success of a spill response. There must be a system that allows immediate reporting of decisions so that timely action may be taken, and there must be a means of providing timely feedback. Likewise, whatever system is established must be consistently and comprehensively used by all participants.

The same sort of detail should go into describing other functions including wildlife relocation and deterrence, disposal of oily debris and waste oil, temporary oil storage, and documentation and cost recovery. All of these should be addressed from the standpoint of the State of Hawaii's own goals for spill response activities. This then could be used as a basis for explicitly incorporating the state's priorities as necessary into the Coast Guard's area plan.

4. **Up-to-date listing of state and local government-owned response equipment.** The resources available to the state and local governments can spell the difference between disaster and success in a spill response. For example, in the *American Trader* spill, it was the local governments that first boomed off the river channels and small boat harbor entrances against the spilled oil.

   Particular attention should be given to identifying equipment that, while not necessarily appearing immediately applicable to spill response, could prove useful. For example, during the *American Trader* oil spill, the Huntington Beach Police Department regularly overflew the spill site in its helicopter equipped with an infrared-sensing video camera. This camera, intended to be used in such things as spotting fleeing suspects at night, was able to easily locate spilled oil during darkness. With this unit, the city was able to out-perform both NOAA and the Coast Guard on spill tracking (it also identified an incidence of surreptitious oil dumping from an offshore oil platform into the slick).

   These listings should include such information as sizes, quantities, and location. It also should cover custody and access issues. For example, the local police and fire department may have hand-held radios that could be used in a spill response. Other agencies will need to know that these specific agencies have them and who specifically to contact to get them.

5. **Resource protection.** This should include mapping of important economic and environmental resources, together with specific descriptions of preferred means of protecting them (e.g., multiple booming of small boat harbor entrances), access points, staging areas, special characteristics, jurisdictional issues, and other relevant information. The logistics of achieving the needed protection (i.e., sources of booms, mobilization, and transport) should also be covered.

6 **Wildlife rehabilitation.** This typically becomes a responsibility of state and local governments. The contingency plan should cover responsibilities, policies and priorities, equipment, facilities, and disposal of carcasses.

7. **Natural resource damage assessment.** As trustee for certain natural resources, the state will need to determine the extent to which a spill may have harmed them. This will be the basis for a recovery from the spiller of any natural resource damages under federal or state law. These damages are among the most contentious in any negotiation or litigation over spill damages. Ideally, the state can join with the federal government and industry to establish joint, cooperative procedures to avoid the "dueling scientists" situations that have characterized spills in the past. In any event, a data-gathering plan should be available at the outset of the spill.

8. **Policies and procedures for dealing with the news media.** The plan should address means for getting information out to the news media and the public. This is essential for establishing and maintaining the credibility of the spill response. The Coast Guard has recognized this and has established a Public Information Assist Team (PIAT) to help the federal on-scene coordinator meet the demands for public information and communication.

The state should be prepared to take similar action. A successful example of this comes from the *American Trader* spill. The City of Huntington Beach public information officers posted news updates, with maps of the spill, on an hourly basis at the city's incident command post. They issued regular news releases, participated in and arranged radio and television interviews, responded to media inquiries, and held press conferences (as many as four each day).

Major oil spills attract tremendous media interest, and a major spill in Hawaii will certainly generate world-wide news coverage. The plan should address means for accommodating media vehicles at command centers or other locations (especially satellite transmission vans; on the second day of the *American Trader* spill there were 32 media vans on scene) and means for granting media interviews. (Satellite technology allows live reports at all times, and a live broadcast in New York at 7:00 a.m. means an interview at 1 or 2 a.m. Hawaii time. Interest also will be intense in Japan and, should the spill involve the BHP facility, in Australia. The state must be prepared to give interviews 24 hours a day.)

9. **Documentation.** The present plan contains a brief overview of documentation, but more detail is needed so that procedures and practices do not have to be invented during the crush of an actual response. Good documentation of costs incurred, damages, and all actions taken is essential to cost recovery and, oil spills being such fertile ground for lawsuits and litigation.
10. **Response training and periodic drills.** The plan should include information on how the state will maintain readiness internally and how it will evaluate the readiness of others. It should cover policy on training and drills and include information on drill planning and evaluation.

Hold a General State Spill Response Planning Meeting

Many of the suggestions set out to this point either expressly or implicitly require the State of Hawaii to develop policies and goals. The recommended changes to the state's contingency plan, for example, address numerous areas in which express policies will have to be developed. Some of the needed policies and goals may exist, although perhaps only within a particular agency. These should be brought out for acceptance by the state as an entire entity; where they are lacking, new policies and goals should be devised.

State and local officials should meet face-to-face to discuss and plan for oil spill response within the context of the over-all spill response structure (i.e., the National Contingency Plan, area plan, and state plan). Emphasis should be placed on full discussion of roles and responsibilities, available resources, command, control, and communication, protection priorities, terminology, access to local expertise and knowledge, and related matters.

We suggest that the organizers of the meeting craft an agenda that includes all important topics and use it as a guide for the conduct of the meeting. It may be wise to use a trained meetings' facilitator to ensure that the purposes of the meeting are achieved and that there is less chance of getting bogged down on any particular matter.

We also suggest that the organizers request selected attendees or others to develop discussion papers on selected key issues. These would provide a point of departure for discussions and could help to ensure that relevant information is available to participants. Possible topics for discussion papers include the following (many alternate or additional topics could be developed):

- Proposed state-wide goals and policies for oil spill response;
- Volunteer utilization policies and procedures;
- Integration of city and county personnel, policies, and resources into the state's spill response structure;
- Natural resource damage assessments and baseline data collection;
- State policy on the use of non-mechanical means of spill response.

The meeting could make use of expert committees on certain topics such as marine firefighting or communications. Any committees should report back to the meeting as a whole so that all attendees have an opportunity to participate in final decision making.

The point of the meeting should be to develop a state-wide consensus on important oil spill response issues. Only by including all affected players from the state and local governments can such a consensus be developed. And only by open decision making can it be validated.

The initial meeting should be followed up with regular meetings (perhaps yearly or every other year; see the section on Drills) and response drills to build expertise and rapport. These later meetings can be used to revise existing policies and goals and to develop new ones as circumstances warrant.

Prestaging of Appropriate Oil Exclusion Equipment at Key Points

Because of the proximity of likely spill locales (e.g., Barbers Point, Honolulu Harbor entrance, Reef Runway anchorage) to important economic and environmental resources (e.g., other harbors, marinas, Waikiki, Koko Head Natural Park), there will be little time between the occurrence of a major spill and its impacts on the threatened resources. Thus, time will be of the essence in protecting key economic and environmental resources. For this reason, there will be little opportunity to mobilize and deploy equipment such as oil exclusion booms, absorbent booms, and the like.

The state should identify resources of particular significance and the specific equipment needed to keep oil out of them. This equipment should be maintained on-site in easily deployable manner. Shoreline boom anchors should be in place at channels so that, to the extent possible, booms merely have to be strung. As time permits during the course of the response, additional anchoring, including the use of in-water boom anchors, could be accomplished. Because a single line of booms is almost never effective in keeping spilled oil out of an area sought to be protected, plans and procedures should call for multiple lines of defenses. No site should be dependent on single booming for its protection. This has been demonstrated over and over again in spills such as the *Exxon Valdez*, the *American Trader*, and the Gulf War spills.

In some locations such as harbors and marinas, booms may be strung using vessels of opportunity. Boom handlers may come from local governmental HAZMAT teams, facility personnel, and oil spill response organization personnel, as available and appropriate. At other locations such as industrial water intakes, it may be possible for facility crews to string the booms entirely from the land and no boats would be needed.

Response Planning Standards for Neighbor Island Harbors

Each of the harbors at the outer islands that regularly handle bulk oil receives shipments of oil in barges ranging in size from 30,000 barrels to 67,000 barrels. Yet each has only a very limited stock of oil spill response equipment, none of which is suitable for anything but the calmest waters.

For example, according to the Coast Guard's area contingency plan, the following response equipment is available at Kahului:

- 1,500 feet of 8x10 "harbor boom"
- One "Swiss Olea" skimmer and one "Skimpak" skimmer
- 10 bales each of sorbent boom and sorbent sweeps and 12 bales of sorbent pads
- Three small boats suitable for boom deployment
- A variety of other equipment including pumps, generators, a 1,500 gallon collapsible storage tank, and trucks.

We note that, in addition to these listed resources, Chevron has some boom at its facility near the harbor, there is some boom belonging to Pacific Environmental (Penco) in Shed 1B, the Harbor Division maintains a Boston Whaler at Shed 1B, and a commercial tug is usually stationed at Kahului Harbor. The barges that call at

Kahului (and other neighbor island ports) also carry 750 to 1,000 feet of boom and some absorbents, and the Coast Guard has a boom trailer with 1,000 feet of boom on it.

The so-called harbor boom really is suitable for only the most benign conditions. It would ordinarily be considered to be a calm-water boom, for containment or exclusion on ponds and the like, and not really suitable for harbor use. The Olea skimmer is classed as a calm-water or industrial-type skimmer with a tested recovery rate of four to nine gallons of oil per minute (Oil Spill Response Products catalog 1991). The Skimpak skimmer is also a calm-water skimmer with a recovery rate of something in the vicinity of 10 or less gallons of oil per minute.

How does this compare to the actual need? We observed the arrival of the tug *Niolo* and the tank barge *Noho Hele* at Kahului. The barge has a capacity of about 37,000 barrels of No. 6 fuel oil. Assume that this barge has a worst-case accident and spills its entire cargo. Thirty-seven thousand barrels is over 1.5 million gallons. Assume further that half of this amount was to be picked up on the water (the rest either dissipates naturally or washes up on shore – this is the standard Coast Guard estimation methodology), and then add in an emulsification factor of 1.8 (as the Coast Guard does). This means that there would be an estimated 1.4 million gallons of emulsified oil to pick up. If each of the skimmers at Kahului worked at its highest capacity, non-stop, around the clock, they would take 1,165 hours (over 48 days) to remove the spilled oil. Of course, this is highly unrealistic. Within a couple of days other resources would be available from Oahu and elsewhere. But before it arrived, those two tiny skimmers, together with the very limited supply of absorbents, would be all that is available to clean up the spill.

It is the first 24 to 48 hours after a spill that are the most critical in terms of controlling it. While more robust equipment may be transported to the outer islands from Oahu and the mainland, it will take time to mobilize and transport it. We doubt that significant equipment, other than the CIC and MSRC vessels, could be transported from Oahu to Kahului or any of the other neighbor island ports within less than 24 hours. The state should establish response planning standards to ensure that a meaningful response can be mounted within the first 24 to 48 hours after a spill at the neighbor islands. Shippers or other responsible personnel would have to show that they have or have access to sufficient oil discharge containment, storage, transfer,cleanup equipment, personnel, and other resources to begin the effective containment and recovery of a worst-case oil spill.

The State of Alaska has developed response planning standards for oil terminal facilities, exploration and production facilities, crude oil pipelines, crude oil tank vessels and barges, and non-crude oil tank vessels and barges. For crude oil tankers and barges, the standard is for a showing of the ability to contain and clean up within 72 hours a spill of 50,000 barrels from a vessel or barge with a cargo volume of 500,000 barrels or less, and 300,000 barrels from a vessel or barge of larger size. For non-crude tank vessels and barges, the standard is a showing of the ability to contain or control within 48 hours, and to clean up within the shortest possible time, 15% of the total cargo capacity of the tanker or barge. To continue with the example of the *Noho Hele*, and using Alaska's standard for non-crude barges, the showing would be an ability to contain or control and begin cleaning up about 233,000 gallons (5,550 barrels) of oil.

We use Alaska's standards here as an example of the type of standard that could be developed. The actual figures in Hawaii's standard could be different to reflect Hawaii's situation. Also the classifications (crude or non-crude) could be different. The Coast Guard, for example, differentiates among four classes of oil: (1) non-persistent (including gasoline, kerosene, naphtha, gas oil jet fuel, automotive diesel, and number 2 diesel) (2) light crudes and fuels, (3) medium crudes and fuels, and (4) heavy crudes and fuels and residual products such as asphalt.

Lightering Standards for Laden Tank Vessels and Tank Barges

Vessel casualties resulting in oil spills seldom damage all the tanks on the vessel. Similarly, damaged tanks sometimes do not spill their entire contents. In order to prevent greater loss of oil, and in order to enhance ship

stability or to enable salvage of a grounded tanker, responders may have to remove the remaining oil in the damaged tanks and some of the oil in undamaged tanks to other vessels.

In order to accomplish this, tankers need specialized equipment including large fenders, cargo hoses, reducers and adapters as appropriate, portable cargo transfer pumps, or an external source of power if the on-vessel pumps aren't working. Because of the extensive experience the oil industry has gained in lightering operations in the normal course of business, there is a high degree of expertise available.

Hawaii seems to have a sufficient supply of vessels to which oil can be lightered if necessary. In particular, the tank barge MSRC 400, a 40,000 barrel capacity barge, could prove to be an especially valuable asset for the islands. Other tank barges are available and could be pressed into lightering operations, including the various bunkering barges, inter-island tank barges, and Navy tank barges.

The problem likely will come in the area of transfer equipment. At the present time, there is little commonality to the manifold fittings that would have to be used to lighter a stricken vessel. For instance, the Hawaiian tanker fleet has cargo manifolds from 12" to 24" in diameter, and of British, Japanese, and U.S. make. Not having the proper fitting could prevent the transfer of oil from a stricken tanker to another vessel even if they were to be brought alongside each other immediately.

For this reason, the state should require tank vessels and barges to carry such equipment (i.e., reducers, hoses, and adapters) as would allow them to use a standard package of oil transfer equipment and to demonstrate that they carry or have immediate access to sufficient oil transfer equipment to lighter to and from other vessels.

Nighttime Response Capabilities

Given the geographic proximity of the areas in which oil spills are likely to occur to important recreational and ecological resources, rapid and continuous response to spills is essential. Should a spill occur at night, responders will need to locate, track, and observe the spilled oil. Additionally, they will need to be able to conduct clean-up operations after dark.

Presently there is no such nighttime response capability in the islands. The state should require responders to show that they can initiate and sustain oil spill containment and recovery operations at night. Available technology would easily allow this. For example, forward-looking infrared sensor technology is readily available and has been shown to allow visual tracking of spilled oil after dark. The ability also gives users the opportunity to direct containment and skimming operations in darkness.

Beach and Shoreline Closures During Oil Spills

Typically, one of the first actions that is taken in response to a spill in an accessible area is the closing of the beaches or shoreline to the public. As a public safety measure, this duty generally falls upon state or local police. Beach closings have several important purposes. First, they prevent the public from exposing themselves to the toxic properties of the spilled oil. Second, they allow the professional clean-up workers the space to work without interference from unauthorized individuals. Third, they prevent the tracking of oil off the beaches and into other, uncontaminated areas. Additionally, beach closures can reduce the extent to which contaminants are forced deeper into the sand through the effects of foot traffic (or vehicular traffic in areas where vehicles ordinarily are allowed on the beach). They also reduce the chance that oiled animals would be scared off or away from the beach, thus precluding any chance of their rescue and rehabilitation.

An established policy on closing oiled or potentially oiled beaches to unauthorized persons would help to reduce these problems. The policy should include procedures for notification of the news media so that word can get out quickly and widely to the public. It also should include plans for signage at appropriate locations such as beach access points, parking lots, and at intervals along the beach.

A final subject for the policy should be enforcement. There almost always is somebody who does not get the word. Other people intentionally disregard the closure for any variety of well-intentioned reasons (e.g., to

independently patrol for and rescue oiled wildlife) and not so well-intentioned reasons (on the mainland, surfers are notorious for disregarding beach closures). Enforcement of the closure should be assigned to specific organizations such as police or, where they normally are stationed, lifeguards.

Clean Beach Standard

The other side of the beach closure issue is the beach opening issue. At what point after a spill should the beaches be re-opened to the public for all the typical contact that beach use implies? Traditionally, beaches in most areas of the U.S. have been opened to public use after an oil spill when oil could not be seen, felt, or smelled in the sand. But this approach, as inexact as it is, may leave a potential for significant public exposure to hydrocarbons that may not be detectable with the ordinary senses.

Hawaii's beaches are the core of the tourist economy. Hundreds of thousands of sunbathers, swimmers, surfers, and others use the beaches each year. Accordingly, the state has to be especially concerned about the impact that any residual oil on the beaches might have on the public's health and safety.

A numerical hydrocarbon concentration standard, based on accepted testing protocols, would reduce the possibility of such exposure. Such a standard was used successfully after BP's *American Trader* spill. The program worked as follows. When BP considered that a beach segment was fully cleaned, they advised the "beach audit team," which consisted of members from the Coast Guard, the California Department of Fish and Game, BP, Orange County, and the agency having jurisdiction over the beach segment (i.e., one of the cities or the state) of this fact. Members of the beach audit team walked the beach segment to make a visual, olfactory, and tactile examination (sight, smell, and touch). Also, a contractor collected samples of the sand and analyzed them using a modified EPA 418.0 test method. The samples were taken on approximately 500-foot centers both within and above the intertidal zone. The sand samples were analyzed to determine the total petroleum hydrocarbons present in the soil. If the average hydrocarbon concentration in the samples taken for the segment was below100 parts per million, then the beach was considered safe.

The Orange County Health Care Agency then expressed its opinion of the safety of the beach, and the Coast Guard On-Scene Coordinator, the city officials, and the California Department of Fish and Game would re-open the beach to the public. The 100 parts per million standard was based on existing practice for other petroleum contaminated site cleanups for residential areas and on EPA risk assessment model calculations.

The part of this procedure that involved the sand sampling and testing was developed by a "Cleanup Evaluation Committee" made up of representatives of BP, Newport Beach, Huntington Beach, Orange County, NOAA, the Huntington Beach Wetlands Conservancy, and the State of California. The committee defined as its objective the development of a recommendation regarding criteria for making the decision to open the beach to the public. The committee considered a number of suggestions and decided that the samples and testing would be a good way to obtain objective evidence of the safety of the beaches. The sampling program had the result of identifying localized lenses of oil-contaminated sand that probably would have gone undetected in the traditional inspections. For example, the testing showed a high concentration of hydrocarbons at two lifeguard stations. One of these was crude oil and was recleaned. The other was diesel oil, probably from boaters; it, too, was recleaned. The testing also provided an objective basis for decision-making.

Marine Firefighting Capabilities

Fires and explosions account for up to half of all the tankers lost in any recent year. Many of the world's largest oil spills have resulted from fires, including the *Castillo de Bellver* (50 to 80 million gallons, 1983, off South Africa), the *Atlantic Empress* (41.5 million gallons, 1979, off Barbados), the *Irene's Serenade* (12 to 36 million gallons, 1980, off Greece), and the *Hawaiian Patriot* (30.4 million gallons, 1977, 120 miles off Necker Island). More recently the *Puerto Rican* exploded and burned off San Francisco in 1984 (one death, over a million gallons of oil spilled) and in 1990, the *Mega Borg* experienced a fire and major oil spill in the Gulf of Mexico.

During the response to the *Puerto Rican* fire, which occurred at the pilot station about 10 miles outside the Golden Gate, the Coast Guard requested the assistance of the San Francisco and Oakland fire departments as well as the Navy's Port Services Office at Treasure Island (in San Francisco Bay). Oakland sent its fireboat (San Francisco's was under repair), which was quickly disabled in the low winds and seas at the site (3-foot seas, 10 knot winds). The Navy sent two YTB tugs, one of which was also disabled. As it was, the Navy YTBs and the four Coast Guard UTBs were able to successfully cool the ship's hull and lay down a foam blanket on its deck, and the fire soon burned itself out. Had wind and wave conditions been worse, these vessels, most of which (the Navy YTBs and the city fireboat) were not intended for use on the open sea, could not have been used at all.

Honolulu has a modern harbor fireboat, and the former fireboat (presently used in tours of the harbor) is equipped with its firefighting pumps and monitors. But neither the *Moku'ahi* nor the *Abner T. Longley* is designed for offshore firefighting. While each of these vessels can respond to offshore fires under certain conditions, under moderate-to-severe conditions, they likely would be too dangerous to take outside the harbor.

Some of the tugs based at Honolulu also have some firefighting capability. The *Nunui* will soon have a remote-controlled monitor we were told, and at least one of the Sause Brothers tugs has a monitor. These will help with firefighting, but are not a solution. In addition, the Navy's two ARS 50 class salvage vessels have four 1,000 gallon-per-minute fire pumps and three monitors. These, too, would help in offshore firefighting, assuming that they would be available.

Despite the availability of these resources, we believe that the state should seek means to enhance the ability to fight offshore fires in all conditions of winds and waves. The Navy's salvage vessels frequently are unavailable due to assignments elsewhere, and other firefighting assets do not have the capacity nor capability to effectively respond to an offshore fire in anything but the most moderate conditions.

We believe that there is a need for firefighting vessels capable of offshore operation and of providing water and foam to the deck of a very large crude carrier in ballast draft in accordance with ABS Class I firefighting standards. In this regard, we note that the *Lindsay Foss* class escort vessels, recommended elsewhere in this report as possible standby rescue vessels to be stationed at Barbers Point, have two remote-controlled monitors, each with a 6,600 gallons-per-minute fire pump. Similarly, the *LOOP Responder*, an emergency response vessel designed for the Louisiana Offshore Oil Port (a single point mooring complex located in the Gulf of Mexico) is equipped with two remote-controlled monitors and two 7,500 gallons-per-minute fire pumps.

Recently the National Research Council's Marine Board made the following recommendations, in which we concur, with specific reference to Hawaii:

> "The area planning process within the National Contingency Plan should include a review of local and area firefighting and salvage readiness and capabilities."

We note that the current version of the area contingency plan covering Hawaii does not cover firefighting.

Fire safety also should be improved in Honolulu Harbor. Protection is especially important at the berths normally used for shore-to-vessel and vessel-to-shore transfers, specifically Piers 28, 29, 30, 31, 32, 33, 34, and 51A. Fixed shoreside monitors and pumps are commonly used at oil transfer berths in other harbors and should be considered here. The same is true of Piers P-5 and P-6 at Barbers Point Harbor.

At the petroleum berths at harbors on the other islands, there is no fire protection other than the local fire departments. Pumps and monitors also should be considered for these sites. It may also be useful to require tugs based or used at these harbors to be equipped with firefighting capabilities.

Oil Spill Response Drills

The Coast Guard, CIC, MSRC, and others periodically conduct oil spill response drills. These generally are intended to test specific aspects of the sponsoring entity's response planning or resources. The state should identify specific aspects of spill response planning and operations that it wants to test and conduct drills

accordingly. For instance, state-sponsored on-water drills could focus on practicing exclusionary or diversion booming of critical waterways or other resources of importance to the state. Table-top drills could focus on mobilization of state resources and personnel from affected agencies. Drills also could focus on specialized aspects of response such as communications, command and control, or development of action plans.

It is not necessary to drill everyone on everything in every drill. Specialized drills could be held regularly to test specific matters. The state may wish to mount a major drill annually. Alternatively, it may wish to hold a major drill every other year and an annual planning meeting in alternate years as mentioned above. Unannounced drills are sometimes preferred but may be logistically and technically infeasible.

Whatever drills the state conducts, it should plan for carefully. Drills should have specific goals and objectives. They should be based on realistic scenarios. The point of the drills is to gain knowledge and familiarity with spill response. They also build teamwork and camaraderie.

Evaluations of Oil Spill Response Drills

Oil spill response equipment such as booms and skimmers are tools. The best way to learn how to use a tool is to actually use it and learn from your mistakes as you go along. Oil spill drills give those who are supposed to use these tools the chance to learn how they work. Just as important, spill drills give them the chance to learn what they do not know about their tools, as well as what their tools cannot do, or will not do. Knowing this, they can make a point of picking up the needed skills, getting new tools, and fine-tuning the old ones.

But no improvements will come about without scrutiny and feedback. Monitoring periodic drills, testing of the oil spill contingency plans, and reporting findings is the needed scrutiny and feedback.

The state should develop a program of spill drill evaluations for its own drills as well as for drills in which it participates that are called by others. The evaluations must be based on a solid grounding in oil spill contingency planning and the conduct of oil spill drills. But we strongly believe that, in addition, the following three factors will determine the success or failure of the evaluations:

1. **The evaluation must be based on response in the world of real oil spills.** Knowing about contingency planning, or about spill drills, is only part of what is needed. Contingency planning and spill drills are not ends in themselves. They are tools that are used to help with the real thing – real spills of real oil. Knowing about what happens in oil spills, the often chaotic, always changing, chronic crisis atmosphere of dealing with the real thing, will put the spill drill into a meaningful context, and will give the state a leg up on improving response to real oil spills.
2. **The evaluation must be conducted professionally.** The evaluation has to specify the proper issue to be addressed in the spill drill. In addition, the data gathering has to be designed and conducted in a way to ensure that all necessary information is obtained. Then there must be appropriate analyses of the information gathered. Throughout all this, there must be an understanding and commitment to the concept of objectivity and fairness.
3. **The evaluation must be presented clearly and compellingly.** The evaluation is to be presented as a written report. In order for the report to have the greatest value, it must present its findings as lucidly as possible. People reading the report must be able to understand immediately what is being discussed, even if they were not at the drill or do not fully understand all aspects of spill response. Moreover, the report's findings must be fully documented so that controversy is minimized.

Dispersants and In-Situ Burning

In our interviews with industry personnel, we noticed that there was a great deal of enthusiastic interest in the use of dispersants and in situ burning for spill response. Each can be a valuable tool in some circumstances, and each requires rapid decision making because the window of opportunity for effective use of either technique is quite short. To this end, the Coast Guard, EPA, and the State of Hawaii have entered into letters of agreement on the use of dispersants and in situ burning.

The existing letters of agreement specify that dispersants and in situ burning are to be used only after all available methods of physical or mechanical removal have been found to be infeasible or ineffective. Some industry officials complained that this restriction, coupled with the other conditions found in the letters of agreement, renders dispersants and in situ burning unavailable as oil spill response tools.

We do not agree that the situation is as bad as that. We do believe that some changes are warranted in the letters of agreement, and describe them below. We believe that Hawaii, as it builds its spill response expertise and defines its spill response goals, should take a close look at these letters of agreement to be sure they continue to reflect the state's policies and desires.

Dispersants

Part of the fallout from the *Exxon Valdez* spill was a controversy over authorization for the use of dispersants. Industry officials accused the Coast Guard and the State of Alaska of delaying permission for dispersant use, thereby worsening a situation that could have been at least partly controlled. This line of reasoning overlooks the fact that, even if permission had been given for immediate use of dispersants as soon as the spill occurred, there was only a very small amount of dispersant on hand in Alaska and no effective means available to apply the dispersant.

Nevertheless, apparently stung by the accusations of delay, Coast Guard officials have worked hard to see that dispersant authorization is immediate. The letter of agreement on the preapproved use of dispersants in Hawaii is one result of that work.

We note that the letter of agreement, in its description of areas in which dispersant use is not preapproved, does not mention areas where dispersed oil may reach a coral reef within two hours of dispersant application. Corals are quite susceptible to harm from oil, and what little information there is on the effects of dispersed oil on corals indicates that they are quite sensitive to that as well. We believe that reefs should be excluded from preapproved dispersant use as well as shorelines and administratively protected areas.

One other flaw in the letter of agreement is the small scale maps that accompany it to show the dispersant exclusion zones. As they presently are drawn, they are of almost no use in identifying areas in which dispersants are allowed or not allowed. This is particularly the case at the borders of the exclusion zones. Better maps, using larger scales, would be more helpful (we note that the text of the letter of agreement does explicitly define the exclusion zones).

In Situ Burning

In situ burning of spilled oil has gained a particular appeal as a spill response tactic, especially among industry officials, in the years since the *Exxon Valdez* spill. It offers the potential for removing a large quantity of oil in a short time with no need to store and dispose of any recovered material.

The interviews and our review of the various equipment lists we obtained shows that there is no capability for in situ burning in Hawaii. There are no burn booms and no igniters available anywhere on the islands. Since, in our opinion, in situ burning is almost always ill-advised, this lack of capability is as it should be.

Recently, the International Tanker Owners Pollution Federation — ITOPF, the governing body for the Tanker Owner's Voluntary Agreement on Liability for Oil Pollution, made up of a majority of the world's tanker owners and bareboat charterers, representing over 97% of the world's tanker tonnage – reached the same conclusion, making the following statement:

> "...there would seem to be very few, if any, scenarios where in-situ burning would offer a more viable and effective alternative to existing response methods; not sufficient to justify adding fire-resistant booms to equipment stockpiles (Ocean Orbit Newsletter 1995)."

The problems confronting in situ burning in Hawaii are many. Spilled oil is difficult to ignite. Several proprietary igniters are on the market but none of them have been demonstrated to be effective in anything but

the most benign conditions. Once lit, the oil must reach high enough temperatures to maintain the burn. This is difficult on the ocean since, as the slick burns, it thins and the cooling effects of the wind and water eventually extinguish the burn. In any event, the oil must be of sufficient thickness to be burned, which on the open sea usually means that it must be artificially concentrated using fire-resistant booms, a process that is fraught with all the difficulties associated with oil containment at sea.

Not the least of the problems of in situ burning is the potential toxic nature of the smoke plume resulting from a burn. An in situ burn would be especially inappropriate in the case of a major spill from Barbers Point that is being carried toward Honolulu and Waikiki. Since spilled oil generally moves with the wind, the smoke plume also would be carried toward the city and its resort area. In effect, the time when it would be most desirable to use in situ burning, when there is a large amount of oil moving toward sensitive environmental or economic resources, is the time when it would be least desirable due to the potential side effects.

Additionally, to be effective, an in situ burn would have to be initiated before the spilled oil lost more than about 20% of its weight through evaporation. But Hawaii's climate, including warm air temperatures, warm water temperatures, and general breeziness, would quickly remove the lighter fractions necessary to support combustion. In addition, the winds and currents that characterize Hawaiian waters would tend to break any spilled oil up into discrete patches that would limit the potential scope for any burning.

Another problem is that the residue left after in situ burning is quite viscuous and has a high specific gravity. It is difficult to remove or clean up should it wash ashore. Even more important is the fact that it would tend to sink due to its high specific gravity. Sunken oil has the potential for smothering coral reef and bottom-dwelling species, fouling fishing gear, and sporadically polluting beaches following storms or current changes. This last point is completely ignored in the letter of agreement on in situ burning.

In situ burning is essentially inappropriate for Hawaii. Time, money, and effort spent in planning and preparing for in situ burning of spilled oil, in our opinion, will be wasted.

One good course of action would be to do away with the letter of agreement on in situ burning. Probably equally good would be to leave it in place should some unforeseen circumstances arise in which in situ burning would be a preferred response alternative and would be technologically feasible.

To the extent that response is predicated on the use of dispersants or in situ burning, or any other strategy for that matter, responders should be required to show that the equipment and supplies needed are on hand or readily and timely available. Presently, there is very little dispersant and no fire booms available on the islands. If these are to be the response strategies relied on, the present ability to use them effectively is non-existent.

Worst Case Oil Spill in Hawaii

OPA 90 requires vessel and facility contingency plans to demonstrate an ability to respond to a "worst case" discharge, and also requires the area contingency plans to be adequate to respond to such a spill. Subsequent regulations have defined a "worst case" spill for the purposes of vessel contingency plans to be the discharge in adverse weather conditions of a vessel's entire oil cargo. The present Coast Guard area contingency plan defines the worst case spill as the immediate and total loss of the entire cargo of a 150,000 dwt tanker. This would amount to a spill of about 1,000,000 barrels.

These two planning standards are fine for compliance with federal law and regulations. We are concerned, however, that they misrepresent the real worst case spill. We believe that as severe as a spill of a vessel's entire oil cargo would be, it is not the true worst case. A more accurate depiction of the worst case would be the collision and loss of two such tankers. This could result from several scenarios including navigational error and power/steering failure. Because of the possibility, admittedly slim, but foreseeable, of the simultaneous loss of two loaded tankers, we believe that Hawaii should use that as its planning standard for catastrophic spill response.

RECOMMENDATIONS

Prevention

1. **Establish a Hawaii Office of Marine Safety** within state government, likely within the Department of Transportation. The State of Hawaii needs to get much more serious about spill prevention. While there has been a commendable improvement in the overall system of spill prevention and response preparedness in Hawaii in the past several years, we strongly feel that the system is not nearly as safe as it can and should be. The State of Hawaii has, to date, had only a peripheral role in the safety of the oil transport system in the state, and because of its overriding public trust responsibility to protect the welfare of the environment and people of the state, the State of Hawaii must assume a leadership position with regard to spill prevention and response. The state needs to vastly enhance its involvement in spill prevention and response planning. Response preparedness should remain the responsibility of the State HEER office (see Response Preparedness Recommendations). However, the only practical way for the state to become a significant force in spill prevention is to centralize responsibility within a separate well-funded, well-staffed, politically autonomous department. This should be the Office of Marine Safety (OMS). As background, Addendum 3 gives a brief overview of the Washington OMS. It is well known that once oil is spilled into the sea, it is virtually impossible to contain it, recover it, clean it from shores, prevent injury to wildlife, rehabilitate injured wildlife, or to restore injured ecological, social, and economic systems. The primary mission of the Hawaii OMS then, should be to reduce the risk of oil and other hazardous substance spills into the state's marine waters. The office should be staffed with qualified mariners and other specialists capable of detecting significant problems in the oil transport system in the state, and recommending and implementing improvements. The office should be responsible for safety screening of tank, cargo, and passenger vessels, monitoring compliance with regulations, maintaining an accurate vessel information data base, conducting thorough casualty investigations, and commissioning various studies as necessary to reduce the risk of major spills.

   The state should be able to attract and retain highly qualified maritime personnel — master mariners, marine surveyors, risk analysts — which will put government oversight for the first time on an equal footing with industry, precisely where it should be.

2. **Raise the cap on the Environmental Response Fund from the present $7 million to $30 million.** This should be done for three principal reasons. First, the establishment and full operation of the prevention programs of the Hawaii OMS will cost money. Secondly, improving the response posture of the HEER office will cost money. Finally, as a contingency fund for the state's response to a major spill, $7 million will not go very far. Alaska's fund is capped at $50 million, and we feel a reasonable level to consider for Hawaii would be $30 million. Clearly, the public is willing to pay a fraction of a cent per gallon of gasoline to improve prevention and response preparedness for oil spills. Out of fairness to industry, the statutory allowance for the use of these monies should be clarified and restricted specifically to spill prevention and response preparedness. This fund should not become a funding source for other state programs.

3. **The state should commission a thorough Risk Assessment** of the system for transporting oil and other hazardous substances through Hawaiian waters. The assessment should identify potential causes, sources, size and types of oil spilled, potential flow rates, spreading characteristics and encounter rates. This should take approximately two years and should be conducted by maritime experts and risk analysts. This assessment should accomplish the following tasks:

   a. Identify vessel traffic patterns — particularly for tankers, tank barges, cargo and passenger vessels — and identify traffic convergences/restrictions and the locations and situations that could cause collisions or groundings.

b. Evaluate the potential benefit of various vessel tracking/traffic systems, as was done in other ports in the Coast Guard VTS 2000 project, including automated surveillance systems (ADSS, GPS, etc.)

c. Evaluate and compare the relative safety risk of the two types of offshore moorings — single point and multi-point — at Barbers Point Marine Terminal (BPMT), and if one proves inherently more safe, require the conversion of the other to the safer system.

d. Include a rigorous analysis of the spill risk from disabled vessels such as loaded tankers and tank barges, and how best to minimize such risk. The disabled tanker study should include an analysis of the full-spectrum of power/rudder failure scenarios – various failure recognition times, sea conditions, wind speed and direction, size and speed of tank vessel, and proximity to grounding or collision situations. It should also include various tug types, sizes, and response times to take disabled tank vessels in tow.

4. **The state should establish and implement a vessel casualty risk matrix and vessel screening program** for all large (over 500 ton) vessels.

5. **The state should establish, administer, and fund a Marine Safety Citizens Advisory Council.** This could be any number of permutations of the two Regional Citizen's Advisory Councils now operating in Alaska, but it seems essential that local citizens — those with the most at stake and often the most knowledge in all this — be given an active voice in the protection of their shores. The council could, for instance, be composed of representatives from tourism, commercial fishing, Native Hawaiians, environmental groups, municipalities, etc. The citizens' council would advise government regulators, industry, the area committee, etc.

6. **All oil shippers: crude oil tankers, product tankers, and inter-island tank barges should be required to demonstrate to the state that they have in place at all times adequate salvage and emergency towing capability on standby or in escort sufficient to take control of laden, disabled tank vessels in any and all possible situations along their route.** The loss of propulsion or steerage is a very serious concern. Disabled tanker contingencies could include pre-positioned tugs, escort tugs, or any combination of the two. It could also include a contractual relationship with Navy Sup/Salv capability. The tugs must **be demonstrated** to have maneuvering characteristics and horsepower sufficient to accomplish the task of vessel control, even in extreme situations. In addition to laden crude oil tankers transiting to and from Barbers Point Marine Terminal, of particular concern here is loss of power or steerage on harbor approaches of inter-island barges and product tankers.

7. **Emergency tow packages should be required on all tank vessels.** Protocols for the assessment of the urgency of the situation, and emergency towing protocols and equipment need to be thought through well ahead of time. Every tank vessel should be fitted with adequate towing wire, and pick-up line and buoy, that would be easily deployable in emergency situations. For tankers, the Prince William Sound emergency tow package might provide a model (400 feet of 2-1/4" tow wire, 720 feet of 6" circumference polypropylene floating pick-up line, pick-up buoy, 2-1/4" D shackle connecting pick-up line to tow wire). It should be stored in such a manner, such as on a reel, to allow **rapid deployment** — within 15 minutes — by a crew of two without power.

8. **The state should commission a thorough evaluation of crew competence** aboard tank vessels in Hawaiian waters. This should include crew background and experience, longevity in the Hawaii trade, roles and responsibilities onboard, task analysis, training, morale, fatigue, organizational expectations and their impact on performance, dynamics of multi-national crews, language barriers, effect of multiple time-zone crossings, effect of automation systems on crew performance, etc.

9. **The state should develop a system for improving the safety of uninspected towing vessels** including regular inspections, operator/crew standards, radar endorsement requirements, collision avoidance training, etc., relying on recommendations from the Coast Guard's Uninspected Towing Vessel Safety Study.
10. **The state should either commission or require a full safety audit of the BHP and Chevron refineries, and the entire tank farm and pipeline system on Oahu** and other islands as appropriate.
11. **The state should establish and administer a state-of-the-art casualty and near-miss investigation and reporting system.** The current Coast Guard system does not provide adequate information to trouble-shoot and prevent failures in the oil transport system.
12. **The state should establish a confidential reporting system** for maritime industry employees either on vessels or ashore, to report problems without fear of retribution by their employer. A 1-800 number should be established and industry should be required to post and/or otherwise notify its employees. The state should also access the Marine Accident Reporting Scheme (MARS) that was recently established by the Nautical Institute of London to allow anonymous whistle-blowing by tanker crews concerning safety risks.
13. **The state should refine and strengthen its oversight of substance abuse prevention protocols** within the shipping industry in Hawaii.
14. As an **interim protective approach,** before the vessel traffic pattern analysis is completed as part of the Risk Assessment, the following should be **implemented immediately:**
    a. **An east-west Traffic Separation Scheme (TSS) for large transiting vessels off south Oahu and the channels to the east and west of the island** to reduce the risk of collision.
    b. **A mandatory exclusion in the pilotage area around the Barbers Point Marine Terminal for any vessels other than those directly engaged in commerce at the terminal.**
    c. **All vessels over 500 tons (i.e., oil, cargo, passenger) should be excluded from transiting within 10 miles of any shore or shoal** unless they are on approach to a harbor or anchorage, and then shall approach only in such a way as to leave maximum searoom between the vessel and shoal or shore at all times (i.e., do not cut corners).

    These should be verified in the Risk Assessment Vessel Traffic Analysis.
15. **An emergency rescue/salvage vessel should be required to be on standby at BPMT whenever a laden tanker is in the BPMT Pilotage Area,** and the vessel should be at least Lindsay Foss class (7,600 hp, Tractor tug).
16. **The state should require the installation of weather buoys at BPMT and at the bunkering area outside Honolulu Harbor.** These should provide continuous, real-time wind and sea conditions to Aloha Tower and should be used to enforce stop/go conditions for transfer operations.
17. **The state should initiate a program of aerial surveillance** of all laden oil and hazardous substance vessels in island waters.
18. **The Aloha Tower-Honolulu Harbor Traffic control capability should be enhanced with radar** and upgraded further as recommended from vessel traffic study.
19. **Tugs in escort of large vessels transiting harbor entrances should be evaluated and upgraded as needed.**
20. **All loaded product tankers transiting Barbers Point Harbor should be required to be tethered to an assist tug** of sufficient capability to maneuver the laden vessel in loss of power or steerage. This harbor has a **very** narrow entrance relative to the size of vessels it accommodates.
21. **Routing agreements/shipping lanes should be established for inter-island tug/barges** and other waterway users should be notified that these are cautionary areas.

22. **The state should commission a thorough assessment of the salvage posture in Hawaii.**
23. **A hearing should be held in front of the Hawaii Legislature** calling the oil shippers, ship operators and charterers, classification societies, insurers, flag state representatives, vessel crews, the shoreside refineries, and the U.S. Coast Guard to discuss the state of affairs in oil spill prevention (as distinguished from spill response) in the state.
24. **The state should have access to any and all information concerning the shipment of oil in Hawaii** (i.e., ship vetting information and crew history, except financial information) and should provide **strict penalties for non-compliance.**
25. **The state should verify the authenticity of all merchant mariner documents** for officers on large vessels, particularly foreign flagged vessels. It is easy for anyone to obtain counterfeit documents in some ports around the world.
26. **Aerial surveillance of remote Hawaiian Islands** should be enhanced. Routing agreements in addition to the existing areas to be avoided (ATBAs) should be negotiated with all principal shippers through the islands, and they should be observed and enforced.
27. **All tank vessels should be required to have helms fitted with autopilot alarms** capable of indicating that if the helm is turned with the autopilot engaged, an alarm will notify the watchstander that the rudder did not respond.
28. **The state should evaluate and upgrade as needed the protective fendering at all petroleum product piers in the state.**
29. **The University of Hawaii Sea Grant College Program should initiate and sponsor,** along with the United Nations International Maritime Organization (IMO), a **World Tanker Safety and Spill Prevention (TSSP) Conference.** You are in an ideal location to attract the leaders of the world's shipping interests to an international conference that could just possibly make a real difference in the future of oil shipping safety.
30. **The state should,** together with the Coast Guard, **implement and enforce general bunkering standards and rules both offshore and within Honolulu Harbor.** These should include weather restrictions for offshore bunkering, pre-bunkering conferences, emergency shutdown plans, watch standards, and overfill alarms. Safety of transfer operations should take precedence over commercial pressures to bunker in marginal weather.
31. **State personnel should board each and every tanker calling at the Barbers Point Marine Terminal** in order to monitor any potential pollution-causing situations and enforce stop/go weather restrictions. State personnel should participate in drydock inspections of vessels when possible.
32. **State personnel should participate in regular industry inspections of hoses, buoys, anchors, and seabed pipelines at the Offshore Marine Terminal.**
33. **The State of Hawaii should join** and become an active participant in the **States/B.C. Task Force on Oil Spills.**
34. **The State of Hawaii must drastically enhance its Energy Conservation program.** The state should establish an aggressive yet reasonable phase-in of minimum fuel efficiency standards for automobiles, and should consider the enactment of a reasonable gasoline tax dedicated solely to energy conservation initiatives, particularly in the transportation and electrical generation sectors. It is possible, with presently existing energy efficiency technologies, to reduce the amount of oil consumed in Hawaii by 50%. Doing so would reduce the number of tanker deliveries in the state from the present 105 or so each year to only 50 or 60. Obviously having 50 fewer loaded tankers each year in Hawaiian waters would substantially reduce the risk of a catastrophic spill.

Response Preparedness

1. **The state should enhance the oil spill response oversight capabilities within the Department of Health's Office of Hazard Evaluation and Emergency Response.** Because of its responsibilities to its residents and visitors, and because of its role as trustee for certain natural resources, the State of Hawaii should take an active role in oil spill response planning and operations. To this end, the state should provide the Department of Health's Office of Hazard Evaluation and Emergency Response (HEER) with the resources it needs to carry out its responsiblities effectively. Specifically, the state should provide HEER the financial resources needed to hire personnel with suitable training and experience in marine and coastal oil spill response operations.

   The HEER personnel should actively participate in all oil spill response planning efforts undertaken in the state. HEER should be represented on and take a proactive role in the Area Committee established under OPA 90. In addition, HEER should be present at all oil spill response drills, either as a participant in appropriate cases or as an observer. HEER, as the responsible state agency, should be integrated into any unified command structure established during drills and, of course, during actual oil spill response. Finally, HEER should promulgate any needed regulations regarding oil spill response.

2. **The State of Hawaii Oil and Hazardous Substances Emergency Response Plan should be improved.** The state has oil spill response resources within its control that should be expressly acknowledged and listed within the context of the state's contingency plan. Moreover, the state has responsibilities for natural and economic resources within its jurisdiction. These important state interests may or may not be adequately represented by the Coast Guard, responsible parties, and other spill responders. For example, the state is the trustee for certain ecologically sensitive areas. Ensuring their protection is the responsibility of the state. Additionally, the state's relationship with local governments make it the natural focus of local spill response efforts.

   Specific areas that the plan should focus on include the following:

   a. A description of the state's goals for oil spill response;
   b. Detailed descriptions of specific roles and responsibilities within the state's response for each state agency (and local government agencies);
   c. Response operations, including containment and control, communications, wildlife relocation and deterrence, disposal of oily debris and waste oil, temporary oil storage, and documentation and cost recovery;
   d. Up-to-date listings of state and local government-owned response equipment, including such information as sizes, quantities, and location;
   e. Resource protection, with mapping of important economic and environmental resources, together with specific descriptions of preferred means of protecting them, access points, staging areas, special characteristics, jurisdictional issues, and other relevant information;
   f. Wildlife rehabilitation, including responsibilities, policies and priorities, equipment, facilities, and disposal of carcasses;
   g. Natural resource damage assessment, so that a data gathering plan is available at the outset of the spill;
   h. Policies and procedures for dealing with volunteers;
   i. Policies and procedures for dealing with the news media;
   j. Documentation;
   k. Response training and periodic drills.

3. **The state should convene a meeting of state agencies and local government agencies with spill response duties to develop improved interaction and coordination.** State and local officials should meet face-to-face to discuss and plan for oil spill response within the context of the overall spill response structure (i.e., the National Contingency Plan, area plan, and state plan). Emphasis should be placed on full discussion of roles and responsibilities, available resources, command, control, and communication, protection priorities, terminology, access to local expertise and knowledge, and related matters. The initial meeting should be followed up with regular meetings (perhaps annually) and response drills to build expertise and rapport.
4. **The state should require prestaging of appropriate oil exclusion equipment at key points.** Time will be of the essence in protecting key economic and environmental resources. The state should identify resources of particular significance and the specific equipment needed to keep oil out of them. This equipment should be maintained on-site in easily deployable manner. Shoreline boom anchors should be in place at channels so that booms merely have to be strung. No site should be dependent on single booming for its protection.
5. **The state should ensure response planning standards for neighbor island harbors.** Each of the harbors at the neighbor islands that regularly handle bulk oil receives shipments of oil in barges ranging in size from 30,000 barrels to 67,000 barrels. Yet each has only a very limited stock of oil spill response equipment, none of which is suitable for anything but the calmest waters. The first 24 to 48 hours after a spill are the most critical in terms of controlling it.
6. **The state should establish lightering standards for laden tank vessels and tank barges.** Vessel casualties resulting in oil spills seldom damage all the tanks on the vessel. Similarly, damaged tanks sometimes do not spill their entire contents. In order to prevent greater loss of oil, the damaged tanks and remaining undamaged tanks may have to be emptied. In order to accomplish this, the state should require laden tank vessels to carry or have immediate access to sufficient oil transfer equipment to lighter to and from other vessels. Because at the present time there is little commonality to the manifold fittings that would have to be used to lighter a stricken vessel, the state should require tank vessels to carry such equipment (i.e., reducers, hoses, and adapters) as would allow them to use a standard package of oil transfer equipment.
7. **The state should require oil spill responders to have nighttime response capabilities.** Rapid and continuous response is essential, due to the geographic proximity of the areas in which oil spills are likely to occur and important recreational and ecological resources. Should a spill occur at night, responders will need to locate, track, and observe the spilled oil. Additionally, they will need to be able to conduct clean-up operations after dark. Presently there is no such nighttime response capability in the islands. The state should require responders to show that they can initiate and sustain oil spill containment and recovery operations at night. Available technology would easily allow this. For example, forward-looking infrared sensor technology is readily available and has been shown to allow visual tracking of spilled oil after dark. This ability also gives users the opportunity to direct containment and skimming operations in darkness.
8. **The Department of Health should establish a policy on beach and shoreline closures during oil spills.** People come to oiled beaches out of curiosity, with a desire to help, or in disregard or ignorance of the spill. Their presence can expose them to the toxic properties of the spilled oil and can interfere with the activities of professional cleanup workers. They also can end up tracking oil into uncontaminated areas, drive oil deeper into the sand, and scare oiled animals away from shore, precluding any chance of rescue and rehabilitation. An established policy on closing oiled or potentially oiled beaches to unauthorized persons would help to reduce these problems. The policy should include procedures for notification of the news media and for signage and enforcement at the affected sites.

9. **The Department of Health should establish a "clean beach standard" to be used in deciding whether to reopen oiled beaches.** Hawaii's beaches are the core of the tourist economy. Hundreds of thousands of sunbathers, swimmers, surfers, and others use the beaches each year. Accordingly, the state has to be especially concerned about the impact that any residual oil on the beaches might have on the public's health and safety. Traditionally, beaches in most areas of the U.S. have been opened to public use after an oil spill when oil could not be seen, felt, or smelled in the sand. This approach may leave a potential for significant public exposure to hydrocarbons. A numerical hydrocarbon concentration standard, based on accepted testing protocols, would reduce the possibility of such exposure.

10. **Marine firefighting capabilities should be enhanced.** Honolulu has a modern harbor fireboat and the former fireboat, now used in tours of the harbor, is still equipped with its firefighting pumps and monitors. But neither the *Moku'ahi* nor the *Abner T. Longley* is designed for offshore firefighting. While each of these vessels can respond to offshore fires under certain conditions, under moderate to severe conditions, they likely would be too dangerous to take outside the harbor. The state should seek means to enhance the ability to fight offshore fires in more severe conditions of winds and waves.

    Fire safety also should be improved in Honolulu harbor. Protection is especially important at the berths normally used for shore-to-vessel and vessel-to-shore transfers, specifically Piers 28, 29, 30, 31, 32, 33, 34, and 51A. Fixed shoreside monitors and pumps commonly are used at oil transfer berths in other harbors and should be considered here. The same is true of Piers P-5, and P-6 at Barbers Point Harbor.

    At the petroleum transfer berths at harbors on the other islands, there is no fire protection other than the local fire departments. Pumps and monitors also should be considered for these sites. It may also be useful to require tugs based or used at these harbors to be equipped with firefighting capabilities.

11. **The state should carry out its own oil spill response drills.** The Coast Guard, CIC, MSRC, and others periodically conduct oil spill response drills. These generally are intended to test specific aspects of the sponsoring entity's response planning or resources. The state should identify specific aspects of spill response planning and operations that it wants to test and conduct drills accordingly. For instance, state-sponsored on-water drills could focus on practice exclusionary or diversion booming of critical waterways or other resources of importance to the state. Table top drills could focus on mobilization of state resources and personnel from affected agencies. Whatever drills the state conducts, it should plan for and evaluate carefully.

12. **The state should conduct detailed evaluations of oil spill response drills to identify areas in which the state's interests can be better protected and to identify areas in which the state can make significant contributions.**

13. **The state should rigorously evaluate current policies and practices relating to the use of dispersants and in situ burning.** The existing protocols on the use of dispersants and in situ burning are flawed and should be reevaluated. More attention should be given to health effects, effects of currents and winds, and other factors that make the use of these non-mechanical approaches difficult to control and give them uncertain effects.

    To the extent that response is predicated on the use of dispersants or in situ burning, or any other strategy for that matter, responders should be required to show that the equipment and supplies needed are on hand or readily and timely available. Presently there is very little dispersant available and no fire booms are available on the islands. If these are to be the response strategies relied on, the present ability to use them effectively is non-existent.

14. **The state should redefine the worst-case oil spill for Hawaii to reflect the real situation.** The present Coast Guard area contingency plan defines the worst case spill as the immediate and total loss of the entire cargo of a 150,000 dwt tanker. This would amount to a spill of about 1,000,000 barrels. We believe that as severe as such a spill would be, it is not the true worst case. A more accurate depiction of the worst case would be the collision and loss of two such tankers.

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ADDENDUM I

Case Histories of Five Tanker Disasters

Torrey Canyon

1967

(from "Times Atlas of the Oceans")

Vessel Description: Liberian oil tanker, 297 m in length. At the time of loss she was fully loaded with over 119,000 tonnes of crude oil; her draught was about 16 m, full speed about 15 3/4 knots

Time of Stranding: 08.50 GMT

Date: Saturday, 18 March 1967

Place: Seven Stones reef, about 7 nm north-east of the Scilly Isles, Great Britain

Voyage: From Mina al Ahmadi, Kuwait, to Milford Haven, Wales

On Tuesday, 14 March, after passing between Tenerife and the Grand Canary Island, the *Torrey Canyon*'s course was set to 018°T, in order to pass 5 nm west of the Scilly Isles, which were then about 1,400 nm away.

At about 02.30 on Saturday, 18 March, the master left night orders asking to be called either as soon as the Scilly Isles were detected by radar, or sighted, or in any case not later than 06:00. There was a moderate north-westerly wind with visibility about 10 nm.

The master was called at 06:00 and informed by the chief officer that the Scilly Isles had not yet been detected.

At about 06:30, the Scilly Isles were detected by radar on the port bow at a range said to be about 24 nm (about 26 nm is more likely to be correct). The vessel was several miles east of her intended track but there was still plenty of time to compensate for this displacement.

At 06:55 the chief officer altered course to port to 006°T, to head for what he initially thought was the radar echo of Bishop Rock; it was probably the echo of the eastern Scilly Isles. However, the vessel was only on 006°T for five minutes because when the master was informed of the course alteration by the chief officer, he asked if the original course of 018°T from the present position would take the vessel east of the Scilly Isles. The chief officer affirmed this so the master ordered him to alter course back to 018°T. This was at 07:00, when the master came to the bridge.

The vessel was now heading almost directly towards her graveyard, the Seven Stones reef. However, the master fully intended to alter course to port when the *Torrey Canyon* was east of the Scilly Isles in order to pass through the five-mile-wide passage between the Scilly Isles and the Seven Stones reef. He expected also to have the alternative of altering course to starboard to pass through the 10-mile-wide passage between the Seven Stones lightvessel and the Longships lighthouse.

At 07:35 Bishop Rock lighthouse was sighted, visually.

At 08:00 the vessel's position was said to have been fixed by two bearings and a radar range; the chief officer was relieved by the third officer.

At 08:12, approximately, Peninnis Head lighthouse was abeam at 4.5 nm.

At 08:18 position was fixed: 4.7 nm east of Peninnis Head lighthouse. Course was altered to port, first to 016°T, and then, a few minutes later, to 013°T. Fishing vessels were then sighted, at least two of them on the port bow.

At 08:25 the vessel's position was fixed again and the course altered to port by 3° to steer 010°T; however, because the tidal stream was setting easterly at a rate of probably between 0.5 and 1.0 knot, the course made good over the ground was about 018°T.

At 08:30 the course was altered to starboard by 3° to steer 013°T in order to keep clear of a fishing vessel on the port side. It was claimed that fishing nets were seen on both sides at about this time.

At 08:38 the third officer plotted an incorrect position; however, the master realized that it was in error and new observations were made.

At 08:42 the master switched from automatic steering to manual, and personally altered course to port to steer 000°T, and then switched back to automatic steering.

At 08:45, the third officer, now under stress, observed a bearing, forgot it, and observed it again. The position now indicated that the *Torrey Canyon* was less than 1 nm from the rocks ahead. The master ordered hard-to-port. The helmsman who had been standing by on the bridge, ran to the wheel and turned it. Nothing happened. He shouted to the master who quickly checked the fuse – it was all right. The master then tried to telephone the engineers to have them check the steering gear aft. A steward answered – wrong number. He tried dialing again, and then noticed that the steering selector was on automatic control instead of manual. He switched quickly to manual, and the vessel began to turn. Moments later, at 08:50, having only turned about 10°, and while still doing her full speed of 15 3/4 knots, the vessel ground on Pollard Rock.

A number of cargo tanks were ruptured on impact, and crude oil began immediately to spread around the vessel. To make matters even worse, the moment of grounding was within minutes of the high-water neaps, and the vessel was soon to settle down further onto the rocks as she lost her reserve buoyancy and as the sea level fell.

Consequences: Despite almost immediate salvage operations, heavy seas pounding the vessel during the following days caused her to become a complete wreck. During these operations there was an explosion aboard which killed a member of the salvage team. No other lives were lost. The oil pollution was massive, the worst ever experienced; both British and French coasts suffered. After the vessel broke up in heavy seas it was bombed by the Royal Air Force in an attempt to burn up any remaining oil. However, although some fires were started, it is believed that only a small proportion of the oil burnt away before the *Torrey Canyon*'s remains sank out of sight on Thursday, March 1967. Concern over the bombing by the RAF, which was of a Liberian ship, outside British territorial waters, led to the 1969 Convention allowing for intervention on the high seas to prevent pollution.

Argo Merchant

1976

(from "Times Atlas of the Oceans")

Vessel Description: Liberian oil tanker, length 183.5 m. Normal service speed 16 knots; at the time of her loss, owing to combination of weather conditions and boiler trouble, average speed was between 8 and 9 knots. Load carried 28,000 tonnes of dense fuel oil; draught about 10.7 m.

Time of Stranding: 06:00 local time

Date: Wednesday, 15 December 1976

Place: In position 41°02'N, 69°27'W, near Nantucket Shoals, off east coast of America

Voyage: From Puerto La Cruz, Venezuela, to Salem, Massachusetts

At 23:00 on Sunday, 12 December, the *Argo Merchant*'s position was fixed off Cape Hatteras: Diamond Shoal lightvessel was bearing 310°T, at 9 nm; course was set directly towards Nantucket lightvessel, 415 nm ahead. The master's intention was to pass about 4 nm east of the lightvessel and east of Nantucket shoals.

On 13 and 14 December noon positions were calculated from celestial observations.

At 18:00 on 14 December the gyro compass system was noted to be erratic; thereafter the vessel was steered by reference to the magnetic compass.

At 22:00 one of the two radars onboard was switched on; during subsequent hours a number of vessels were detected but none was identified as Nantucket lightvessel.

At 01:00 on 15 December the master joined the second officer on the bridge. The depth sounder, switched on some time before 04:00, recorded a decrease to between 27 and 37 m, much less than expected.

At 04:00 the chief officer relieved the second officer; the latter remained on the bridge as did the master. All three were now concerned at not finding Nantucket lightvessel at the expected time of 03:30; the chief officer urged the master to "do something" but the master decided not to change course of speed. Visibility was said to be about 7-8 nm; wind was strong southerly.

At 04:30 a radio bearing indicated that Nantucket lightvessel was right ahead but subsequent events prove that this must have been incorrect.

At 05:30 the chief officer desperately tried to obtain a celestial fix, though he knew conditions were unsuitable. In any case, in his haste he made a mistake in calculation: the position found was absurd and was discarded without further check. It was decided to wait until 06:00 when conditions for celestial observations might improve.

At 06:00 the *Argo Merchant* stranded; the master ordered the engines to be run astern but she was stuck firmly aground.

Cause: The probable track of the *Argo Merchant* was determined during the Liberian Marine Board Investigation and is based on the magnetic courses steered as recorded in the ship's log. Comparison of gyro-compass and magnetic compass records indicate that the gyro was probably erratic some time before it was found to be so. Also, allowances being made for wind and current were declared not altogether appropriate.

The *Argo Merchant*, built in 1953 and so, relatively old, was found to have some deficiencies which contributed towards her loss (e.g. faulty gyro and course recorder, and possibly a faulty radio direction finder). But the principal cause of her loss was navigational incompetence. The master had three clear warnings of impending danger: (1) Noon positions determined on 13 and 14 December indicated the probable track of the vessel towards the grounding position. (2) Nantucket lightvessel was neither sighted nor detected by radar, long after the expected time of 03:30 (i.e., two and a half hours before grounding). (3) The depth soundings gave absolute proof that the vessel was off her proposed track and was running into shallow waters three hours before grounding.

Consequences: Some attempt was made at salvage but the weather worsened and the ship was abandoned two days after grounding. There was no loss of life. The vessel broke up but, fortunately, with an offshore wind, most of the oil which leaked dispersed seawards. Nevertheless, costly precautions were taken to forestall possible pollution, and, as the disaster followed a number of other incidents in or near the U.S., the American public was alerted to the dangers of pollution.

Amoco Cadiz

1978

(from "Times Atlas of the Oceans")

Vessel Description: Liberian oil tanker, length 334 m, capacity 232,182 dwt, 109,700 grt. Single screw, and powered with a 30,400 bhp diesel engine. Maximum draught 19.8 m

Time of Initial Stranding: 21.04 GMT

Time of Final Stranding: About 21:30 GMT

Date: Thursday, 16 March 1978

Place: Near Portsal, north coast of France

Voyage: From Kharg Island, Iran, to Rotterdam via Lyme Bay, English Channel

The *Amoco Cadiz* was fully laden with crude oil, part of which was for discharge at Lyme Bay. On the morning of 16 March she passed through the traffic separation scheme off Ushant, though her exact path is uncertain. At 09:46 her steering gear system failed in a rough sea with a strong south-westerly wind, about 8 nm north of Ushant.

The ship, with rudder stuck initially in the hard-a-port position, started to veer north. The master, concerned about obstructing the approach to the west-going traffic lane, stopped the engine and transmitted radio warnings that the ship was not under command. He requested other vessels to keep clear of her but did not request outside assistance; the engineers were attempting to repair the steering gear.

By about 10:05 the vessel's original momentum was lost, and she began to drift under the influence of wind and tidal stream only. The latter, with rates up to 1 knot (neaps), was setting easterly from the time of breakdown until about noon; south-westerly until about 17:00; then north-easterly until grounding.

By 11:00 the vessel's heading had changed to 160°T, and she had drifted about 1 1/2 nm in a south-easterly direction.

At 11:20 the engineers reported failure in repairing the steering gear; in the heavy seas the rudder swung about and could not be locked for them to carry out the work. The master, realizing that he needed outside help, radioed for tugs.

The tug *Pacific*, then 15 nm away, responded promptly and arrived at the ship at 12:20. Making fast proved difficult in the heavy seas; a towing hawser was finally made fast on the starboard bow. Shortly after 14:00 the *Pacific* began towing off to starboard to try to turn the *Amoco Cadiz* onto a westerly heading. By then she had drifted about 6 1/2 nm SSE from her 10:05 position and was less than 6 nm off Ushant Island. The tug stopped the *Amoco Cadiz* drifting south, but could not stop her drifting 2 nm further east. Her heading changed only 20° to starboard, from about 160°T to 180°T.

At 16:15 the towing hawser parted and the engine of the *Amoco Cadiz* was at once put to run astern with all possible power. As a result the heading changed to 130°T (i.e, the stern turned towards the wind, which was veering from SW to NW and continued to blow with gale force). For the next 2 1/2 hours, with the engine running astern, the vessel's motion was towards the northeast.

By 19:00 the *Pacific* had prepared a new hawser and was ready to try again. This time, the stern of the *Amoco Cadiz* was made fast. Her engine was stopped to enable the difficult operation to be carried out. But she swung round to head 260°T and drifted eastwards; at 20:04 the port anchor was dropped (1.3 nm west of Roche de Portsal buoy) but dragged, even though a large scope of cable was paid out. Seas were being shipped over the starboard bow and it was considered unsafe for the crew to try to drop the starboard anchor. (The French authorities later recovered the port anchor and found that both flukes had broken off.)

At 20:33 the crew got the towing hawser on board but it was not made fast until 20:55. The *Pacific* moved off to begin towing but minutes later, at 21:04, the *Amoco Cadiz* struck the ground aft. The pump room was damaged and started to flood. Oil leaked and because of fire risk all power was switched off. At about 21:30 the vessel struck ground again and the engine-room flooded. The *Amoco Cadiz* was firmly aground. The *Pacific* continued to tow without effect until the towing hawser parted at 22:12. A second tug, the *Simson*, arrived about an hour later but could only stand by. The ship was doomed.

It was impossible to launch the lifeboats in the heavy seas. French naval helicopters were alerted and performed a daring rescue during darkness in the early hours of Friday, 17 March. No lives were lost.

Cause: The obvious cause of the disaster was the failure of the steering gear. However, the dangers of a lee-shore in the circumstances of breakdown are well known. The *Amoco Cadiz* on her passage to Lyme Bay could

have passed much further offshore without increasing her passage distance or time significantly, but thus increasing her safety margin. Vessels are not compelled to enter the traffic separation zone off Ushant, but if they do they must comply with it.

After the breakdown, the hazardous position of the *Amoco Cadiz* was not fully appreciated by those on board. Even without steering, engine power could have been used more effectively; more urgent steps could have been taken to summon assistance from tugs and to prepare both anchors.

Consequences: The entire oil cargo was lost and the resulting pollution was far in excess of the previous worst case (the *Torrey Canyon*). Following the *Amoco Cadiz* disaster the French Government introduced stricter regulations concerning laden tankers approaching the coasts of France. Radio reports have now to be made to the French marine authorities, and the areas in which laden tankers could operate are restricted. The French Government also insisted that IMO redesign and move further seaward some of the traffic separation schemes in the vicinity of the coast of France, to ensure that laden tankers pass further offshore.

Exxon Valdez

1989

(from "Out of the Channel" and personal observation)

Vessel Description: U.S. oil tanker, 300 m in length. At the time of grounding, she had 1,286,738 barrels of crude oil.

Time of Stranding: 00.04 AST

Date: Friday, 24 March 1989 ("Good Friday")

Place: Bligh Reef, Valdez Arm, Prince William Sound, Alaska USA

Voyage: From Valdez, Alaska to Long Beach, California

On Thursday, 23 March, 9:12 p.m., the *Exxon Valdez* cleared the dock after loading almost 1.3 million barrels of Alaska North Slope crude oil from the Valdez Marine Terminal of the Trans-Alaska Pipeline. The mates and captain, having been involved in either cargo-loading operations or drinking across the bay in Valdez, were fatigued and of questionable performance capability. At 10:20, she turned south at Entrance Island on Port Valdez into the established inbound/outbound Traffic Separation Scheme (TSS) out through Valdez Narrows and Arm. The harbor pilot was disembarked at 11:24 at Rocky Point, and shortly afterwards the Captain radioed the Valdez Traffic Center to request permission to divert from the outbound (westward) traffic lane to the inbound (eastward) lane to avoid glacial icebergs in the Arm.

The radar relied on by the Valdez Traffic Center had been downgraded in the early 1980s and now focused primarily on the Narrows – it didn't always reach as far as Bligh Reef.

The Valdez Traffic Center watchstanders later tested positive for alcohol and marijuana use.

As the vessel returned to a speed of 11 knots after disembarking the pilot, the captain noticed that the ice in the lanes was heavy and ordered a course change to 180°T, in order to try to slip around the eastern edge of the ice outside the TSS. This is not an unusual procedure for tankers avoiding ice in this area, when they want to maintain their speed.

The captain ordered the ship put on autopilot, that the ship's computers load up or accelerate the engines to sea speed of 14 knots, and to turn the ship back into the TSS when it was abeam of the Busby Island light. He then left the bridge under command of the Third Mate who did not have pilot credentials for Prince William Sound.

Thus, the vessel was at this point loading up to full sea speed, outside the TSS, headed directly toward Bligh Reef, on autopilot, piloted by a mate without pilotage credentials for this seaway. The Third Mate later testified that he then ordered the vessel taken off autopilot. It is suspected that this command was either never given or never executed by the helmsman. At 11:52, the wing watch and helmsman were changed; the helmsman who

would later testify that "I get so confused." When the Busby light was abeam, the Third Mate ordered a simple 10 degree right rudder to return to the TSS. The vessel did not respond.

The Bligh Reef (red light) buoy could now be seen off the starboard bow, indicating the vessel was headed for the reef.

The voyage data recorder aboard the vessel later indicated a turn did not commence until 12:01 a.m., despite the Third Mate's testimony that he had ordered the hard over five minutes earlier. It is strongly suspected that the vessel had unknowingly been left on autopilot, and until the mistake was noticed, did not respond to helm commands. By then, it was too late.

At about 12:04 a.m., March 24, the vessel grounded into Bligh Reef and at 12:26, the captain radioed the VTC in Valdez to report the grounding and, in a rather extraordinary understatement, report that "evidently, we're leaking some oil!"

The captain radioed Valdez Coast Guard that he was attempting to wiggle the vessel off the reef; his commands suggest he was actually maneuvering the vessel harder on the reef to protect her from sinking. Although the official estimate of the amount of oil released was about 250,000 barrels, or 1/5 of the load, other estimates suggest that perhaps 2–3 times that amount was spilled. The remainder was transferred to lightering vessels and the ship was refloated, taken to Long Beach, reconstructed, and returned to service in foreign trade under the name "S/R *Mediterranean*."

Consequences: Though not the largest oil spill in terms of volume of oil spilled, the *Exxon Valdez* spill became the most damaging — biologically, socially, and economically — in history. Coastal currents spread the oil eventually over 10,000 square miles, and 1,500 miles of shoreline were oiled. More marine mammals and seabirds were killed than any other spill on record. Coastal communities dependent on coastal fisheries were in turmoil for years.

Although Exxon spent over $2 billion on a massive clean-up effort, only about 20,000 barrels, less than 7%, was eventually recovered. Today, it is estimated that several million gallons of *Exxon Valdez* crude remain trapped in beach sediments of Prince William Sound.

Braer

1993

(from "Innocent Passage," J. Wills)

Vessel Description: U.S. managed tanker, built in Japan, flagged in Liberia, owned in Bermuda by Americans, crewed by Greeks, Poles, and Filipinos, carrying Norwegian oil to Canada. At the time of grounding, she had 84,413 tons of Gulfax crude on board and 1,700 tons of heavy fuel oil.

Time of Stranding: 11:13 GMT

Date: 5 January 1993

Place: Garth's Ness, southern tip of Shetland, U.K.

Voyage: From Mongstad, Norway to Quebec, Canada

On the morning of Sunday, 3 January 1993, the T/V *Braer* set sail from the Mongstad oil terminal, north of Bergen. In Mongstad, there had been trouble with the steam boiler, which was needed to heat the ship's fuel oil for her main engine. They had to use the auxiliary burner to inert the cargo tanks during loading.

Weather upon sailing was poor – 30 foot seas, 50 knot south winds. Green water was taken on deck. Progress was very slow – after 24 hours, the vessel was only 60 miles out, an average speed of 25 knots.

The U.S. Coast Guard had given the *Braer* a complete inspection on November 11, 1992 (7 weeks earlier), and passed her with a clean certificate. Although she was 17 years old, she wasn't particularly old by international

standards. Several sixteen foot-long steel pipes were lashed to steel racks on the deck outside the Inert Gas Room. Heavy seas were running the full length of the deck. Large waves slammed the vessel.

The rack holding the pipes was constructed at order of the Chief Engineer on a cold, wet, open deck in the mid-Atlantic in mid-winter on her journey to Norway. Welding is better done in warm, dry conditions. The wind rose and seas increased to 50 feet.

The rack and pipes broke loose in the heavy weather south of Shetland. They rolled around on the port aft deck, and it was judged too dangerous to send anyone out to secure the pipes. The rolling pipes on deck soon smashed the fuel tank vent pipe, allowing seawater to enter the fuel tanks. The spiral of mechanical failure had begun.

They had been running slow because of the heavy seas and the main engine, a 7-cylinder, two-stroke Sulzer, slowed and clogged. They could have switched to running on diesel, but did not. Because of fuel contaminated with seawater, the auxiliary engines, generators, and steam boiler failed at the same time as the main engine, and the ship was in serious trouble. The ship's electrical power stopped — the *Braer* was dead-in-the-water, broadside to a force 9 gale, with a fast approaching lee-shore — South Shetland.

At 05:00, the Captain radioed not the Coast Guard, but his home office in Stamford, Connecticut for instructions. No mayday was sent immediately. This turned out to be a grave mistake.

At 05:19, when the captain spoke with the Coast Guard, he reported engine failure, but "no immediate danger."

At 6:26 a.m., the captain realizing the vessel's northward drift toward Sumburgh Head, issued the "Pan" message that the Coast Guard had urged him to issue at 6:11 a.m. which allowed rescue vessels to be dispatched. The delay in calling for assistance is deemed a significant contributing cause for the grounding.

The *Braer* had broken down in the "Sumburgh Roost," the Fair Isle Channel, in some of the messiest tidal currents known, in the midst of a North Sea hurricane. Lowering the anchors, which required sending men forward on decks awash, was simply impossible. No one could reach the bow towing cables to deploy. And there was no stern anchor.

As the vessel drifted within 2.5 miles of Sumburgh Head, her crew was lifted off by the RAF Coast Guard helicopter. At 8:50 a.m., only the captain and one crewman were left on board. Two fishing boats now standing by — the *Philorth* and the *Sette Mari* — were helpless to assist. The salvage tug *Star Sirius* was still 44 minutes away.

Shetlanders had spoken for generations of a witch named Norna whose lair was high on Fitful Head, luring ships to their doom for centuries off the Roost. The *Braer* was to be her prize catch.

The salvage tug *Star Sirius* arrived at the vessel around 9:30 a.m. and stood by with no one aboard to fix a tow to the vessel. Later, the Shetland Fishermen's Association would say they were "astonished" at the decision to abandon ship so early.

At 11:07, the first line fixed by the *Star Sirius* missed. They then fixed a second line; it was received, but it was too heavy to hold. The men were lifted off. Four minutes later, at 11:13, the *Braer* struck the rocks at Garth's Ness. She and her cargo became a total loss.

Consequences: The intense hurricane-force winds that drove the vessel onto S. Shetland continued for two to three more weeks and the huge seas and turbulence effectively emulsified most of the *Braer*'s 600,000 barrels of Gulfax crude with sea water. As a result, the oil naturally dispersed, biological damage was minimized, and most of Shetland's coastline was untouched. Bottom sampling later found perhaps 100,000–200,000 barrels distributed over a large portion of the seabed between Shetland and the Scottish mainland in two sedimentary basins. It is assumed that this seabed oiling resulted from the intense surface mixing of seawater, oil, and sediment which caused the oil to sink.

ADDENDUM 2

Preparation for a Tank Vessel Examination — U.S. Coast Guard

To Ship masters and Agents:

The following list has been made to help you prepare for your upcoming Coast Guard Examination. This is not an all inclusive list of a complete examination and some things may not apply to your vessel. You should make all applicable items ready and available for examination:

I. If you are equipped with a cargo pump room, a gas-free Chemist's Certificate will be required prior to the examination of the pump room. Failure to obtain the certificate will result in cargo operation delays.

Ballast Tank - If the vessel is more than 10 years old, a Certified Marine Chemist's Certificate will be required for at least one ballast tank located in the cargo block, mid-ship half length section. Arrange which ballast tank with the CG dispatcher or CG Inspector.

II. Provide a copy of the following papers or documents:

Classification Document
Classification Society status report
Latest Drydock survey and special survey gauging reports
Certificate of Registry
Cargo Ship Safety Construction Certificate
Cargo Ship Safety Equipment Certificate
Safety Radiotelegraphy Certificate
IMO Certificate of Fitness (Gas/Chemical Carriers)
International Oil Pollution Prevention Cert. and Supp.
Load Line Certificate
IMO Certificate of Fitness
IOPP Certificate and Supplement
Certificate of Financial Responsibility
Crew list
A drawing of the cargo tank arrangement
Safety Radio Telegraph
Vapor Collection System Certification from Class Society
Safe Manning Document

The following expiring documents will be removed by the USCG inspector when they leave your vessel. If you wish, make copies for your records. New documents will be issued at the conclusion of your examination:

Coast Guard Letter of Compliance or Tank Vessel Examination Letter, Subchapter "O" Endorsement

III. Make the following documents or books available for inspection:

Officer Competency Certificates (licenses)
Current Health Certificates for all crew members (This is a medical examination stating that you are fit for duty and is valid for two years.)
Procedures and Arrangements Manual or Operations Manual as applicable
Approved Crude Oil Washing (COW) Manual
Approved ballast manual (DCBT must include text of resolution 14 of MARPOL

Oil/cargo record book
Oil transfer procedures
Trash log for compliance with MARPOL ANNEX V
Proof of hose testing
Shipping document and cargo manifest
Certificate of inhibition or stabilization of cargo
Declaration of Inspection if transferring bunker
Cargo information cards for the cargo on board
Waiver letters if any
IGS approval Cert.
TVEL_____ TVE Enclosure_____
Inclining experiment

IV. Be ready to calibrate and/or demonstrate the proper operation of the following:

Combustible gas detectors or fixed gas detection system (will require the proper span gas for calibration)
Oxygen analyzer
Toxic gas detector
Overboard discharge monitor
Cargo pump emergency shutdowns (remote and manual)
High level alarms (95% - where required)
Low level alarms (where required)
Overfill alarms (98% - where required)
Quick closing valves (remote and manual)

Be ready to demonstrate the proper operation of the following:

Inert Gas System Alarms

Low water flow or water pressure to the scrubber
High water level in the scrubber
High gas temperature on the discharge side of the blowers
Inert gas blow failure
High oxygen content at the discharge side of the inert gas blowers (greater than 8%)
Automatic control system power failure
Low water level in the deck water seal
Low gas pressure forward of the deck water seal (under 100 mm water gage)
High gas pressure forward of the deck water seal

Oily Water Separator Check

15 PPM alarm (test to be in accordance with system manufacturers instruction)
System auto stop
Recording device (if fitted)
Stock of manufacturers recommended spare parts and consumable supplies

Fire Fighting Systems

This test will require the use of two fire hoses and, if fitted with an on deck foam system, two foam monitors. Water only will be sent through the foam monitor.
Demonstrate pump are capable of providing 75 psi at all stations
Operate all fire fighting pumps using fire hose/monitors
Fire control plan
Emergency gear locker
Semi-portable and portable extinguishers

Fire fighting outfits/suits (Non conducting boots and gloves, rigid helmet, lantern, axe, water resistant protective clothing)
SCBA 1200 Liter
Foam analysis
Fixed fire fighting (storage room for fire agent)
International shore connections

Steering Gear Systems

Operate the steering gear on each steering gear pump
Operate the steering gear in all modes of operation (wheel, hand, non-follow up, and emergency)
Demonstrate the steering failure alarms
Demonstrate the low hydraulic oil alarm in the reservoir

Emergency Generator/Accumulator Batteries

Demonstrate automatic starting feature
Demonstrate the manual transfer procedures

Vent Systems

Piping
P/V valves, flame screens, goosenecks
Expansion trunks

Pumprooms

Remote shutdowns at all stations
Overspeed trips
Low lube oil trip
Sources of ignition
Proper ventilation
Explosion proof fixtures
Stuffing boxes gas tight glands
Gasfree

Lifesaving Equipment

Current servicing of liferafts (retro fit of reflective tape, installed thermal protective aids)
Proper stowage of LR including weak link attachment
Lifeboats davits and winches properly rigged
Lifeboats (falls end for ended, renewed), muster lists, embarkation lighting, drills in log
Lifebuoys
Public address system
Life jackets
Immersion suits

Navigation and Communication Systems

Proper operation of radars and ARPA
Current U.S. or foreign charts and publications
Navigation light operation
Echo depth sounder and recorder
Rudder angle indicator
Bridge to steering communications (intrinsically safe radios)
SATNAV operation

Gyro and repeaters
Magnetic compass and deviation log
Maneuvering characteristic chart
Emergency radios (portable/lifeboat)
EPIRB's
Parachute flares
Channel 16 on bridge

Habitation/ILO

Minimum age crewmember 15
Hospital space
Crew's room and lounge
Galley (grease traps readily removable, fire damper, arrangement to secure fans, fixed means to extinguish a fire)
Means of escape (at least two widely spaced)

Engine Room

Non conducting mats at switchboards (front, sides, and rear)
Bilge pumps
Skylights (no glass or wood)
Main propulsion control
Oil placard
Engine room ventilation shutdowns
Operate the engine room ventilation shutdowns.
Fuel oil cutoff valves

Miscellaneous

Oil in prohibited spaces – forward of the collision bulkhead

IGS CHECK OFF LIST

1. IGS SYSTEM APPROVAL BY _____ DATE _____
2. IGS SOURCE: BOILER (FLUE GAS) _____ GENERATOR _____
3. UPTAKE VALVES (FLUE GAS SYS) OPERATIONAL _____
4. SCRUBBER
   A. PRIMARY WATER SUPPLY _____ DOESN'T INTERFERE WITH FIRE FIGHTING CAPABILITY _____
   B. ALTERNATE SOURCE _____
   C. SCRUBBER LEVER OR FLOW INDICATOR _____
5. BLOWERS
   A. AT LEAST TWO _____ TOTAL CAPACITY _____
   (MUST BE 125% OF TOTAL CAPACITY OF CARGO PUMPS)
   B. BOTH TESTED _____
6. REGULATING VALVE OPERATIONAL _____
7. FRESH AIR INTAKE CLOSED WITH BLANK FLANGE _____
8. DECK WATER SEAL
   A. TYPE (WET, SEMI-DRY, DRY) _____
   B. WATER SUPPLY _____
   C. HEATING COIL _____
9. PRESSURE/VACUUM BREAKER
   A. TYPE (LIQUID OR HIGH VELOCITY VENT) _____
   B. IF LIQUID, LIQUID USED _____
10. DECK PIPING
    A. AUTOMATIC NON RETURN VALVE _____ STOP VALVE _____
    (FITTED JUST AFTER DECK WATER SEAL)
    B. CONDITION OF PIPING _____
    C. FITTED WITH SHUTOFF VALVE OR BANJO FLANGE AT EACH TANK
    YES/NO (INCLUDING SLOP TANKS)
11. ALARMS AND INSTRUMENTATION
    ALARMS:
    A. HIGH 02 (8%) _____ TESTED _____
    B. HIGH TEMP _____
    C. LOW IG PRESSURE _____ HIGH IG PRESSURE _____
    D. IG BLOWER FAILURE _____
    E. POWER FAILURE TO AUTOMATIC GAS REGULATING VALVE _____
    INSTRUMENTATION:
    A. 02 LEVEL (% BY VOL) RECORDER _____
    B. IG PRESSURE RECORDER _____
    C. 02 INLINE ANALYZER - TYPE _____ SPANNED _____
    D. READOUTS AVAILABLE TO CARGO OFFICER _____
12. SYSTEM SHUTDOWNS:
    A. LOSS OF WATER SUPPLY TO DECK WATER SEAL _____**ALARM**
    B. HIGH IG TEMPERATURE _____**ALARM**
    C. LOW WATER LEVEL/FLOW IN SCRUBBER _____**ALARM**
    D. HIGH WATER LEVEL IN SCRUBBER _____**ALARM**
    E. REMOTE OUTSIDE OF SPACE _____

ADDENDUM 3

Washington State Office of Marine Safety

Agency Programs

After the Exxon Valdez spill in 1989 and two major spills along the Washington coast in 1988 and 1991, the Washington State Legislature passed the Oil Spill Prevention and Response Act of 1991. This legislation:

- Created the Office of Marine Safety (OMS),
- Established a reserve account in the event of a major oil spill, and
- Funded other spill related activities.

OMS' mission is to reduce the risk of oil spills in Washington waters by promoting safe marine transportation. The agency's programs focus specifically on improving human performance as the most effective means to prevent oil spills.

Vessel Screening

The Screening Program evaluates cargo and passenger vessels entering Washington waters for relative risk posed to public safety and the marine environment. The OMS Screening Program uses a database of risk-related vessel data and a risk matrix based upon expert opinion of experienced Puget Sound mariners to screen vessels. The matrix prioritizes ships for boarding and inspection by monitoring personnel in the OMS field offices.

Vessel Monitoring

The purpose of the Monitoring Program is to monitor vessels and evaluate compliance with prevention plans, contingency plans, and other state, federal, and international laws. The program focuses on vessels identified by the Screening Program as a high priority for boarding. The OMS Puget Sound field office began operating in November 1993, and field office staff daily board ships entering Puget Sound. OMS opened a Columbia River field office in Portland, Oregon in July 1994. The Columbia River field office is a joint venture with Oregon's Department of Environmental Quality.

Prevention Planning for Tank Vessels

The Tank Vessel Prevention Planning Program provides the best achievable protection of Washington's marine environment. Beginning June 7, 1995, owners and operators of tankers and tank barges must submit oil spill prevention plans demonstrating compliance with best achievable protection standards in four major categories:

- Operating Procedures;
- Personnel Policies;
- Management Practices; and
- Technology

Education and Technical Outreach

The Education and Technical Outreach Program targets specific pollution causing events and develops and implements solutions to these problems. OMS identified bunkering as its first priority for education and technical outreach. OMS worked with a technical advisory committee to develop bunkering procedures. In August 1994, these procedures were adopted as regulations effective October 1994. OMS is now implementing an education and monitoring program to reinforce these bunkering procedures.

Vessel Contingency Planning

All tank vessels and cargo and passenger vessels of 300 gross tons or greater must file oil spill contingency plans with OMS. The Contingency Planning Program is responsible for ensuring the capability for an effective response to vessel oil spills in Washington State waters. This is accomplished by reviewing and approving vessel oil spill contingency plans and evaluating drills. The Contingency Planning Program also reviews and approves primary spill response contractor applications.

Marine Information System

The OMS Marine Information System contains information on ships and casualties, vessel prevention and contingency plans, agents, owners, and other relevant data. OMS is now entering world-wide data on casualties, events, and personnel into the system. The system was developed for OMS, and is on-line and available to all OMS employees. OMS' Screening Program relies heavily on this information.

Vessel Investigations

Vessel incidents provide a unique opportunity to determine what went "right" and "wrong" in a particular vessel operation. OMS investigations focus on the human and organizational factors that lead to vessel incidents. Each investigation is an opportunity to develop prevention methods that may reduce the possibility of a similar incident occurring in the future. OMS investigates oil spills, groundings, fires, explosions, sinkings, collisions, allisions, losses of propulsion or steering systems, and incidents involving human error. Vessel investigations are entered in OMS' database and may be used to screen a vessel upon its next arrival into Washington waters.

Interagency Coordination

Comprehensive prevention planning involves a high degree of interagency coordination with agencies and governments that share a responsibility for the Pacific Coast, Puget Sound, and the Columbia River. OMS works closely with the United States and Canadian Coast Guards, the Washington State Department of Ecology, the Oregon Department of Environmental Quality, British Columbia, and other West Coast states to avoid duplication of effort and maximize the use of resources on spill prevention programs.

ADDENDUM 4

DET NORSKE VERITAS TECHNICA
RENSSELAER POLYTECHNIC INSTITUTE
THE GEORGE WASHINGTON UNIVERSITY

August 21, 1985

PRINCE WILLIAM SOUND RISK ASSESSMENT

PROJECT WHITE PAPER

EXECUTIVE SUMMARY

The Prince William Sound (PWS) risk assessment project has three primary objectives: (1) to identify, evaluate, and rank the risks of oil transportation in PWS, (2) to identify, evaluate, and rank proposed risk reduction measures, and (3) to develop a risk management plan and risk management tools that can be used to support a risk management program. The Prince William Sound risk assessment project is designed to provide system stakeholders with the information, techniques, and tools required to understand and to reduce the risk associated with the transportation of oil in PWS. The involvement of all TAPS shippers, the Regional Citizen's Advisory Council, Alyeska, the Coast Guard, and the State of Alaska DEC in the management of the project provides the study team with unique access to individuals and information and will ensure that all viewpoints are considered in the analysis.

The PWS risk assessment will not attempt to determine an "acceptable level of risk" a priori. Rather, the analysis will describe and measure the current level of risk in the system, will identify and measure the potential effectiveness of risk reduction measures, and will identify and rank potential system improvements according to effectiveness, cost, and implementation feasibility. The degree to which these improvements are accepted and implemented by the steering committee and other system stakeholders will define the level of system risk that is accepted. The determination of acceptable risk will be a product of the PWS analysis, not an initial parameter subjectively determined or a value calculated from some other environment. The products of the risk analysis will produce a dynamic capability — the continuing ability to evaluate system changes and to monitor and manage the system.

1. INTRODUCTION

This white paper describes the framework, methods, and models that will form the basis of the PWS risk assessment. The study scope will address the risks of marine oil transportation from the Valdez Marine Terminal to 20 miles outside of Hinchinbrook Entrance. It will examine causal and contributory factors such as marine traffic, weather, external environmental variables, human error, and mechanical failure. The study will address technical and operational aspects of the tanker fleet, regulatory requirements, and operating company management. Excluded from the scope of the study are events that could occur within the terminal itself or events caused by certain extremely low probability natural phenomena (e.g., a lightning strike).

The project approach will integrate a system oriented simulation-based methodology with the more traditional event oriented probabilistic approach. This combined approach will compensate for the inherent weaknesses in each method. Both structured expert judgment and historical data analysis will be used to support each element of the modeling process. The proposed peer review of the methodology by the National Academy of Sciences/ National Research Council Marine Board will affirm the technical validity of the work. The continuing dialogue between the study team and stakeholders throughout the project will ensure the results are realistic and viable.

II. DESCRIPTION OF PROJECT RESULTS

The project will deliver a range of products that will provide a basis for recommendations for the effective measurement, monitoring, and management of risk in Prince William Sound. These products will be delivered in five sets: (1) a description of the current system risk, (2) an evaluation of this current or baseline system risk, (3) a description of risk reduction measures, (4) an evaluation of risk reduction interventions, and (5) a computer-based risk management tool that can be used to support a risk management program.

1. *Risk Description:* Risk states and risk scenarios will be identified and described. Risk states are unique states of the system described by values of system variables such as wind, visibility, location, vessel type, ice conditions, and vessel traffic. Each risk state may be viewed as an opportunity for an incident. The probability that an incident will occur in any given state, however, varies significantly among risk states. The enumeration and description of risk states provide the basis for identifying high risk situations in the Sound and for developing strategies to minimize the incident potential of high risk conditions.

   Risk scenarios are unique sets of ordered events (event trees or causal chains) that result in an incident of interest. The sequences are composed of the initiating event (fault or failure) and subsequent equipment and/or human failures that are part of the accident chain. Possible sequences of these events will be identified and described. Identification of these sequences is essential to the development of strategies that interrupt these chains.

2. *Risk Evaluation:* The baseline risk of the PWS system will be determined by evaluating both risk states and risk scenarios. The evaluation of a risk state requires the determination of two factors: the relative probability that an incident will occur given that the system is in a defined state, and the frequency of occurrence of the system state. The probability that an incident could occur during a given system state will be determined based on a combination of expert judgment and historical data. The frequency of occurrence of system risk states, or opportunities for incident, will be determined by a simulation model of PWS. The result of this analysis will be a ranking of system states based on the relative probability of incident occurrence.

   The evaluation of risk scenarios requires the calculation of the probabilities for each step in the causal chain based on historical data or analytic models. The result of this evaluation will be a ranking, based on the absolute probability of occurrence per tanker transit, of the types of incident scenarios in PWS and the identification of the dominant causal factors for these events. The system and scenario evaluations will be combined to produce a description of the current or base line marine transportation risk for oil tankers in PWS.

   The system simulation, after calibrations based on historical data and the scenario analysis output, will produce a risk profile of PWS that will estimate the frequency of occurrence of incident/system state combinations. This profile will, for example, allow the calculation of the probability of an unpowered grounding at Hichinbrook entrance during conditions of high winds and sea state. More traditional risk representations such as frequency vs. consequence and cumulative probability vs. consequence will be constructed. These distributions and the system profile produced by the simulation will be used as the basis for the evaluation of proposed changes to the system.

3. *Risk Reduction Description:* Risk reduction measures and system changes that have been proposed by prior studies, groups, and processes or currently exist in law and regulation will be identified and new initiatives will be identified. The risk reduction measures will be classified as to their nature and objective. Risk reduction measures may, for example, be classified as ship specific (e.g., inspections), operation specific (escort requirements), or system wide (VTS rules). The objective of risk reduction measures may be one or more of the following:

   - to prevent errors or failures that can cause an incident (e.g., inspections, training programs, quality programs),

- to prevent an incident given that errors or failures have occurred (e.g., vessel traffic control, escort vessels),
- to lessen the effects of an incident once it occurs (e.g., hydrostatic loading).

The potential cost (initial and operating, allocation of costs), and implementation difficulty (time required, technical and organizational difficulty) for each risk measure will also be identified and described. All proposed risk reduction measures will be examined for potential adverse human health and safety impacts.

4. *Risk Reduction Evaluation*: Risk reduction measures and system changes will be evaluated using a three step process. The first evaluation will be a straightforward evaluation of the effect of each proposed measure on the baseline risk of the PWS system. The effectiveness will be measured by the overall system risk reduction produced by the measure or change, the effect on dominant causal scenarios, and the effect on the spill risk profile of the system (the frequency vs. consequence distribution). The tools developed in the analysis will provide four additional evaluation capabilities. They will enable (1) the evaluation of the effect of removing or changing existing system restrictions or constraints, (2) the evaluation of the cumulative impact of groups of measures, (3) the evaluation of the effect of changes in system parameters (e.g., increase in non tanker vessel traffic, changing ice conditions), and (4) the identification and evaluation of secondary effects of changes that may be modeled in the system simulation. This secondary impact is an important area of investigation since an intervention that makes one section of the system safer may increase the risk in another section of the system or increase the overall system risk at a later time. Risk reduction measures that have a negative or negligible impact on the system or have an adverse safety or human health impact will be excluded from further evaluation.

   The second evaluation of risk reduction measures will be two dimensional: the measures will be displayed on an effectiveness vs. cost plot and the relative cost effectiveness of measures will be calculated. This analysis will produce four risk reduction groups: (1) high cost – high effectiveness, (2) low cost – low effectiveness, (3) low cost – high effectiveness and (4) high cost – low effectiveness. Categories (1) and (2) and (3) will be evaluated in a third phase. Category (4) measures will be dropped from further evaluation since they will be cost ineffective and should not be implemented until and unless their effectiveness can be improved or their cost reduced. The final evaluation for selected measures will be a multidimensional evaluation using appropriate analytic techniques and computer-based modeling tools. This evaluation will allow a structured consideration of all the effectiveness, objective, cost, and implementation parameters described above. Although the analysis will be performed by the project team, the relative importance assigned to the attributes used in the analysis will be derived from interaction with stakeholders. The results of these three analyses will provide the basis for an integrated risk reduction strategy.

5. *Risk Management Tool*: The final product will be a computer-based tool for risk monitoring and risk management in Prince William Sound. The results of the simulation and risk mitigation modeling will be used to build a decision support tool that will enable managers to assess the risk level of the system based on current system parameters and to evaluate the risk impact of changes in the system. These changes could be the evaluation of new proposed risk mitigation measures (e.g., a technological improvement in the VTS), or could be changes in the system itself (e.g., increased vessel traffic or a change in the composition of vessel traffic in PWS).

III. PROJECT METHODOLOGY

Six project tasks are associated with the development of project deliverables. A seventh task consists of developing the final report and ensuring adequate public dissemination of the study results.

The first step toward the results is the development of a system description that identifies the system parameters and variables required for structuring risk models. Ship rides, interviews with experts and

stakeholders, and analysis of prior studies will provide the project team with essential knowledge of the system. The objectives of this task are to establish relationships with all relevant experts, to identify expectations and concerns, to obtain a global understanding of the system from first-hand experience, to identify the system parameters and variables that will be used in structuring risk models and to identify local data sources and obtain relevant data.

The system description provides a point of departure for the project's modeling and analysis work, tasks two and three. A novel approach has been adopted for this project: integrating expert judgment-based analysis with an analysis of historical data, and integrating a scenario based causal approach with a situational-based system analysis of risk in PWS. These tasks will involve extensive interaction with local experts identified in task one as well as intensive data analysis. Expert judgment will be elicited using structured interviews and questionnaires and analyzed and modeled using techniques developed by the project team in prior studies. Data that will be analyzed will include local data obtained from Coast Guard, state, industry sources, Coast Guard national casualty data, and international tanker accident data.

Tasks four and five are modeling and simulation tasks which will develop a system and event simulation that can be used to produce a risk profile of Prince William Sound. The risk profile produced by the simulation will identify high risk situations, how often they occur, and what causal factors produce them. The sequence analysis output will be used to simulate and evaluate the ordered sequences of events that could produce incidents.

Task six is the development and evaluation of risk reduction measures. Prospective risk mitigation measures will be identified, collated, and categorized based on interviews and the review of prior studies, reports, and commissions. A three-stage evaluation of proposed interventions and system changes will provide the basis for the development of an integrated risk management strategy and risk monitoring and management tools.

The project team will provide status reports, a draft final report, and a final report to the Steering Committee. Extensive information dissemination activities will be required to ensure that stakeholders not represented on the steering committee have the opportunity to understand the project's objectives, process, and results. The project team will facilitate the proposed Marine Board review by providing all necessary materials and information to the reviewers and by responding to their questions.

IV. BACKGROUND ISSUES: ACCEPTABLE RISK AND CONSEQUENCES

Two critical issues must be addressed in the assessment of risk in any complex system. The first is how to account for the distribution of potential impacts or consequences of events considered in the risk analysis. The second issue is how to define, establish, or calculate an acceptable level of risk for the system.

Risk has two components: the probability of occurrence of an incident, and the impact or outcome of the incident. One objective of risk analysis is to develop a relationship between probability and outcomes so that a system may be managed within a desirable risk contour. Management measures are taken to ensure that high impact events have an extremely low probability and more frequent events consist of low impact incidents. The events of concern (casualties or incidents involving tankers underway in PWS) have a potential for severe or even catastrophic oil outflows. The primary concern of this analysis will be, therefore, the determination of the probability of occurrence of these unwanted events and the identification and evaluation of measures required to prevent or reduce their effects. Consequences of a spill (the potential for environmental, human health, and social impacts and the feasibility of response) will be assumed to be a function of the spill location and system state determined from the system simulation, and the potential spill volume, as determined from the scenario and simulation analyses. A tanker casualty may result in an oil outflow that ranges from zero (no discharge) to the total loss of the cargo. The distributions of oil outflows for each type of potential casualty developed from world wide data and the PWS simulation will be used to develop an incident frequency vs. expected outcome distribution for PWS tanker related incidents. The incident type distributions will be used to calculate an expected spill value for each incident type. For the purposes of evaluating risk interventions and developing

risk management strategies, particular attention will be given to two critical values of spill volume, the expected and maximum outflows, determined from the potential spill size distributions for each incident scenario. The expected spill value calculated for each scenario analysis is anticipated to be equivalent to the loss of most of the cargo in one or more tanks. The simulation model, which will be based on the actual TAPS fleet, will be used to project the maximum spill size for each incident. The situational and scenario-based analysis will, therefore, support the creation of a consequence rating that will be used in the evaluation of risk reduction measures.

The second difficult issue that has complicated many risk assessments is the determination of the acceptable level of risk in a complex system. The determination of risk acceptability is essentially a sociological and political process that can be aided by analysis but cannot be delegated to the analyst. Acceptability implies a subject (who accepts the risk?) as well as an object (what risk should be accepted?). The difficulty of this process is illustrated by the fact that, although the Ports and Waterways Safety Act of 1972 directed the Coast Guard to determine the acceptable level of risk for U.S. Ports, the Coast Guard has not developed a methodology for making this determination. The PWS risk analysis will describe and measure the current level of risk in the system, and will identify, evaluate, and rank potential risk reduction measures. The level of risk accepted in the system is a dynamic quantity and will be defined for PWS by the degree to which system improvements are accepted and implemented. Risk levels for other ports in the United States and Europe, where available, will be compiled and used to provide a basis for comparison during this evaluation process. The determination of an acceptable level of risk will be a product of the project, not an a priori assumption.

Hawaii's Readiness to Prevent
and Respond to Oil Spills

NONTANKER MARINE VESSELS IN HAWAII: CONSIDERATIONS REGARDING THE OIL POLLUTION ACT OF 1990

Appendix 5

Noel A. Ludwig

February 1997

INTRODUCTION

Government agencies are currently implementing aspects of the Oil Pollution Act of 1990 (OPA 90), which legislated specific and comprehensive safety requirements for oil tankers using American ports. However, since OPA 90's impact on nontanker vessels consists mainly of insurance requirements for vessels over 300 gross tons, both federal and state regulations may be insufficient to safeguard against oil spills from nontanker vessels into Hawaiian waters.

While nontanker vessels are generally smaller than tankers, many are still capable of oil spills in excess of 10,000 gallons (the threshold for a major oil spill, for example, in Florida) and occasionally exceeding 100,000 gallons (the threshold for a major spill under federal law). For the purposes of this report, spills in the range of 10,000 to 100,000 gallons will be considered medium size, while those over 100,000 gallons will be considered large. In Hawaii, a number of domestic commercial fishing, charter fishing, tour, and tug vessels are capable of medium-sized spills. On the other hand, most cargo, cruise, and foreign commercial fishing vessels, as well as some tugs, are capable of large oil spills. Some cruise ships are even capable of very large oil spills (>1 million gallons). Older vessels are particularly visible in Hawaii's fishing industry, and many of these are uninsured. This situation, combined with the large percentage of marine vessels of all classes without oil pollution coverage, may be of some concern to both government officials and citizens in Hawaii.

This report characterizes the various classes of oceangoing vessels in Hawaii not covered under OPA 90, their potential for medium-to-large oil spills, and the legal inadequacies regarding them, then concludes with some suggestions for further discussion. Presentation of the subject matter is divided into four parts. The first section characterizes the fleet based in Hawaii today and also notes the presence of vessels that visit but are not homeported in the islands. The next two sections cover accidents involving these vessels and the vessels' insurance characteristics, respectively. Finally, some points of departure for resolving this potentially hazardous situation are presented for discussion.

For the purposes of this appendix, it would be optimum to categorize Hawaii's marine vessels according to fuel capacity, but what little data the U.S. Coast Guard has it holds in confidentiality. As a result, any description of the fuel capacity characteristics of this fleet involves a certain amount of extrapolation. Nonetheless, the data procured for this report should be sufficient to characterize vessels in the various classes covered below.

CHARACTERISTICS OF HAWAII'S MARINE VESSELS

All vessels in Hawaii must be either documented or registered. "Documentation" is required by the U.S. Coast Guard for all vessels over five tons net weight if they are commercial vessels; pleasure craft can be documented at the option of the owner. If a boat of any weight is not documented, it must be "registered" at the Harbors Division, Department of Transportation, State of Hawaii. Of the 16,612 registered and 1,146 documented vessels in Hawaii in 1984, approximately 80% were listed as pleasure boats, 10% as commercial fishing or charter boats, and the remaining 10% in other categories, including small tour boats (Skillman et al. 1984; Hamm and Quach 1989). Since owners of vessels which are already documented can also choose to register them, it is possible that some overlap exists between the two numbers, but if so it is undoubtedly minor.[1] The rapid influx of vessels — especially fishing vessels — into Hawaii from the late 70s to early 90s has decreased significantly in the last few years, and will probably remain fairly stable for some time. Indeed, the number of registered vessels actually dropped to about 14,000 in 1995, while the number of documented vessels had dropped to 1,038 by 1990 (LMR Fisheries Research 1992; Vessel Registrar, Hawaii State Department of Land and Natural Resources pers. comm.).

[1] When registering a vessel, the owner must provide proof of ownership, plus vessel name, identification number, length, hull material, hull manufacturer, location where vessel is kept, type of fuel and engine, principal use and whether or not the vessel has a radio. If the vessel is registered as commercial, the owner must state its tonnage as well.

The diesel engine, using screw propulsion, is the most common for virtually all usage categories of documented vessels. Outboard and inboard-outboard motors are the most common in nearly all usage categories for registered vessels. Larger vessels, which average 36 feet in length, tend to use diesel fuel. Smaller vessels, which average 16 feet in length, tend to use more refined fuel, which is less persistent in the environment when spilled (Skillman et al. 1984). Size classes and propulsion types are shown in Tables 1 and 2. Home islands are listed in Table 3. As may be seen in Table 1, already in 1984 at least 147 nontanker vessels longer than 60 feet were homeported in Hawaii, at least 47 of them longer than 100 feet. A large percentage of the vessels longer than 75 feet have fuel capacities above 10,000 gallons, the ramifications of which merit greater attention and concern. As will be seen below, a large proportion of visiting ships are also longer than 100 feet and have very large fuel capacities. For example, Table 4 displays the large sizes (and thus, by implication, fuel capacities) of the visiting foreign longliner fleet.

TABLE 1. Classification of Marine Vessels in Hawaii by Length and Usage

Length (ft.)	Recreational	Commercial Fishing	Passenger/ Fishing	Passenger Carrying	Freight	Other/Not Specified	Total
<14	3,793	55	0	2	0	288	4,138
14–15	2,594	50	0	12	0	67	2,723
16–24	6,633	932	7	52	0	188	7,812
25–30	1,009	213	46	26	0	29	1,323
31–40	750	121	103	53	0	24	1,051
41–60	315	50	57	34	3	36	495
61–100	18	26	3	30	2	21	100
101–150	1	1	0	5	3	11	21
151–250	0	2	0	1	18	5	26
>251	0	0	0	1	7	2	10
Not Spec.	0	0	0	0	0	24	24
Total	15,113	1,450	216	216	33	695	17,723

Source: Skillman et al. (1984)

TABLE 2. Classification of Vessels in Hawaii by Type of Propulsion and Usage

Propulsion	Recreational	Commercial Fishing	Passenger/ Fishing	Passenger Carrying	Other/Not Specified	Total
Gas	124	11	16	30	1	182
Diesel Oil	459	130	175	95	60	919
In/Outboard	11,060	1,283	25	56	321	12,745
Sail/In/Out	1,339	14	0	13	37	1,403
Sail Only	1,814	2	0	19	206	2,041
Other	315	10	0	2	62	389
Not Specified	2	0	0	1	60	63
Total	15,113	1,450	216	216	747	17,742

Source: Skillman et al (1984).

TABLE 3. 1984 Classification of Marine Vessels Responding to Questionnaires by Island

Island	Commercial	Charter	Recreational	"Passenger Carrying"	Total
Oahu	502	21	10,051	23	10,597
Hawaii	412	39	1,763	11	2,225
Kauai	225	6	986	20	1,237
Maui	132	14	913	32	1,091
Molokai	31	2	271	1	305
Lanai	7	0	55	1	63
Total	1,309	82	14,039	88	15,518

Source: Skillman and Louie (1984).

TABLE 4. Lengths of Foreign Longline Vessels Visiting Hawaii, 1986–88

Length (ft.)	1986	1987	1988
49–75	1	0	4
76–100	63	83	98
101–125	124	149	156
126–150	276	250	198
151–175	286	273	282
176–200	54	62	104
201–225	4	5	6
225–250	1	1	2
251–275	0	3	1
276–300	1	6	4
301–325	3	4	4
325–350	0	3	6
351–375	1	2	1
376–400	0	1	0
>401	0	4	6
Total	814	846	872

Source: Lucas and Iversen (1992).

Commercial Fishing Vessels

Although the vessels used in Hawaii's fisheries can essentially be divided into commercial, charter, and recreational fishing boats, to a limited extent the classes overlap. Some confusion even exists over what constitutes a "commercial fisherman," which state law defines as anyone who has a commercial fishing license, yet which state vessel loan applications and dock space criteria define as anyone who derives at least 51% of their gross income from fishing (Department of Land and Natural Resources 1979). Thus, some care must be taken, for example, when interpreting the numbers of commercial fishing boats.

Hawaii's commercial fishing fleet reportedly consists of approximately 1,500 vessels (Hamm and Quach 1989), of which 525 boats could be considered full-time commercial or charter-boat fishing operations as of 1990 (Table 3). The majority of boats take part in the troll, handline, and longline fisheries working out of Honolulu Harbor and Kewalo Basin. Although the fleet is never all in port at any one time except during times of inclement weather, all available berths are usually filled (U.S. Dept. of Transportation 1992; WPRFMC

1994). This lack of berths, plus the usually low profits and the fact that all fisheries except for some pelagic tunas are currently operating at or near (and in some cases beyond) maximum sustainable yield, suggests that the fleet will not grow significantly in the near future without major improvements in docking facilities or procedures (LMR Fisheries Research 1992).[2]

The large majority of local commercial fishing vessels are less than 100 feet long. Many of these are multipurpose vessels (i.e., those capable of entering more than one fishery) which range in length from medium (40 to 75 feet) to large (longer than 75 feet) (Figures 1 and 2). In May 1995, at least 55 large commercial fishing vessels were operating out of Hawaii, essentially all of them multipurpose vessels participating in the longline, bottomfish, and lobster fisheries. These are generally newer, steel-hulled vessels ranging up to about 110 feet in length (Pooley 1993 and pers. comm.) and averaging 80 to 90 feet. Fuel capacities range up to 40,000 gallons, averaging between 20,000 and 25,000 gallons (Department of Land and Natural Resources 1979; Rusty Nall, Pacific Environmental Co. pers. comm.).

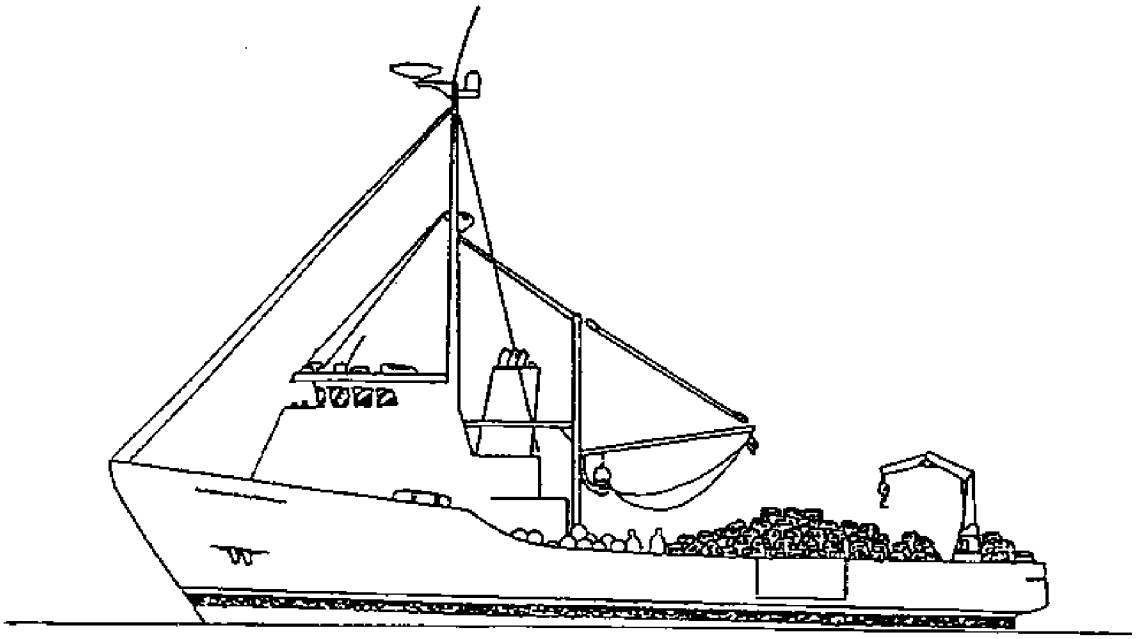
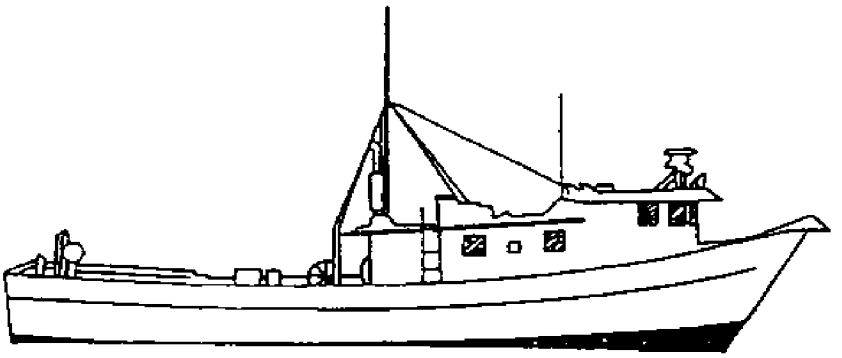


Figure 1. *Drawing of a typical large multipurpose fishing vessel, here rigged for the lobster fishery. From Clarke and Pooley (1988); used with artist's permission.*

[2] Longline and albacore vessels have, however, been observed to "raft" up to four deep in Kewalo Harbor, meaning that four or more vessels may use the same berth (Samuel Pooley, National Marine Fisheries Service pers. comm.).

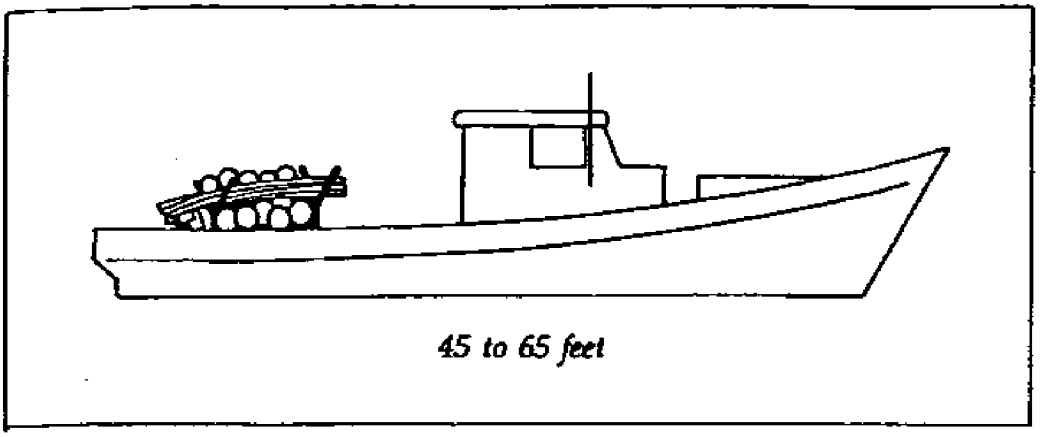


65 to 90 feet

Figure 2. *Drawing of a typical modern, medium-length Hawaii longline vessel. From Pooley (1993); used with artist's permission.*

Any categorization of vessels is complicated by the presence of multipurpose boats and the range of sizes found in vessels of any one fishery. The number of medium multipurpose vessels is thus somewhat uncertain and best divided into groups according to their major fishery, as discussed in the following paragraphs. Furthermore, while Table 1 provides a useful breakdown of Hawaii-based vessels, it must be kept in mind that many of the 1,450 registered commercial fishing vessels in the table are actually charter vessels operated by fishermen who carry commercial fishing licenses.

Hawaii's longline fishery has seen a dramatic increase in permitted vessels over the last decade, from as few as 15 in the early 1980s to 156 in 1991 and 165 in 1992 (Boggs and Ito 1993; Pooley 1993; Nitta and Henderson 1993). However, since then the number has crept up only to 167, of which 55 are longer than 75 feet, and is currently capped. Active in Hawaiian waters at present are 122 of the longliners, 44 of which are longer than 75 feet (Dollar 1994; Samuel Pooley, National Marine Fisheries Service pers. comm.). Although a moratorium was placed on vessels entering the Northwest Hawaiian Islands (NWHI) longline fishery in 1991, an amendment made in June 1994 allowed all permit holders to upgrade their vessels to the length of the longest vessel active during the moratorium, or 101 feet (Dollar 1994). Another amendment opened up a loophole allowing the 45 or so inactive permits to be sold or transferred to incoming vessels (Tummons 1994c). Of the 112 medium-length vessels currently permitted to participate in Hawaii's longline fishery, 42 are less than 56 feet long and 70 are between 56 and 74 feet in length (Dollar 1994). Most of these are fairly old, wooden-hulled sampans (Figure 3).



45 to 65 feet

Figure 3. *Drawing of a typical older Hawaii longline sampan. From Pooley (1993); used with artist's permission.*

From interviews with companies in Honolulu that refuel boats, local longliners may be divided into single-engine (6,000 to 8,000 gallon fuel capacity) and double-engine (16,000 to 20,000 gallon capacity or more) boats which coincide with medium and large longliners, respectively. The single-engine boats are mostly moored at Kewalo Basin in Honolulu. The double-engine boats are moored in Kewalo and Honolulu Harbors (Piers 16, 17, and 37). Some boats are also moored at Kawaihae Harbor on the island of Hawaii. In addition to diesel fuel for the main engines, fuel is used for auxiliary engines and generators (e.g., powered line throwers), and vessels usually carry at least 20 gallons of lubricating oil.

The number of longline fishing vessels active in the Pacific stabilized at around 1,400 in 1987, nearly all of them either Japanese- or Korean-flagged – up from a mere 700 in 1984 (Doulman 1986; Lucas and Iversen 1992). For example, in 1988 there were 872 port calls into the Port of Honolulu by foreign fishing vessels alone, more than 90% of which were tuna longliners. These vessels were typically between 76 and 200 feet in length, but ranged up to more than 400 feet long (Table 4; Lucas and Iversen 1992). On any given day in 1995, half a dozen or more were docked in Hawaii, using their own tanker vessels for refueling. For example, a random sample in May 1995 showed that the *Hakuru Maru* (171 ft.), the *Kensho Maru* (182 ft.) and the *Zenko Maru* (186 ft.) were all docked in Honolulu Harbor. The Japanese and Korean fleets use very large motherships and refrigerated cargo ships, both of which also call regularly at Honolulu. A large percentage of these foreign vessels are heavier than 300 gross tons, and are thus required under OPA 90 to show proof of liability insurance in order to be allowed access to Hawaiian ports. Yet their sheer numbers could tax local authorities to the point where some of the smaller vessels slip through without demonstrating this sufficiently.

Recently, several owners of large foreign longliners inquired into the feasibility of basing their operations out of Hawaii, possibly by buying up some of the NWHI longline permits made available in 1994. Lucas and Iversen (1992) speculated that "many more" than 30 of these could eventually be homeported in Honolulu. Most of these longliners have capacities of 100,000 gallons or more (Rusty Nall, Pacific Environmental Co. pers. comm.), which would constitute a major oil spill under OPA 90 should one of these vessels break up in Hawaiian waters with a full load of fuel. Around 180 foreign and domestic longliners are likely to be present in Hawaiian waters at any one time, including perhaps a dozen or more large foreign longliners together holding two to three million gallons of "floating oil." Their presence, if left unregulated, presents probably the largest oil spill threat in Hawaiian waters at this time.

Longliners aside, the commercial fishing industry in Hawaii can be divided into pelagic handline (*ika-shibi*), pole-and-line (*aku*), trolling (pelagic and bottomfish), lobster, shrimp, and precious coral segments. In addition to these, it is likely that a proportion of the Pacific purse seine fleet (115 vessels in 1984) and albacore boats (30 or more in 1979) visit Hawaii each year (Department of Land and Natural Resources 1979; Boehlert 1993; Doulman 1986).

Pole-and line (*aku*) boats (Figure 4) brought in over 99% of the (skipjack tuna) catch until the late 1970s, but by 1990 their share had fallen to 72%. The number of pole-and-line boats has fallen as well, from 15 in 1971 to five in 1992, no more than four of which were fishing full time (Boggs and Kikkawa 1993; LMR Fisheries Research 1992). One *aku* vessel, 72 feet in length, sank outside of Keehi Lagoon as this report was being prepared, spilling at least 500 gallons of diesel fuel (Honolulu Advertiser 6 May 1995, p. A4; Neil Hurley, U.S. Coast Guard pers. comm.). Pole-and-line vessels generally work out of Kewalo Basin and Kaneohe Bay on Oahu, though one or more may operate out of Hilo. These vessels are all at least 25 years old, and most are fairly large, ranging up to 90 feet in length. Most have a capacity of about 10,000 gallons of diesel fuel, some of which is used for auxiliary engines such as that which powers their pump spray systems (Boggs and Ito 1993). They also carry about 100 gallons each of lube oil and hydraulic oil, which present perhaps an even greater risk than the fuel oil because of their environmental persistence (Department of Land and Natural Resources 1979; Boggs and Ito 1993; Boggs and Kikkawa 1993; Rusty Nall, Pacific Environmental Co. pers. comm.).

Shrimp and lobster boats in Hawaii have varied in number from four to more than 16 since 1983 (Clarke and Pooley 1988; Polovina 1993). At present, nearly all are medium-to-large multipurpose vessels which also take

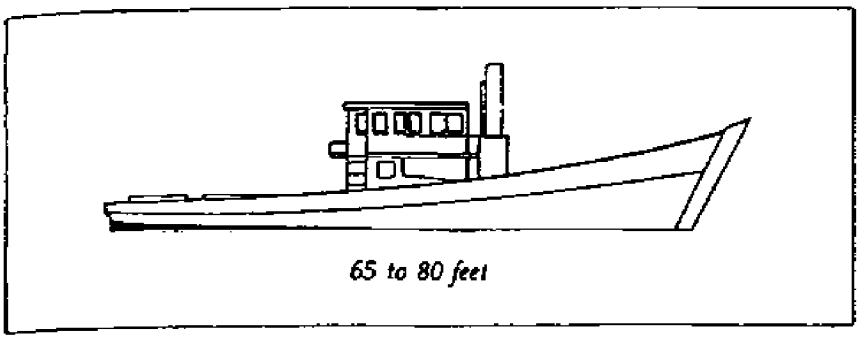


Figure 4. *Drawing of a typical Hawaii pole-and-line (aku) vessel. From Pooley (1993); used with artist's permission.*

part in the longline fisheries (Figure 1). These vessels range from 62 to well over 100 feet in length and from 6,000 to 40,000 gallons in fuel capacity (Table 5; Polovina 1993). Many of the smaller vessels (Figure 5) are also part-time albacore trollers. In 1990, 14 vessels participated in the NWHI lobster fishery and only one in the shrimp fishery; 12 of the 14 lobster boats were over 10 years old, and three were over 20 years old. Only one — a multipurpose vessel — was being used strictly for the lobster fishery, highlighting the fact that much of Hawaii's fishing fleet is aging. These boats averaged about two months at sea per trip, and thus filled their fuel tanks to the brim prior to each of their three or so trips per year (Polovina 1993).

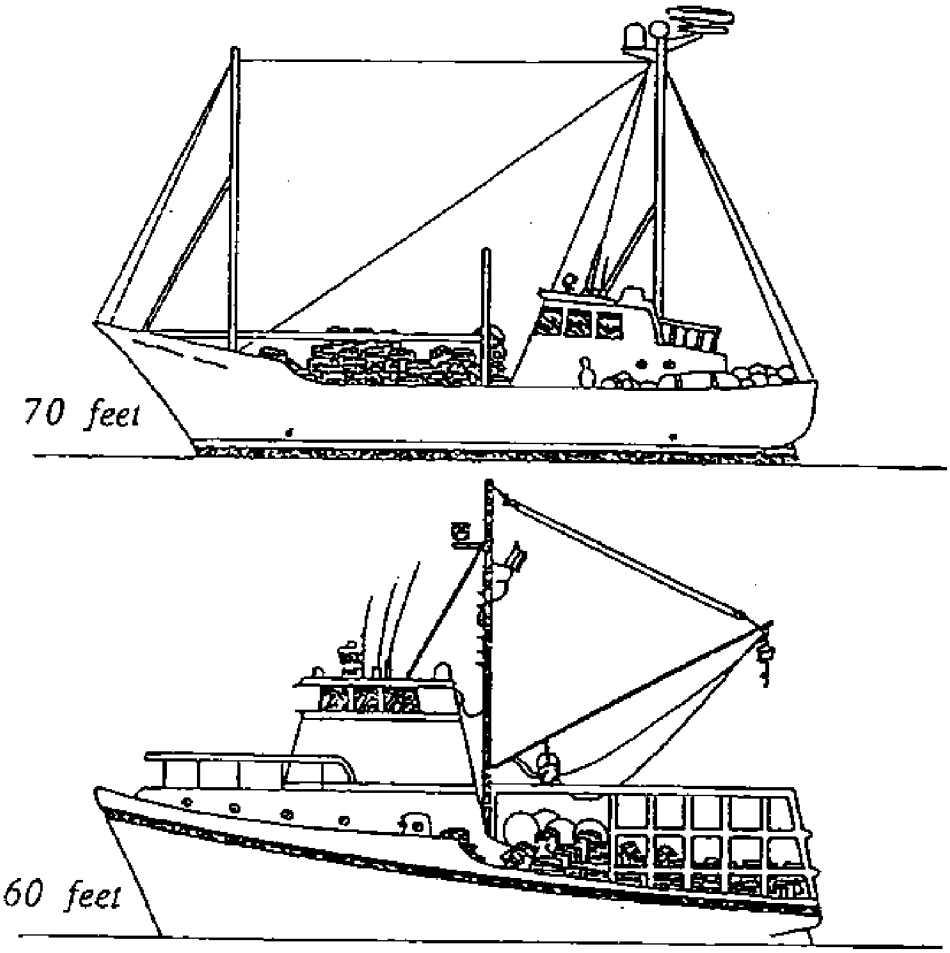


Figure 5. *Drawings of typical medium-length Hawaii lobster vessels. From Clarke and Pooley (1988); used with artist's permission.*

TABLE 5. Classification of Lobster Vessels in Hawaii

Class	No. of Boats	Length	Fuel Capacity (gals.)	Hull Age (yrs.)
I	5	99–175 (Average 115)	25,000–40,000 (Av. 31,400)	Average 9.5
II	3	62–88 (Average 73)	6,000–30,000 (Av. 14,200)	Average 11.0
III	7	63–66 (Average 72)	6,500–15,000 (Av. 15, 500)	Average 11.2
0	1	Had permit, but fishing was sporadic.		

In March 1992, the Western Pacific Regional Fishery Management Council (WPRFMC) set up a limited-entry system for the Hawaiian lobster fleet, which set the maximum at 15 vessels for any given season. Operational difficulties and cost constraints favor the "midsize" vessels of 65 to 100 feet in length (Clarke and Pooley 1988; Polovina 1993), and vessels of this size group will likely make up the bulk of Hawaii's lobster fleet in the future. In 1993, a closed season eliminated all activity in Hawaii's crustacean fisheries (Tummons 1994a), but harvesting recommenced in 1994 at a lower level (Samuel Pooley National Marine Fisheries Service pers. comm.).

Handline vessels may be divided into pelagic and deepwater (bottomfish) handliners. The pelagic handline (*ika-shibi*) fishery grew from fewer than 40 boats in 1976 to at least 230 vessels by 1980, but decreased somewhat in recent years as several boats moved into the longline fishery (Boggs and Ito 1993; Pooley 1993). Of the 1,100 or so deepwater handliners, all but approximately 35 fish around the main Hawaiian Islands (MHI) (LMR Fisheries Research 1992). These are usually smaller vessels, ranging from 12 to 50 feet in length, with most in the 32–45 foot range (Figure 6; Pooley 1993). The deepwater handline fishery in the western NWHI currently consists of eight vessels (LMR Fisheries Research 1992; Tummons 1994b), generally 48- to 65-foot multipurpose vessels with "extended fuel and hold capacity" (Figure 7). These vessels can upgrade to 60 feet in length according to the current moratorium. Twenty-seven or more vessels have permits from WPRFMC to conduct deepwater handlining in the *eastern* NWHI, where there is no limit on permits at present. This number includes 15 vessels which fished only part-time in 1990 (LMR Fisheries Research 1992; Tummons 1994b).

Fuel capacity is generally around 15,000 to 20,000 gallons for the larger handline vessels, both pelagic and bottomfishing. Like other fishing vessels, handline boats use additional fuel for auxiliary generators, specifically for hydraulic gurdies which deploy the "handlines" (Smith 1993; Garlow Petroleum pers. comm.). The NWHI bottomfish handline fisheries have been managed on a limited-entry basis since 1989, so the number of vessels there is not expected to grow significantly. Indeed, in recent years the bottom fisheries of both the MHI and the NWHI appear to have exceeded maximum sustainable yield (Haight et al. 1993), leading one to conclude that the number of boats participating in the bottomfish handline fishery may drop in the years to come.

The troll fishery employed 160 full-time commercial vessels in 1976, ranging from 25 up to 85 feet long (Figure 7). This number swelled in the mid-1980s when rising prices for albacore tuna enticed mainland vessels to join the fleet. Between 10 and 20 of these have relocated to Hawaii and are generally 65 to 85 feet in length (Department of Land and Natural Resources 1979; Boggs and Ito 1993; Pooley 1993). Fuel capacity of those albacore boats which ply waters close to the MHI averages about 5,000 gallons, but those which frequent the NWHI often have fuel capacities in excess of 10,000 gallons (Diamond Head Petroleum pers. comm.). The number of active vessels is indeterminant at present, but is probably quite large since the commercial and

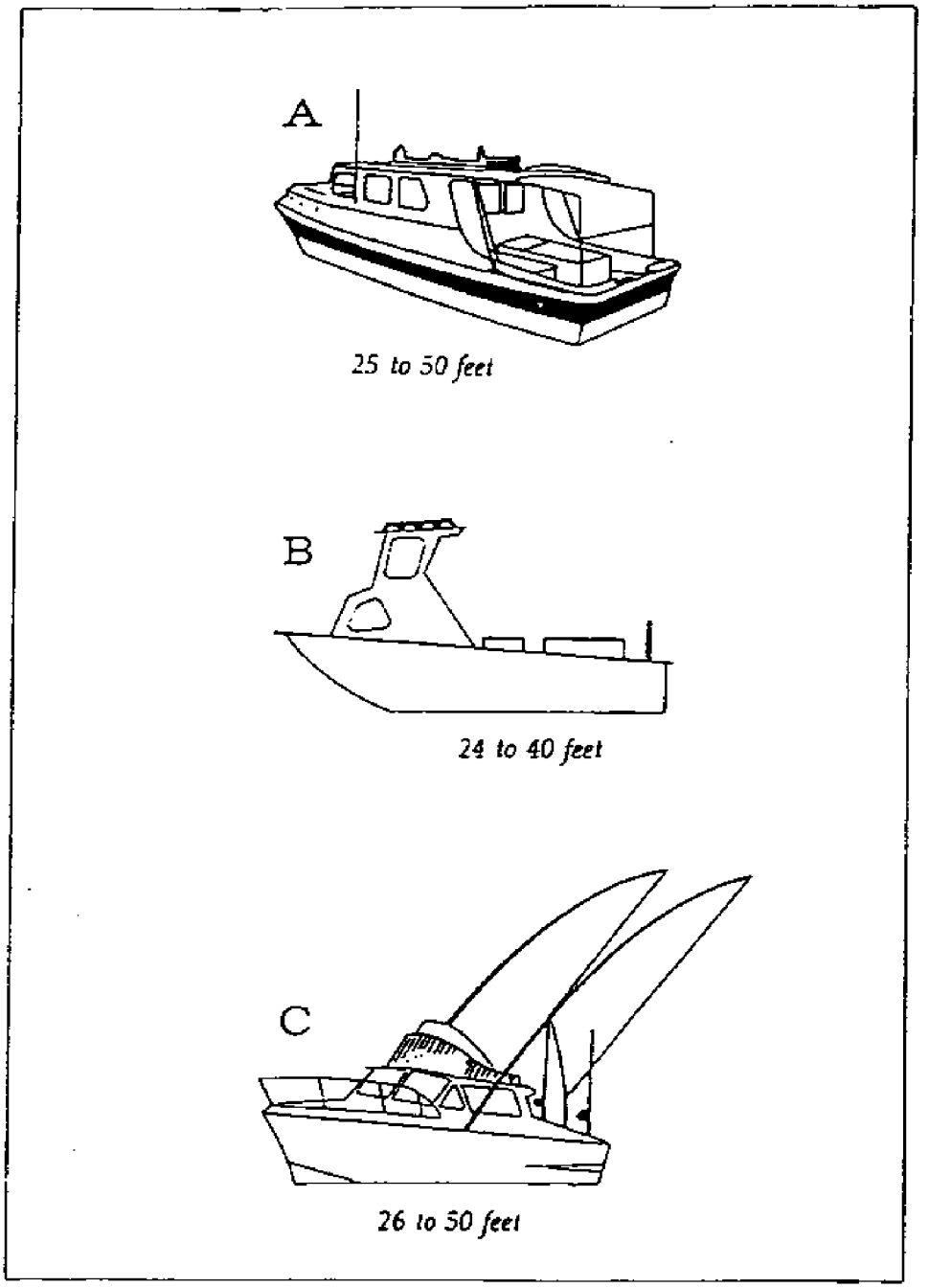


Figure 6. *Drawings of typical MHI (a) bottomfish, (b) pelagic handline, and (c) trolling vessels. From Pooley (1993); used with artist's permission.*

charter troll fleets together are estimated to range between 500 and 750 vessels (WPRFMC 1994). Yet some of these boats also take part in the lobster and handline fisheries, so there may be some overlap in numbers. Trolling, conducted throughout the Hawaiian Islands and usually within 20 miles of shore (Boggs and Ito 1993; Pooley 1993), places all of these boats in the proximity of reefs.

There has been no ship-based coral fishery in Hawaii since 1978, except for a single harvesting attempt in 1988. Yet a survey of the Hancock Seamounts scheduled to take place sometime in the next few years could revitalize this industry (Grigg 1993, and pers. comm.).

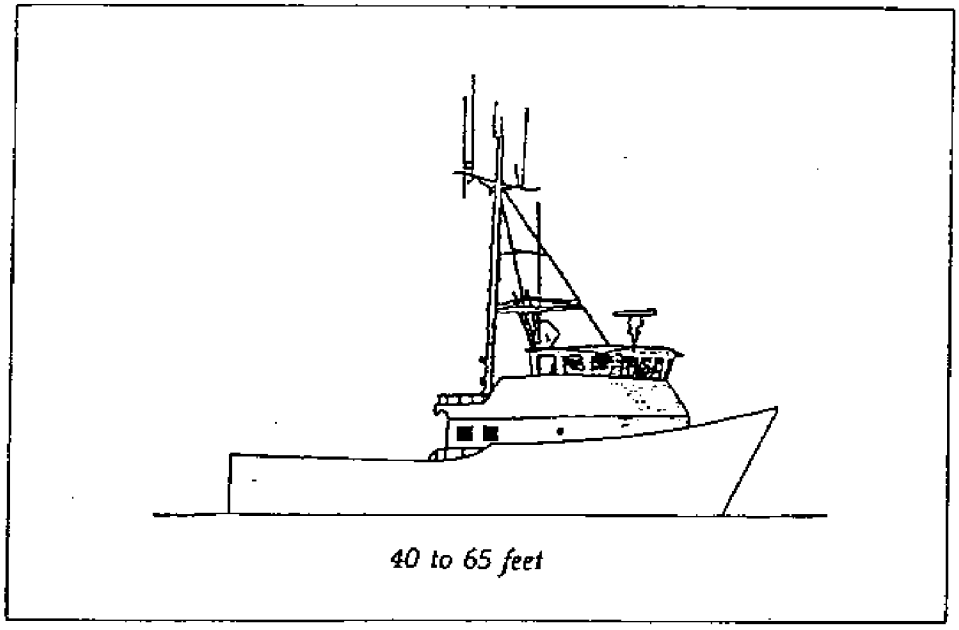


Figure 7. *Drawing of a typical medium multipurpose fishing/NWHI bottomfish vessel. From Pooley (1993); used with artist's permission.*

Charter Fishing Vessels

Though less confusing than the composition of Hawaii's commercial fishing fleet, the local charter fishing fleet is still somewhat complex in makeup. In part, this is because the U.S. Coast Guard and the state Harbors Division classify vessels differently. For example, in 1982, the combination of "charter fishing" vessels documented by the U.S. Coast Guard and "passenger fishing" vessels registered by the Hawaii Harbors Division produced a list of 214 boats in Hawaii's charter fishing industry, according to a document by Samples et al. (1984). Yet the same document later estimates that the fleet comprises only 119 boats, a number which is echoed by other authors (e.g., Helvey et al. 1987). Of the 214 vessels in Samples et al. (1984), about half (51%) had fished commercially in 1982, suggesting a partial resolution to this discrepancy. A further 8% of the vessels had participated in commercial tours. The number of active vessels has increased along with tourism, and the number of commercial and charter troll vessels together is probably between 500 and 750 at present (Samples et al. 1984; Boggs and Ito 1993; WPRFMC 1994).[3]

A telephone survey by the author (May 1995) of currently registered/ documented charter fishing vessels in April 1995 produced a figure of about 50 boats on Oahu, between 50 and 75 on the Big Island, and between 20 and 50 on the other islands, thus supporting a number somewhere between 120 and 175 vessels in operation today. Of the vessels which listed a base of operations in 1982, about half (48%) were homeported on the Big Island, followed by Oahu (27%), Maui (17%), Kauai (8%), and Molokai (3%) (Table 3). Of the vessels which listed lengths, the range was from 20 to 59 feet, averaging 36 feet (43 feet on Oahu). Fuel capacity averages about 500 gallons, with the largest being 1,600 gallons. The *mean* vessel age was 11 years (13 years on Oahu), while the *median* age was only four years – demonstrating a preponderance of young vessels supplemented by a few much older vessels. Of vessels described, 88% were powered by diesel engines (100% on Oahu and 96%

[3] Under Hawaii Revised Statutes, Article 189-2, charter boat operators are required by law to register as commercial fishermen if they catch and sell even a single fish per year (Smith 1993). This allows estimation of the total number of fishing vessels in Hawaii, but further blurs the line between commercial and charter fishing vessels.

on the Big Island) and 12% by gas engines. At the time, vessels on Maui (for example) had an average remaining operating life estimated at only nine years, so these demographics may have changed somewhat in the intervening years (Samples et al. 1984). Most charter vessels conduct troll fishing (Boggs and Ito 1993), operating within a few miles of both shore and reefs.

Recreational Boats

In 1991 there were an estimated 12,690 "personal boats" in Hawaii, of which approximately 74% were engaged in fishing as their primary activity (Smith 1993). The exact number is difficult if not impossible to produce since Hawaii is one of the few coastal U.S. states which does not require a saltwater recreational fishing license (Smith 1993). About 90% of Hawaii's recreational boats have lengths of 24 feet or less, while the rest range from 25 up to more than 100 feet in length (Table 1). Although the small- to medium-size boats generally use inboard/outboard motors and a mere 10–20 gallons of fuel (Table 2), the larger recreational boats have capacities which range up to about 1,200 gallons and average approximately 500 gallons (from author's telephone interviews with fuel truck operators, May 1995). In spite of their great numbers, personal boats are thus the least likely of the vessels operating in Hawaiian waters to cause damage to the environment. The recreational vessel distribution in Hawaii is presented in Table 3.

Commercial Tour Boats

Most tour boats operate out of Keehi Lagoon, Honolulu Harbor, and Kewalo Basin on Oahu, and Lahaina on Maui (Markrich 1990; U.S. Dept. of Transportation 1992). Table 3 shows their approximate distribution. The Maui boats are mostly small, six-passenger motor/sail cruise boats. The Oahu boats range from this size up to the large, steel-hulled vessels used for dinner cruises (such as the *Navatek* and the *Star of Honolulu*) as well as glass-bottomed boats and semi-submersibles. Glass-bottom boats are currently operating on Oahu, Maui, and Kauai (Markrich 1990).

Fuel capacity in tour boats varies from about 100 gallons for the smaller vessels to 1,600 gallons for the *Starlet*, 6,000 gallons for the *Navatek* and 25,000 gallons for the *Star of Honolulu*. Glass-bottom boats have surprisingly small tanks: the *Holoholokai*, perhaps the largest in Hawaii, has a capacity of only 120 gallons. In the submarine tour business, surface boats average about 500 gallons in fuel capacity, ranging up to 2,800 gallons for Atlantis Submarine's 79-foot *Discovery*. Semi-submersibles such as that used by Nautilus Tours have a fuel capacity of only 200 gallons, divided into four separate tanks, and actual submarines such as those operated by Atlantis Submarines are powered only by batteries (from author's telephone interviews with fuel truck operators). Several of the sailboats and catamarans based near Waikiki and Lahaina have inboard-outboard motors on board, but rarely are more than five gallons of fuel taken on board.

Other Charter Boats

This category includes dive boats and research vessels, the former active mainly around Maui and Molokini islet. Indeed, several dive boats may be present at one time inside Molokini crater, since all associated dive tour companies concentrate their activities during midday, when hundreds of tourists may be in the water at once (Markrich 1990). In 1989, the number of dive tour operators was estimated at 34 (15 on Oahu). Some of these operated more than one vessel, and many also offered tours, complicating any statistical compilations (LMR Fisheries Research 1992). Dive boats average around 200 gallons fuel capacity (from author's telephone interviews with fuel truck operators). As may be seen in Table 1, the number of "passenger carrying" vessels in Hawaii — including both this category and tour vessels — equalled 216 in 1984.

Cruise Vessels

Honolulu Harbor has berthing space for three large passenger cruise ships, and the Big Island, Maui, and Kauai each have space for one cruise vessel. The largest companies serving Hawaii are American Hawaii Cruises, Aloha Pacific Cruises, Trans-Pacific Cruises, and Cunard Line. The last of these operates the Queen Elizabeth

II, the largest cruise ship afloat, which has a fuel capacity of 4,381.4 tons or 3.3 million gallons (Reed Kaina Schaller Advertising, Inc. 1988; Cunard Line Customer Services pers. comm.).

Cargo Vessels and Tugs

As may be seen in Table 1, in the 1980s there were at least 33 cargo vessels documented in Hawaii, in addition to which a number of foreign cargo vessels visit the islands each year. Indeed, over 1,800 overseas vessels arrived at Honolulu Harbor alone in 1986, many of which were cargo vessels (Nakayama 1987). Of the cargo vessels which visit Hawaii annually, over 90% are nontanker vessels (U.S. Department of Commerce 1985). The Hawaii-based company with the largest number of cargo vessels is the Matson Company, which had nine such vessels in the Hawaiian circuit in July 1995. Average fuel capacity of these is about 882,000 gallons (21,000 barrels), and these vessels typically leave port with about 693,000 gallons (16,500 barrels) of fuel on board. The largest Matson ship is the 760-foot *Matsonia*, whose capacity is somewhat greater (Dale Hazel Hirsch, Matson Navigation pers. comm.).

Over 30 tugs work out of Honolulu Harbor alone, ranging from inner-harbor ship-assist tugs to interisland and ocean-going tugs (Reed Kaina Schaller Advertising, Inc. 1988). One of the larger tug companies in Hawaii is Smith Maritime, which operates nine tow boats and various other vessels. Smith's largest tow boat, the *Niolo*, has a fuel capacity of 120,000 gallons (Jack Smith, Tow Boat Services Management pers. comm.).

Cruise liners, cargo vessels, and tugs thus have fuel capacities greater than all but the largest nontanker vessels in any other class and often comparable to the tankers and tank barges so carefully regulated under OPA 90.

MARITIME ACCIDENTS AND OIL SPILLS IN HAWAIIAN WATERS

The U.S. Coast Guard reported 557 oil spills around the state in 1990, up 200% from 1980.[4] Most of these spills were small, from 10 to 100 gallons, but in some instances, fairly minor spills have generated major headaches and cleanup costs: although it apparently consisted of a more persistent crude oil — and thus represents a worst-case scenario — a mere 120 gallons from a Barber's Point tanker spill in 1984 was sufficient to close 20 miles of beach on Kauai, requiring six days and $150,000 to clean up. Spills can also be exacerbated under certain conditions, expanding up to 500% in volume through emulsification (Pfund 1992a). The Coast Guard is unable to report what percentage of the 557 spills above from 1990 involved marine vessels, but it reported 79 spills from fishing vessels in Kewalo Harbor alone in 1990, up from 40 in 1989 (*Honolulu Star-Bulletin*, December 1990, p. A1). Many more spills occur elsewhere, involve other types of vessels, go unreported, or have uncertain sources. Undoubtedly, Hawaii is vulnerable to vessel-based spills due to its mid-ocean location.

Unfortunately, data on vessel-based oil spills in Hawaii are spotty, and much must be inferred from other data. According to Markrich (1990), who gleaned his data from *The Honolulu Advertiser* and *The Honolulu Star-Bulletin* articles from 1965 to 1985, a total of 366 separate 'accidents' were reported in Hawaiian waters during this period, only 141 of which were recorded in the Coast Guard data base. And according to insurance specialists interviewed by Markrich (1990), these 366 incidents probably represent only about half of the accidents which actually occurred, a discrepancy due in part to the lack of a central depository in Hawaii for marine insurance records.[5] Although Markrich does not identify the number of accidents which resulted in spilled oil, the most common accidents in his tables are grounding (23%) and collision (18%). Since a full 43%

[4] In part, this is due to improved documentation of oil spills in more recent years

[5] According to Capt. Samuel E. Burton, U.S. Coast Guard (pers. comm.), many unreported accidents were probably too minor to require reporting to the Coast Guard under existing state and federal laws..

of these accidents occurred offshore of Oahu, some threat of adverse impacts to Hawaii's beaches and tourist industry from vessel-based oil spills can be inferred, with damage and cleanup costs inflated accordingly. Relevant data are summarized in Tables 6 through 10.

Of course, the refined fuel and diesel oil used by Hawaii's commercial fishing, charter, and recreational boats are of less concern than the heavy crude oil carried by tankers regarding coating of beaches and coastal areas, but are of equal or greater concern regarding living marine resources because of their toxicity. As noted above, while tankers and vessels weighing 300 gross tons or more are regulated under OPA 90, other vessels are not.

Overall, the number of commercial fishing vessel accidents which were reported increased from five or less per year in the 1960s and 1970s to 20 per year in the 1980s, according to Markrich (1990). Fishing vessels displayed by far the greatest rise in accidents of any vessel type over this period. Indeed, two of the (at the time) eight *aku* boats sank in 1990 alone; another sank and spilled 500 gallons of fuel as this report was being prepared (*Honolulu Advertiser*, 6 May 1995, p. A4). About 25% of all fishing boat accidents occurred inside or within one mile of a harbor, and about half of the accidents occurred around Oahu (Markrich 1990; LMR Fisheries Research 1992; Table 7).

TABLE 6. Classification of Marine Accidents by Type of Nonrecreational Vessel, 1965–85 (percentages)

Accident	Commercial Fishing (%)	Charter Fishing (%)	Other Charter (%)	Tour (%)	Total %
Grounding	23	14	35	33	23
Collision	15	27	12	15	18
Fire	5	7	6	2	5
Explosion	2	4	0	1	2
Foundering	19	15	6	2	13
Capsizing	1	1	6	1	1
Structural Failure	23	8	6	4	13
Other	15	24	30	39	24
Total %*	103	100	101	97	99

*Deviation from 100% due to rounding.

Source: Markrich (1990).

TABLE 7. Classification of Marine Accidents by Type of Nonrecreational Vessel, 1965–85 (percentages)

Island	General Purpose (%)	Longline (%)	Aku (%)	Lobster and Shrimp (%)	Ika-shibi (%)	Unknown (%)	Total %
Oahu	48	47	65	47	0	100	48
Hawaii	14	17	4	0	100	0	16
Kauai/Niihau	21	5	9	17	0	0	14
Maui/Kahoolawe	6	5	13	17	0	0	7
Molokai	7	5	9	0	0	0	6
Lanai	0	0	0	17	0	0	1
NWHI	4	17	0	33	0	0	8
Other	0	3	0	0	0	0	1
Total %*	100	99	100	101	100	100	101

*Deviation from 100% due to rounding.

Source: Markrich (1990).

TABLE 8. Classification of Marine Accidents by Type of Tour Vessel, 1965–85 (percentages)

Accident	Sightseeing Tour (%)	Dinner Cruise/ Catamaran (%)	Glass-Bottom Boat (%)	Other (Raft) (%)	Total %
Grounding	30	42	33	0	33
Collision	14	20	17	0	15
Fire	2	4	0	0	2
Explosion	0	4	0	0	1
Foundering	2	0	17	0	2
Capsizing	0	4	0	0	1
Structural Failure	18	4	34	0	14
Other	34	23	0	100	29
Total %*	100	101	101	100	97

*Deviation from 100% due to rounding.

Source: Markrich (1990).

TABLE 9. Classification of Marine Accidents Involving Charter Fishing Vessels, by Island, 1965–1985 (percentages)

Accident	Oahu (%)	Hawaii (%)	Kauai/ Niihau (%)	Kahoolawe/ Maui (%)	Molokai (%)	Total State (%)
Grounding	7	19	0	28	0	14
Collision	29	17	0	34	0	24
Fire	9	6	0	12	0	7
Explosion	0	11	0	0	0	4
Foundering	9	22	60	6	0	15
Capsizing	0	3	0	0	0	1
Structural Failure	11	11	0	6	100	11
Other	35	11	40	17	0	24
Total %*	100	100	100	103	100	100

*Deviation from 100% due to rounding.

Source: Markrich (1990).

TABLE 10. Classification of Marine Accidents Involving Tour Vessels, by Island, 1965–85 (percentages)

Accident	Sightseeing Tour (%)	Dinner Cruise/ Catamaran (%)	Glass-Bottom Boat (%)	Other (Raft) (%)	Total (%)
Oahu	38	27	17	0	32
Hawaii	6	4	0	0	5
Kauai/Niihau	6	4	17	100	8
Maui/Kahoolawe	40	54	67	0	45
Molokai	10	8	0	0	8
Lanai	0	4	0	0	1
Total %*	100	101	101	100	99

*Deviation from 100% due to rounding.

Source: Markrich (1990).

While many of the older, less seaworthy commercial fishing boats have been phased out in recent years, they have been replaced by larger boats often operated by crews unfamiliar with Hawaiian waters and sea conditions. One notable example was the *Friendship*, a 65-foot fishing boat which ran aground outside Kewalo Basin with nearly 10,000 gallons of fuel on board in October 1994 (Figure 8). Fortunately, the weather was calm and less than 1,000 gallons leaked out before the rest was pumped into salvage boats. The accident nonetheless forced the closing of an area from Honolulu Harbor to 200 yards east of Kewalo Basin to all surfing and swimming (*Honolulu Advertiser*, 25 October 1994, p. A1 and 26 October 1994, p. A2). (The area affected, however, is not normally used for swimming, and closure only lasted a few days. Samuel E. Burton, U.S. Coast Guard pers. comm.). The problem is further highlighted by the grounding of the *Jin Shiang Fa*, a 137-foot Taiwanese longliner, on Rose Atoll — a wildlife refuge near American Samoa — in October 1993. All 100,000 gallons of diesel fuel in the vessel's fuel tanks were lost, creating an oil slick 11 miles long which significantly impacted marine life over one third of the atoll (*Honolulu Star-Bulletin*, October 1993, p. A4 and 17 January 1994, p. A2; Capune 1995). While few if any of the local fishing boats fall into this size group, larger foreign longliners with this fuel capacity routinely stop over in Honolulu. Under the National Contingency Plan (NCP), 100,000 gallons constitute a major spill, and the cost of cleanup and lost revenue to the state could be considerable.

Charter fishing boats accounted for 32% of all maritime accidents reported statewide between 1965 and 1985, 26% of which involved hull damage. Approximately half of these accidents took place on Oahu, followed by the Big Island, Maui, and Kanai (Markrich 1990). Other charter boats, including dive boats and research vessels, accounted for only 5% of all maritime accidents, but 31% of all monetary losses statewide during these years. Seven such incidents involved dive boats, mostly off of Maui, Lanai, and Molokini, at least two of which involved groundings (Markrich 1990). Table 8 shows that collisions and groundings together account for over a third of all accidents involving charter vessels in Hawaii. Of course, not all of these resulted in spilled oil, but lacking data specifically detailing such spills, the data still demonstrate the existence of a palpable threat of oil spills from such vessels.

For tour vessels, Maui and Oahu have roughly equal numbers of accidents. On Oahu the large vessels are dominant in numbers of both vessels and accidents, accounting for 60% of the island's tour boat-related incidents and 81% of its tour boat-related monetary losses between 1965 and 1985. Of these incidents, 30% on all islands involved groundings. Accidents involving catamarans are again split roughly equally between Maui and Oahu. Of all accidents involving catamarans, 38% between 1965 and 1985 resulted in hull damage, most often in and around harbor areas (65%) and on reefs (23%). During these years, six accidents involved glass-bottom boats, two of which involved groundings on reefs and one of which was a total loss (Markrich 1990). Table 9 shows that the two most significant causes of accidents among tour boats during these years were again grounding and collision.

Figure 8. *The* Friendship, *a Hawaii-based longliner, sinking outside of Kewalo Harbor in October 1994. The* Nakue, *a Marine Logistics, Inc. pollution response vessel, stands off to the right. Photography by Jackie Miller.*

Certainly, a noticeable percentage of these accidents involve oil spills. Worldwide, in 1989 and 1990, passenger vessels and fishing vessels accounted for 15% of the collisions and 35% of the groundings that spilled more than 10,000 gallons of fuel per accident (Pfund 1992b). Based on the nine-year period from 1983 to 1991, the probability of a 10,000 to 20,000 gallon oil spill in Hawaiian waters is once in 2.25 years, and that of a 40,000 to 50,000 gallon spill is once in 4.5 years, whereas the probability of a catastrophic spill of more than 10 million gallons (i.e., tanker-based) is only once in 135 years (Lee 1992). As an example, in Kewalo Basin alone, the number of oil spills jumped from 40 in 1989 to 79 in 1990. Although most of these were suspected to result from "midnight (clandestine) dumping" by fishing boats rather than accidents, they were still vessel-based. Cleanup of the Kewalo spills, estimated to average between 50 and 100 gallons, cost about $1,000 apiece (*Honolulu Star-Bulletin*, December 1990, pp. A1 and A10).

Such statistics suggest that at the very least these vessels should be required to post a liability insurance certificate in order to operate (Pfund 1992b). At present, small-to-medium vessels responsible for oil spills can only be fined up to $10,000 by the state. Those vessels reporting their spills generally receive an even smaller fine for "owning up and acting responsibly" (*Honolulu Star-Bulletin*, December 1990, pp. A1 and A10). While spillers, if identified, are billed for the cost of the cleanup, many of these vessels — indeed, the ones most likely to spill — are often unable to pay.

THE OIL POLLUTION ACT, INSURANCE, AND HAWAII'S NONTANKERS

In the wake of the *Exxon Valdez* oil spill on March 24, 1989, the U.S. Congress passed the Oil Pollution Act of 1990 (OPA 90), which defines the rights and roles of affected states in dealing with oil spills in their waters. OPA 90 created a $1 billion oil spill liability trust fund to enable the federal government to respond quickly to oil spills, and preserved for states the right to enact stricter legislation.

In full effect starting in 1995, OPA 90 makes owners of all vessels in American waters liable for damages and cleanup costs of oil spills emanating from their vessels up to $600 per gross ton or $500,000, whichever is greater. There are a number of ways in which this liability cap may be broken, including cases of gross negligence (Title I, Sections 1002 and 1004; Barry Ogilby, Carlsmith, Ball, Wichman, Case, and Ichiki, Attorneys at Law pers. comm.). This legislation foreshadows a problem particularly for Hawaii, which not only lacks a specific plan for prevention of oil spills (Rappa and Moravcik 1992), but which also has a number of older, small-to-medium sized boats which operate routinely in its rough offshore waters and near its coral reefs. In addition, Hawaii's oil spill contingency plan, the State Oil and Hazardous Substances Emergency Response Plan — which delineates the state's duties in case of an oil spill — has not yet been thoroughly tested to determine its viability (Rappa and Moravcik 1992). This plan should be augmented by a prevention plan ensuring, among other things, that all vessels with fuel capacities of 10,000 gallons or more receive annual safety inspections.

OPA 90 goes on to state that the responsible party for any vessel over 300 gross tons must "establish and maintain . . . evidence of financial responsibility sufficient to meet the maximum liability" to which it could be subject in the event of an oil spill. "Financial responsibility" is defined as "evidence of insurance, surety bond, guarantee, letter of credit, qualification as a self-insurer, or other evidence of fiscal responsibility" (Title I, Section 1016). However, OPA 90 places no such requirements on owners of vessels smaller than 300 gross tons. Nor does the State of Hawaii, although the U.S. Coast Guard has implemented rules which "provide a satisfactory methodology to prove financial responsibility" in such vessels (Barry Ogilby, Carlsmith, Ball, Wichman, Case and Ichiki, Attorneys at Law pers. comm.).

Hawaii has no limits at present on oil spill liability except for interisland tankers (Rappa and Moravcik 1992). Yet a significant majority of the commercial fishery fleet in Hawaii does not carry pollution insurance, or indeed insurance of any kind. In 1982, Karl Samples found that nearly 75% of Hawaii's fishing boat owners responding to surveys had no vessel insurance coverage whatsoever, and it may be assumed that a majority of

those who did not respond had either been denied coverage or had not applied for it. A majority of uninsured respondents (77%) cited the high cost of insurance as the main factor prohibiting coverage, while 11% did not feel insurance was necessary and 6% had been rejected as bad risks (Samples 1982). A telephone interview with John Grosseto (June 1995), head of one of the larger marine insurance agencies in Hawaii, confirmed this information. Indeed, Grosseto estimated that much more than half of the commercial fishing fleet is totally uninsured, while half or less of those who are insured have also bought pollution insurance, which is optional under OPA 90 for nontanker vessels smaller than 300 gross tons. Thus, should a large uninsured fishing vessel spill all or most of its fuel along Hawaiian shores, the damage and cleanup costs could not be ameliorated by the vessel's owner, whose major asset is now a pile of scrap awash on a reef.

Grosseto notes that while hull insurance costs from 2.5% to 12% of the hull value and liability insurance costs $3,000 to $7,000 per crew member, pollution insurance costs only $500 to $1,000 per commercial fishing vessel and $400 to $700 per charter fishing vessel. Thus, pollution coverage is only a small addition to the total cost of insurance coverage and, should the state mandate oil pollution coverage for certain vessels, compliance with such a requirement could require less enforcement than do requirements for other types of insurance. The benefits of such requirements are readily apparent when one considers that the average cleanup of a 10,000 gallon spill of diesel fuel is about $20,000 (John Grosseto, Grosseto Marine Insurance pers. comm.; Rusty Nall, Pacific Environmental Co. pers. comm.)

Of the charter fishing and tour vessels, Grosseto estimates that close to 100% have basic insurance coverage, since it is required in order to obtain docking space. However, of the recreational boats, again many and probably most are totally uninsured. Since pollution coverage is optional for these boats as well, it is likely that a large proportion of those with basic coverage have not opted for pollution coverage (John Grosseto pers. comm.). Indeed, even such high-technology and high-profile vessels as the *Navatek* have not made use of pollution insurance (Jim Cummings, Island Navigation pers. comm.).

The problem of insuring these vessels is compounded by a variety of factors. In particular, the U.S. Coast Guard has limited authority and physical resources to enforce regulations, and its Fishing Vessel Safety Decal Program is voluntary. As a result, many commercial fishing vessels are not routinely inspected for seaworthiness or safety equipment. Those inspections which do take place are conducted by marine surveyors at the request of insurance companies. These surveyors are unregulated and have no national standard for conducting surveys. Thus, some vessels are declared seaworthy regardless of condition, at a time when they must traverse ever-increasing distances in order to make their voyages profitable (Markrich 1990). While these distances place the vessels far from MHI shores for an increasingly large portion of their trip, they also place additional constraints on safety expenditures while at the same time increasing the amount of fuel which must be taken on prior to leaving port.

Perhaps partly as a result of this trend, there has been a notable rise in reported fishing vessel accidents over the last 20 years (Markrich 1990). (Alternatively, reporting may have simply improved throughout this period, especially since monetary losses and awards also jumped alarmingly over the same 20 years. Capt. Samuel E. Burton, U.S. Coast Guard pers. comm.) By the early 1980s, an average of 250 fishing boats were sinking per year off American shores. In Hawaii, from 1982 to 1987 alone, marine insurance rates for commercial fishing boats jumped 400%, while rates for charter boats and tour boats increased 15% or less. In some instances, fishing boat owners already operating under a slim margin of profit have been saved from bankruptcy only because banks are unwilling to repossess boats that they know cannot be resold for a reasonable amount (Markrich 1990). Percentages of fishing crews killed per year in U.S. waters have decreased since the mid 80s, but commercial fishing is still the most hazardous industrial occupation in the country (Samuel Burton, U.S. Coast Guard pers. comm.).

For the tour and charter boat industry, the situation is much more optimistic, as reflected in their very high rates of basic insurance coverage. Yet even here, problems loom. In 1986 and 1987, several large marine insurance companies dropped their Hawaii accounts due to the small size of the market, forcing the remaining companies

to raise their rates (Markrich 1990). In addition, the skyrocketing number of personal injury cases — estimated to have increased by 300% between 1982 and 1987 alone — and associated awards will likely have reverberations in terms of rate increases, making insurance costs even more prohibitive. As a result, many Hawaii boat owners either dropped insurance altogether or switched to foreign insurers in places like Brazil and the Bahamas. These companies are generally seen as unreliable in terms of paying their claims (Markrich 1990), and doubtless the incentive for oil pollution coverage through such companies is marginal at best.

CONCLUSIONS AND RECOMMENDATIONS

There may be a need for Hawaii to address a potential gap in its measures protecting the state from damage caused by oil spills by vessels not adequately covered by OPA 90. Although it is beyond the scope of this document to undertake a detailed cost-benefit analysis of this issue, it should be obvious to the reader that there is cause for some concern. In particular, insurance regulations imposed by the U.S. Coast Guard and the State of Hawaii may be insufficient to provide a reasonable measure of cost recovery from oil spills emanating from such vessels.

A large proportion of nontanker vessels in Hawaii — particularly those of the commercial fishing fleet — are without any insurance at all, much less any oil pollution coverage. Damage to such uninsured vessels which results in oil spilled into Hawaiian waters often forces the federal or state government to foot the bill for cleanup costs, recovery of which can be problematic and time-consuming if it happens at all. Thus, insurance requirements up to and including oil spill insurance should be mandated for all vessels capable of spilling 10,000 gallons or more into Hawaiian waters. In addition, the state should increase the dollar amounts of fines it levies against parties responsible for medium sized oil spills, a strategy which has had success as a deterrent against vessel based spills in California (Barry Ogilby, Carlsmith, Ball, Wichman, Case, and Ichiki, Attorneys at Law pers. comm.).

On the other hand, most of these fishermen are operating with marginal profit and may be reluctant to pay Hawaii's climbing insurance rates. To alleviate this, both Samples (1982) and Markrich (1990) have suggested that these fishermen form co-ops which will enable them to acquire group coverage at reduced rates. The state should do all it can to facilitate such actions. In conjunction with such requirements, the state should reinstate its recently discontinued registration/documentation of marine vessels based in Hawaii, especially those over five tons. As suggested in the 1990–95 Hawaii Fisheries Plan, the state should also establish a specific registration for commercial fishing vessels (LMR Fisheries Research 1992).

As with dock space criteria for charter fishing vessels, all boats over five tons (or all boats with over 10,000 gallons of fuel capacity) should be required to show proof of insurance before they are allowed to acquire fishing licenses. As a parallel example, any vehicle in Hawaii used to transport hazardous waste (which includes flammable fuels) must take out a $5 million liability insurance policy (recently increased from $1 million following California's lead) before a "Hazmat" license is issued, and Hawaii has one of the most lenient permitting requirements in the country for such transport (Unitek Environmental Services pers. comm.). Oil is not classified as hazardous waste when being used as fuel, but the volumes are similar whether the vessel is a hazardous materials truck, a fuel transport truck, or a fishing vessel and of these, only fishing vessels are without insurance requirements. Thus, Hawaii's marine vessel regulations may be outdated as a result of heightened awareness of oil spill risks over the last decade. On the other hand, Hawaii's fleet of recreational boats — most of which are too small to entail much concern regarding oil spills — would probably best be served through other methods, such as educational programs.

Since, as noted above, vessel inspections by marine surveyors are often inadequate, the state should require insurers of marine vessels to undertake a full survey of a boat's seaworthiness as a prerequisite for insurance, and should set guidelines as to what constitutes a thorough survey. In addition, a central depository of insurance-related information for marine vessels should be set up by the state. This depository would allow the public to monitor the state's compliance with these regulations, and help determine liability in the event of an

oil spill. Further suggestions for Hawaii include reconciling different versions of what constitutes a commercial fishing boat and what constitutes a charter fishing boat, so that the former may be more adequately monitored; requiring saltwater recreational fishing licenses; and constructing a specific statewide plan covering all aspects of oil spill prevention.

Although such regulation would be problematic both for Hawaii's fishing fleet and for the cash-strapped state government, it would likely pay for itself in the long run by reducing the number and costs of mid-size oil spills. Perhaps some of these savings could then be used to help finance programs aiding Hawaii's fishermen in acquiring insurance, thus completing the cycle. Such legislation would also serve to improve safety in Hawaiian waters and reduce the number of search-and-rescue missions the Coast Guard must undertake.

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