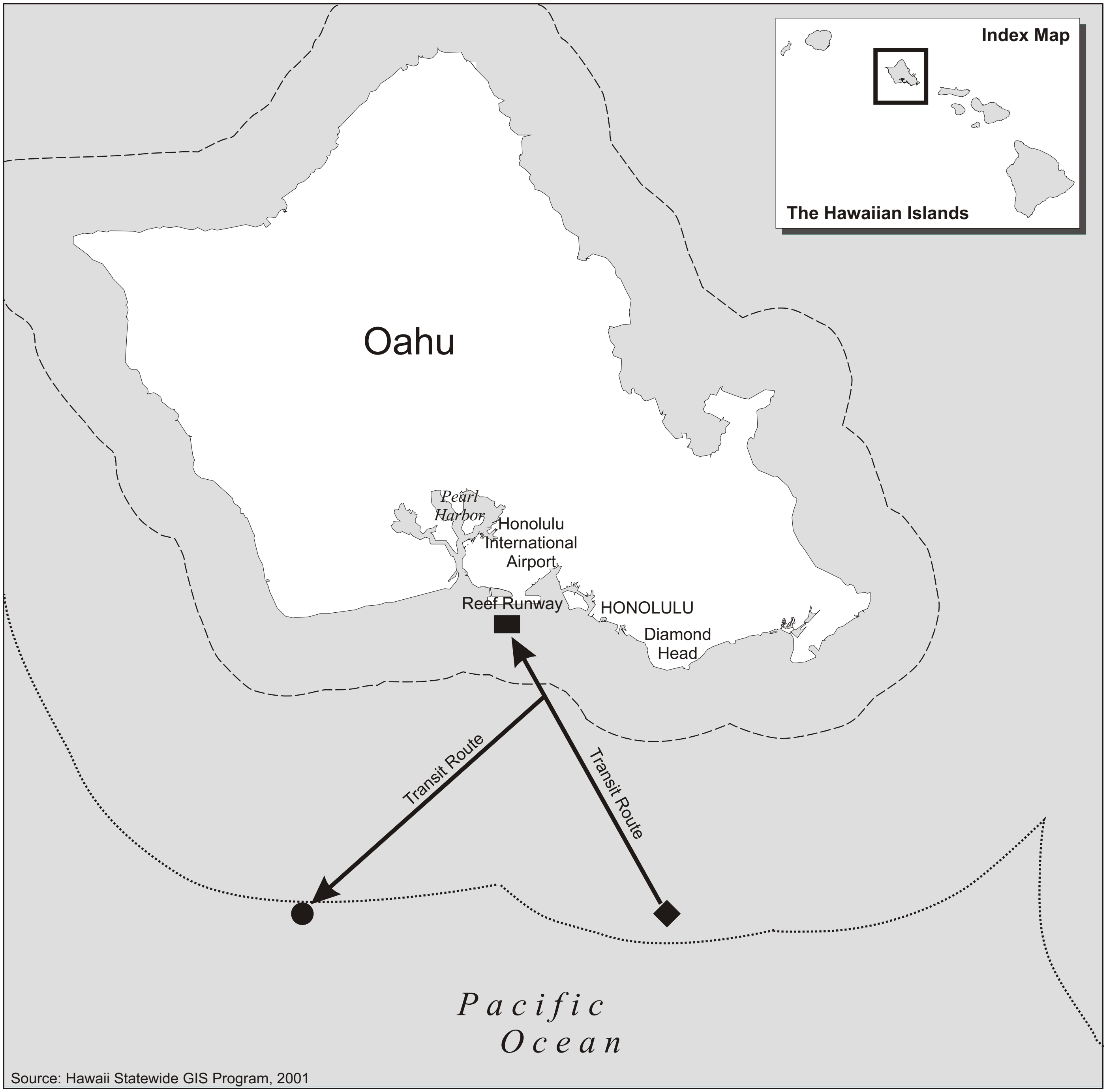
2.0
DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

2.0 DESCRIPTION OF PROPOSED ACTION AND ALTERNATIVES

The U.S. Navy proposes to recover to the maximum extent practicable *Ehime Maru* crewmembers, personal effects, and certain characteristic components unique to *Ehime Maru*, such as the anchors, forward mast, placard, and ship's wheel, by moving the vessel to a shallow-water area to permit safe diver access and recovery operations. The Navy would use a specially-equipped offshore construction vessel to lift and move *Ehime Maru* from its current location. Flexible lifting plates would be placed under *Ehime Maru* to lift it from the seafloor using linear winches mounted on the heavy-lift vessel. *Ehime Maru* would then be transported, while suspended from the heavy-lift vessel approximately 100 feet (30 meters) above the seafloor, to a shallow-water recovery site approximately 115 feet (35 meters) deep. *Ehime Maru* would then be placed on the seafloor, and skimmer systems and containment booms would be pre-positioned to contain any diesel fuel or lubricating oil released. After *Ehime Maru* is stable, the heavy-lift vessel would be replaced by an ocean-going barge that would serve as a work platform for diving operations. Navy and Japanese divers would enter the hull and attempt recovery of crewmembers, any personal effects, and other uniquely characteristic components found inside. They would also safely remove remaining diesel fuel and lubricating oil to the maximum extent practicable. The barge would then lift *Ehime Maru* from the seafloor. The barge would relocate *Ehime Maru* to a deep-water site outside of state of Hawaii waters with a depth of at least 1,000 fathoms (6,000 feet [1,800 meters]) and outside the limit of U.S. territorial waters (figure 2-1).

One shallow-water recovery site and one deep-water relocation site are under consideration as part of the Proposed Action. These sites have been analyzed in detail in this EA. The Recovery-not-possible Alternative, which would leave *Ehime Maru* at its current location and in its present condition, will also be considered and analyzed. Under this alternative, the recovery operation would not be initiated and *Ehime Maru* crewmembers, personal effects, and certain characteristic components would not be recovered, and no diesel fuel or lubricating oil would be removed from the vessel. The deck also would not be cleared of cargo nets, fishing hooks and long lines, rafts, rigging on the masts, and any other obstacles that could cause a future impact to the marine environment.

Three alternative methods of recovering the crewmembers were considered but determined not to be technically feasible or safe. Thus, they were not studied in detail for analysis in this EA. These alternatives were deep-water recovery at the present site, recovery while the vessel was lifted and suspended from the heavy-lift vessel, and recovery out of water. Four additional shallow-water recovery sites were also considered but not analyzed because of safety and environmental concerns. These unacceptable alternatives are described in section 2.2.



LEGEND

- Current Location
- Reef Runway Shallow-water Recovery Area
- Deep-water Relocation Site (Beyond the 1,000-fathom contour)
- U.S. Territorial Waters (12 Nautical Miles)
- Hawaii State Waters (3 Nautical Miles)

NORTH

No Scale

Ehime Maru Current Location, Reef Runway Shallow-water Recovery Area, and Deep-water Relocation Site

Figure 2-1

2_1RelocationSite053101

2.1 PROPOSED ACTION

The overall effort consists of phases beginning with a feasibility study (appendix G), followed by this Environmental Assessment. The Proposed Action involves the remaining phases: mobilizing recovery forces, using ROVs to place lifting plates under the hull at the current location, deep-water lift and transit to a shallow-water recovery site approximately 115 feet (35 meters) deep including a post-lift ROV survey at the current location, crewmember recovery and diesel fuel and lubricating oil removal, and relocation of the vessel to a deep-water site. (Naval Sea Systems Command, 2001d)

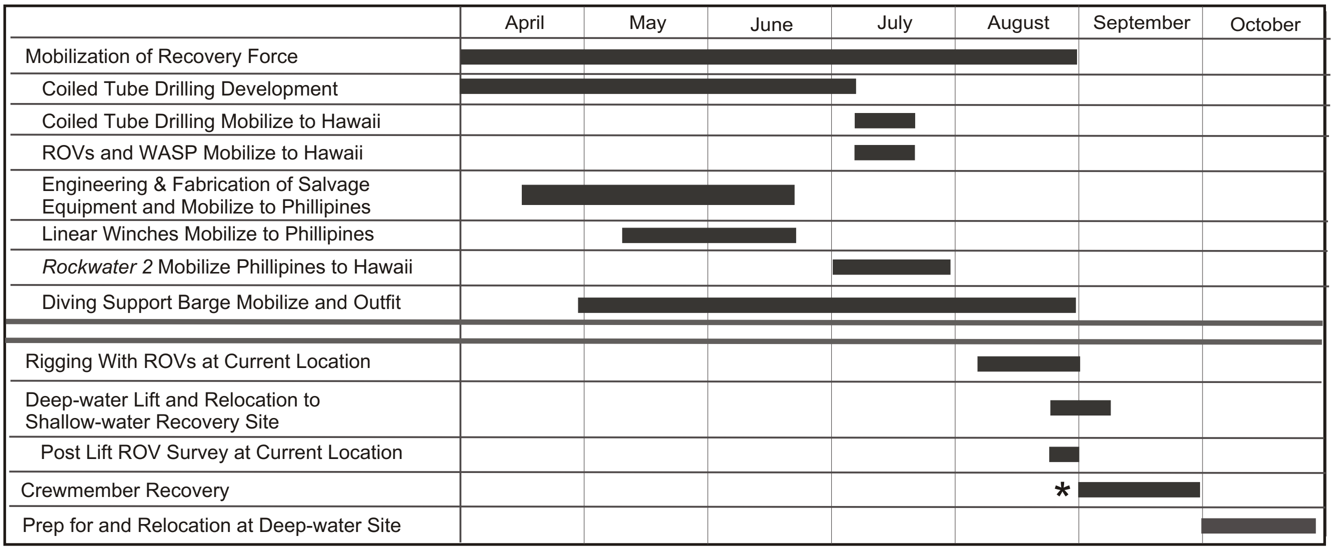
The recovery plan would include provisions for control of anticipated releases of oil. To further ensure timely and effective response actions and protection of the environment, an Incident Action Plan (IAP) has been developed (appendix F). The IAP describes resources and procedures for control of any unanticipated releases, and has been developed in advance to address unanticipated releases of diesel fuel and lubricating oil. The IAP and its implementing organization, the Unified Command, are described more fully in section 2.1.4.3. The Navy recovery plan would include use of Naval Sea Systems Command emergency response equipment, as well as local commercial response equipment, such as the oil spill response vessel *Clean Islands*. The Navy's operation orders for the recovery operation would require actions developed in the Proposed Action to be implemented. If a situation develops outside the Proposed Action, then the IAP would be used and modified as necessary by the Unified Command after consultation with the Navy. The IAP would be subject to review and approval by the members of the Unified Command, which includes Navy, Coast Guard, and State of Hawaii representatives. Japanese officials would be invited to observe the operations of the Unified Command.

The Navy would obtain appropriate state and federal permits. The Navy would also follow applicable federal requirements for *Ehime Maru* recovery and relocation.

2.1.1 MOBILIZING RECOVERY FORCES

Mobilization of recovery forces would include the acquisition, charter, rent, manufacture, and movement of all equipment necessary to support the operation. Figure 2-2 shows an overall notional timeline leading to the final phase, the deep-water relocation of *Ehime Maru* by the end of October 2001. The mobilization schedule for July is driven by the necessity to take advantage of optimal weather conditions for recovery and relocation operations in August through October. However, since this operation is unique, the timeline is subject to change due to unforeseen or uncontrollable circumstances. The major equipment that would be required to perform the recovery operation includes the following:

- Heavy-lift vessel
- Ocean-going barges and tugs
- Coiled tube drilling system
- Two underwater work-class ROVs



* Starts 48 hours after relocation to shallow-water recovery site

Representative Schedule for Recovery and Relocation Activities

Figure 2-2

- Working Atmospheric Suit Prototype (WASP) One Atmosphere Suit (a deep-water diving suit for emergency use only)
- Specially designed and fabricated equipment including pulleys, weights, spreader assembly, lifting frame, and other support hardware
- Heavy lift linear winches
- Lifting wire

Commitment for the floating assets is critical, specifically for the heavy-lift vessel, *Rockwater 2*, shown in figure 2-3. As shown in the timeline, the systems requiring a long lead-time for acquisition, testing, and transit include the coiled tube drilling system, winches, and the engineering, fabrication, and procurement of special recovery equipment. Naval Sea Systems Command began acquisition of these systems via contract with a contractor experienced in deep ocean operations. The acquisition would be completed in time to meet the required shipment date for transport to Hawaii. Equipment would be ready for shipment in mid-June. The shipment to Hawaii would take approximately 3 weeks. All equipment, including the winches and wire, would be staged in Hawaii by mid-July to complete outfitting *Rockwater 2*.

The ROVs and the WASP, as shown on figure 2-4, are currently located in Houston, Texas. They are being shipped over land to California and would arrive in Hawaii in mid-July on board anchor-handling tugs or barges. The vessels would also have on board the coiled tube drilling system and other salvage support equipment. *Rockwater 2* would arrive in Hawaii for final outfitting in mid-July and would be ready to complete the deep-water lifting operation by August 2001. The Navy and the U.S. Fish and Wildlife Service would cooperate by taking prudent measures to minimize the potential importation of alien species.

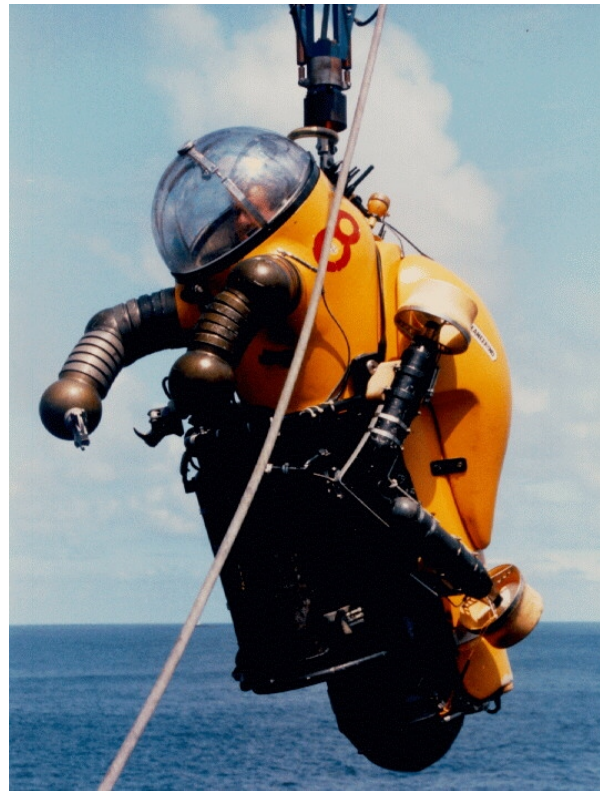
The United States has invited the Government of Japan to participate, and they have expressed an interest in providing the Japanese research vessel *Kairei* and the ROV *Kaiko* (figure 2-4) for the post-lift inspection. The U.S. Navy ROV *Deep Drone* and a support vessel would be used if the Japanese ROV is not available.

Additional assets and equipment would be required to support the divers during the crewmember recovery, the potential diesel fuel and lubricating oil removal, and relocation. A Navy contractor would supply an ocean-going barge with ballast lift capability, support tugs, and related equipment and recovery support expertise. The contractor would mobilize the barges and tugs from the West Coast of the United States in mid-August and begin outfitting of the equipment for diving support, lift support, and diesel fuel and lubricating oil removal in late August. The contractor would provide support equipment including mooring systems, crane, power, accommodations, and berthing services. The Navy's Mobile Diving and Salvage Unit One (MDSU-ONE) would provide the divers, diving equipment, and services. The barges and tugs would support the crewmember recovery operations until completion, which is currently anticipated for October.

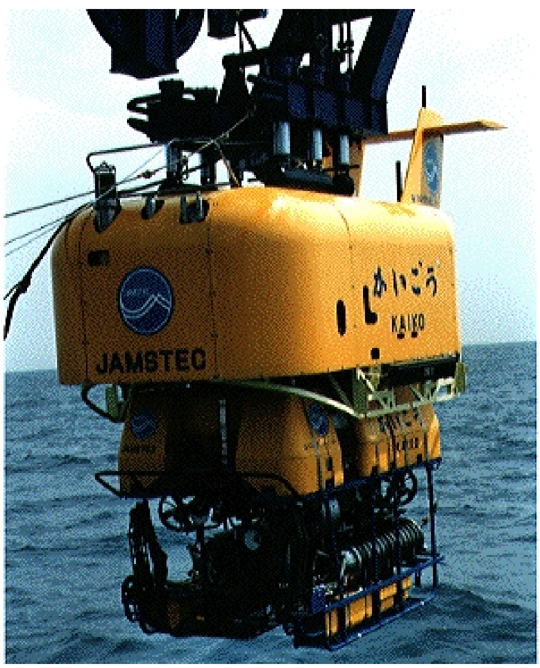
Rockwater 2
Heavy-lift Vessel

Figure 2-3

Remotely Operated Vehicle *Deep Drone*



Working Atmospheric Suit Prototype (WASP)



Japanese Remotely Operated Vehicle *Kaiko*

Japanese Research Vessel *Karei*

Deep-water Recovery Assets

Figure 2-4

2.1.2 LIFT PREPARATION WITH ROVS AT CURRENT LOCATION

This phase of the operation would include preparation of *Ehime Maru* for lifting from the 2,000-foot (600-meter) depth. The operation would be conducted primarily by the lift vessel, *Rockwater 2*, with assistance from the anchor-handling tug. *Rockwater 2* is a multi-purpose support vessel with dynamic positioning capability, a wave-compensated crane, and other assets necessary for the operation. It would be outfitted with special drilling equipment, winches, lifting wire, two work-class ROVs, the WASP, and all fabricated hardware for the operation. The rigging would be performed in the sequential steps as described in the following sections. The Navy would install shields on lighting to minimize the upward reflection of any outdoor lighting used in preparation for the next day's activities.

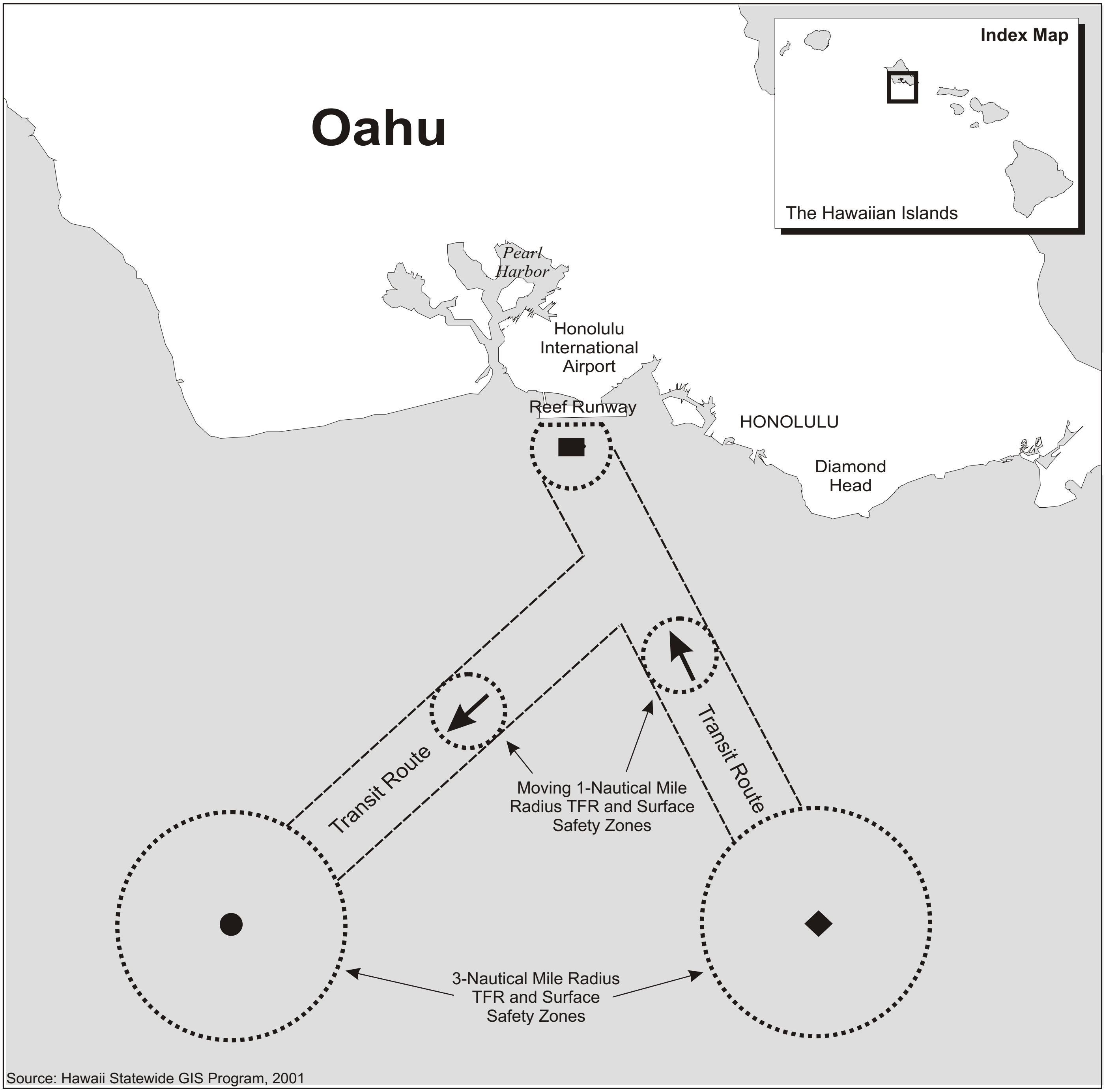
A temporary flight restriction and a Coast Guard surface safety zone would be established with a 3-nautical-mile (approximately 6-kilometer) radius around the lift preparation area (figure 2-5) to minimize the potential intrusion of watercraft and aircraft during lift and relocation activities. The temporary flight restriction would extend up to an altitude of 2,000 feet (approximately 610 meters). The Navy would request dedicated warning Notices to Mariners (NOTMARs) and Notices to Airmen (NOTAMs) for ships and aircraft, respectively, to avoid the lift preparation area. The Coast Guard would establish a surface safety zone, issue NOTMARs, and enforce the surface safety zone as required to keep other vessels clear of the area. The FAA would establish a temporary flight restriction and issue NOTAMs. The temporary flight restriction would be enforced by the FAA.

2.1.2.1 Inspection of *Ehime Maru* by ROV

Before lift preparation a thorough inspection of *Ehime Maru* would be performed by at least one of the ROVs to finalize details for the rigging. During this inspection, a number of tests and trials would be performed, including scouring out the area beneath the bow of *Ehime Maru* with water jets. The ROVs would also be used to perform a visual survey to determine if there are any marine resources in the area that should be avoided. Resource agency observers would provide assistance in making the determination.

2.1.2.2 Removal of Materials

The ROVs would be used to remove and recover any items attached to or around *Ehime Maru,* including cargo nets, fishing hooks and long lines, rafts, and rigging on the masts. No fishing nets were on board. To the maximum extent practicable, the deck would then be cleared of all other obstacles, such as the masts, that could cause an impact to the marine environment or jeopardize the safety of the recovery operations. The forward mast would be removed by the ROVs. To remove the center mast, a 1.5-pound (0.7-kilogram) U-shaped linear charge would be placed at the base to cut it from the deck. The members of the Unified Command would be notified to be on standby before the shaped charge is used. An alternate method would use a plasma rod to burn through the metal of the center mast, so it could either be bent over or removed. Both masts, if removed, would be taken to the surface by the ROV.



LEGEND

- ◆ Current Location
- ■ Reef Runway Shallow-water Recovery Area
- ● Deep-water Relocation Site
- ...... Temporary Flight Restriction Space Up to 2,000 Feet in Altitude and Surface Safety Zone
- – – – Transit Route

NORTH

No Scale

Temporary Flight Restriction and Surface Safety Zone

Figure 2-5

2.1.2.3 Placement of Lifting Plates and Aligning Weights

Rockwater 2 would place various pieces of equipment on the seafloor adjacent to *Ehime Maru* in preparation for installation of the lifting plates (figure 2-6). The lifting plates are approximately 66 feet by 5 feet by 0.75 inches (20 meters by 1.5 meters by 19 millimeters), with bridle terminations on each end. Placement and alignment would be accomplished using the wave-compensated crane to dampen the effect of ocean waves, and a precision navigation system.

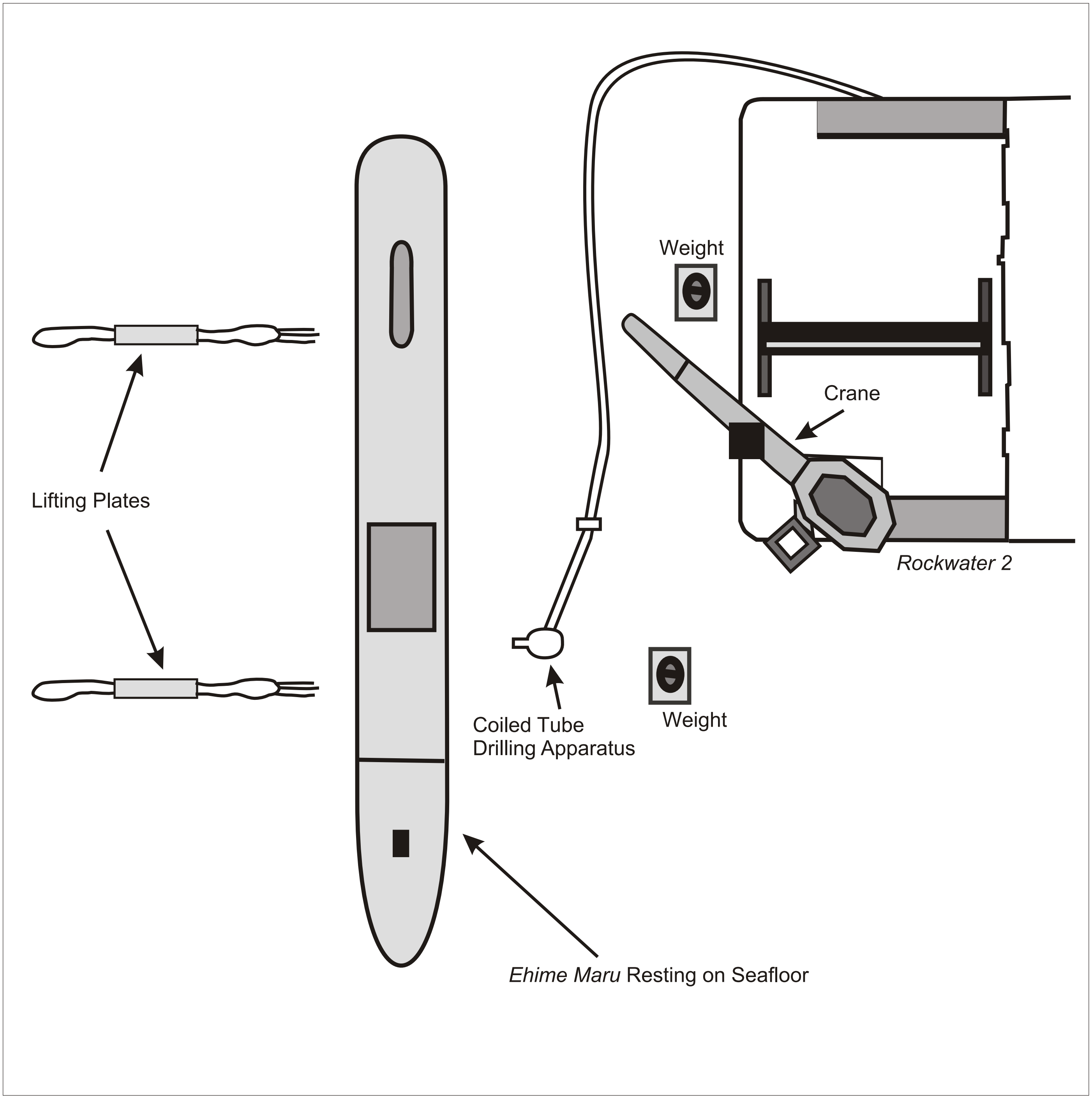
2.1.2.4 Coiled Tube Drilling

A coiled tube drilling system, shown schematically in figure 2-7, would be used to drill beneath the hull of *Ehime Maru*. The system is operated from the surface, with the drilling head positioned on the seafloor. As shown on the figure, a tunnel (approximately 14 inches [350 millimeters] in diameter) would be drilled beneath *Ehime Maru* using the directional capability of the system. Additional tunnels may be drilled parallel to the original tunnel depending on the testing that would be performed in Houston before mobilization. The process would be repeated for both forward and aft lifting plate locations.

2.1.2.5 Lifting Plate Installation

After the tunnels are drilled beneath *Ehime Maru*, messenger lines would be used to attach high-strength wire ropes to the ends of the lifting plates (figure 2-8). The lifting plates would then be pulled under the hull through the drilled tunnels using either *Rockwater 2*'s linear winch or the crane on the anchor-handling tug. A water-jetting assembly would be attached to the end of the lifting plates to assist in the extrusion of the plates through the sediment beneath *Ehime Maru*.

This phase is one of the most critical in the operation. A contingency plan has been developed in case the drilling operation is not successful. The contingency plan includes lifting the stern of *Ehime Maru* by *Rockwater 2* to enable the lifting plates to be pulled under the hull. This method requires scouring away the seafloor beneath the bow of *Ehime Maru* and then using a sling to lift the stern about four degrees, allowing the two lifting plates to be pulled under the hull. This method could increase the risk of further damage to the hull and subsequently increase the potential for a release of diesel fuel and lubricating oil. A surveillance helicopter and a skimmer system would be on site should this plan be chosen as the method to install the lifting plates.

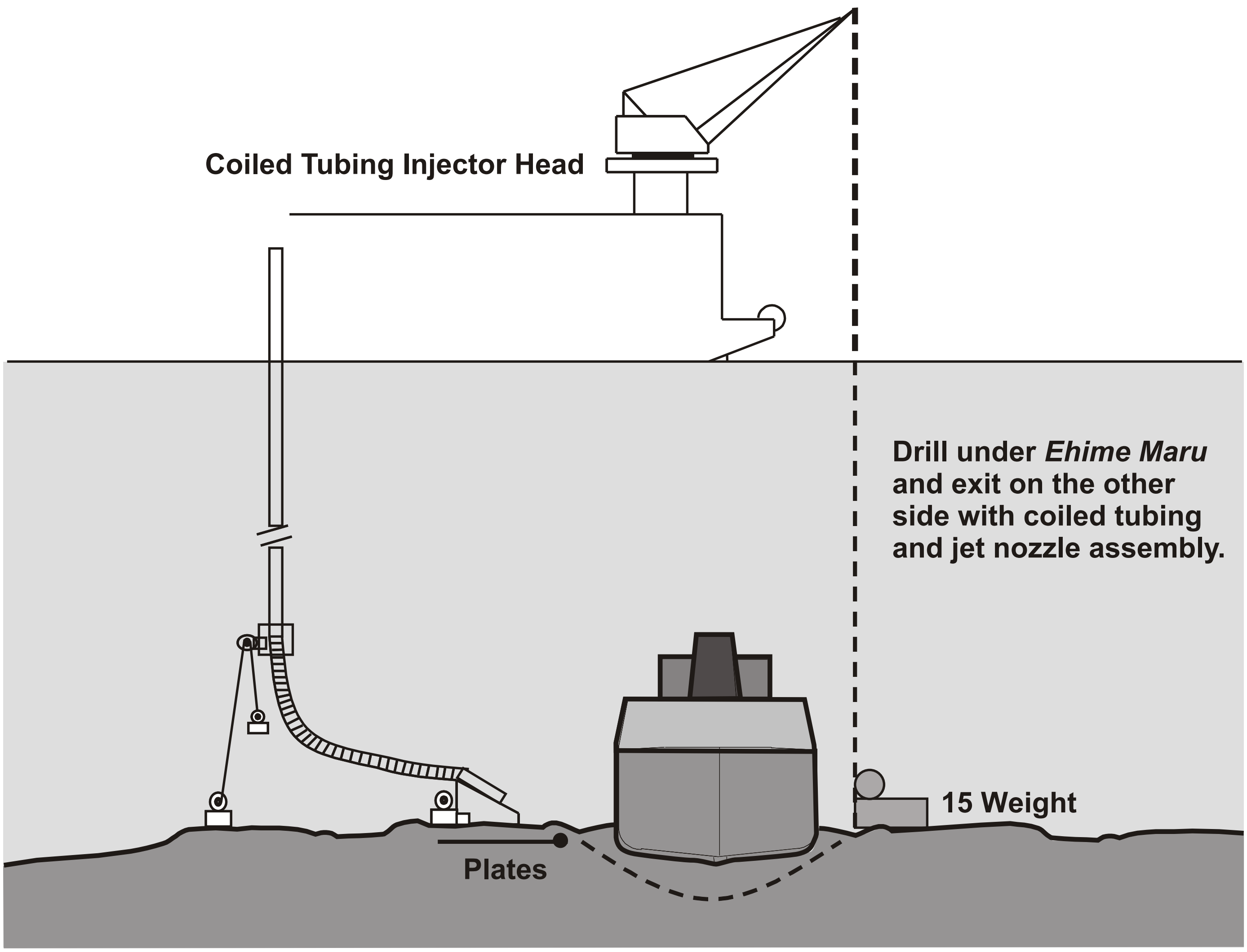


Plan View of Lifting Plates and Anchors on the Seafloor

Figure 2-6

No Scale

2_6PositioningPlates052101



Coiled Tube Drilling System

Figure 2-7

No Scale

2.1.2.6 Installation of Spreader Assembly

The next step in the rigging process would be installation of the spreader assembly (figure 2-8). The spreader assembly, which would distribute the weight of *Ehime Maru*, is buoyant to facilitate rigging. The assembly would be lowered with the wave-compensated crane and positioned over *Ehime Maru* at a predetermined location. When properly positioned, the two lifting plates would be attached to the spreader assembly using messenger lines from *Rockwater 2*. ROVs would be used extensively during all activities in this phase. Figure 2-8 shows the spreader assembly positioned above *Ehime Maru* and the ends of the lifting plates in the process of being attached to the spreader.

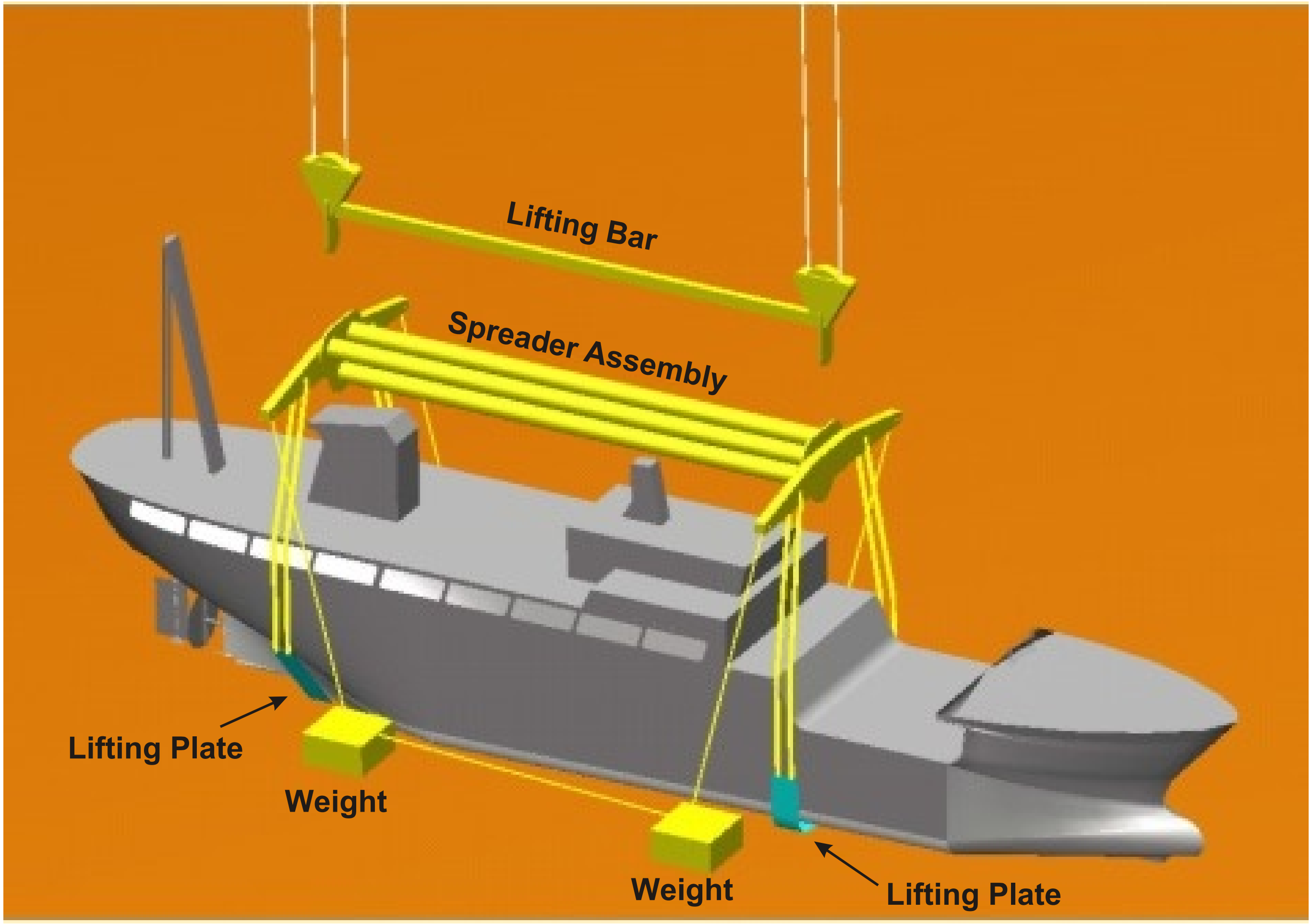
2.1.2.7 Lowering the Lifting Bar

The final step in the rigging process would be lowering the lift wires to the spreader assembly and completing the connection between *Rockwater 2* and *Ehime Maru*. The winches would let down the lift wires, lowering the lift bar to the spreader assembly. The ROVs would assist in aligning the lift bar with the spreader assembly and in making the final connections between the two. Once the lifting bar is attached to the spreader assembly, *Ehime Maru* would be ready for lifting.

2.1.3 DEEP-WATER LIFT AND TRANSIT TO THE SHALLOW-WATER RECOVERY SITE

This phase of the operation would include making the initial lift of *Ehime Maru* from the seafloor, inspecting the vessel while it is suspended approximately 100 feet (30 meters) above the seafloor, transiting to the shallow-water recovery site along a previously determined route while maintaining a distance of approximately 100 feet (30 meters) from the seafloor, and placing the hull on the seafloor at the shallow-water recovery site. Immediately after the initial lift, *Ehime Maru* would be inspected underneath to assess its integrity before transport. Exact transit routes would be determined based on a recent bathymetric survey. Throughout each of the following steps of this phase, one of the ROVs would be deployed to monitor the condition of the hull and lifting rig. The Navy would also videotape the operations at the surface using both surface and aerial cameras.

Subsequent to the successful lift of *Ehime Maru*, any personal effects that remain on the seafloor would be recovered with the ROV manipulators and a collection basket. Recovered items would be placed in the basket and subsequently brought to the surface. All personal effects would then be inventoried, washed with fresh water, placed in appropriate containers, and turned over to the City of Honolulu Medical Examiner for transfer to the Japanese Consulate. In addition to the recovery of personal effects, any remaining items that may endanger the marine environment (for example, cargo nets, long lines, and fishing hooks) would also be recovered.



Installation of Lifting Plates, Spreader Assembly, and Lifting Bar

Figure 2-8

No Scale

2_9AssemblyInstallation052801

The Navy would deploy multiple buoys approximately 30 days before the deep-water lift to measure wind speed and direction and sea-state data. The buoys would be placed at strategic locations, such as the coral fringe approximately 2 to 3 nautical miles (4 to 6 kilometers) from shore and upcurrent and downcurrent from the shallow-water recovery site.

2.1.3.1 Transit Routes

The routes between the current location of *Ehime Maru*, the proposed shallow-water recovery site, and the proposed final deep-water relocation site were surveyed using a precision fathometer coupled to a global positioning system. This information would enable the *Rockwater 2* to proceed safely along the prescribed route. One of the ROVs would be deployed to monitor the condition of *Ehime Maru* and the rigging gear. The ROV would use its sonar to ensure that *Ehime Maru* remains suspended approximately 100 feet (30 meters) off the seafloor and would not collide with any outcroppings, rocks, or cliffs. The transit speed would be approximately 1 knot (approximately 2 kilometers per hour). The vessel would only be moved during daylight and during favorable weather conditions to ensure the safety of operation personnel, to minimize the potential for mishaps, and to ensure detection of any “sheen” resulting from the release of diesel fuel or lubricating oil. Data from surveys by USNS *Sumner*, a U.S. Navy oceanographic vessel, have been used to prepare bathymetric charts, which were used to determine the proposed transit routes.

At the coral fringe, approximately 2 to 3 nautical miles (4 to 6 kilometers) from shore, the seafloor abruptly rises approximately 1,500 feet (450 meters) (see figure 1-1). At this point the heavy-lift vessel would delay moving any closer to shore. The Navy would time the final movement to the shallow-water recovery site to coincide with favorable wind speed and direction, currents, and tides. This extensive sea-state analysis, as well as real-time spot weather forecasts, would allow the Navy to choose an optimal time for the vessel’s movement to the shallow-water recovery site.

A temporary flight restriction and a Coast Guard surface safety zone would be established with a 1-nautical-mile (approximately 2-kilometer) radius, centered on the heavy-lift vessel. The temporary flight restriction would extend to an altitude of 2,000 feet (approximately 610 meters). This temporary flight restriction would be issued and enforced by the FAA. The Navy would request the dedicated warning NOTMARs and NOTAMs for ships and aircraft, respectively, to avoid the transit route. The Coast Guard would issue NOTMARs and enforce the surface safety zone as required to keep other vessels clear of the area until the vessels reach the Naval Defense Sea Area, at which point the Navy would then enforce the surface safety zone.

2.1.3.2 Sea-state Limitations During the Deep-water Lift and Transit

The transit operation would be conducted when forecasted wave heights do not exceed safe operating limits of the lifting equipment. Desired minimum winds would be 10 to 12 knots (approximately 20 to 24 kilometers per hour), depending upon currents. Currents would be monitored with appropriate instrumentation to provide near real-time measurements.

2.1.3.3 Oil Release Preparedness during Lift, Transit, and Placement at the Shallow-water Recovery Site

Ehime Maru had approximately 65,000 gallons (25,000 liters) of diesel fuel, approximately 1,200 gallons (4,500 liters) of lubricating oil, and 46 gallons (182 liters) of kerosene on board at the time of the collision. It is assumed that the force of the collision opened the vessel's bulkheads and that fuel tanks and other closed containers were crushed by the enormous change in pressure caused by the rapid sinking of the vessel. Based on aerial observations for 3 days following the collision, the Navy has conservatively estimated that the volume potentially remaining, and thus the maximum credible release, would be approximately 45,000 gallons (170,000 liters).

Baseline water samples would be taken at the shallow-water recovery site prior to operations. Baseline samples would also be taken of the diesel fuel *Ehime Maru* used. Recovery personnel would try to obtain a sample of any remaining diesel fuel or lubricating oil from *Ehime Maru*. In the event of a release, initial and periodic sampling for total hydrocarbons and benzene would be taken.

The diesel fuel on *Ehime Maru* is a non-persistent fuel, meaning that if released, natural weathering processes would cause it to evaporate and disperse relatively quickly (appendix I, part 2). Diesel fuel, even at a depth of 2,000 feet (600 meters), would be expected to rise to the sea surface and be subject to surface winds, mixing by waves, and warmer temperatures, thus enhancing evaporation. With anticipated local weather, wind, and sea-state conditions, and no emergency response effort, approximately 65 percent of a significant release would be removed (into the air and into the water column) by natural processes in the first 5 hours following release. After 10 hours, less than 10 percent of the released diesel fuel would remain on the water's surface. The diesel fuel would naturally evaporate and disperse into the water column and would be diluted to harmless, non-detectable levels. Unless it is dispersed in very shallow water, there is sufficient water volume to adequately dilute the dispersed fuel. The diesel fuel may display some toxic characteristics, and until diluted may be expected to have an impact on marine life in the immediate vicinity of the release. Releases would be contained or recovered before they impact the sensitive resources in Hawaii's nearshore waters.

The lubricating oil on *Ehime Maru* is a more persistent oil, but the Navy anticipates very little of the 1,200 gallons (4,500 liters) would remain due to the location and likely extent of the collision damage. The Navy would be prepared to accelerate natural dispersion of any diesel fuel or lubricating oil released using chemical dispersants, only if the Coast Guard determines it is necessary or if such accelerated dispersion would result in a net environmental benefit. Chemical dispersants would only be applied if mechanical measures (containment booms and skimmer systems) are not effective, and only with the approval of the federal On-Scene Coordinator (OSC), in accordance with applicable provisions of the Regional and Area Contingency Plans.

Despite the low probability of its occurrence, the Navy would be fully prepared to respond to greater than the maximum credible release of 45,000 gallons (170,000 liters) with on-scene booms, skimmers, sorbents, and dispersant capability. Booms would be pre-positioned near the shallow-water recovery site, and any anchors would avoid areas of coral, seagrasses, and other sessile marine life. The booms would be attached to tag lines that could be easily moved to a potential release site.

The Navy has three open-ocean skimmer systems in Pearl Harbor, each with a recovery capacity of 57,000 gallons (220,000 liters) per day and adequate storage capacity. The Navy has also arranged to deploy the local industry oil spill cooperative's oil spill response vessel *Clean Islands* as required. *Clean Islands* has two on-board skimmers with a daily recovery capacity of approximately 62,000 gallons (approximately 235,000 liters) per day. During the lift and relocation phase of the recovery operation, two Navy skimmer systems and *Clean Islands* would be on scene, with the one remaining Navy skimmer on standby. In addition, an open-ocean containment boom would be deployed at the shallow-water recovery site and positioned as required to contain possible releases or to divert them to the skimmer systems.

The Navy would survey the proposed shallow-water recovery site for the presence of coral and seagrass. The survey would be documented with videotape. This survey would also determine if there are any unknown man-made structures (such as cables and pipelines) or unexploded ordnance in the area. If structures or unexploded ordnance is found, they would be marked and avoided.

Representatives from the U.S. Fish and Wildlife Service would survey bird habitats and populations at the Marine Corps Base Hawaii at Kaneohe Bay, Kaena Point, a point on the south shore of Oahu, and the Kilauea National Wildlife Refuge on the island of Kauai, before and after operations. U.S. Fish and Wildlife Service personnel would provide technical support at the current location of *Ehime Maru* and during transit to the shallow-water recovery site should birds should become oiled. In addition, U.S. Fish and Wildlife Service and/or National Marine Fisheries Service personnel would be aboard an oil skimmer to observe and collect any distressed birds that come in contact with oil. If at all possible, an oiled bird stabilization unit would be established at a convenient location. In the unlikely event wildlife (birds, mammals, and sea turtles) become oiled, the National Marine Fisheries Service would be notified. The International Bird Rescue Research Center would be contracted for technical advice and assistance during critical stages of the lift and relocation phases to support rescue and rehabilitation of oiled wildlife.

2.1.4 ACTIVITIES AT THE SHALLOW-WATER RECOVERY SITE

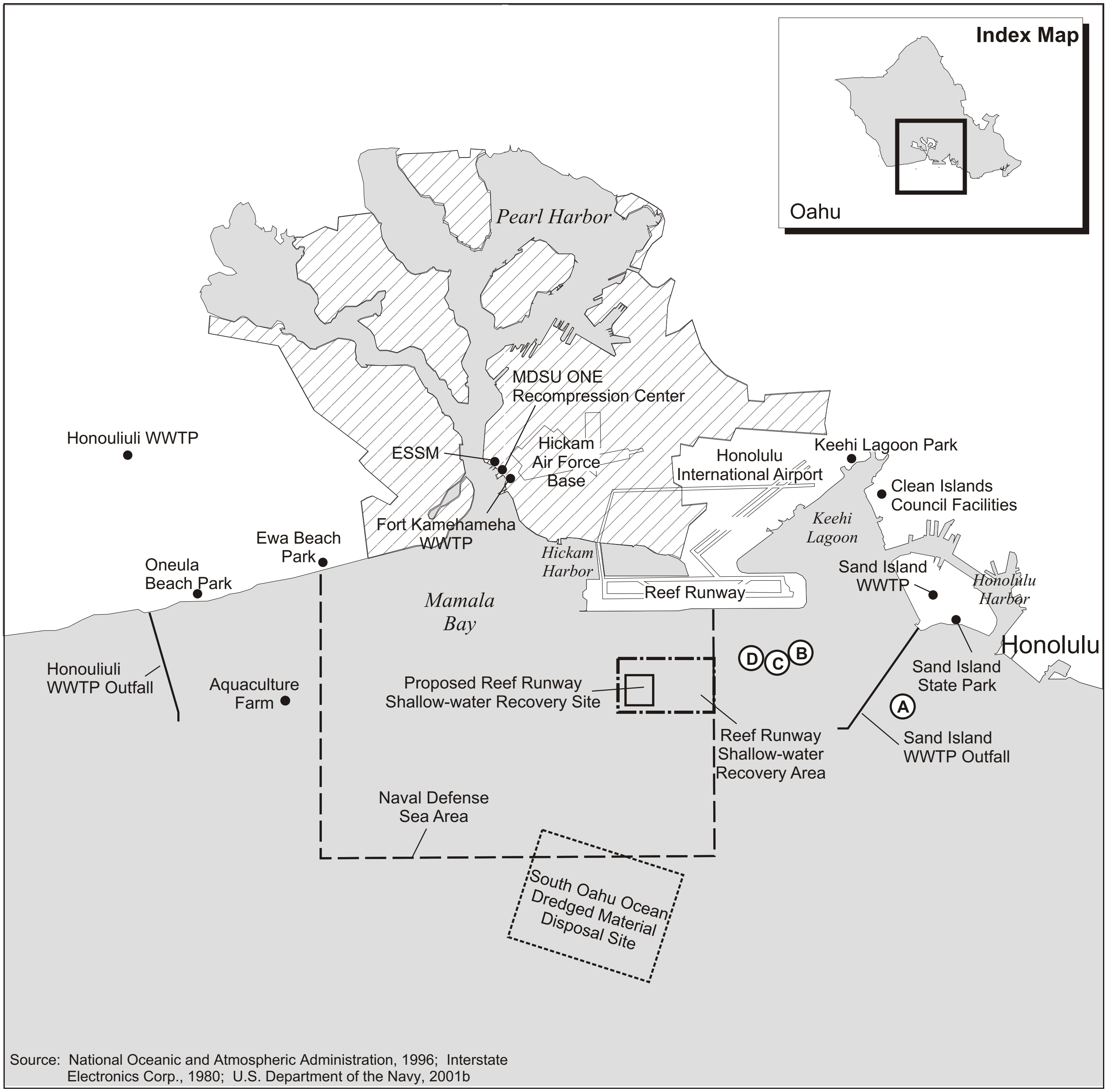
The results of a preliminary Location Assessment study (appendix D) narrowed the list of five potential shallow-water recovery sites to a single site. The Location Assessment compared the attributes of each candidate recovery site in order to support a ranking and decision concerning the preferred area to conduct shallow-water recovery operations.

Based on the scoring methodology detailed in appendix D, the Reef Runway site was clearly rated as the preferred site. The other four sites were not chosen because of safety or environmental concerns and are discussed further in section 2.2.3. The Reef Runway site would be selected from an area on the south coast of Oahu, roughly adjacent to the west end of Honolulu International Airport's Reef Runway (figure 2-9).

Field surveys were conducted at the Reef Runway shallow-water area to assess the seafloor conditions, such as gradients, bottom sediments, and marine habitat that would allow setting the hull down in a stable, upright position. The original field surveys were based on a preliminary four-point mooring plan that defined an anchor spread of approximately 1,000 by 1,000 feet (300 by 300 meters) and an operating depth of 72 to 100 feet (approximately 22 to 100 meters). The National Marine Fisheries Service, the U.S. Fish and Wildlife Service, the State of Hawaii Department of Land and Natural Resources Aquatic Division, and U.S. Navy specialists collaborated and recommended a site adjustment to the west and seaward (figure 2-10) that would not adversely affect biological resources and would meet recovery operation requirements. Shortly following the initial site layout, significant modifications to the rigging plan and mooring plan deepened the bottom requirements to approximately 115 feet (35 meters) to embed the vessel hull and enhanced the mooring system to six points with an anchor spread of 1,750 by 2,100 feet (533 meters by 640 meters). The new requirements drove the analysis deeper (more southerly) and westerly where the seafloor slightly flattens as it approaches Pearl Harbor Channel. The diving support contractor proposed three potential mooring layouts that would meet mission requirements (figure 2-10). Again, the aforementioned state and federal agencies collaborated in selecting a preferred site, just inside the west boundary of the shallow-water recovery area. In addition, they worked closely with the diving contractor in modifying the mooring plan to avoid sensitive areas and in modifying the techniques that would be used for attachment. Based on this preliminary plan, the agencies surveyed the proposed vessel location and anchor points to confirm seafloor conditions. Details of the site conditions and the mooring plan are provided in appendix E.

Once at the shallow-water recovery site, *Ehime Maru* would be positioned generally parallel to the shoreline at a depth of approximately 115 feet (35 meters). An ROV would conduct a thorough survey of *Ehime Maru* to ensure that its hull rests solidly on the seafloor. To ensure diver safety, no dives would be attempted until the vessel has remained in a stable position for 24 hours. At that time, an external diver survey would be conducted, and the divers would assist *Rockwater 2* in detaching the lifting bar. The spreader assembly would remain suspended over *Ehime Maru*. *Rockwater 2* would then leave the area.

The diving support barge would then be moored as shown in figure 2-11. The mooring design would provide sufficient station keeping for conducting dive operations over *Ehime Maru* and to provide for precision positioning during the final lifting operation. The current design is based on information received from various sources regarding the environmental and bottom conditions at the shallow-water recovery site. Specifically, the environmental conditions (i.e., wind, seas, and current) are based on data compiled by the Naval Pacific Meteorology and Oceanography Center. Based on present information, the proposed shallow-water recovery site has been determined to be at 21 degrees 17 minutes 29.4



LEGEND

- Reef Runway Shallow-water Recovery Area
- Proposed Reef Runway Shallow-water Recovery Site
- Commercial Anchorages
- Naval Reservation

WWTP - Wastewater Treatment Plant
ESSM - Emergency Ship Salvage Material
MDSU ONE - Mobile Diving and Salvage Unit One

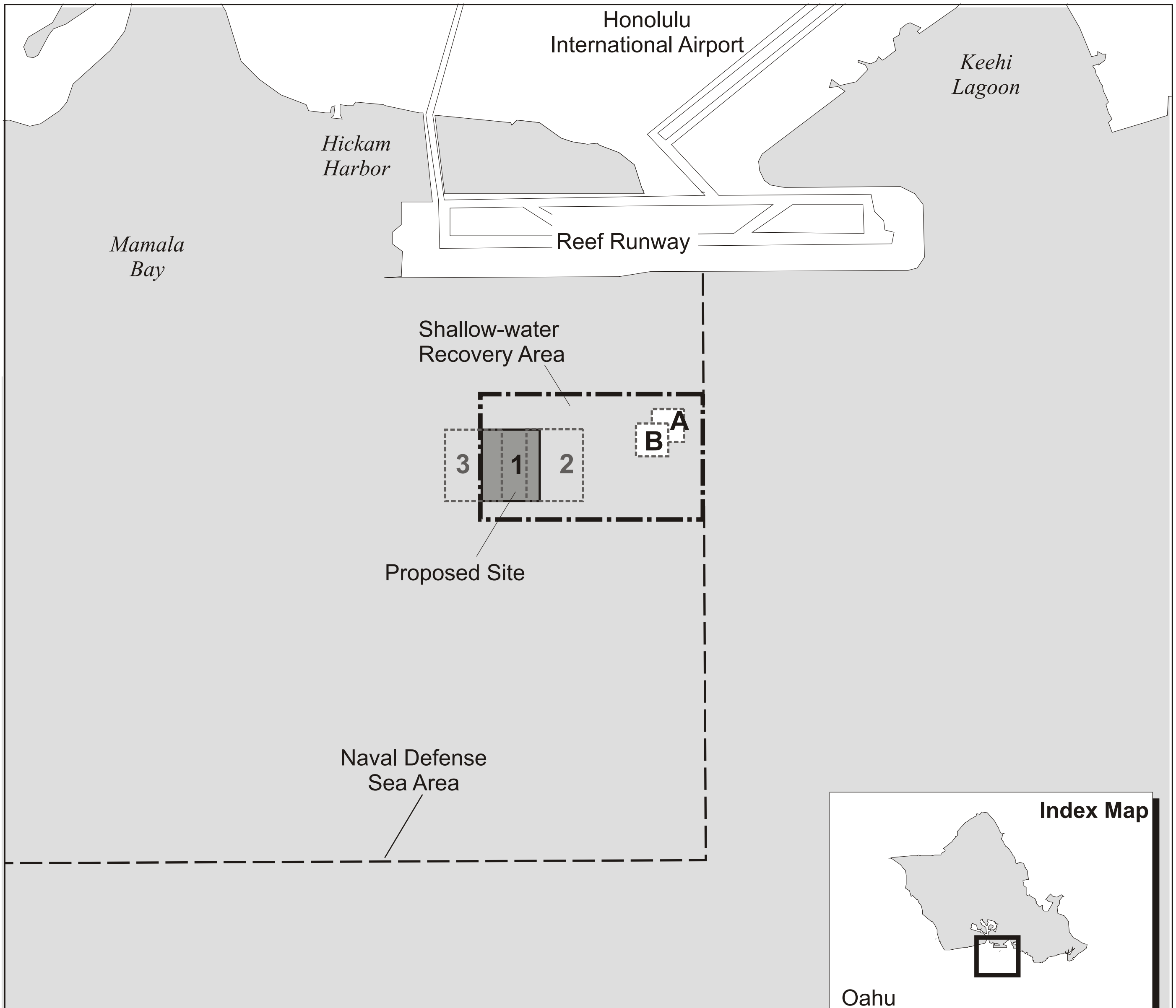
NORTH

No Scale

Reef Runway Shallow-water Recovery Area Vicinity Map

Figure 2-9

2_9VicinityMap060501



Source: Hawaii Statewide GIS Program, 2001

LEGEND

A/B Candidate Sites - Initial 1,000- by 1,000-foot (300- by 300-meter) sites based on 72 to 100 feet (22 to 30 meters) of sea water depth requirement and preliminary mooring plan

- A - Original Navy selected location
- B - Modified location based on input from State of Hawaii Department of Land and Natural Resources, U.S. Fish and Wildlife Service, and National Oceanic and Atmospheric Administration (National Marine Fisheries Service)

1/2/3 Candidate Sites - 1,750- by 2,100-foot (533- by 640-meter) sites based on depth of 115 feet (35 meters) of sea water and modified mooring plan.

- 1 - Preferred site based on input from State of Hawaii Department of Land and Natural Resources, U.S. Fish and Wildlife Service, and National Oceanic and Atmospheric Administration (National Marine Fisheries Services)
- 2 - Viable secondary site - meets mission and environmental criteria
- 3 - Excluded site did not meet mission requirements

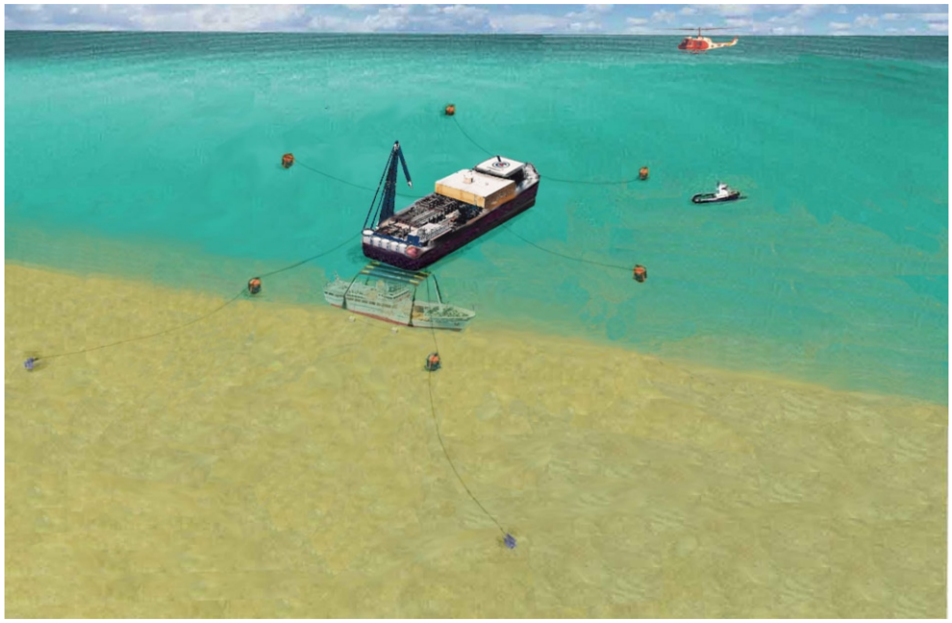
Reef Runway Shallow-water Recovery Area and Proposed Shallow-water Recovery Site

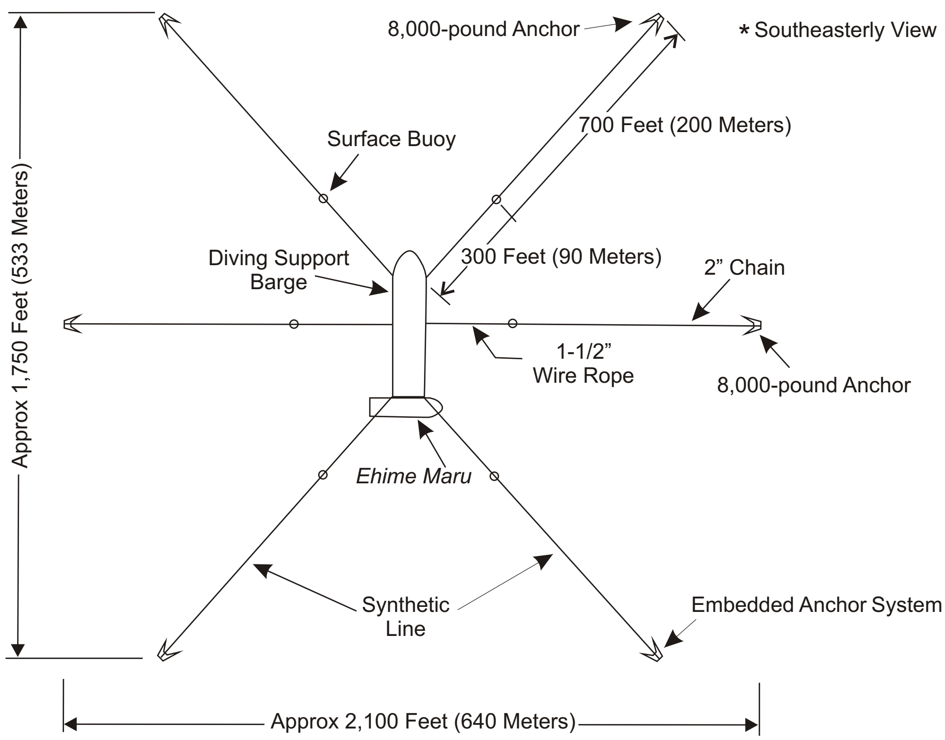
NORTH

No Scale

Figure 2-10

2_10RecoveryArea060501





Diving Support Barge and Mooring Plan Schematic

Figure 2-11

No Scale

2_12MooringPlan060101

seconds North latitude and 157 degrees 56 minutes 23.4 seconds West longitude. This location corresponds to a water depth of approximately 115 feet (35 meters). At this location, indications are that the bottom consists of a layer of sand and/or coral rubble volcanic rock substrate. The depth of unconsolidated material below *Ehime Maru* appears to be greater than 10 feet (3 meters) thick. The thickness of unconsolidated material varies greatly at the anchor points but should generally range from 6 feet (2 meters) to greater than 20 feet (6 meters) for the four anchor points emanating from the beam of the barge and bow into the deeper water. The two northern-most anchor points will consist of piles driven into a hard rock substrate. A detailed discussion of the proposed site selection and mooring plan can be found in appendix E.

The proposed plan would consist of a hybrid six-point mooring system in order to provide the needed position control during diving and lifting operations. This system would be a combination of traditional anchor arrangements and embedded anchor points. The final design and exact position of the embedded anchor points would be determined in part by core samples at the site.

Following the operation, in late October 2001, the driven piles would be cut off flush to the seafloor to restore the seafloor to pre-operation conditions.

Ehime Maru's flat bottom and low center of gravity would generally provide sufficient stability at the shallow-water recovery site. After *Ehime Maru* has remained stable for a total of 48 hours, the internal diving operation would begin. However, at any time that the vessel shifts, or otherwise exhibits any indication of instability, diving operations would cease until stability is corrected.

The Navy would request dedicated warning NOTMARs and NOTAMs for ships and aircraft, respectively, to avoid the recovery site.

2.1.4.1 Crewmember Recovery

At the shallow-water recovery site, divers from the U.S. Navy and Japanese divers from the U.S. Navy's Ship Repair Facility (SRF) in Yokosuka, Japan would perform a visual inspection and would conduct underwater video documentation of all ship spaces inspected. The U.S. Navy divers and the SRF Japanese divers would train and practice together before the recovery operation begins.

The SRF Japanese divers would play an integral part in the recovery operation by providing diving and topside support. While one SRF Japanese diver is in the water, another SRF diver would be at the communications console to help identify spaces through the diver's camera topside monitor.

The Japanese Maritime Self Defense Force (JMSDF) would also be invited to provide divers to observe crewmember recovery from the diving support barge. The JMSDF divers would not dive with the U.S. Navy and the SRF divers.

In accordance with *The U.S. Navy Diving Manual*, a minimum of eight divers would be required to operate a surface-supplied diving side using more than one diver. This operation would require two diving systems in use with a minimum of 16 divers per shift. Adequate numbers of divers, necessary to complete the mission in approximately 30 days, would be available for daylight diving during the recovery operation. Additional personnel would be required for decontamination, chamber surface-decompression, stage handling, topside camera systems, winch operations, and medical services. Although there would be no night diving, routine operations on the barge and preparation for the next day would require 24-hour activity during the diving operations.

The divers would attempt to recover crewmembers, personal effects, and other items uniquely characteristic to *Ehime Maru*. They would use underwater cutting tools and other tools as available to access as many compartments as can be entered safely. Diver safety would be of paramount importance, and all safety measures would be followed during recovery operations. Divers would inspect compressed compartments, but would not enter dangerous areas.

The Navy would establish a surface safety zone with a radius of 1 nautical mile (approximately 2 kilometers) around the recovery operations to ensure diver safety. Recovery activities could extend over 2 months. Communications integrity for the recovery operations may be maintained by establishing a temporary flight restriction area at and below 2,000 feet (approximately 610 meters) mean sea level within a radius of 1 nautical mile (approximately 2 kilometers) of the recovery activities. This temporary flight restriction would be issued and enforced by the FAA.

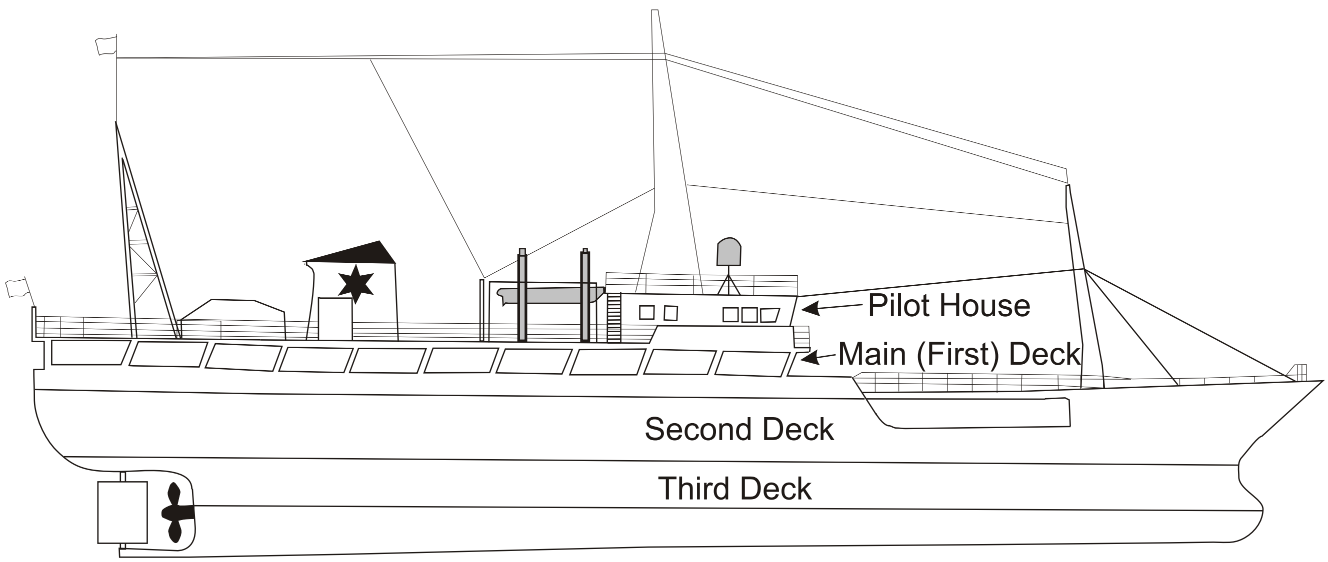
2.1.4.2 Entering, Inspecting, Recovering, and Documenting all Compartments

Entering

Divers would wear MK-21 surface supplied deep-sea gear with an emergency gas supply, which has a normal maximum working depth of 190 feet (58 meters). The divers would be supplied with air from the surface. Three divers would be used whenever entering the ship. A schematic of *Ehime Maru* is shown in figure 2-12. *Ehime Maru* consists of a 3rd deck, 2nd deck, main deck, pilothouse level, and observation deck. The 3rd deck is the deepest deck and has the engine room, student mess room, and refrigerator storeroom.

Inspecting, Recovering, and Documenting

The initial inspection would be conducted at the last reported location of the crewmembers. Any crewmembers and personal effects encountered would be collected and removed to the surface. If all crewmembers could not be recovered during this search, the divers would conduct an extensive search of every space, where safe entry can be achieved, documenting it on videotape. The entry to each space would be clearly marked and numbered. The diver would enter the space and perform a thorough search of the entire space. A helmet-mounted camera and light system would be connected to a video recorder and monitor on the diving barge. The Diving Supervisor, a Japanese diver, and Japanese officials would be able to observe the entire search through this monitor on the diving barge. The ship's drawing would be marked as the divers complete each inspection



Source: Shin Kurushima Dockyard Co., LTD. Engineering Division

Cross-section of *Ehime Maru* Deck Levels

Figure 2-12

No Scale

2_12EhimeMaruCross060101

to the satisfaction of the topside personnel. Operations would continue until all crewmembers have been found or all spaces have been thoroughly searched with video documentation, unless continued searches are deemed unsafe. U.S. Navy, State of Hawaii, or Japanese officials would take articles recovered, treat them, and maintain custody from the time the articles are brought to the surface by the divers.

Details of Support Platform to be Used

Naval Sea Systems Command would contract for a diving support barge. This barge would be used as a dive platform during the recovery and diesel fuel and lubricating oil removal phase and then used as the lift platform for relocation to the deep-water site. The 360-foot-long by 100-foot-wide (120-meter-long by 30-meter-wide) barge has power, water, galley, mooring gear, cranes, and living accommodations for 80 personnel. The barge also contains oily water/oily waste storage tanks to hold the residual diesel fuel and lubricating oil pumped from the *Ehime Maru*. The barge would be moored and supported with the assistance of a commercial tug contracted by Naval Sea Systems Command.

Type of Diving and Number of Chambers Required

Divers would be conducting operations that require decompression. Surface decompression is a technique that fulfills all of or a portion of a diver's decompression obligation in a recompression chamber instead of in the water, significantly reducing the time a diver must spend in the water. Also, breathing oxygen in the recompression chamber reduces the diver's total decompression time. Decompression would be conducted on the diving barge in a recompression chamber under controlled conditions. At least two chambers installed on the barge would be used for surface decompression with oxygen, and the chambers would also be used for the treatment of arterial gas embolism. Recompression chambers at MDSU-ONE would be used for treatment of decompression sickness.

Control of Oil Released During Crewmember Recovery Phase

During the crewmember recovery phase, the Navy would provide personnel for continuous monitoring from the diving support barge to monitor for leaking oil. One Navy skimmer system would be located on site for the initial survey period and retained as required. Booms would be deployed to contain any anticipated release of diesel fuel. Two additional Navy skimmer systems and *Clean Islands* would be on standby. Two Clean Islands Council helicopter dispersant bucket systems would also be on standby for immediate response in the unlikely event it should be necessary, and only if approved by the Coast Guard. CINCPACFLT would coordinate all unanticipated oil cleanup efforts with the U.S. Coast Guard and the State of Hawaii.

Timeline

The planned duration of the recovery operation is approximately 30 days. This includes video documentation, environmental remediation, and bad weather days. The length of this phase could be reduced if all crewmembers are found early and environmental remediation is not warranted based on the residual fuel on the ship. As mentioned in section 2.1.4, diving operations would not start inside the hull until *Ehime Maru* has remained stable for 48 hours after placement at the shallow-water recovery site. This initial time would be used to monitor vessel stability and perform external inspections of the vessel's condition. Upon the completion of the recovery operation and environmental remediation, the JMSDF divers would be invited to do a final closeout inspection.

2.1.4.3 Oil Disposition

The Navy would use all available resources to protect the environment from the release of diesel fuel and lubricating oil from *Ehime Maru* during the recovery operations. These measures would be appropriate given the high environmental sensitivity and economic importance of Hawaiian waters and shorelines and the unusually long lead-time allowed for planning the potential response. The Navy anticipates relatively minor oil release levels with minimal environmental impact during recovery operations, but would be prepared to contain and remove a larger release. Every effort would be taken to contain and clean up any release such that oil would be immediately contained and not impact the shoreline or aquatic resources.

Research into *Ehime Maru*'s diesel fuel and lubricating oil characteristics indicate that the remaining diesel fuel is non-persistent and would be expected to evaporate and naturally disperse more rapidly than heavier fuel oils. As noted, of the original 65,000 gallons (246,000 liters) on board, the maximum amount remaining after the collision is estimated at 45,000 gallons (170,000 liters). It also appears that approximately 1,200 gallons (4,500 liters) of the more persistent lubricating oil was on board at the time of the collision. The diesel fuel is relatively toxic to the marine environment and could irritate the skin of divers. However, the MK-21 diving gear would provide protection for the divers. The Navy, using booms and skimmers, would attempt to recover any releases of diesel fuel and lubricating oil to the maximum extent practicable before they reach the sensitive resources in Hawaii's nearshore waters. After consultation with the Coast Guard, alternative oil spill response technologies (elasticity modifiers, solidifiers) would only be considered as dictated by the Area Contingency Plan.

Most or all of the diesel fuel would have likely been released through ruptured tanks or open tank vents. The integrity of the fuel tanks was potentially compromised from the collision damage and the crushing effects of water pressure (62 atmospheres) on partially filled tanks as the vessel descended rapidly to 2,000 feet (600 meters). The recovery plan would seek to minimize the further release of diesel fuel and lubricating oil during recovery operations. Raising the vessel, transporting it to the shallow-water recovery site, and subsequent diving operations with *Ehime Maru* resting on the bottom in shallow water may result in continued "sheening" as very small amounts of residual diesel fuel and lubricating oil are released from the vessel and rise to the sea surface. Consequently, the risk of a significant diesel fuel and lubricating oil release is considered minimal. Nevertheless, the Navy would be prepared to respond to a maximum credible release of 45,000 gallons (170,000 liters) diesel fuel or an even greater release, with mechanical recovery and dispersant capability. However, sheening might not be eliminated entirely with booms and skimmers, and alternate actions may be warranted (such as sorbents, monitoring, and weathering actions). In the event of an unanticipated release, the Navy would work with the Coast Guard Captain of the Port, the State of Hawaii, and other federal, state, and local government agencies to amend the IAP in any way practicable to minimize environmental impacts. The recovery operation would maximize the use of available response resources.

The Navy's Recovery Commander would have the Naval Sea Systems Command offshore pollution response equipment on standby during the recovery operation in the event of an oil release. This equipment would include booms and skimmer systems. The Navy would also contract with the Clean Islands Council to ensure their presence and that their technical expertise and that adequate and appropriate equipment would be available for a release.

The Navy Recovery Team's established command structure for the recovery operation would include control of a maximum credible diesel fuel and lubricating oil release. The Unified Command, under the Incident Command System (ICS) (see figure F-1, appendix F) would be activated prior to critical operations to monitor for and coordinate a unified federal, state, and local response to an unanticipated diesel fuel and lubricating oil release. Only the unanticipated release of oil would require actions by the Unified Command in accordance with the approved IAP. The IAP (appendix F) has been fully coordinated and approved by members of the Unified Command.

The Unified Command would use the Incident Command Post facilities on Sand Island Access Road in Honolulu, Hawaii during the lift and relocation activities. The Unified Command in this instance would consist of the federal OSC, the state OSC, and the CINCPACFLT Deputy Chief of Staff for Maintenance as the Incident Commander. A representative of the Japanese government would be invited to observe the operation with the ICS team.

The Navy, considering diver safety first, would remove to the maximum extent practicable the remaining fuel once the vessel is placed on the seafloor at the shallow-water recovery site. Removal of fuel at 2,000 feet (600 meters) is not possible, as current technology is limited to a maximum depth of less than 1,000 feet (300 meters). Fuel removal would also be further complicated unless the tanks were relatively undamaged, whereas those on *Ehime Maru* have been exposed to 2,000 feet (600 meters) of water pressure, or approximately 62 atmospheres. Removal of the fuel while suspended under *Rockwater 2* would be unsafe, because it would require working on the vessel while it was under strain and in a seaway. Once the vessel is placed in the shallow-water recovery site, a risk versus gain assessment considering risks to divers and the environment would be conducted for fuel removal. Should persistent fuel leakage occur, divers would tap into the tanks through their tops and sides, or other methods of removal would be attempted, where feasible and appropriate.

Oil and hazardous materials possible on this type of vessel include diesel fuel, lubricating oil, freon, and minimal quantities of paint and solvents located topside. There were no polychlorinated biphenyls (PCBs), ammonia, or asbestos on board *Ehime Maru*. The Navy would ensure appropriate disposal of the oil removed. During the removal actions, the U.S. Environmental Protection Agency and the U.S. Coast Guard would be invited to monitor the Navy's certification that the vessel is prepared for relocation to the deep-water site.

A vessel decontamination area would be established at the ESSM facility located on Hickam Air Force Base, Hawaii, or other appropriate location. The hulls of any contaminated vessel would be wiped with "hand cleaner" to remove any oily film, if necessary. Because an oil boom must be cleaned before returning it to inventory, a boom cleaning station would also be established at the ESSM facility, or other appropriate location.

2.1.5 RELOCATION TO A DEEP-WATER SITE

Once the dive team completes shallow-water recovery operations, *Ehime Maru* would be lifted back off the seafloor and taken to a deep-water site with a depth greater than 1,000 fathoms (6,000 feet or 1,800 meters). The deep-water relocation site (see figure 2-13) under consideration is located in an area just beyond the 1,000-fathom contour and outside the limit of the U.S. territorial waters. The barge that supports the diving operations would be used to make the lift and take *Ehime Maru* to the deep-water relocation site. Steps required in this phase are discussed in the following sections.

2.1.5.1 Preparation for Relocation

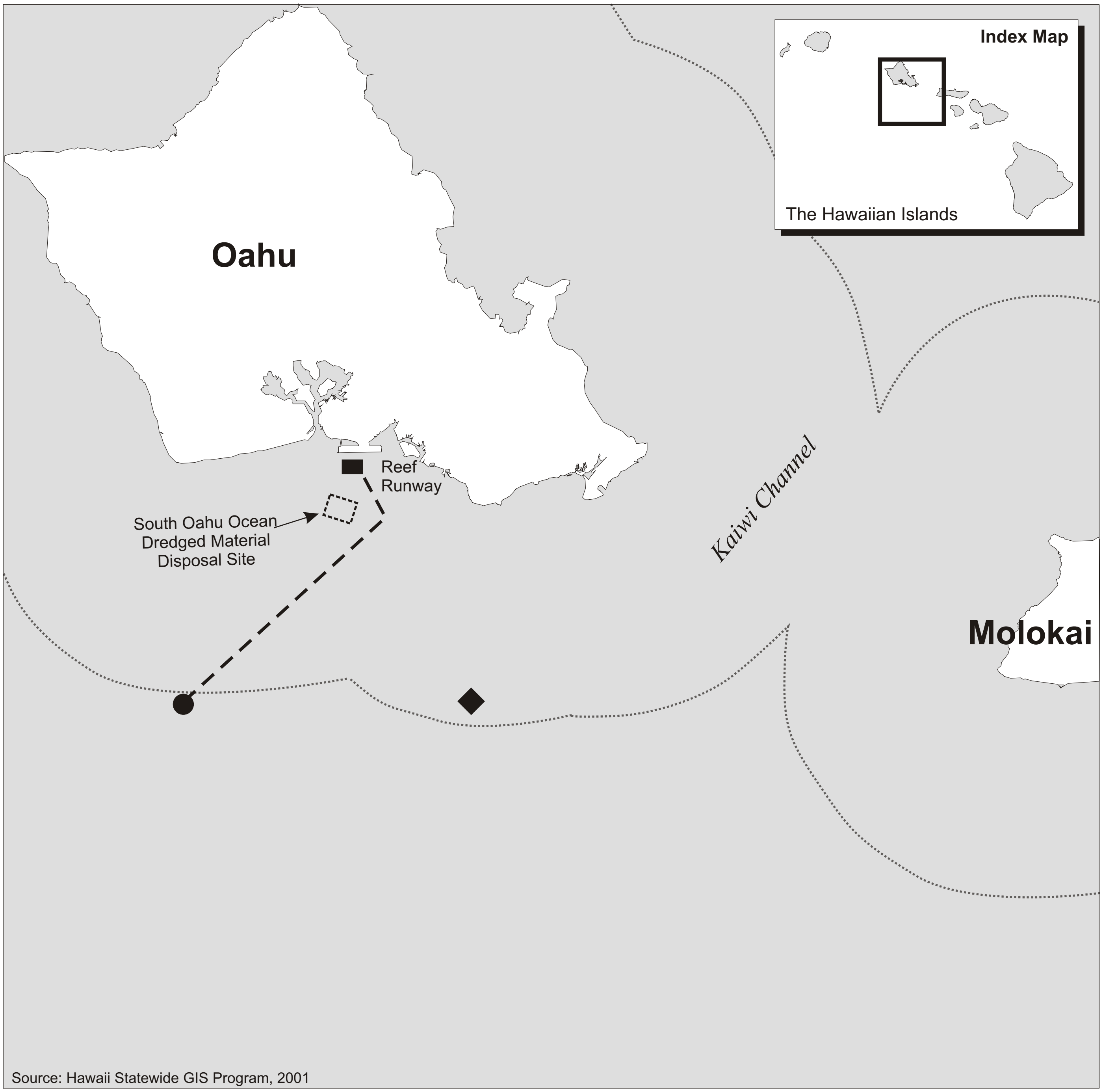
The initial task in this phase would be the completion of the removal of the diesel fuel and lubricating oil from *Ehime Maru* in preparation for relocation to the deep-water site. The Navy would remove, to the maximum extent practicable, all known hazardous materials that may degrade the marine environment and that are not an integral part of *Ehime Maru* or the components of *Ehime Maru* before vessel relocation. Once crewmembers, personal effects, cargo nets, fish hooks and long lines, and diesel fuel and lubricating oil have been removed, divers would secure all doors and hatches in an effort to minimize the release of floatable debris during relocation to the deep-water site. The Navy would document all known hazardous material not removed from the vessel.

2.1.5.2 Method for Reattachment

The recovery barge would settle (ballast) down approximately 15 feet (5 meters) while moored directly over *Ehime Maru*. Divers would then assist in rigging lift chains from the barge to the spreader assembly and secured to the lifting plates under *Ehime Maru*. A final inspection would ensure that all rigging is still in place (figure 2-14).

2.1.5.3 Lift from Seafloor

Once divers are clear of the water and conditions are acceptable, the slack would be taken out of the lifting chains using deck winches. Once all slack is out of the chains, the barge would be deballasted to lift *Ehime Maru* clear of the seafloor for transit to deep water.



LEGEND

- ◆ Current Location
- ■ Shallow-water Recovery Area
- ● Deep-water Relocation Site
- — — — Transit Route
- ·········· U.S. Territorial Waters

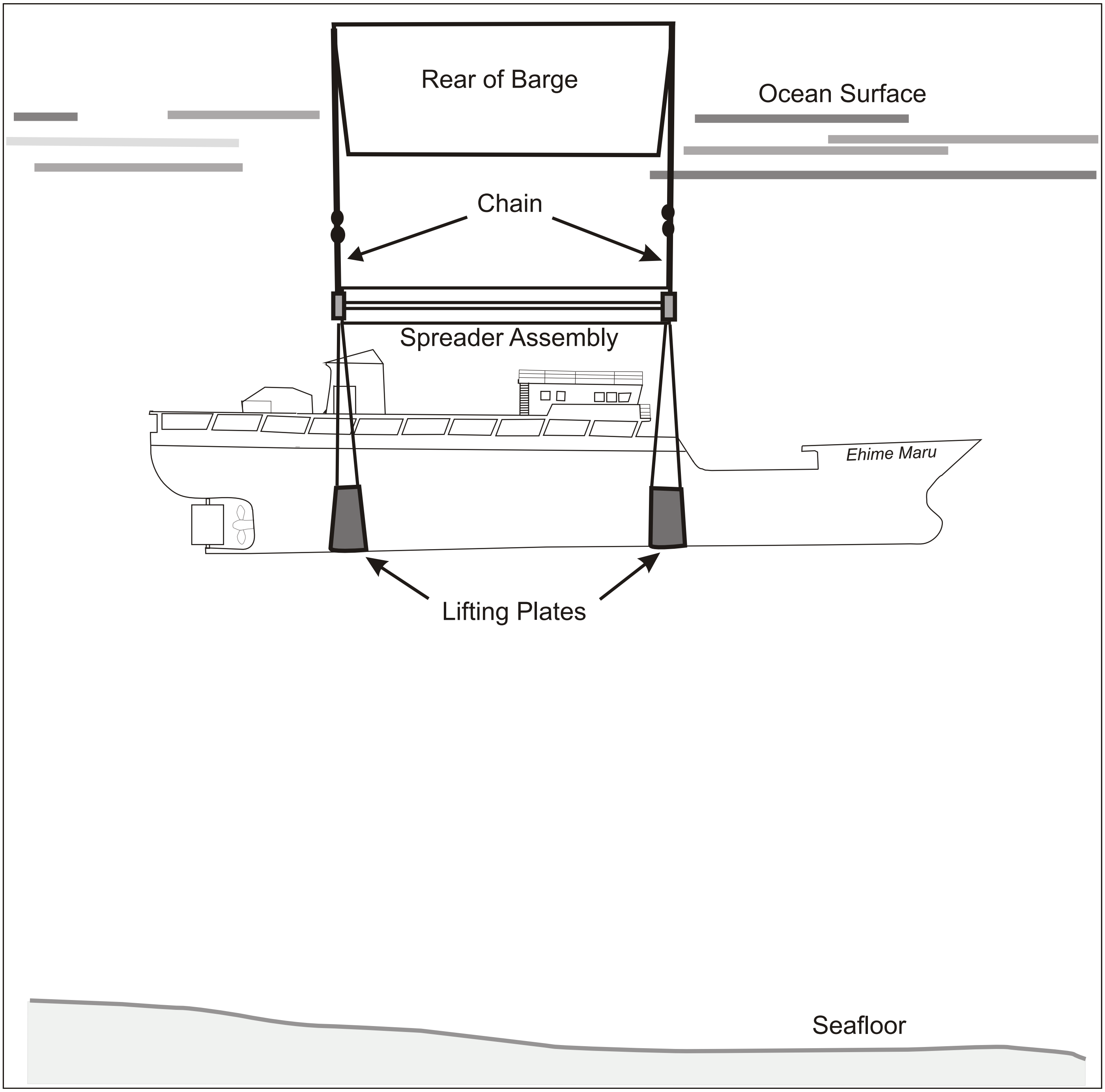
NORTH

No Scale

Deep-water Relocation Site

Figure 2-13

2_13DeepWater060101



Ehime Maru
Suspended Below Diving Support Barge

Figure 2-14

No Scale

2_14RecoveryBarge060101

2.1.5.4 Transit to the Relocation Site

Two tugs would be used to tow the barge and *Ehime Maru* to the selected deep-water relocation site following a previously surveyed route. One tug would tow, while the other would be connected to the stern of the barge to maintain constant drag for control. A maximum speed of 1 knot (approximately 2 kilometers per hour) would be maintained. The transit route would avoid crossing over the South Oahu Ocean Dredged Material Disposal Site.

After *Ehime Maru* has been lifted from the seafloor and has started its transit to the relocation site, divers would again survey the shallow-water relocation site to ensure all materials have been removed from the site. JMSDF divers would be invited to inspect the seafloor for any remaining objects. Additionally, an ROV would videotape the shallow-water recovery area after removal of all equipment and debris. No debris would remain after the recovery operation is completed.

A temporary flight restriction and a Coast Guard surface safety zone would be established with a 1-nautical-mile (approximately 2-kilometer) radius on each side of the transit route. The temporary flight restriction would be up to an altitude of 2,000 feet (approximately 610 meters). This temporary flight restriction would be issued and enforced by the FAA. The Navy would request the dedicated warning NOTMARs and NOTAMs for ships and aircraft, respectively, to avoid the transit route. The Coast Guard would establish and enforce the surface safety zone outside the Naval Defense Sea Area as required to keep other vessels clear of the area.

2.1.5.5 Relocation at the Deep-water Site

Once at the deep-water relocation site, the temporary flight restriction and Coast Guard surface safety zone would be expanded to an area with a radius of 3 nautical miles (approximately 6 kilometers). The temporary flight restriction, up to an altitude of 2,000 feet (approximately 610 meters), would be issued and enforced by the FAA, and the Coast Guard would establish and enforce the surface safety zone. Both the temporary flight restriction and the surface safety zone would be published in NOTAMs and NOTMARs. During the transit and relocation activities, the Navy would provide periodic surveillance overflights to monitor for any release of oil or floatable debris on the surface. A Navy skimmer system would be retained on standby throughout the process. Although not anticipated to be required, two helicopter dispersant bucket systems would be on standby in Honolulu, and would be used only with the approval of the federal OSC. Following the relocation operation, the barge would be towed back to Pearl Harbor to demobilize the dive system and personnel, completing the operation.

Following arrival at the deep-water relocation site, the towing gear would be removed. Divers would then position either mechanical, explosive, or thermal release devices below the lifting bar. *Ehime Maru* would then be released from the lifting bar. The lifting bar would be retrieved and placed aboard the barge.

The proposed deep-water relocation site is anticipated to be at 21 degrees 05 minutes North latitude, 158 degrees 07 minutes West longitude. *Ehime Maru* would be equipped with a 30-day pinger to assist in determining its final location on the seafloor. The pinger would be identical to the equipment used on flight recorders for commercial and military aircraft. Table 2-1 lists the specifications of the pinger.

Table 2-1: Pinger Specifications

Manufacturer	Dukane
Frequency	37.5 kHz
Output	160.5 decibel sound pressure level re 1 micropascal at 1 meter RMS (163.5 peak)
Actuation	Water (fresh or salt)
Radiation Pattern	Rated output over 80 percent of sphere
Size	1.3-inch (33-millimeter) diameter and 3.92 inches (10 centimeters) long
Operating Depth	Surface to 20,000 feet (6,000 meters)
Pulse Length	Not less than 9 milliseconds
Operating Life	30 days

Source: Naval Sea Systems Command, 2001c

2.2 ALTERNATIVES CONSIDERED BUT DETERMINED NOT FEASIBLE

Several alternative recovery procedures and locations were considered and rejected as not reasonable alternatives. They are discussed in the following sections.

2.2.1 RECOVERY IN PLACE AT DEEP-WATER LOCATION

Three alternatives were considered for recovering crewmembers and personal effects at the approximately 2,000-foot (600-meter) depth. The first option considered was the use of an ROV to enter the hull and search for crewmembers and recover personal effects. This option was deemed not feasible once the vessel was located. Based on the visible damage to the exterior hull and probable damage to the stern from the penetration of USS *Greeneville*'s rudder, it would be reasonable to assume that bulkheads and piping on the interior also suffered damage. Without clear definition of where to locate crewmembers, a full search of all compartments would be necessary, but a precision method of cutting to provide access to the interior of the vessel at that depth does not currently exist. Recovery would be further impeded by the likelihood that the damaged vessel could damage the ROV's umbilical and thus jeopardize the success of the mission equipment.

Secondly, the Navy considered using saturation divers for deep-water recovery. However, available saturation systems do not provide adequate capability at 2,000 feet (600 meters).

The third discarded option involved lifting *Ehime Maru* as high as possible below the *Rockwater 2* and using divers to recover crewmembers and personal effects while suspended. However, recovery from a vessel suspended in the open ocean would be too dangerous. Naval Sea Systems Command determined that this option would be extremely hazardous and could result in loss of divers' lives. Because of this potential loss of life and the early search and condition evaluations, the Navy concluded that the recovery operation should not be attempted while *Ehime Maru* is suspended in deep water.

2.2.2 RECOVERY OUT OF WATER

The Navy considered removing *Ehime Maru* from the water by placing its hull on a submersible barge or heavy lift ship such as *M/V Blue Marlin*. However, the maximum depth at which these vessels can ballast down is approximately 30 feet (10 meters). Because the keel of *Ehime Maru* when suspended would be approximately 115 feet (35 meters) below the surface, use of a submersible barge or heavy lift ship is not possible.

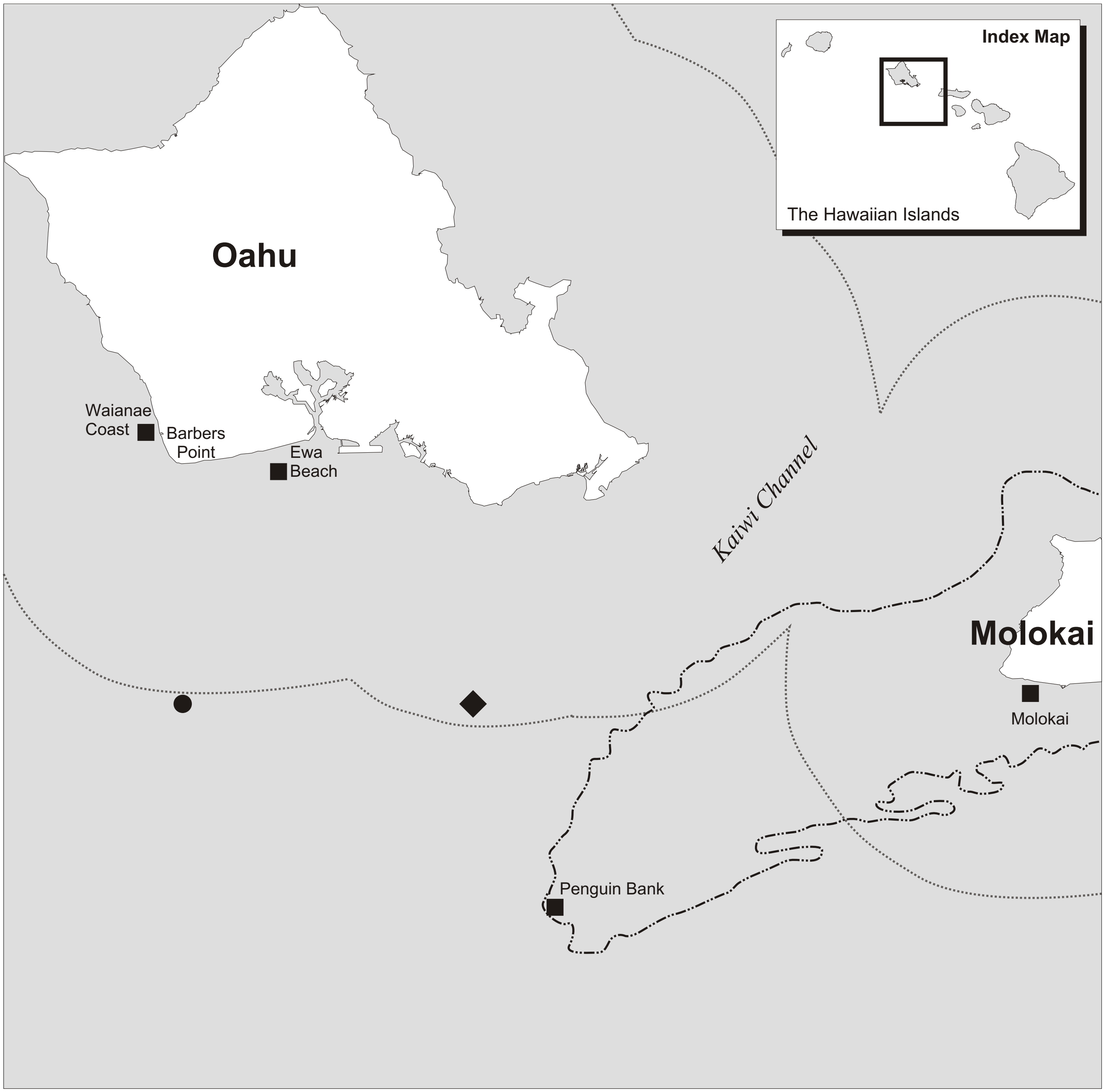
Another out-of-water option would be to attempt to transfer the load from the lifting ship to a fixed crane, then place it on a transport barge for recovery while offshore. Although this option is technically feasible, it could only be done under ideal weather conditions. Even if excellent weather conditions prevail, this option still presents an unacceptable risk of loss of the vessel, damage to equipment, or injury to personnel, as well as a much higher risk of an oil release.

The option of heavy lifting *Ehime Maru* to the surface by way of a spreader assembly while still rigged was analyzed. Under this scenario, the vessel would be lifted, positioned on a barge, taken to Pearl Harbor, and off-loaded on land for crewmember recovery. This option had severe structural and stability issues, especially when breaking the sea/air interface. This option would also increase environmental hazards caused by any residual oil release beyond an acceptable risk.

2.2.3 RECOVERY AT OTHER SHALLOW-WATER SITES

Figure 2-15 shows the four shallow-water recovery sites considered in the Location Assessment (appendix D) and determined not feasible. Of these four sites, Penguin Bank and southwest Molokai were eliminated following the Location Assessment study because of their overall poor performance in meeting stated program goals and objectives. The Ewa Beach and Waianae Coast sites exhibited many favorable characteristics, but were later determined to have environmental concerns that would prevent meeting mission criteria for diver safety. A brief summary of the issues surrounding the four sites is provided below.

Both Penguin Bank and the southwest Molokai sites are within the Hawaiian Islands Humpback Whale National Marine Sanctuary. In addition, the Penguin Bank seafloor was below the preferred depth for recovery operations. It is also situated in the open channel,



LEGEND

- ■ Candidate Shallow-water Recovery Sites
- ◆ Current Location
- ● Deep-water Relocation Site (Beyond the 1,000-fathom contour)
- Penguin Bank
- U.S. Territorial Waters (12 Nautical Miles)

NORTH

No Scale

Shallow-water Sites Deemed Not Feasible for Recovery Operations

Figure 2-15

2_16NotFeasibleSites060101

an area of extremely volatile sea state. Southwest Molokai was also considered unsuitable because of the dangerously shallow transit route the vessel would have to traverse across Penguin Bank, its relatively pristine environmental setting, and the difficulty of providing support and emergency services for a moderately long-term operation.

The Waianae Coast site is about 1 nautical mile (2 kilometers) northwest of Barbers Point, and Ewa Beach is approximately 2 nautical miles (4 kilometers) west-southwest of the entrance to Pearl Harbor, Oahu. Both of these sites were subjected to additional detailed bathymetric mapping, subsurface video surveys, and agency consultation in order to increase the fidelity of the data. Both sites rated well for seafloor conditions, enforceable airspace, and moderately favorable sea states, but were rated down for their proximity to high use public beaches and recreation areas. Surveys at both sites also indicated the presence of resting green sea turtles and critical habitat. Additional information on these sites is presented in appendix L.

2.3 RECOVERY-NOT-POSSIBLE ALTERNATIVE

If the Recovery-not-possible Alternative is chosen, *Ehime Maru* would not be recovered and would remain at its current location in its present condition. This alternative would not allow for the recovery of *Ehime Maru* crewmembers, personal effects, and certain characteristic components, or for the removal of diesel fuel and lubricating oil. The deck would not be cleared of cargo nets, fishing hooks and long lines, rafts, rigging on the masts, and any other obstacles that could cause a future impact to the marine environment.

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