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 Filippino 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 windlases, 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, radar range indicator, rate-of-turn indicators, charts, radios, logs, auto/manual steering changeover and emergency steering procedures posted

13. **Radio Equipment** – equipment operational, aerals, 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, CO₂, 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

\[(a) \times (b) \times (c) \times (d) \times (e) \times (f) = \text{estimated VTS benefits}\]

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 ports, 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 BPM) 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 sheltered 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)
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 *Numui* — 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 hp 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 under equipped 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 Kalahi, Aua, and Paililo 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).


- September 17, 1976: Mystery spill sends tar balls onto beaches at Kauai (Honolulu Advertiser 9/18/76).

- January 17, 1977: Tanker Irene’s 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 Kanai (Honolulu Advertiser 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 Kanai (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 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 Yipex (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 five 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 more 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 light 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 below 100 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 boats; 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 technologically 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 boom 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 viscous 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 database, 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/floats 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 vectoring 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 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.

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 lighten 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 lighten 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 tags 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 boom or 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 gyrocompass 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