Aleutian Islands Risk Assessment

Report to the Aleutian Islands Risk Assessment Advisory Panel

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Considering Options for Salvage & Oil Spill Response in an OPTIMAL RESPONSE SYSTEM

This report describes the approach and information used to develop two components of an Optimal Response System for the Aleutian Islands: salvage and oil spill response. As part of the Phase B of the Aleutian Islands Risk Assessment, and with input from a diverse Advisory Panel, an Analysis Team of expert contractors has recommended an system to enhance response to vessel accidents and oil spills. The full recommendation is described in an *Optimal Response System for the Aleutian Islands: Summary Report* (Nuka Research, 2014a).

The recommendations for the salvage component were based on the resources already in the region, services, resources used in two recent salvage operations in the region (for the *M/V Kuroshima* in 1997 and *M/V Selendang Ayu* in 2004), interviews with experienced salvors and operators of vessels and equipment typically used in salvage operations. Lightering operations were a focus. The Analysis Team recommends that salvage capacity (including marine firefighting) be enhanced with the addition of a 60,000 bbl, heated storage barge to the resources in the region, a heavy-lift helicopter of opportunity program and stationing of a helicopter lightering package in the region, and the inclusion of FiFi 1 or 2 firefighting capacity on the emergency towing vessel that is recommended as part of the overall recommendation. (Emergency towing generally is not discussed in detail in this report.) These salvage resources are estimated to cost just over $1 million annually, not including the costs of managing the entire system.

For oil spill response, the Analysis Team's recommendation was based on review of existing resources, consideration of the Aleutian Islands operating environment and logistical constraints, and tactics already developed by the State of Alaska. The Analysis Team recommends enhancing nearshore response capacity with a Nearshore Task Force based in the region that would rely on vessels of opportunity derived from willing members of the fishing fleets based in Dutch Harbor, Sand Point, and False Pass. This task force would be supported by the addition of a marine logistics base to support a sustained response in remote areas, augmented by pre-planning for the need to cascade additional equipment into the region and an Incident Management Team in the region. Spill response resources are estimated to cost $4.1 million annually, not including the costs of managing the entire system.

Overall, the salvage and oil spill response recommendations would increase equipment and resources within the region, but with a focus on those resources that are most critical to response in this remote region, or most likely to be deployable in the Aleutians operating environment. The recommendation also builds on local resources and anticipates the need to bring resources in from other places due to the impracticality of maintaining all needed resources in the region.

Overview

The AIRA Optimal Response System Summary Report is supported by a series of interrelated studies as shown in the following figure.

OPERATING ENVIRONMENT

Characterizing Environmental Conditions in the Aleutian Islands

- Summarizes weather data used in Response Gap Analysis and Towing Analyses

Impact of Environmental Conditions on Vessel Incident Response in the Aleutian Islands: A Response Gap Analysis

- Characterizes how often environmental conditions alone would preclude or significantly impede a range of emergency and oil spill response operations in the region.

REGULATORY REQUIREMENTS

Regulatory Resource Study

- US and Alaska regulations
- Cost of compliance

VESSEL TRAFFIC

2012 Transits of Unimak Pass

- Updates Phase A vessel traffic study
- Estimates innocent passage vessel transits
- Informs per-vessel cost estimates

CONTEXT CONTEXT CONTEXT CONTEXT

OPTIMAL RESPONSE SYSTEM ELEMENTS

EMERGENCY TOWING

Minimum Required Tug Studies

- 2013 study calculates minimum tug bollard pull needed to control representative vessel based on 2010 traffic data.
- 2014 study updates calculation for 75th percentile containership based on 2012 data.

Tug of Opportunity Study

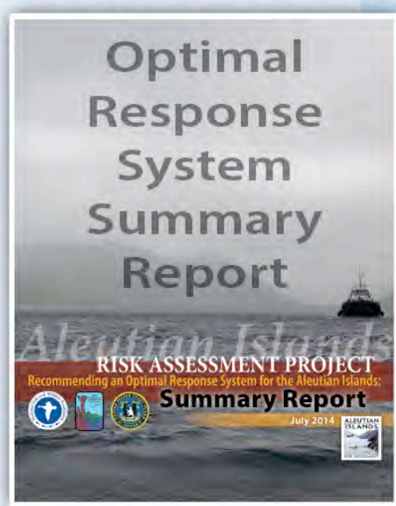
- Calculates the ability of tugs of opportunity in the region to reach various scenario locations and rescue a large ship.

Purpose Designed Towing Vessel

- Presents design and cost estimate for towing vessel intended to maximize features such as speed and seakeeping for Aleutian Islands operations.

Estimated Response Times for Tugs of Opportunity in the Aleutians

- Evaluates availability, capability, and response time for tugs of opportunity to assist 75th percentile containership at various scenario locations based on 2012 tug location data.



Best Available Technology

- Identifies best available technology tugs based on review of existing vessels and set of criteria applicable to Aleutian Islands.

Tug Location Study

- Presents geographic areas that can or cannot be reached by tugs based at different locations in the Aleutian Island.

SPILL RESPONSE & SALVAGE

Considering Options for Salvage & Oil Spill Response in Optimal Response System

- Describes approach used to identify spill response and salvage resources and system components for recommended system.

BENEFITS, COSTS, & IMPLEMENTATION

Benefit-cost Analysis of Risk Reduction Options

- Analyzes predicted benefits and costs and concludes that predicted benefits of proposed system will exceed costs of system implementation.

Considering Options for the Management & Funding of an Optimal Response System

- Describes approach used to identify nonprofit model for recommended system.

Considering Options for Salvage & Oil Spill Response in an OPTIMAL RESPONSE SYSTEM

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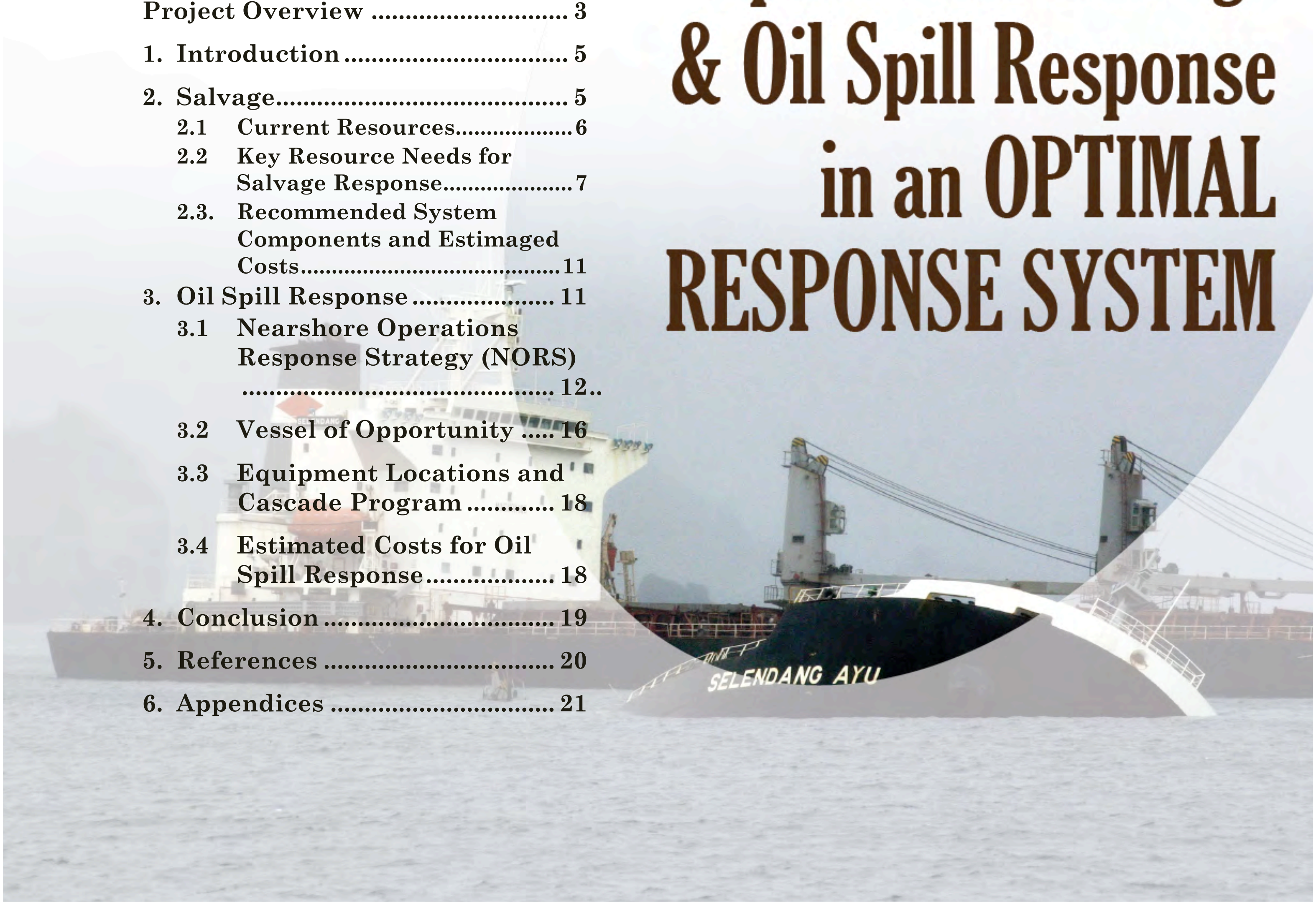


1. INTRODUCTION

As part of the Aleutian Islands Risk Assessment (AIRA), the Analysis Team was charged with recommending options for enhancing both salvage and oil spill response in a recommended Optimal Response System for the Aleutian Islands. This document provides additional background and support for the Analysis Team's recommendation in the report, *Recommending an Optimal Response System for the Aleutian Islands: Key Findings* (Nuka Research, 2014a). Salvage (including firefighting) and oil spill response represent distinct but overlapping areas: while different companies will often provide the services, there are some overlapping resources such as storing oil collected through lightering or on-water recovery.

Emergency towing is incorporated in the category of "salvage" in federal regulations, but is *not* included here. Although potentially vital to both salvage and oil spill response operations, emergency towing options were studied separately with an emphasis on accident prevention, and are not included in this report.

Federal regulations govern both salvage and spill response planning for large vessels moving through the Aleutian Islands, which are *not* in innocent passage. These requirements are described in the Regulatory Resource Study (Nuka Research et al., 2013). This report recommends a modified configuration of resources for the region. For salvage, this would facilitate lightering via heavy lift helicopter and increase storage capacity for both lightered or recovered oil. For spill response, the Analysis Team proposed to displace multiple hubs of predominately open-water recovery equipment with an enhanced nearshore recovery and shoreline protection, vessel-of-opportunity program, and the ability to support a large nearshore response in a remote area using a marine-based logistics base.

2. SALVAGE

Salvage covers a wide range of services related to mitigating the risks of pollution and fire in the event of a vessel accident as well as recovering the vessel and associated equipment and materials. This includes: lightering, marine firefighting, salvage, and wreck removal. Salvage operations may involve varied and unique equipment – including vessels, barges, specialized pumping systems, and helicopters – depending on the service needed and the context of the vessel being salvaged.

The consideration of options for salvage was based on the resources already in the region, services and resources used in two recent salvage operations in the region (for the *M/V Kuroshima* in 1997 and *M/V Selendang Ayu* in 2004), and interviews with experienced salvors and operators of vessels and equipment typically used in salvage operations.[1] Because of its role in both salvage and pollution prevention and

[1] Alan Matykiewicz, Marine Response Alliance (July 2013) and Bob Umbdenstock, Resolve Marine (July 2013). The Analysis Team considered all information provided during interviews, but the final

mitigation, lightering operations were a focus. Although both incidents resulted in some immediate loss of oil, lightering was implemented successfully.

PHOTO: Lightering the* Selendang Ayu, *2005 (Unified Command photo)

2.1 Current Resources

Currently there are four companies certified for the Western Alaska Captain of the Port Zone as primary resource providers that can enable vessel operators to comply the Salvage and Marine Firefighting regulations (33 CFR Part 155, Subpart I). These four companies are listed in the U.S. Coast Guard's Homeport page and are:

- Marine Response Alliance
- Donjon-Smit
- Resolve Marine Group
- T&T Salvage

There is also one resident salvage company based in Dutch Harbor. In 2013, the national Resolve Marine Group partnered with the 35 year-old Magone Marine Service, Inc.

Based on available subcontractor equipment and asset lists, the four primary resource providers draw from the same pool of subcontractors in Alaska and the Lower 48. For instance, the Dutch Harbor resident tugs operated by Dunlap Towing and Harley Marine Services are listed as subcontractors for towing service with both the Marine Response Alliance and Resolve Marine Group per those companies' websites.

recommendation does not necessarily replicate input received. Information was also obtained from the websites of T&T Bisso (www.ttsalvage.com) and Donjon Smit (www.donjon-smit.com).

Although each company has their own salvage masters and some limited proprietary equipment in Alaska, a vast majority of their equipment is located in the continental United States. To provide the required capabilities in Alaska, the primary resource providers have established networks and contracts with other companies, as subcontractor support. This support ranges from a list of resident and transient tugs, fire suppression materials and pumps, commercial diving and other salvage equipment.

2.2 Key Resource Needs for Salvage Response

Based on a review of previously referenced salvage operations in the region, lightering by heavy lift helicopter was identified as one of the key activities likely to be crucial to a response. While lightering directly to a vessel is also an option, this was identified as an inferior option in the *Selendang Ayu* incident, due primarily to sea state (Unified Command, 2005). High sea states and the fact that many incidents occur in very shallow water make ship-to-ship lightering less feasible than helicopter lightering, due to the hazards of mooring vessels alongside one another.

Storage for lightered or recovered product was also identified as being extremely important to sustain either type of operation. A current inventory of temporary storage devices in Unalaska has shown insufficient assets for response to a significant marine based incident (see below).

2.2.1 Heavy-lift Helicopter Program of Opportunity

Emergency lightering will require pumping equipment, transfer hoses, and shore based tanks or other equipment. Lightering via heavy-lift helicopter requires tanks that can be lifted by the helicopter, and the necessary equipment to implement the lift.

For purposes of cargo lightering and other salvage-related heavy lift operations, Type 1 (Heavy) helicopters are needed.[2] Civilian Type 1 helicopters suitable to and available for marine salvage are not generally staged in Alaska, and must be mobilized from the Pacific Northwest or other location. Heavy-lift helicopters are significant assets, and their operators typically keep them moving around the country – and the world – performing specialized tasks.

The clearest candidates for helicopter lightering and salvage are the extreme heavy lift aircraft, primarily the Erickson/Sikorsky S-64 Skycrane[3] (maximum hook load 20,000-25,000 lbs.) and Boeing 234 Chinook[4] (maximum hook load 20,000-22,000 lbs). At least 26[5] of these two models are operated by the U.S. and Canada by

[2] Helicopters are divided into three general weight/payload capacity categories: Type 1 (Light), Type 2 (Medium), and Type 3 (Heavy). (NIAC, 2009)

[3]Operated primarily by Oregon-based Erickson Air-Crane (20 worldwide), additionally by Helicopter Transportation Services (unknown number), Siller Helicopters (unknown number), and potentially other smaller operators.

[4]Operated by Oregon-based Columbia Helicopters. No other Chinook operators were identified.

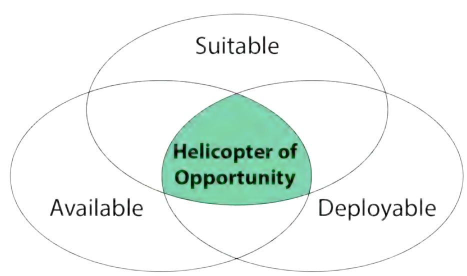
[5]Based on review of company websites and interviews conducted May 28, 2014 with Swanson Group Aviation (Jeff Allen), Erickson Air-Crane (Lauren Bennett), Helicopter Transport Services (Mark Pilon), Croman Corporation (Brian Beattie), and Columbia Helicopters (David Horax).

Erickson Air-Crane, Columbia Helicopters, Helicopter Transport Services, and Siller Helicopters. Other Type 1 helicopters with lighter load capacities may be suitable for some missions, including the Boeing 107 Vertol, Sikorsky S-61, Bell 214, Super Puma, and Kaman K-max.

While it was considered too costly to have a suitable aircraft permanently staged in Unalaska for the occasional salvage incident, the Analysis Team recommends that a heavy-lift helicopter of opportunity program be created to facilitate the prompt deployment of one of these assets to the region when needed. This will be further facilitated by having a package (or loadout) of the necessary equipment for lightering operations pre-staged in the region to prevent the helicopter from having to transit to another location to be outfitted for lightering operations.

Figure 1 summarizes some of the factors that will determine the timely deployment of a helicopter to the Aleutian Islands. While suitable helicopters may already be operating in Alaska or as close as British Columbia, they are also often deployed overseas and may be as far away as South Africa, Afghanistan, or Papua New Guinea.[6] Some heavy lift helicopters are more easily transported by fixed-wing aircraft than others are, depending on both the available airframe(s) and capability of the operating company. This means that, for instance, a transport-ready Skycrane in Turkey could theoretically be "closer" to an incident in the Aleutians than a Kmax in Oregon which has no fixed-wing transport arrangements and cannot reasonably be moved by anything less than a 747 airplane.

Key Factors for an Incident Heavy Lift Helicopter



Suitable:	Available:	Deployable:
The helicopter must match the mission. Extreme heavy lift helicopters (Skycrane, Chinook) will likely be the best but not the only option. Range may also be critical factor.	Helicopters must be ready and contractually available. Exclusive-use contracts are an obstacle, and a potential opportunity.	Helicopters can be fly or be transported from their current location, to the incident. Some helicopters will be closer, others may be ready to deploy via fixed-wing airplane.

Figure 1. Factors related to the timely availability of a helicopter for lightering operations

[6] These locations were just a few of the places that suitable helicopters were deployed by members of the Oregon Heavy Lift Helicopter Consortium when several members were interviewed in May 2014.

While weather conditions and the ability to fly into the area and implement a lightering mission represent important planning assumptions, they are ultimately out of the control of those preparing for a potential future response. On the other hand, there are a number of potential obstacles or delays that may be overcome through the advance planning of a Heavy-lift Helicopter of Opportunity Program, including:

- **Identifying suitable helicopters and the companies that operate them.** The Oregon Heavy Lift Helicopter Consortium represents the logical starting point.
- **Determining an estimated number of helicopter contracts that would be needed to have the best chance of securing a helicopter promptly when needed, and securing contracts with multiple companies to maximize access.** Helicopter availability will be determined primarily by whether it is already engaged (and, if so, whether that contract is exclusive or allows for redeployment to an emergency and location (including the potential for transporting via fixed-wing aircraft). This may include exploring the potential to participate in interagency resource sharing as is used for firefighting contracts.
- **Optimizing preparation within the region.** Understanding the options for transport of helicopters via fixed-wing aircraft will facilitate planning for which airports will be accessible to different types of transport (depending on weather conditions). For instance, it could be preferable to transport a helicopter via jet to Adak or Cold Bay, along with its full support package, thereby eliminating the need for the helicopter to fly long legs over ocean or uninhabited terrain.

The program should also verify the necessary contents of the heavy lift helicopter package to ensure that it will be compatible with all potentially contracted helicopters.

2.2.2 Storage barge

Adequate oil storage (whether from cargo or bunkers) is necessary to support lightering operations as well as secondary storage for oil spill response. An in-region barge would represent a significant increase in storage for lightering and spill response (Figure 2), and would be able to mobilize to support activities in different parts of the region. The Analysis Team recommends that the Managing Entity contract for or acquire such a barge to be staged in Dutch Harbor.

Current in-region assets include tank trucks, vacuum trucks, drums and portable skid tanks, which are not well suited to lightering operations. There are only two dedicated oil storage barges with a capacity of 249 bbl each, which are owned by the City of Unalaska. In addition, Alaska Chadux has two 59-bbl towable bladders and could cascade more oil storage devices if needed. There is a heavy-lift barge based in Dutch Harbor[7] but there are no dedicated lightering barges in the Aleutian Islands region. The nearest dedicated response barges are based in Cook Inlet and Prince William Sound, and would take days to arrive even in Unalaska, or longer to reach

[7] http://www.resolvemarine.com/opa90/opa_90_coverage_table.php

the Western Aleutian Islands assuming that the barges could be released from local obligations and the weather was conducive to transit:

- **Cook Inlet:** CISPRI Barge 141 (operated by Ocean Marine Services) would take just over 3 days to travel at 9 knots[8] the approximately 700 nm from Nikiski to Unalaska.[9] It has a capacity of 59,411 bbl (CISPRI, 2010).
- **Prince William Sound:** SERVS keeps several barges, with capacities up to 104,791 bbl in Valdez (APSC, 2013). A barge would take approximately 4 days to travel approximately 850 nm at 9 knots from Valdez to Unalaska.

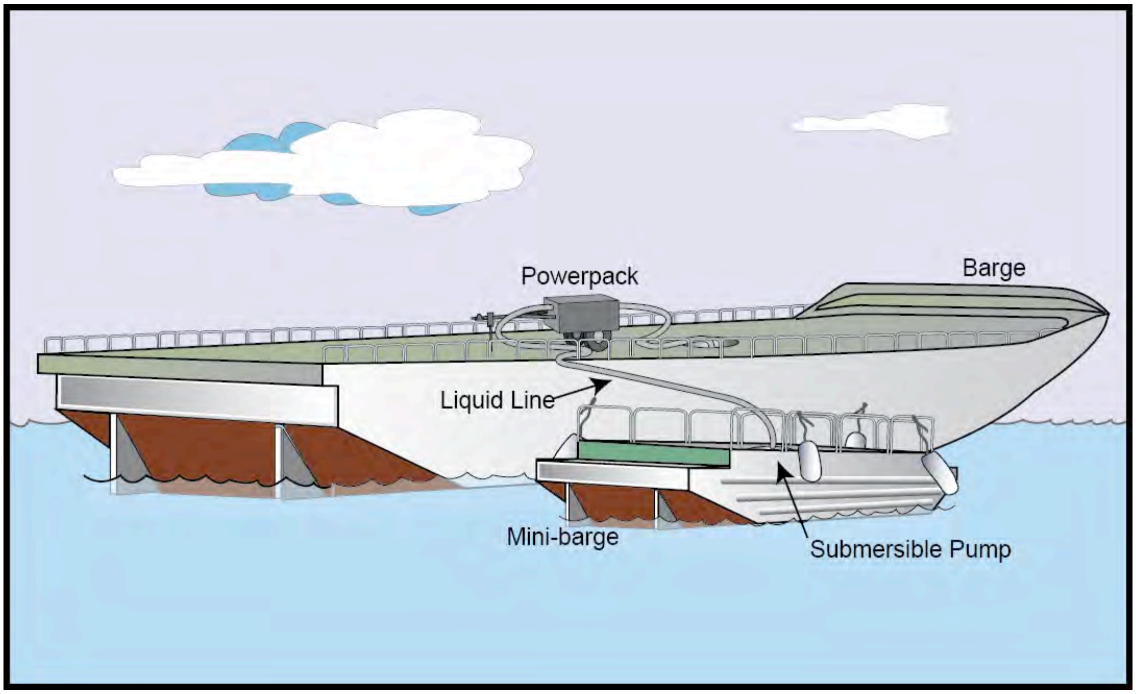


Figure 2. Marine-based storage can serve both lightering and, as shown here, secondary storage for spill response

Based on the vessel traffic study conducted for Phase A, large vessels transiting the region at that time had *average* fuel volumes up to 53,000 bbl, Especially given the transit times from other parts of Alaska, a 60,000 bbl barge represents a reasonable capacity to have readily available in Dutch Harbor. Tankers carry far more than 60,000 bbl in oil cargo (DNV and ERM, 2010) and potentially far more in the future depending on the development of proposed energy export projects in British Columbia and the U.S. Pacific Northwest (Nuka Research, 2014b). Thus, a 60,000 bbl barge could still be considered practical and all that is needed to lighter the fuel tanks of the stricken vessel, or partially lighter tanker fuel or cargo until additional resources can be cascaded into the area. Additionally in support of oil spill response, it could provide initial secondary storage for oil that has already spilled and is collected in an oil-water mixture until additional storage capacity can be brought from other parts of Alaska or the country.

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[8] An assumed speed of 9 knots is used as an assumed average speed for an empty barge traveling under calm conditions. This is a rough calculation for illustrative purposes only.

[9] The barge is located in Nikiski in the summer, and moved the ice-free waters of Seldovia for the winter.

Finally, the barge should be heated to maintain the viscosity of the oil to facilitate efficient pumping and avoid oil "setting up" during transit or while awaiting discharge at berth. This is especially important for heavy fuel oil, which is carried as bunkers in many vessels transiting the region (OCIMF, 2013).

2.3 Recommended System Components and Estimated Costs

The recommended salvage services and the management and overhead to establish and manage them would cost an estimated $1 million annually. Table 1 summarizes this estimate, with further details found in Appendix A.

Table 1. Estimated annual costs for recommended salvage resources

	SERVICE/RESOURCE	EST. ANNUAL COST
Salvage	Helicopter lightering package	$79,572
	60,000 bbl tank barge	663,968
	Helicopter of Opportunity Program	20,000
	Salvage management and overhead	322,421
	Subtotal	**$1,085,961**

The cost estimate above represents a first order estimate, which would be refined by the managers of the Managing Entity. The Analysis Team also anticipates that the entity will grow over time, so costs will inevitably change.

3. OIL SPILL RESPONSE

The recommendation for oil spill response was built on the recently completed update to the State of Alaska's Spill Tactics for Alaska Responders (STAR) Manual (ADEC, 2014), consideration of the response gap analysis (Nuka Research, 2014b), interviews with key stakeholders from the Advisory Panel,[10] and the best professional judgment of the Analysis Team.

The Analysis Team recommends that oil spill response resources focus on nearshore response. Responding in protected water areas will facilitate the targeting of resources to priority sensitive or coastal areas, while increasing the likelihood that response activities can be implemented and sustained in the typically rough weather

[10] Interviews were conducted with Bob Heavilin (retired), Alaska Chadux (January 2013); Shirley Marquardt, City of Unalaska (August 2013); Frank Kelty (City of Unalaska (August 2013); and Dustin Dickerson, Unalaska Native Fisherman's Associatoin (August 2013); Matt Melton, Alaska Chadux (October 2013); Dave Barry, Gallagher Marine Systems (November 2013); and Scott May, ECM Maritime, (November 2013). The Analysis Team considered all information provided during interviews, but the final recommendation does not necessarily replicate input received.

of the region (Nuka Research, 2014b). Furthermore, a nearshore response that incorporates vessels of opportunity and their crews will take advantage of existing resources in the region and local knowledge of vessel captains and crews.

At the same time, it is important to note that conditions in many locations can be expected to vary significantly over time, depending on the prevailing weather and swell direction. Additionally, the large distances between these protected waters will require transiting more exposed areas, which may have few places of refuge and involve long, exposed crossings. Even small strait crossings are subject to widely varying, and frequently hazardous, conditions (Fett et al., 1993). The use of vessels of opportunity, recruited locally, will incorporate both able vessels and knowledgeable captains and crew.

3.1 Nearshore Operations Response Strategy (NORS)

The STAR Manual was updated in 2014 to include the Nearshore Operations Response Strategy (NORS), which describes a general configuration of tactics and resources that could be used to mount a response in a remote areas with an emphasis on nearshore operations.

NORS is directly applicable to the Aleutian Islands because of the remoteness of most locations, especially in the Western Aleutians, and the likelihood that nearshore response will still be possible in protected waters even if environmental conditions hamper or preclude open-water response (Nuka Research, 2014b).

3.1.1 Nearshore Task Force

The STAR Manual describes a Nearshore Response Group consisting of five nearshore task forces (NSTF). The Analysis Team recommends that just one NSTF be stationed in the Aleutian Islands to provide the immediate deployment of nearshore and sensitive area protection strategies, particularly those already identified and developed as Geographic Response Strategies (GRS). As with other services and resources, the Managing Entity could contract for the development and maintenance of a NSTF or implement it directly. The Analysis Team finds that this represents a prudent level of resources, while still enhancing the response capability from the level currently available. Additional resources would be brought in as needed (and as available) through the cascade program.

This section describes the basic resources for one NSTF consisting of five strike teams: three to conduct nearshore free-oil recovery, and two to implement shoreline protection strategies (such as GRS) (See Figure 3.) Critical ancillary resources will also be necessary, such as the oil storage barge(s) described in the salvage section, aerial observation, decontamination, waste management, and logistical support for responders. The latter is addressed at least in part with a marine logistics base as described in the next section.

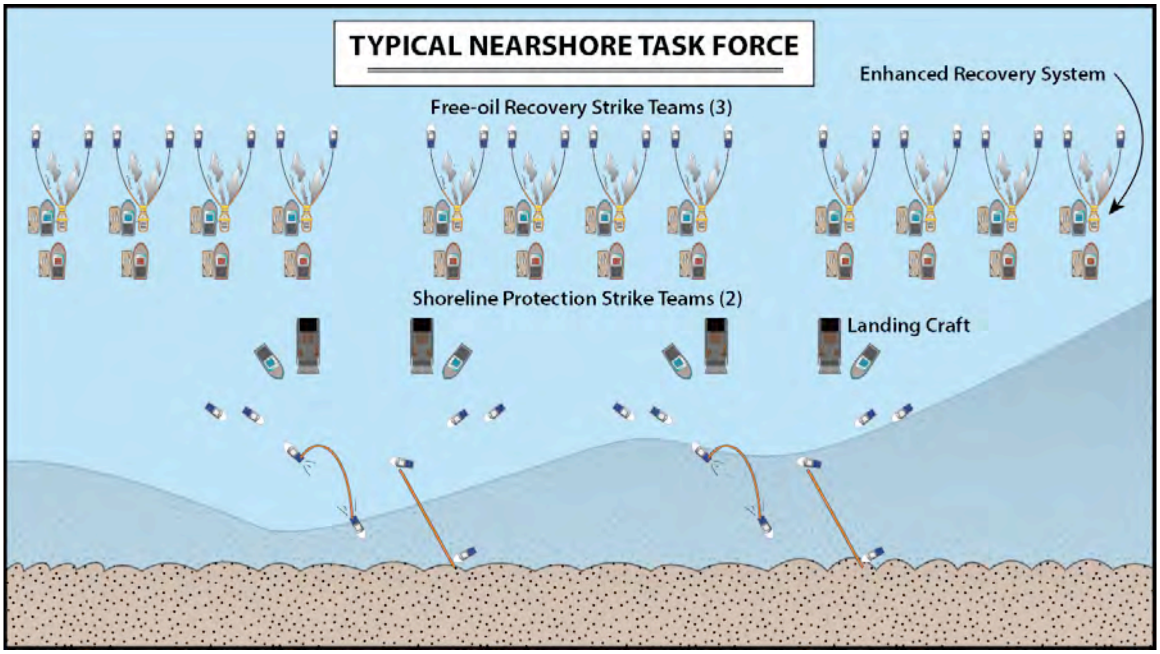

Figure 3. Possible configuration for a NSTF: three free-oil recovery strike teams and two shoreline protection strike teams (ADEC, 2014)

A strike team for nearshore free-oil recovery is composed of two small vessels that advance ahead of the skimmer and two larger vessels to attend to the skimmer itself and storage mini-barges for primary oil storage. The best available technology for nearshore free oil recovery includes enhanced recovery devices, such as the Current Buster, and high efficiency disc skimmers. (ADEC, 2014)

A strike team for shoreline protection is composed of up to 10 small vessels and two landing craft. These vessels and crew should be able to transport boom and anchoring systems to the site, deploy anchors and boom arrays, and tend boom. The strike team should be supplied with up to 5,000 feet of protected water boom, 50 anchor systems, 500 feet of shore-seal boom, and 5,000 feet of snare boom, and adequate ancillary equipment. (ADEC, 2014)

Table 2 summarizes the response resources needed for a nearshore free-oil recovery strike team and shoreline protection strike team.

Table 2. Summary of resource requirements for nearshore free-oil recovery strike team and shoreline protection strike team

Nearshore STRIKE TEAM Equipment and Personnel Recommendations		
	Free-oil Recovery Strike Team[11]	Shoreline Protection Strike Team
Vessel Platforms	8 – Class 2 or 3 Skimmer Tending Vessels 4 – Class 3 or 4 Primary Storage	10 – Class 3 or 4 Boom Deployment Vessels 2 – Class 2 or 3 Support Vessels

[11] Alternative configurations are possible, e.g. Skimming in J-boom configuration, or herding oil (gated U-boom, etc.).

	Tending Vessels	(Class 1 or 2 Landing Craft or equivalent)
Containment	4 – Enhanced Recovery Systems	5,000 ft Protected Water Boom 500-ft Shoreseal Boom 5,000 ft Snare Boom 50 ea. Anchor Systems
Skimming	4 – High Efficiency Oleophilic Skimmers (Crucial 13 disc or equivalent)	1 – Small Skimming System
Primary Storage	8 – 249 bbl Primary Storage Devices (mini barges or equivalent towable bladders)	1 – 50 bbl Primary Storage Device
Personnel	1 – Strike Team Leader 16 – Tow Boom Vessel Crew 12 – Skimmer Tending Vessel Crew 8 – Storage Tending Vessel Crew	1 – Strike Team Leader 20 – Tow Boom Vessel Crew 6 – Support Vessel Crew

3.1.2 Marine Logistics Base

A large oil spill response in the Aleutian Islands will require significant numbers of personnel, as well as the resources to support their food, accommodations, waste generation, and other needs. There are different options for achieving this: a single barge operating as a forward logistics base or a combination of locally available vessels with berthing and other necessary resources (Figure 4). Due to the high cost of obtaining and maintaining a dedicated logistics barge, the Analysis Team recommends that this function be met with local resources as shown in Figure 5. This could include the storage barge mentioned above, as well as a ferry or other vessel(s) for berthing, support vessels for decontamination and storage, and a vessel with a helipad. It is assumed that once deployed, the marine logistics base will be capable of operating for up to 21 days without resupply. A logistics base comprised of local resources will also be inherently suited to Aleutian Islands conditions.

Most of the necessary components might be provided by contracts with local resources that are only activated at the time of an incident. Other equipment and supplies would have to be assembled, maintained, and warehoused.

As described in the STAR Manual, "this type of platform serves multiple functions, including:

- Accommodation and messing facilities
- Equipment storage
  - Skimming equipment
  - Boom storage, maintenance and deployment
  - Parts and equipment maintenance/repair
  - Mini-barge storage and support

    - Personal protective equipment (PPE) storage and distribution
- Secondary storage for recovered oil
- Decontamination
- Temporary storage for oily solid waste
- Potable water storage
- Helicopter support (Heli-Pad)
- Command center." (ADEC, 2014, p. B-VI-2-4)

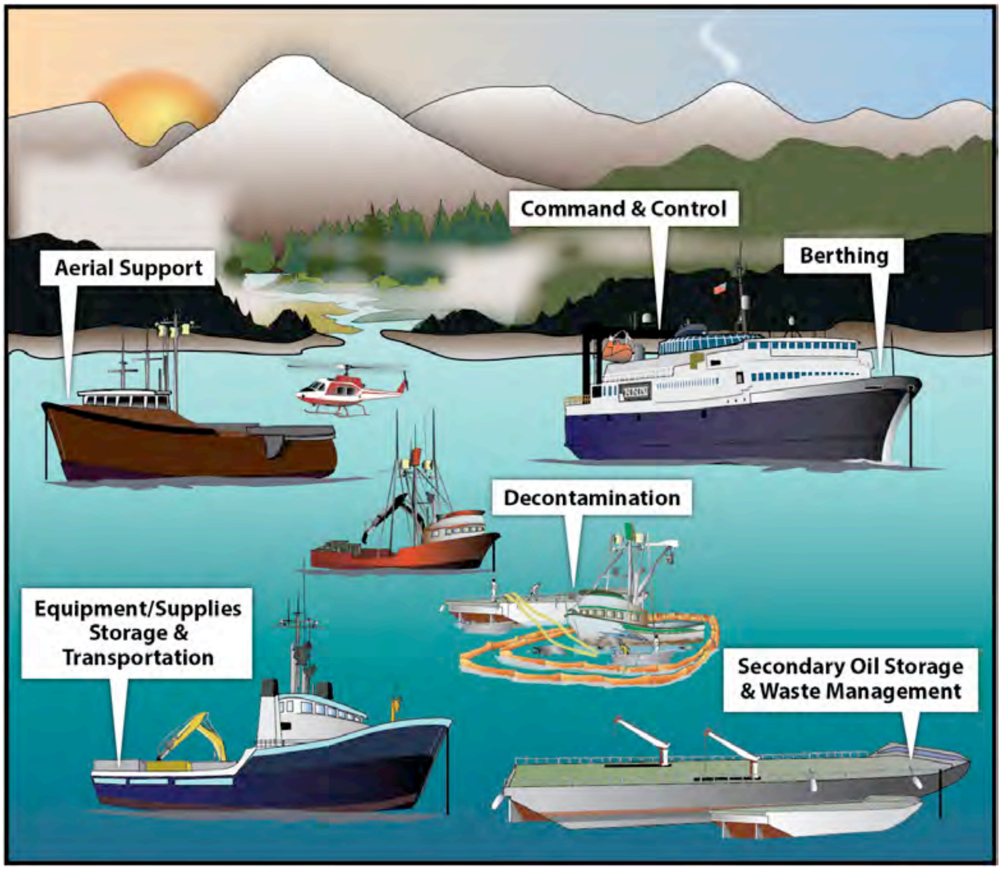

Figure 4. A multi-vessel logistics base can be assembled from local resources to support a nearshore response in remote areas

The first order estimated cost is just over $325,000 year (see Section 4) and the Analysis Team is proposing that a plan for assembling a marine logistics base be developed as a first step. Potential places of refuge that are likely to be suitable to logistic base operations could also be identified in advance.

3.2 Vessel of Opportunity Program

The approach to nearshore response described above requires a significant number of vessels capable of operating in the nearshore waters of the Aleutians. Due to the challenges of bringing such vessels in from other locations, and the expense of having a fleet maintained in the region strictly for oil spill response, the Analysis Team recommends that a vessel of opportunity program should be developed that ensures that at least 150 vessels – primarily fishing vessels – are engaged to support a potential response, with a plan in place to conduct training on an regular (annual) basis, or as needed.

Fishing vessels already operating in the region will naturally be well suited to Aleutian Islands conditions, and their captains and crew familiar with safe operations in the area. Vessels would need to be identified, contracts secured, and vessels classified according to the type of response role they are capable of playing.

With 36 vessels required for the three nearshore recovery strike teams, and 20 required for the two shoreline protection strike teams (see Table 2, above), a total of 56 vessels would be required for each daytime operational period, assuming that the same vessels can be refueled and the crew housed and fed without having to travel long distances back to a land-based logistics base. The estimated need for 150 vessels allows for the fact that some vessels will always be unavailable due to maintenance or repairs, seasonal movements in and out of the region, and seasonal movements within the region.

Based on review of public databases on fishing vessel permits, there are likely to be sufficient fishing vessels of various sizes in Dutch Harbor, False Pass, and Sand Point depending on the season and assuming that they are willing to participate. Table 3 summarizes vessel numbers based on these databases.

Table 3. Fishing vessels in Dutch Harbor, False Pass, and Sand Point (Alaska CFEC, 2014 and NMFS, 2014)

VESSEL LENGTH (feet)	DUTCH HARBOR	FALSE PASS	SAND POINT
<30	46	44	264
30-50	30	27	107
51-65	5	2	15
Federal permit only[12]	6	1	10
TOTAL	87	75	396

The Managing Entity would create, or contract for the creation of, a vessel of opportunity program that would contract with vessel operators, train captains and crew as needed to implement their assigned tasks,[13] conduct drills and vessel checks as needed, and engage in the initial callout in the event that a significant spill required their engagement in response. In addition to implementing nearshore recovery directly, fishing vessels could be used for logistical support, wildlife hazing, and other support activities. This would also require developing a system for determining vessel locations at a given time, which may require incorporating information from multiple sources including Automated Identification Systems, Vessel Monitoring Systems, or daily boat checks in harbors.

[12] Vessel length was not available for federal fishing permit vessels.

[13] Few fishermen in the region are currently trained in HAZWOPER or any aspects of the deployment of oil spill response equipment, though there would likely be willingness to train and certainly to help in the event of a response. (Interviews with Frank Kelty and John Days, May 2014.)

3.3 Equipment Locations and Cascade Program

The Aleutian Islands region spans hundreds of miles, and an incident could require that a response be mounted far from the nearest city or infrastructure. Rather than place equipment at hubs throughout the region as would be dictated by the federal regulations (see description in Nuka Research et al., 2013), the Analysis Team proposes that the spill response resources described here would be based in Unalaska as the largest population center and the best able to maintain the workforce necessary to manage the equipment. The resources themselves are intended to be able to mobilize to more remote areas, with the marine logistics base. The one exception to this focus is the vessel of opportunity program, which will by necessity rely on vessels in local ports such as Sand Point, in addition to Dutch Harbor. As noted in the Summary Report (Nuka Research, 2014a) the Analysis Team has also recommended that the emergency tow vessel be based in Adak at least part of the year to maximize its ability to reach distressed vessels in the eastern Aleutians.

While the system recommended here represents an increase in spill response capacity located within the region, large spill or prolonged response would require resources beyond those described here. The Analysis Team recommends that the Managing Entity contract for, or create, a program to plan for the cascading of equipment from other parts of Alaska and the country. This program would be expected to draw heavily on resources based in Cook Inlet, Prince William Sound, and Southeast Alaska in particular, as the owners and operators of that equipment are willing. The cascade program would identify resources, establish contractual arrangements with the owners of those resources, and regularly update the list of resources and ownership.

3.4 Estimated Costs for Oil Spill Response

Table 4 shows the first order estimated annual costs for the oil spill response equipment recommended by the Analysis Team. These costs represent the second largest portion of the recommended system from a cost perspective, second only to the location and maintenance of an emergency towing vessel. Table 4 summarizes this estimate, with further details found in Appendix B.

Table 4. Estimated annual costs for recommended oil spill response equipment

	SERVICE/RESOURCE	EST. ANNUAL COST
Spill Response	Nearshore task force equipment	$1,917,884
	Vessel-of-opportunity program	562,000
	Cascade program for out-of-region equipment	16,000
	Marine-based logistics base	325,465
	IMT program	146,516
	Spill response staff, management, and overhead	1,215,080
	Subtotal	**$4,182,946**

As with the salvage costs, the cost estimates above represent a first order estimate, which would be refined by the managers of the Managing Entity. The Analysis Team also anticipates that the entity will grow over time, so costs will inevitably change as the system ramps up to this level and then continues to evolve as appropriate to the context.

4. CONCLUSION

Overall, the Analysis Team recommends that salvage and oil spill response equipment and resources within the region be increased, but with a focus on those resources that are most critical to response in this remote region, and most likely to be deployable in the Aleutians operating environment. The recommendation also builds on local resources and anticipates the need to bring resources in from other places due to the impracticality of maintaining all needed resources in the region.

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6. APPENDICES

Appendix A – Cost Estimate for Salvage Services and Resources

Salvage Staff	Number	Unit Cost	Capital Cost	Loan Period (years)	Amortized Capital Cost ($/yr)	Personnel ($/yr)	Operating & Maintenance ($/yr)	Overhead ($/yr)
Variables								
Interest Rate:			8%					
Overhead Rate:			25%					
Salvage Specialist - Tankermen	2		$0			$170,000		$42,500
Office Equipment	1	$10,000	$10,000	7	$1,921			
Travel	1		$0				$8,000	
Insurance			$0				$100,000	
			Total Capital Cost (Principal)		**Annual Capital Cost**	**Annual Personnel Cost**	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$10,000**		**$1,921**	**$170,000**	**$108,000**	**$42,500**

Helicopter Lightering Package	Number	Unit Cost	Capital Cost	Loan Period (years)	Amortized Capital Cost ($/yr)	Operating & Maintenance ($/yr)	Overhead ($/yr)
Variables							
Interest Rate:			5%				
Overhead Rate:			15%				
Pump Equipment	1	$200,000	$200,000	10	$25,901	$10,000	$3,885
Fly-away Tanks	10	$20,000	$200,000	10	$25,901	$10,000	$3,885
			Total Capital Cost (Principal)		**Annual Capital Cost**	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$400,000**		**$51,802**	**$20,000**	**$7,770**

60,000 bbl Oil Storage Barge	Variables								
	Interest Rate:		5%						
	Overhead Rate/ Charter Profit:		15%						
40K-60 Storage Barge	**Number**	**Unit Cost**	**Capital Cost**	**Loan Period (years)**	**Amortized Capital Cost ($/yr)**	**Personnel ($/yr)**	**Fuel ($/yr)**	**Operating & Maintenance ($/yr)**	**Overhead ($/yr)**
Barge	1	$5,000,000	$5,000,000	15	$481,711		$10,000	$100,000	$72,257
Personnel detailed in Salvage Staff			$0			$0			
			Total Capital Cost (Principal)		**Annual Capital Cost**	**Annual Personnel Cost**	**Annual Fuel Cost**	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$5,000,000**		**$481,711**	**$-**	**$10,000**	**$100,000**	**$72,257**

Helicopter of Opportunity Program	Variables		
	Interest Rate:	8%	
	Overhead Rate:	25%	
Helicopter of Opportunity Program	**Unit Cost**	**Capital Cost**	**Operating & Maintenance ($/yr)**
Staff detailed in Salvage Staff	n/a	$0	
Heavy Lift Helicopter monitoring program	n/a	$0	$20,000
		$0	
		Total Capital Cost (Principal)	**Annual Operation & Maintenance**
	Totals:	**$-**	**$20,000**

Appendix B – Cost Estimate for Spill Response Services and Resources

Oil Spill Response Staff		**Variables**						
		Interest Rate:	5%					
		Overhead Rate:	25%					
Towing Management Staff	**Number**	**Unit Cost**	**Capital Cost**	**Loan Period (years)**	**Amortized Capital Cost ($/yr)**	**Personnel ($/yr)**	**Operating & Maintenance ($/yr)**	**Overhead ($/yr)**
Manager - Oil Spill Removal Organization	1		$0			$125,000		$31,250
Technicians, VOO Program Manager, LBS Program Manager	7		$0			$595,000		$148,750
Admin Staff	1		$0			$60,000		$15,000
Travel			$0				$50,000	
Office Equipment	7	$20,000	$140,000	5	$32,336			
Vehicles	5	$50,000	$250,000	5	$57,744			
Insurance			$0				$100,000	
			Total Capital Cost (Principal)		**Annual Capital Cost**	**Annual Personnel Cost**	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$390,000**		**$90,080**	**$780,000**	**$150,000**	**$195,000**

Nearshore Oil Spill Response Equipment		**Variables**						
		Interest Rate:	5%					
		Overhead/Profit Rate:	15%					
Nearshore Strike Team Composition	**Number**	**Unit Cost**	**Capital Cost**	**Loan Period (years)**	**Amortized Capital Cost ($/yr)**	**Fuel ($/yr)**	**Operating & Maintenance ($/yr)**	**Overhead ($/yr)**
Current buster-type enhanced booming	12	$175,000	$2,100,000	10	$271,960			$40,794
Fuzzy disk high-efficiency skimmers and power packs	12	$105,000	$1,260,000	10	$163,176			$24,476
249 bbl mini-barges for primary storage	24	$150,000	$3,600,000	10	$466,216			$69,932
Protected-water boom for shoreline protection	10000	$10	$100,000	10	$12,950			$1,943
Snare-boom for shoreline protection	10000	$1	$10,000	5	$2,310			$346
Anchoring Systems	100	$300	$30,000	5	$6,929			$1,039
Shoreseal boom	1000	$53	$53,333	5	$12,319			$1,848
Mini barge lightering system	4	$35,000	$140,000	10	$18,131			$2,720
Consumables - initial inventory	1	$100,000	$100,000	5	$23,097			$3,465
Co-op owned vessels	6	$200,000	$1,200,000	5	$277,170	$30,000		$41,575
Misc	1	$500,000	$500,000	5	$115,487			
Annual Operation and Maintenance							$100,000	
Shop, office, utilities, consumables							$250,000	
(Personal cost are detailed in with Oil Spill Response Staff)			**Total Capital Cost (Principal)**		**Annual Capital Cost**	**Annual Fuel Cost**	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$9,093,333**		**$1,369,745**	**$30,000**	**$350,000**	**$188,139**

Vessel of Opportunity Program		Variables			
		Interest Rate:	8%		
		Overhead Rate:	25%		
VOO Program	**Number**	**Unit Cost**	**Capital Cost**	**Operating & Maintenance ($/yr)**	**Overhead ($/yr)**
VOO Program Manager/Trainer - part of OSRO staff in O1	1		$0		$0
Training Base Budget	1		$0	$50,000	
Per Vessel Training Costs - 3,000 per year	150		$0	$450,000	
Travel	1		$0	$12,000	
Insurance			$0	$50,000	
			Total Capital Cost (Principal)	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$-**	**$562,000**	**$-**

Logistical Support Base		**Variables**						
		Interest Rate:	5%					
		Overhead Rate:	15%					
Logistical Support Base Program	**Number**	**Unit Cost**	**Capital Cost**	**Loan Period (years)**	**Amortized Capital Cost ($/yr)**	**Fuel ($/yr)**	**Operating & Maintenance ($/yr)**	**Overhead ($/yr)**
Personnel to be provided by OSRO Staff			$0					
Program Travel			$0				$6,000	
Program Budget			$0				$25,000	
Vessel Charter Budget			$0			$120,000	$100,000	
Equipment Budget	1	$500,000	$500,000	10	$64,752			$9,713
			Total Capital Cost (Principal)		**Annual Capital Cost**	**Annual Fuel Cost**	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$500,000**		**$64,752**	**$120,000**	**$131,000**	**$9,713**

IMT Program		**Variables**					
		Interest Rate:	8%				
		Overhead Rate:	25%				
IMT Program	**Number**	**Unit Cost**	**Capital Cost**	**Loan Period (years)**	**Amortized Capital Cost ($/yr)**	**Operating & Maintenance ($/yr)**	**Overhead ($/yr)**
Individual IMT member training	12		$0			$36,000	$9,000
Annual internal exercise			$0			$24,000	$6,000
Agency exercise			$0			$50,000	$12,500
Equipment	12	$3,000	$36,000	5	$9,016		
			Total Capital Cost (Principal)		**Annual Capital Cost**	**Annual Operation & Maintenance**	**Annual Overhead**
		Totals:	**$36,000**		**$9,016**	**$110,000**	**$27,500**