

# **AC 2009-409: OIL SPILL CONTINGENCY PLANS FOR MALAYSIA, FLORIDA AND QATAR**

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# **OIL SPILL CONTINGENCY PLANS FOR MALAYSIA, FLORIDA AND QATAR**

## **Abstract**

The purpose of this research is to compare oil spill contingency plans of Malaysia, Florida and Qatar. The idea behind the comparison is to identify best oil spill contingency plan practices to expedite the removal of the spill. Furthermore, the three places are selected due to increased oil tankers traffic. Oil spill is the release of a liquid petroleum hydrocarbon into the environment due to human activity mainly into the ocean or coastal waters. Oil may be a variety of materials, including crude oil, refined petroleum products or by-products, oily refuse or oil mixed in waste. Spills take months or even years to clean up.

Most human-made oil pollution comes from land-based activity, but public attention and regulation has tended to focus most sharply on seagoing oil tankers. Malaysia, Florida and Qatar have unique needs and requirements for responding to oil spills, and all have basic needs for an oil spill contingency plan. The Straits of Malacca which stretches for 575.4 miles is situated between Peninsular Malaysia and the Island of Sumatra, Indonesia. The Straits is at its widest in the northern entrance which is almost 253.176 miles and at its narrowest point of barely 9.2064 miles at the southern end. The Straits of Malacca is recognized world-wide as one of the busiest waterway in the world. It is strategically located for movements of vessels to the east and west of the globe. On average about 200 vessels of various types ply the route daily.

The Malaysia and Qatar oil spill contingency plans area have tiered response system, which defines a clear responsibility and authority for any tier in the tiered response. Of late the Straits of Malacca is facing an increasing threat of serious oil pollution from ships. Oil is being deliberately discharged or spilled as a result of collision. A few major incidents have occurred over the last 20 years in the Straits of Malacca. Florida and Qatar has a diverse coastal environment that is important not only for their ecosystem but for the revenue it generates from tourism and fishing. Florida's response system is a network-based operation controlled by county or city officials, depending on the degree of spill, location and the available resource. Growing tanker traffic in Florida waters, shortage of cleanup equipment, types of currents, shallow reefs, and vulnerable coastline all contribute to greater potential damage from an oil spill. Qatar occupies the small Qatar Peninsula on the northeasterly coast of the larger Arabian Peninsula. It is bordered by Saudi Arabia to the south and is oil rich nation.

The National Oil and Hazardous Substances Pollution Contingency Plan, commonly called the National Contingency Plan is the United States federal government's blueprint for responding to both oil spills and hazardous substance releases. The oil spill contingency for Malaysia, Florida and Qatar work well, however Florida response system has some advantages like oil spill information database which enables quicker response. The systems need to enhance their coordination between the parties involved in cleanup and mitigation.

## **Introduction**

Spurred by the impact of the 1989 Exxon Valdez oil spill, the United States in 1990 enacted the Oil Pollution Act (OPA 90). In the same year, the 1990 International Convention for Oil Spill Preparedness, Response and Cooperation was enacted into force, and many of the convention signatories set about reforming and revising their own oil spill status<sup>1</sup>. During the early 1990s, new or revised oil spill regulation emerged in many countries around the world.

With the development of new regulations and improved spill response regimes, the international regulatory framework for oil spill prevention and response has grown more elaborate.

## **Prince William Sound Tanker Spill Prevention and Response Plan**

Tankers transiting Prince William Sound are required by the state to have oil spill contingency plans. The Prince William Sound Tanker Oil Discharge Prevention and Contingency Plan is a required part of each tanker's individual contingency plans. APSC/SERVS is the Primary Response Action Contractor responsible for the implementation aspects of the PWS Tanker C Plan. The prevention portion of this plan requires that each laden tanker transiting Prince William Sound must be escorted by two vessels, one of which must be a specially equipped prevention and response vessel or tug. Laden tankers are tethered to Escort Tugs from the Terminal through the Valdez Narrows and Valdez Arm. Also included in the plan are speed limits for tankers and weather restrictions. The Response portion of the plan includes plans for open-water, near shore and shoreline responses and support operations.

Companies that store, produce, handle, or transport oil and other hazardous substances must comply with these myriad requirements, many of which mandate the development of contingency plans. Oil spill contingency plans serve two broad purposes: demonstrating compliance with applicable regulations and providing essential information that can be applied to any oil spill quickly during response activities. Oil spill contingency planning occurs in both public and private sectors. A public contingency plan is developed by government agencies or ministries, often with industry and public involvement. It may include the following:<sup>1</sup>

- information of state-owned equipment stockpiles;
- local or regional logistical considerations; and
- Natural resource information including sensitive environmental areas.

This paper addresses three systems of oil spill contingency plans and responses.

## **The Malaysia Oil Spill Response System**

Malaysia is a maritime country, which adopted its National Oil Spill Contingency Plan (NOSCP) in early 1970. In line with established international practice, Malaysia has enacted a three-tier approach to all aspects of oil spill preparation and response, which defines the party responsible for oil spill cleanup according to different degrees of oil spill.

The Straits of Malacca which stretches for 500 nautical miles is situated between Peninsular Malaysia and the Island of Sumatra, Indonesia. The Straits is at its widest in the northern

entrance which is almost 220 nautical miles and at its narrowest point of barely 8 nautical miles at the southern end. The Straits of Malacca is recognized world-wide as one of the busiest waterway in the world. It is strategically located for movements of vessels to the east and west of the globe. On average about 200 vessels of various types ply the route daily. These include the very large crude containers of VLCCs, other merchant ships, warships and fishing vessels. With such number of vessels going up and down the straits, it has been very fortunate that the number of accidents is not high. Since 1977 only about 70 marine accidents were reported in the Malacca Straits.

### **Tier 1**

Tier 1 is site-specific. It includes most shore-side industries with oil transfer sites, offshore installations, and vessels that are required to have a shipboard oil pollution emergency plan. It covers small oil spills and oil spillage occurring within specific facilities. Cleanup responsibility is taken by local authorities or local oil companies<sup>2</sup>.

### **Tier 2**

Tier 2 is provided by Regional Councils and unitary authorities acting as Regional Councils. These agencies are responsible for providing an operational response to oil spill incidents within their regions out to a 12-nautical mile limit of Territorial Sea. Under such conditions, this type of oil spill exceeds the capability of Tier 1 and no responsible party can be identified. The Department of Environment will offer adequate resources to Regional Councils to ensure sufficient equipment and personnel available for them to undertake this role. Regional Councils also have responsibility for ensuring that industries with oil transfer sites within their region produce appropriate oil spill contingency plans. An Area Operation Committee (AOC) will be formed to coordinate this Regional Oil Spill Combat Operation, and it is chaired by an officer appointed by the Director General of Environment<sup>2</sup>.

### **Tier 3**

Tier 3 is the responsibility of the Malaysia Department of Environment (DOE). The Malaysia DOE manages the National Oil Spill Contingency Plan. When a spill occurs within a region that is beyond the resources of the region, the DOE will assume responsibility for managing the spill response. Malaysia purchases and maintains oil spill response equipment, which will allow it to contain and clean up a spill up to 25,000 tons of persistent oil. If a large oil spill is beyond Malaysia's own resources, the DOE will seek and coordinate an international response<sup>2</sup>. Figure 1 shows the three-tiered approach to Malaysia's national oil spill contingency plan<sup>1</sup>.

## **Spill Notification and Reporting**

When a spill occurs, it must be reported to local DOE officers or the Marine Department office nearest to the incident site. The report should have the following information<sup>2</sup>:

- location of incident;
- type and size of spill(s);
- date and time of incident; and

- Other relevant information.

## **Cleanup Responsibility**

Industries that are responsible for oil spills must take immediate action to contain the spill and quickly start the cleanup operations. When a spill occurs, an area co-coordinator (AC) is appointed by Malaysia's Harbor Master or the Assistant Port Officer who carries out a prompt investigation of the oil spill incident and forwards the investigation report to the Director of Environment. After notifying the Regional Council or the Department of Environment, the company actuates the local/industry Tier 1 contingency plan. If the person in charge assesses the scope as beyond their capability and seeks support, the regional on-scene commander (ROSC) appointed by DOE or the Regional Council will take over the cleanup responsibility from the industry on-scene commander (OSC). The response then progresses to Tier 2. If a spill response within a region is beyond the capability or resources at the disposal of ROSC, the DOE is to be notified, and the responsibility for response is escalated to Tier 3. At this stage, the Director General of Environment appoints a national on-scene commander (NOSC), and the NOSC will assume control of the response. For a large spill, if the spill has the potential of reaching a shoreline, a shore cleanup coordinator (SCC) will be appointed<sup>2</sup>.

## **Cleanup Strategies**

All OSCs are allowed to take whatever actions are appropriate to clean up and/or mitigate the effects of an oil spill. In general, these actions fall into three main areas<sup>2</sup>.

### **Monitor the Pollution**

Under certain circumstances, it may be inappropriate to contain or clean up a spill. The best and most cost-effective response may be to monitor its progress and leave the oil spill for the weather to disperse naturally<sup>2</sup>.

### **Response at Sea**

Dealing with oil while it is still afloat in the sea is always preferable to allowing the oil to float or wash ashore. The OSC's first priority is to protect the sensitive coastal environment from spilled oil by containing and cleaning the spill while it is in the sea before it reaches coasts and shorelines. The major cleanup options at sea are<sup>2</sup>:

- containment and recovery using booms and skimmers;
- solidification by Biodegradable Oil Interceptor (BOI) treatment;
- use of chemical dispersant;
- use of absorbent (only those approved by DOE); and
- In-situ burning.

### **Shoreline Response**

When oil has stranded on the shore, the environmental impact and cost of cleaning is often much greater than if the oil were dealt with at sea. The most used methods are<sup>2</sup>:

- pre-cleaning – areas are cleaned of debris in advance to make for easier access and to lessen the quantities of oily waste;
- mechanical and labor – machines and personnel are utilized for intensive shoreline cleanup;
- leaving the cleanup to natural processes; and
- Bioremediation – living organisms are used to break down the oily waste.

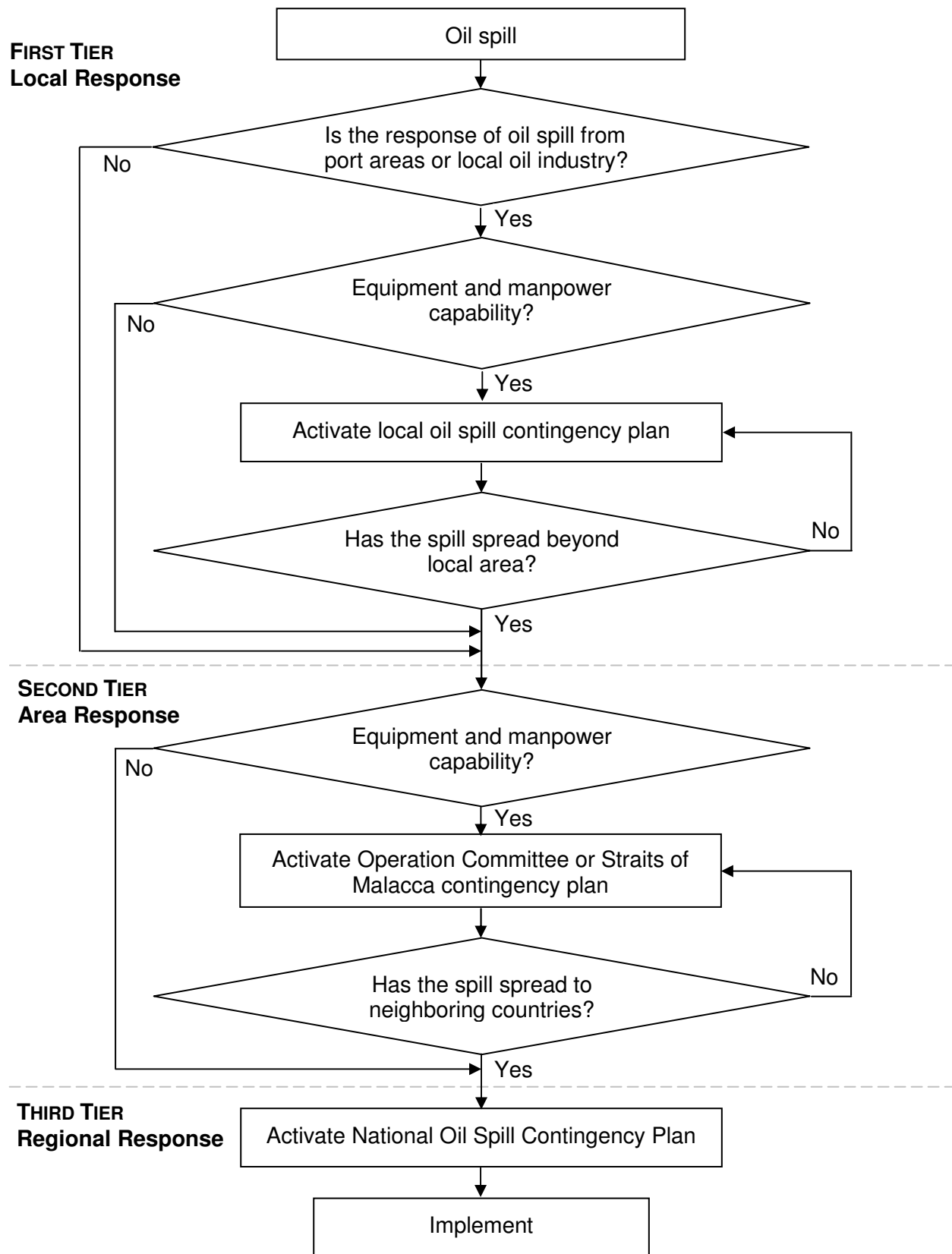
The SCC will decide which method of cleanup to follow based on the specific circumstances. The SCC must also decide cleanup priorities of different locations on the shoreline<sup>2</sup>.

### **Waste Disposal**

All waste should be disposed of in an environmentally sensitive manner. Rules and regulations under the Environmental Quality Act of 1974 (Amendment 1996), governing waste should be followed. It is the responsibility of the OSC to determine and carry out the disposal recovery of all oil waste<sup>2</sup>.

### **Malaysia Information Management System for Oil Spills**

The Department of Environment establishes and maintains a national oil spill database. All oil spill incidents are recorded on this database using information provided by the Regional Council and other reporting agencies. At the conclusion of clean-up operations for minor spills and responses, and as soon as possible during a major spill, the regional or national OSC must send the DOE a full report of the spill and response. The DOE will provide Regional Councils with appropriate oil spill reporting forms for recording. The DOE also maintains and updates a resource database as part of the National Oil Spill Contingency Plan<sup>2</sup>.



**FIGURE 1** Malaysia tiered oil spill response system.

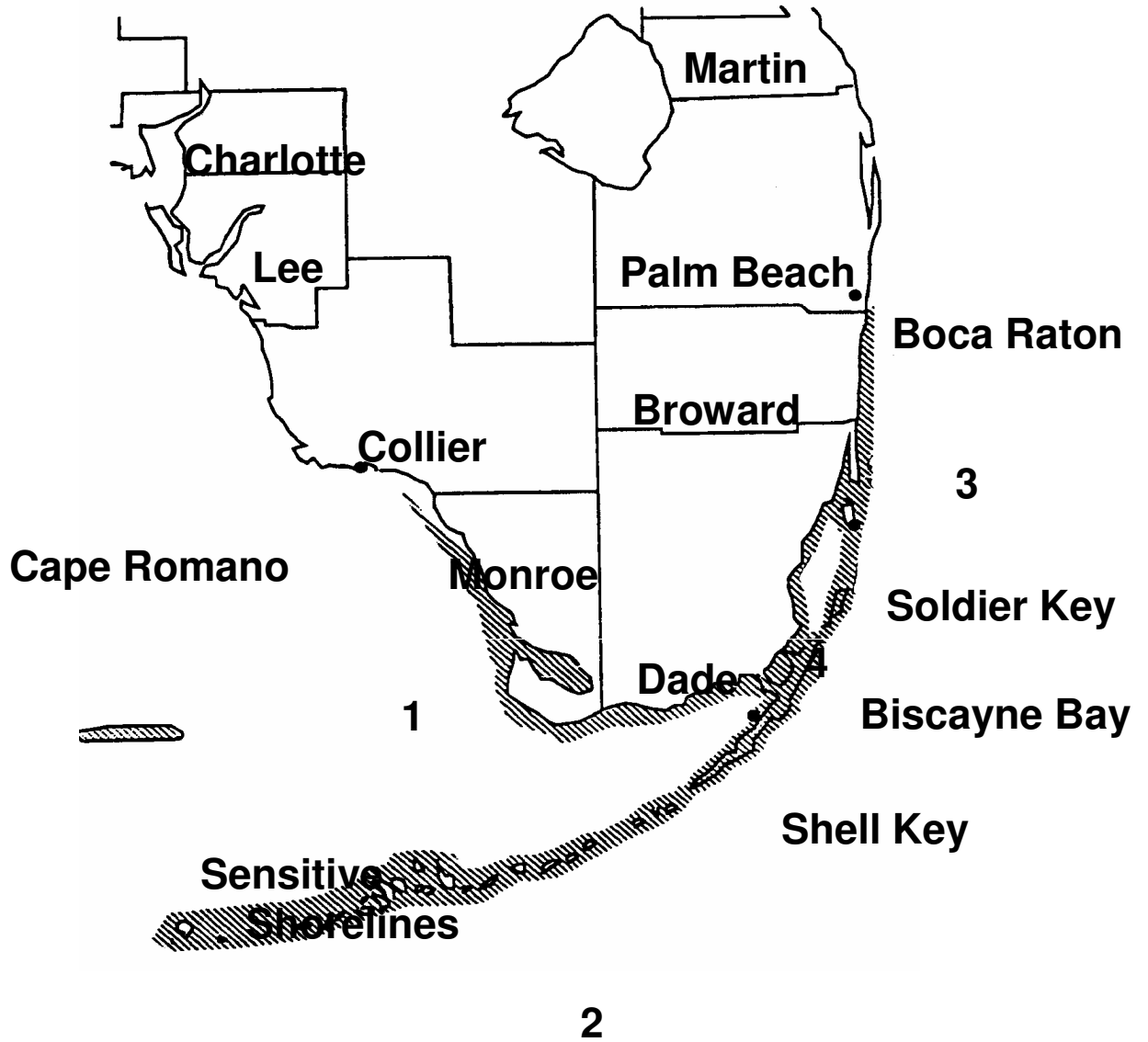
## **Florida Oil Spill Response System**

Florida has a unique shoreline, which is important for both her fishing and tourist Industries. The Florida oil spill response system<sup>6</sup> (Figure 4) follows a plan enacted by the Florida legislature to support the Region IV Contingency Plan. This system can provide a computerized database to expedite the oil response and enhance the existing response capability. The largest spill occurred on September 16, 1969 when approximately 189,000 gallons of #2 fuel oil spilled when the barge Florida, which ran aground off West Falmouth. In recent years, improvements to navigation and more rigorous pilotage requirements are believed to be minimizing risks of future spills in Buzzards Bay. Nonetheless, smaller spills from barge and vessel groundings in the Bay have continued during the 1980s and 1990s. Other notable groundings in Buzzards Bay include the grounding of the Bermuda Star off Cleveland Ledge in 1990, releasing 7,500 gallons of No. 6 fuel. There was also a 50 gallon spill from an empty fuel tank when the QEII grounded off Sow and Pigs Reef near Cuttyhunk in 1992. A January 1996 grounding of the barge North Cape off Moonstone Beach in Rhode Island releasing 880,000 gallons of Number 2 fuel raised concerns of local officials about oil preparedness.

### **Response Category**

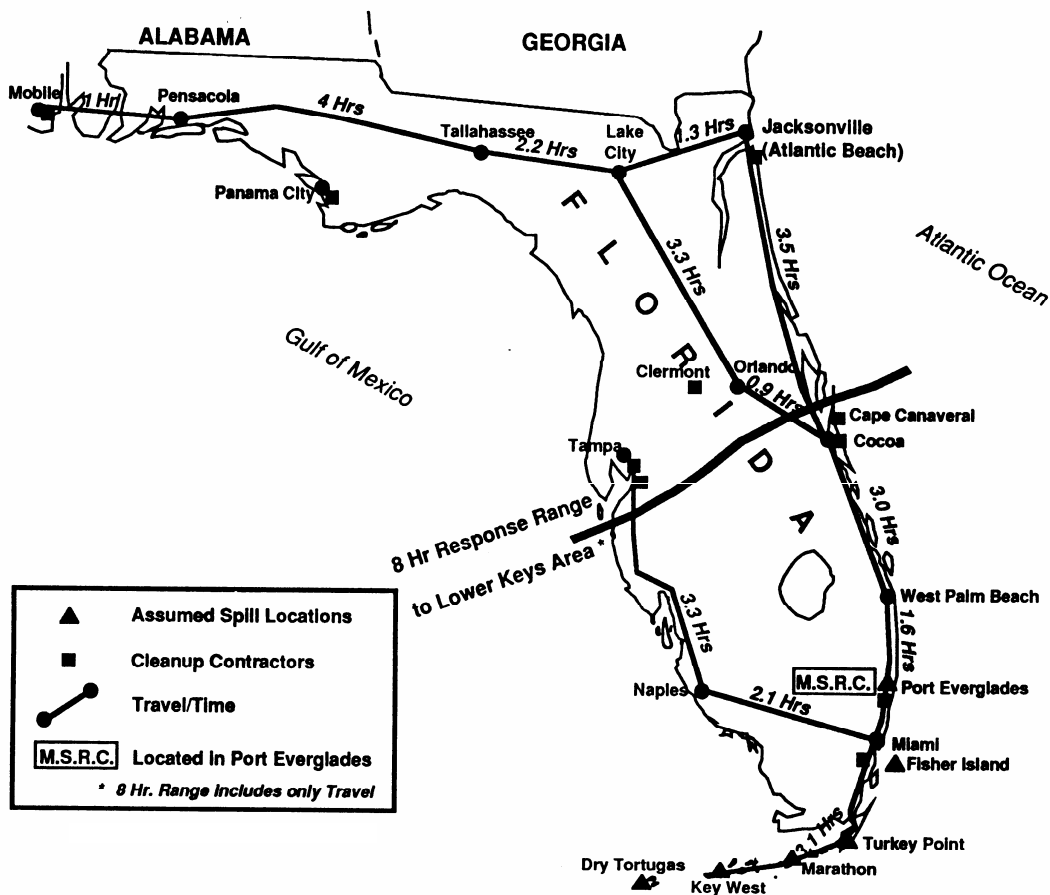
To ensure an effective oil spill response, the Federal Response Organization established a national response center (NRC), a national response team (NRT), regional response teams (RRT), and on-scene coordinators (OSC). If an oil spill is large enough to be beyond the control of the RRT, the NRT can be actuated. The NRT may monitor the spill (evaluating the report of the OSC); request oil spill responses from federal, state, local, or private organizations; and coordinate other activities as may be required to ensure an oil spill response operation is effective<sup>3</sup>.





- 1 - Cape Romano - Shell Key
- 2 - Florida Keys & Reef Tract
- 3 - Key Biscayne - Boca Raton
- 4 - Biscayne Bay

FIGURE 2 Sensitive shorelines in Florida.



**FIGURE 3** Assumed spill locations, cleanup contractors, and expected travel time for cleanup contractors.

### Procedure and Organization

State OSCs are pre-designated federal officials from the U.S. Coast Guard (USCG) or the Environmental Protection Agency (EPA). OSCs collect facts about a spill, identify the potential impact of the spill, and estimate cleanup costs. They hire commercial contractors identified through a database for cleanup and monitor activities. If commercial resources are not available, the OSC can deploy federal resources, personnel, and equipment obtained from the National Strike Force and the U.S. Navy. The main tasks that must be implemented by the OSC are as follows<sup>3</sup>:

- immediately notify the RRT and NRC of spill conditions;
- classify the size of the discharge and determine the proper course of action; and
- Determine the state or local government cleanup capabilities to carry out the response.

The response to oil spills in Florida is based on a methodology of gathering information from oil cleanup contractors, cooperatives, equipment manufacturers, the Marine Spill Response

Corporation (MSRC), Florida port authorities, the Department of Natural Resources (DNR), the EPA, and the USCG<sup>1</sup>. Once an oil spill occurs, current information is immediately available to authority. The contingency plan is operated by an oil spill task force composed of individuals trained in oil spill response methods. The OSC is ultimately responsible for coordinating the cleanup activities and monitoring of the oil spill. Florida's state response team (SRT) is aided by the following groups<sup>4</sup>:

- Department of Natural Resources;
- Department of Environmental Regulation (DER);
- Department of Community Affairs;
- Department of Commerce;
- Department of Highway Safety and Motor Vehicles;
- Department of Law Enforcement;
- Department of Legal Affairs;
- Department of Transportation;
- Game and Fresh Water Fish Commission;
- Governor's Offices; and
- Department of Health and Rehabilitation Services.

The SRT chairperson is either the executive director of the DNR or the secretary of DNR. The chairperson is responsible for the overall management of SRT and its consortium of available resources<sup>5,6</sup>.

**Florida Oil Spill Response Information System: Computerized Database**

The database is maintained and updated by the SRT, and is also used by different industry and government agencies to update inventory of equipment and oil spill cleanup activities. It includes the following information<sup>4</sup>:

- oil-sensitive areas in Florida – areas of sensitive shorelines are identified as reported by the state ( Figure 2);
- oil spill response team – lists addresses and phone numbers of oil spill response agencies: RRTs, SRTs, counties and cities; and
- Cleanup organizations and equipment: provides information on oil spill response organizations and equipment available in Florida.

The advantage of this system is that relevant industries can use the program to update their equipment inventory and necessary response times. The Florida spill SRT is responsible for keeping the database up-to-date and disseminating the information to relevant agencies, cities, counties, and industries. Under this system, when an oil spill occurs, it ensures the relevant party may have information available to respond instantly.

**Data Base Flow Chart**



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**FIGURE 4** *Florida oil response information system.*

Qatar is sitting on the world's largest natural gas fields and some larger oil fields and is one of the world's richest countries. System is a central control operation, with primary authority and control of any oil spill response assumed by the Qatar General Petroleum Corporation (QGPC). Local industries are expected to protect their own facilities, but QGPC also responds to those spills that threaten public and government coasts and the Persian Gulf ecosystem.

Qatar's contingency plan for oil spill cleanup is designed expressly in a broad framework, along which lines detailed action plans can be developed to meet various situations. The QGPC assumes primary authority of operations control for the oil spill response efforts. The corporation's philosophy is to clean up spills originating from its activities and to do everything possible, utilizing its own resources, to prevent any pollution from spreading. The corporation holds material and equipment stock levels based on results of its investigation into maximum possible size of any spill which could reasonably be expected to occur in any one of the oil fields or other offshore facilities. Its basic contingency plan is to develop an oil combating unit when a large spill occurs, defined as a spill beyond the in house capabilities of the corporation. The unit, as will be described, will develop into a complete, in place structure of personnel, equipment and resources that will facilitate the cleanup activities. As the need arises, this in place organization, knowledgeable of available local resources, is prepared to locate and employ outside help.

In the United Arab states it is understood that local industries will protect their own facilities. But if required, the corporation will protect their own facilities. But required, the corporation will loan its available equipment along the following parameters of priority<sup>4</sup>:

- Power station/desalination
- The umm said complex
- West bay cornice and amenity facilities in Doha bay

### **Area of responsibility**

The corporation has a much defined area of responsibility for any oil pollution originating from its own operating areas and along a specifically designated corridor on Qatar's east coast. Its oil spill combat will concentrate mainly on the dispersing, containment and recovery of sea bone oil in addition to efforts aimed at preventing spilled oil from entering power and desalination plants, industrial complexes, and important amenity beaches along Qatar's east cost<sup>4</sup>.

### **Spill reporting procedure:**

Oil spillages must be reported as quickly as possible to the marine superintendent with the following details:

- Location of spill
- Approximate dimension oil spill
- Type of oil (light, dark thick, etc)
- Source

The marine superintendent will assess the situation from information available and will, in consultation with the operation manager, decide on what type of action is to be taken. In case of small spill the marine superintendent will decide whether or not cleanup action has to be taken. In case of medium spill, it can be handled without external help. Whereas in case of large spills it

may require assistance from large Arab state members. In the instance of large spill, the marine superintendent will appoint an Oil Spill Response Committee consisting of<sup>4</sup>:

- A management representative to determine the policy required and initiate contact with other action groups and relevant government agencies within the country.
- An advisor on environmental matters
- An advisor on equipment and its uses. He should come from a reputable contractor, be thoroughly familiar with operating a wide range of anti pollution equipment and will give advice on the deployment and maintenance of equipment. He will be required to make visits to the site of the pollution to give guidance in the handling of equipment and on the methods of the oil containment and pickup.
- An on scene commander (OSC), to be nominated from within the corporation. He will manage the operation on the site, and has the authority to commit manpower and finances to the response team.
- One surveillance member to make routine helicopter flights to site to compile maps and organize reports of the movement of oil from vessels
- Two members at department head level to provide the necessary commitment to the contingency plan and emergency procedures.
- One safety/fire member to administer the safety aspects of personnel and equipment working in a hazardous environment.
- One head of department dealing with the source of pollution to keep the committee fully informed on the steps taken to curb the flow of oil and all related matters.

The oil spill response committee may request services of the legal advisor and the head of the public relations department. The committee is responsible for the development and maintenance of the contingency plan and procedures.

### **Combat section**

The combat section has two sections leaders, leader the onshore and the offshore leader. These leaders are familiar with the equipment available in the corporation and equipment available from other members. They also have limited authority over expenditures necessary for the efficient operation of their respective sections. If suitable personnel cannot be found or released from within the corporation, a contractors' personnel will be employed by leaders. A long term contract is maintained with a contractor in the gulf area to provide a pool of labor capable of being used in connection with the corporation's pollution equipment. The onshore leader and OSC maintain a list of available approved contractors and equipment.

### **Cleanup Capabilities**

The capability for efficient oil spill cleanup depends on the resources that can be supplied by the cleanup organizations, contractors, or cooperatives. The most important resources are equipment and personnel. Performance of the equipment operators is also important, as are their quantity and capacities in determining the effectiveness of a response in operation.

Skimmers are used to recover the oil contained by the booms (booms are placed around the spill to contain it, which helps thicken the oil for skimmer removal). Skimmer performance is affected

by oil viscosity and often by the physical properties of oil. Different skimmer systems have varying oil recovery capacities. But usually the capacity of a certain skimmer decreases once the oil becomes emulsified cooler weather and colder water temperature speed emulsification. According to oil spill contractors, during winter months a quick containment and recovery response, before emulsification of the oil can take place, is essential. For milder conditions and warmer water temperatures, emulsification begins 14 to 16 hours after the spill. So the time lapse between the occurrence of the spill and the start of the cleanup is another factor affecting the success of a cleanup operation<sup>4</sup>.

## **Advantages and disadvantages of oil spill response Systems of Florida, Malaysia and Qatar**

### **1. Method of Approach**

Malaysia has clearly defined responsibilities and authorities in its three-tiered system. The specific advantage of the Florida system over the Qatar system is in the oil spill response information system database, which includes information on oil sensitive shorelines, response teams, disposal sites, cleanup organizations, and equipment.

### **2. Equipment**

The basic cleanup equipment in Malaysia is allocated to each regional council by the DOE. The capacity of the equipment stockpile will enable Malaysia to cope with spills of up to 25,000 tons of persistent oil. The DOE will require international support if the oil spill exceeds their capability. This is ensured by an international agreement between the regional countries of Singapore, Indonesia and Brunei. Malaysia's Information Management System (MIMS) for oil spills can assist the AC in making a decision at the scene of an accident. While their system is not as dynamic as the system of Florida, MIMS does not include recovery equipment locations and response times.

The Qatar response system also has a quantity of equipment available for oil spill cleanup. However, the certainty of the exact status of availability is lesser defined. There is no primary inventory record of equipment available in the country, other than the inventory of the corporation, which is in itself static since it was established on the basis of one analysis of the anticipated needs in the case of a spill. It is not dynamic like that of Florida, which provides the capability of the contractors to adjust inventory levels as they identify need changes through the data base. The equipment information is known, but only unofficially, through the contacts of people within the separate organizations of the country. When a response to a large oil spill cleanup is indicated, it must form the oil spill response committee, on which a key person is the On Scene commander. He will be picked partially for the requirement that he has extensive local contacts. Before he can mobilize oil spill containment efforts, he must make efforts to determine who has what equipment and where it is. QGPC does not have network of other organization to pool resources as does Florida, the corporation does have access to resources of Qatar environmental protection committee, which also has access to other local resources, but this structure is less defined as that of Florida's support structure.

### 3. Personnel

The Malaysia oil spill response team is directly controlled by an area coordinator who is appointed by the Harbor Master of the Assistant Port Officer, who coordinates with the OSC and SCC for any major oil spill. The OSC will control the offshore cleanup and the SCC will control the onshore cleanup. The AC coordinates with the OSC and SCC. When a spill occurs, the AC is called in to investigate the accident and forward the investigation report to the DOE immediately. The AC will take precautionary measures to control the spill by mobilizing existing equipment promptly. Under this organization, the AC must be familiar with the local response team and the availability of resources.

The OSC of QGPC must first establish preliminary contacts to determine the personnel that might be available to their oil spill cleanup efforts. This was another reason for requiring him to be familiar with local conditions, he knows where he can go to find personal availability and then arrangement must be made for their deployment.

The networked Florida oil spill response system, aided by an updated database, provides the cleanup team with the information to mobilize all the required personnel quickly. In the event the OSC cannot muster necessary personnel from local and regional sources, the OSC has the additional authority to deploy federal resources from the National Strike Force and U.S. Navy<sup>4</sup>. The OSC is able to access the available personnel through the database and knows how to deploy them most effectively.

### 4. Time of Response

One of the major factors affecting the success of cleanup operations is the time lapse between the occurrence of a spill and the start of cleanup. Most oil spill cleanup resources are supplied by cleanup contractors and cooperatives in Florida. Florida's system uses the time response to assess the capability of reaching the spill location. According to contractors, it takes 6 to 8 hours when oil starts to emulsify during winter months. Thus, response time during the winter months is vital for Florida response teams since the oil would emulsify faster and make recovery difficult after 8 hours. Table 1 shows response times of contractors.

**TABLE 1** *Typical Oil Spill Cleanup Response Times for Selected Contractors*

Company Name	Location	Response Times (hr) for Locations *				
		A	B	C	D	E
O. H. Materials	Clermont	3	4	5	6	8
Cliff Berry	Ft. Lauderdale	2	3	4	5	7
Denmark	Miami	3	2	3	4	6
Environmental Recovery Group	Atlantic Beach	10	11	12	13	15
Diversified Environmental Services	Tampa	7	8	9	10	12
Haztech	Tampa	7	8	9	10	12
Florida Spill Response Corporation	Cocoa	6	7	8	9	11
Riedel-Peterson	Mobile	15	16	17	18	20

\* Spill locations: A = Port Everglades, B = Miami Beach, C = Turkey Point, D = Marathon, E = Key West



The Malaysia response is defined as a three-tier system, DOE is in charge of deploying resources geographically according to the updated information on the spilled oil. The three-tier response is appropriate for the size of Malaysia, and in addition, Malaysia can seek the support of neighboring countries under their mutual agreement. Unlike the Florida plan, in the event of an oil spill, Malaysia must take some time initially to assemble the response team and resources required. The time needed for the response team and resources to reach a spill site is not known to the Area Coordinator as they have no system of recording dynamic response times or the exact extent of available equipment. This adds uncertainty in determining the response time to a spill.

The time Qatar general petroleum corporation takes in response to an oil spill geographically is appropriate for the size of the response area they must service. Qatar is smaller than Florida and Malaysia and its area of responsibility for cleanup is less. Unlike the Florida plan, in the event of an oil spill, QGPC must expend time initially to assemble the oil spill response committee. then the OSC will need more post spill time to establish what resources are available to the cleanup effort before mobilization can begin, when transportation time to the spill site is added, an undeterminable amount of time would have passes before first workers reach the oil. The time passed is unknown because it will be different at different times, depending on the time to accomplish preemptory functions. Another unquantifiable factor for the QGPC response effort is the extent of equipment available at any given time. QGPC'S assumption is that for medium spills, the corporation has the necessary cleanup equipment. But offshore spills potentially can require more resources than are available to the corporation. All these factors make time the unknown factor in QGPC's oil spill response efforts<sup>4</sup>.

## **Conclusions**

Florida, Malaysia and Qatar have unique needs and requirements for oil spill response, yet both have basic needs for a contingency plan for responding to oil spills. The three systems are performing satisfactorily, primary in response to small and medium spills. However, both need to modify their system to respond to larger oil spills.

1. The idea behind the comparison was to identify best oil spill contingency plan practices to expedite the removal of the spill.
2. A clear line of authority and responsibility is needed for successful cleanup and oil recovery. Florida needs to effectively coordinate among all the parties involved in the oil spill recovery including different contractors and public agencies.
3. In order to perform efficiently and effectively in a real oil spill accident, both Malaysia and Florida need to conduct systematic drills involving all units in the region.
4. Qatar, Malaysia and Florida need to set up training systems to implement a successful contingency plan and provide training courses for oil spill personnel such as the OSC.
5. It is important for Malaysia and Qatar to incorporate a centralized computer database in a dynamic manner that can store and update all the equipment inventory and information concerning the response team.
6. The Florida oil response system needs improved coordination methods, to facilitate the interaction of the many organization responding to cleanup efforts. U.S coast guard official report that experience indicates no clean lines of authority exist among contingency plans, both public and private. True, the state has abundance of resources available to it, but coordination among parties involved is necessary to most effectively utilize these resources in a timely

fashion. With equipment and personnel resource equipment and personnel resource requirements met, the key to effective response is time, primarily, responding to the spill before emulsification begins. After emulsification begins, the cleanup work is more difficult and costly.

7. For the Qatar general petroleum corporation to most effectively respond to oil spill information relevant to equipment and personnel available for response. QGPC should consider implementing a computerized data base system to effectively maintain.

8. This paper is relevant to civil engineering education. Engineers need to understand the process involved in expediting the removal of oil spill before damages occur to marine life and environment.

## References

1. DeCola, E. Oil Spill Contingency Planning in 21<sup>st</sup> Century. *Oil Spill Intelligence Report*, Cutter Information Corporation, Arlington, MA, 2000, pp. 7-13.
2. BOI Technology Holding Sdn Bhd. The Malaysia Oil Spill Response System. 1997-98 Malaysia Oil Spill Response Strategy. <http://www.boitech.com/rs-rsyst.htm>. Accessed Dec18, 2008.
3. R. J. Meyers & Associates and Research Planning Institute, Inc. *Oil Spill Response Guide*. Noyers Data Corporation, Park Ridge, NJ, 1989, pp.23-25.
4. Najafi, F. T., and R. McKenzie. Oil Spill Response System of South Florida and The Country of Qatar. In *Transportation Research Record 1613*, TRB, National Research Council, Washington, DC, 1998, pp. 105-110.
5. Florida Department of Natural Resources. *Florida Coastal Pollutant Spill Contingency Plan*. Tallahassee, FL, 1988-1989, pp. 1-4.
6. Fazil T.Najafi, Oil spill Response Capabilities in south Florida. Transportation research board,1333,1991,pp 13-21