REPORT ON THE
SELENDANG AYU INCIDENT

Photo by Alaska Dept. of Fish and Game

Prepared by
Parker Associates Inc.
For Alaska Oceans Program
3724 Campbell Airstrip Road
Anchorage, Alaska 99504
Phone: (907) 333-5189
Fax: (907) 333-5153
wbparker@gci.net
lakosh@gci.net
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Preamble

The Alaska Oceans Program contracted Parker Associates Inc. to investigate the circumstances surrounding the grounding of the Selendang Ayu, the resultant oil spill and potential solutions for prevention of groundings and effective oil spill response in the demanding conditions present in the Aleutian Islands. The investigation revealed numerous problematic circumstances and policies that adversely affected spill prevention and response. These impediments to spill mitigation are expected to continue to expose Aleutian resources to catastrophic oil spills unless concerted legislative and administrative actions are pursued to substantially improve the equipment and procedures required for effective spill prevention and response. The opinions offered in this report are lay opinions only and are not to be construed as legal advice.

Executive Summary

Summary of the Incident

The Selendang Ayu was a 738 ft., 73,000 DWT dry bulk freighter carrying a cargo of soybeans from Seattle to China along the Great Circle Route that intersects the Aleutian Islands at Unimak Pass and a pass near Shemya Island. The freighter grounded on the Western shore of Unalaska Island on December 8, 2004 after drifting for more than two days subsequent to a failed attempt to repair its main propulsion engine. Four vessels ranging from 1,550 hp to 6,800 hp attempted to take the freighter under tow prior to grounding but severe sea conditions either broke the towline or otherwise rendered rescue too hazardous. The grounding occurred in a severe storm that broke the vessel in half, causing a spill that ultimately released more than 335,000 gallons of fuels and lubricants that primarily consisted of the persistent heavy fuel oil IFO 380. A U.S. Coast Guard helicopter attempting to rescue the freighter crew crashed while lifting personnel off of the freighter deck, causing the loss of six Selendang Ayu crewmembers.

Despite the full acceptance of costs by the owner of the Selendang Ayu, IMC Shipping Co., spill response efforts were largely ineffective in that no attempt was made to contain the spill at the grounding site or recover oil on the open water, allowing the oil to foul hundreds of miles of beaches in the Alaska Maritime National Wildlife Refuge and causing the cancellation of local crab fishing seasons and disrupting other subsistence and commercial fisheries. Lightering efforts to remove remaining oil on the freighter eventually recovered approximately 140,000 gallons of
oils from the ship, but lightering was delayed for more than three weeks and was not completed until 2/15/05, more than six weeks after lightering efforts were commenced. Efforts to protect sensitive areas along the shoreline were also largely ineffective, allowing several salmon streams to become heavily oiled. Shoreline cleanup to date has recovered more than 125,000 bags of oily waste from area beaches. The recovered and observed oiled animals are widely considered to be a small fraction of the actual oil casualties. Small quantities of oil continue to leak uncontained from the ship and shoreline cleanup is underway and expected to continue into the fall season. A total of 1,609 dead oiled birds were recovered and an additional 781 oiled birds were observed but unrecoverable, while another 29 birds were captured with 10 of these birds rehabilitated and released. Six dead mammals were recovered with another 18 observed as oiled.

Summary of the Regulatory Environment

The grounding and resultant spill could have been averted had the captain of the Selendang Ayu diverted to port or a safe anchorage instead of attempting repairs in a building storm with a lee shoreline, but much responsibility for spill damage must also fall at the doorstep of the United States Coast Guard, (USCG), and the Alaska Department of Environmental Conservation, (ADEC), for their failure to require or acquire the appropriate assets to prevent and respond to oil spills in the known severe Aleutian environment. It is the statutory responsibility of these agencies to both: regulate local vessels and facilities with respect to planning and effectuating spill prevention and response, and; otherwise acquire assets through dedicated funds to plan and effect response to vessel casualties and spills where the vessels transiting the area are exempt from direct regulation or the spill source is unidentified. Either state or federal agencies retain authority to order the party responsible for a spill, or potentially imminent spill, to undertake actions they deem necessary to prevent or mitigate the spill.

Both the USCG and ADEC consider the Selendang Ayu and an additional 2,700 annual vessel transits along the Great Circle Route through the Aleutians to be vessels in “innocent passage” as defined by the United Nations Convention on the Law of the Sea, (UNCLOS), and therefore not subject to spill prevention and response planning requirements. An additional un-quantified amount of commercial vessel traffic between Asia and North America or the Panama Canal also travel a Great Circle Route that closely approaches the Aleutians at the Southernmost arch of the archipelago and the volume of this traffic is likely to greatly exceed the traffic that
transits through the Aleutian Chain. The Transpacific ship traffic carries all manner of cargo, is more numerous than local regulated vessels, generally utilizes more persistent oil as fuel than the much smaller local vessels and even transports large quantities of persistent oil as cargo in contrast to the smaller quantities of strictly non-persistent fuels delivered to local ports. The larger size and larger quantities of persistent fuel and oil cargo of these Transpacific ships substantially increases demands over local traffic requirements for towing vessel power to prevent groundings and the quantity of spill response equipment to respond to a worst-case spill.

The USCG, ADEC and numerous other government agencies, collectively called the Alaska Regional Response Team, have cooperated in developing the statewide Alaska Unified Plan for Oil and Hazardous Substance Discharges/Releases and the regional Aleutians Subarea Contingency Plan to prevent or respond to spills related to unidentified or unregulated sources such as the Transpacific vessel traffic. The USCG and ADEC have issued about 240 spill response plans for vessels and facilities in the region that are subject to strict regulation. Although the response contractors and equipment assets in the response plans for regulated entities are not required to respond beyond their contracted obligations, the contactor for virtually all of these plans, the Alaska Chadux Corporation, has voluntarily listed its resources in the Aleutian Subarea Contingency Plan and was contracted by IMC Shipping Co. to conduct the spill response in this instance. Response requirements for these regulated entities include a capability to respond to spills of a magnitude larger than the Selendang spill, albeit for non-persistent diesel fuel instead of the persistent IFO 380. Spill plans for local regulated vessels do include response to spills of equivalent size and for persistent fuel oil. Dozens of spills have occurred in the Aleutians over the last 40 years and several hundred vessel casualties that affected their seaworthiness have occurred in the Aleutians over the last 15 years.

The Oil Spill Liability Trust Fund, (OSLTF), is the source of federal funds for area contingency planning, equipment and spill response actions including spill response actions undertaken by the responsible party above set liability limits. The liability limits are variably set for different types of ships but actual spill costs have greatly exceeded liability limits. In the case of the Selendang Ayu, the liability limit is approximately $24 million, expenditures to date have exceeded $49 million and total oil removal costs are expected to double. The Fund also pays for spill damage claims when the responsible party is unidentified or unwilling/unable to pay for
damages. The Fund was instituted in 1991 and populated to $1 billion dollars with a 5 cent per barrel tax on domestically produced and imported oil but this tax sunset at the end of 1994. The OSLTF assets are rapidly declining with an expected shortfall in Fund commitments to occur in FY 2007 with total depletion expected in FY 2009. Alaska also has a fund dedicated to providing planning and equipping of regional spill contingency plans, the Oil & Hazardous Substance Release Prevention and Response Fund. This fund is also populated with oil tax monies but has no sunset provisions.

Summary of Conclusions and Recommendations

The failed and delayed efforts to prevent and respond to this spill demonstrates systemic deficiencies in contingency planning for both regulated and unregulated spill sources. An examination of the incident, regional environmental conditions, regulatory environment, and spill prevention and response technologies leads to the following conclusions and recommendations:

- Neither the area contingency plans nor the regulated vessel and facility response plans meet the levels of equipment capability or quantity to respond to imminent or actual spills in the ocean environment. Regulated vessels/facilities have very specific requirements for the quantity and capability of response equipment and so present the most definitive avenue for improving regional assets through participation in administrative proceedings.
- The USCG and ADEC have not sought access to their respective dedicated spill prevention and response funds to appropriately equip the area contingency plans, which serve as the response mechanism for unregulated or unidentified spill incidents. Petitions to agency administrators and direct legislative initiatives to obtain appropriation of dedicated funds for specific improvements to spill prevention and response should be sought.
- The mandated level of spill prevention and response equipment capability is well below that which would be effective in the more severe weather conditions often experienced around the Aleutians. Petitions to agency administrators and direct legislative initiatives to obtain increased levels of equipment capability should be sought.
- Commercially available equipment could meet and exceed the mandated levels of capability if the regulators fully applied the existing mandates for effective spill prevention and response. Participation in the administrative review process for area contingency plans and response plans for regulated vessels/facilities is recommended.
Tangible results may not be forthcoming until administrative appeal and judicial review is completed.

- Mandated research and development efforts could substantially improve the ability of oil spill response vessels to effectively recover oil in severe conditions but even the most advanced equipment would not be effective in worst case Aleutian conditions. Petitions to agency administrators, (USCG, MMS, OSRI), and direct legislative initiatives to pursue development of open ocean oil spill response vessels should be pursued.

- Commercially available towing vessels in the region are too underpowered to provide effective rescue towing or are greatly constrained by safety considerations in severe sea conditions, particularly when rescuing the larger vessels transiting the region. These towing vessels are not distributed in a manner that would allow timely response throughout the Aleutians, particularly in those areas where ships pass through the islands and closely approach shorelines. Participation in the administrative review process for area contingency plans and response plans for regulated vessels/facilities is recommended.

- Higher-powered USCG vessels are not consistently available, would only be marginally more effective due to power, maneuverability and tow gear limitations, and timely towing is otherwise inhibited by a policy that gives priority to private salvage contractors. Petitions to USCG administrators for increased availability of vessels, improved towing equipment packages and immediate rescue operations should be pursued.

- Towing vessels of sufficient power and maneuverability, (tugs >175 tons bollard pull with maneuvering thrusters), are available for acquisition from outside the region but design and construction of purpose-built salvage tugs utilizing Voith Schneider Propulsion would be prudent due to the need for extreme maneuverability as a safety consideration during towline attachment in the very severe sea states common in the Aleutians. One of these tugs would have to be stationed at Unimak Pass and Shemya to timely respond to large ships passing through the islands and a third tug would have to be stationed mid-Chain, around Adak or Atka, unless Great Circle Route traffic could be re-routed more than 200 nm from any lee shore. Participation in the administrative review process for area contingency plans, petitions to USCG and ADEC administrators, and a concurrent legislative effort for funding and deployment of these tugs should be pursued.

- Timely detection of disabled ships and reliable traffic routing capability depends on the ability of the USCG to identify and track vessels well beyond the transmission range of
radar and Automatic Identification Systems, (AIS). Transmission of vessel position and course over satellite communications systems could remedy this vessel tracking problem but would require new legislation that would need to be carefully crafted to conform with Law of the Sea provisions. An expanded system of AIS transponders in Aleutian passes used in conjunction with direct satellite observations over the whole Aleutian Chain would bypass the need to regulate international traffic but a legislative mandate and appropriation would be necessary to effectuate this observation and traffic control system. Modification of international shipping protocol, through IMO procedures or voluntary adoption of the tracking system would otherwise be necessary.

- Depletion of the Oil Spill Liability Trust Fund, (OSLTF), assets may impair the ability to fund assets for the Aleutian Subarea Contingency Plan and so legislative reinstatement of the 5 cent per barrel tax is advised. An additional legislated tax on non-oil vessel cargo would provide for a more equitable distribution of the costs incurred due to spills from these cargo ships. Liability limits per vessel tonnage should be raised due to the stark differential between actual spill costs and present liability limits.

- Although both the USCG and ADEC grant vessels an innocent passage exemption from spill response regulations where the vessels are transiting U.S. or Alaskan waters in areas remote from their port of call, their regulations could well be interpreted to allow regulation in all U.S. waters for vessels that will, or have, visited a U.S. or Alaskan port, respectively. Petitions to agency administrators and concurrent clarifying legislation should be pursued to only allow the innocent passage exemption for vessels that never visit a U.S. or Alaskan port as a function of their transit through the EEZ, or minimally the territorial sea, surrounding the Aleutians. In other words, a federal Vessel Response Plan for the Aleutians should be required as a condition of visiting U.S. ports and a state contingency plan should be required as a condition of visiting an Alaskan port.

- UNCLOS clearly allows the flag state to regulate its flag vessels anywhere in the world. A petition to the USCG to require Vessel Response Plans for US flag vessels wherever they transit the U.S. EEZ is recommended.
Report on the Selendang Ayu Incident

Introduction

The tragic loss of life and large oil spill resulting from the grounding of the Selendang Ayu has garnered the attention of the environmental, native and fishing communities and mobilized their efforts to examine the circumstances of the incident and seek remedies to avert or mitigate the impact of potential similar future incidents. This report was commissioned by the Alaska Oceans Program to assess all relevant circumstances surrounding the spill and provide recommendations to the newly formed Safe Shipping Partnership to further corrective measures by the affected collective communities.

Much attention has been focused on the grounding, that is particularly troubling, because the ship’s engine was deliberately disabled in a building storm and the towing efforts of four responding vessels over the following two days were unsuccessful in preventing the grounding on the evening of December 8, 2004. Little attention has been focused upon the failed spill response because it is widely presumed that the severe weather at the time of the grounding, winds exceeding 60 knots and seas up to 35 feet, precluded any meaningful response efforts. The governmental agencies responsible for effective spill prevention and response, the United States Coast Guard, (USCG), and the Alaska Department of Environmental Conservation, (ADEC), have also attempted to deflect criticism of ineffective efforts on the premise that the Selendang Ayu was a foreign flag vessel in “innocent passage”, and was therefore exempt from regulatory requirements to pre-plan for effective spill prevention and response. Alaska’s Governor, the Honorable Frank Murkowski, has called for federal and state agency cooperation in assessing the risks presented by North Pacific vessel traffic in his 2005 State of the State Address. The

1 ADEC Situation Reports attached in Appendix A provide a wide range of spill related facts.
2 12/17/04 Anchorage Daily News-- Risks led to tragedy
3 ADEC Situation Reports, conversations with Capt. Davin Chief of USCG MSO 17th Dist. and Lt. Jerome MSO Anchorage
4 ADEC Situation Reports
5 Conversation with Dan Magone, Owner of the Salvage Tug Redeemer and rescue attempt observer, 12/11/03 Seattle Post Intelligencer-- Dramatic rescue of ship attempted in brutal seas, 12/9/04 Anchorage Daily News-- Rescue copter goes down
6 Conversations with Capt. Stanton Chief of MSO Commandant’s Office, Capt. Davin Chief of USCG MSO 17th Dist., Larry Dietrick ADEC Division Manager Spill Prevention and Response and Leslie Pearson ADEC Response Manager
7 State of State Address http://www.gov.state.ak.us/speeches.php?id=1497
National Transportation Safety Board and USCG are still investigating the incident and have yet to release final investigative reports on the matter\(^8\).

This investigation has revealed, however, that there is a broad underlying unwillingness of regulatory agencies to fully enforce oil spill regulations with respect to regulated vessels and facilities, nor have they properly equipped the governments’ regional spill response plans\(^9\) otherwise required for response to incidents associated with unregulated vessels such as the Selendang Ayu. The risks of spills from unregulated vessel traffic and unidentified sources is recognized in both federal and state statutes\(^10\) that require regional spill plans and create dedicated funds\(^11\) to pay for the costs of planning efforts and physical resources necessary to implement the regional plans when these spills occur. There are no public or private towing vessels in the Aleutians\(^12\) that could provide effective rescue towing of ships the size of the Selendang Ayu during storms and virtually all of the limited spill response assets in the region are designed for use in calm, low-current inland waters\(^13\). The responsible government agencies have, in effect, predestined the total failure of all spill prevention and response efforts unless the incident happens to occur under improbable extended calm weather conditions and at locations where ocean currents will not cause rapid drifting of the disabled vessel or spread of an oil spill.

**Incident Details**

The Selendang Ayu was a 73,000-DWT dry bulk freighter carrying soybeans from Seattle to Xaimen, China. The ship was built in 1998, was 738 ft. long, with a 106 ft. beam, 46 ft. draft and cost $29 million\(^14\). Exact factual details are still being sought, but the approximate course of events is recounted from various press and agency sources that often produced conflicting accounts of events. The Selendang Ayu left Seattle on November 28\(^{th}\) for a transit along the North

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\(^{8}\) Conversations with Capt. Davin Chief of USCG MSO 17th Dist. and Lt. Jerome MSO, FOIA responses

\(^{9}\) Review of Subarea Contingency Plan Resource List and multiple state contingency plans

\(^{10}\) AS 46.04.200 and 42 USC 9605 respectively


\(^{12}\) Tugs reported residing at Aleutian ports are all within the power range of the Sydney Foss that was dragged backwards by the Selendang Ayu, see Appendix H to the *West Coast Offshore Vessel Traffic Risk Management Project* and Table 7 in *Vessel Traffic in the Aleutians Subarea*, Nuka Research and Planning Group April 29, 2005

\(^{13}\) Equipment ratings provided in Chadux Technical Manual and Aleutians Subarea Contingency Plan

Pacific Great Circle Route that intersects the Aleutian Islands at Unimak Pass and a pass near Shemya Island during transits between the Pacific Northwest and Asia\textsuperscript{15}.

The ship’s progress was unusually slow due to a cracked cylinder lining in one of the six cylinders of the single main propulsion engine, which could operate with as few as four cylinders if necessary\textsuperscript{16}. Just after noon on December 6, 2004, the freighter’s Captain ordered the engine shut down to allow the crew to isolate the damaged cylinder from the drive train\textsuperscript{17}. The ship’s position at this point was more than 120 nm Northwest of Dutch Harbor with a building storm approaching from the Northwest and the lee shore of Unalaska Island\textsuperscript{18}. Although the damaged cylinder was quickly isolated, the engine failed to restart after the temporary repairs. The crew continued to attempt to restart the engine until the ship grounded more than two days later.

![Map of the Selendang Ayu Incident](image)

The Captain did not transmit a distress call and only contacted the Harbormaster at Dutch Harbor to request towing assistance sometime after 1 AM on the morning of December 7\textsuperscript{19}. The Harbormaster informed the USCG of the drifting ship at about 3:30 AM and either the Coast Guard and/or the Captain of the Selendang Ayu arranged for a tug, the Sydney Foss to render assistance. The Sydney Foss is a relatively small ocean tug, 132 ft. long with 3,000 hp driving

\textsuperscript{15} Vessel Traffic in the Aleutians Subarea, Nuka Research and Planning Group April 29, 2005
\textsuperscript{16} 12/18/05 Seattle Post Intelligencer-- Questions arise over freighter's engine troubles
\textsuperscript{17} Ibid.
\textsuperscript{18} 12/17/04 Anchorage Daily News-- Risks led to tragedy
\textsuperscript{19} Ibid.
twin conventional propellers\textsuperscript{20}. The tug did have a line-throwing gun to assist in passing a towline for emergency towing operation in severe weather. It was in the Dutch Harbor area on its normal commercial duty of barge towing and did not leave Dutch Harbor until 10 AM after securing its barge. The Coast Guard, in the meantime, diverted the Cutter Alex Haley from its Bering Sea patrol at 5 AM. The Alex Haley was a former Navy salvage vessel converted to Cutter operations and is 283 ft. long, with 6,800 hp engines driving twin conventional propellers\textsuperscript{21}. The Alex Haley was equipped with a line-throwing gun and emergency-towing hawser. Although the Alex Haley arrived on scene first\textsuperscript{22}, it is established USCG policy not to displace private response efforts\textsuperscript{23}, so its earlier interception of the ship would not have altered the sequence of events. The Alex Haley did not even attempt to pass a towline until grounding was imminent on the afternoon of December 8\textsuperscript{th}\textsuperscript{24}. An offer to transfer Coast Guard personnel to the ship for assistance in restarting the engine was proffered but rejected by the Captain of the Selendang Ayu.

By the time the Sydney Foss intercepted the drifting Selendang Ayu at about 7-8:30 PM on Tuesday the 7\textsuperscript{th}, the weather had deteriorated to 20-25 ft seas but with an extraordinary feat of seamanship the tug was able to successfully attach a wire towline using the line-throwing gun to first pass a messenger line from the second deck of the tug. The tug, however, was severely underpowered for towing this large of a ship in these conditions and was therefore unable to turn the ship into the wind and only succeeded in slowing the ship’s drift rate from four knots down to two knots. The Selendang Ayu continued to drift towards the shoreline Unalaska Islands, pulling the Sydney Foss backwards, until the towline finally broke at about 7 AM on Wednesday December 8\textsuperscript{th}\textsuperscript{25}.

Late on the evening of December 7\textsuperscript{th}, two additional towing vessels were dispatched from Dutch Harbor, the 100 ft. long, 4,300 hp harbor tug James Dunlop and the 132 ft. long, 1,550 hp salvage vessel Redeemer\textsuperscript{26}. Neither of these vessels was designed for safe deck operation in the severe 30 ft. seas and 60-knot winds that had developed by the time that they were able to

\textsuperscript{20}Appendix H to the \textit{West Coast Offshore Vessel Traffic Risk Management Project}
\textsuperscript{21}Specifications from the Cutter Alex Haley Website \url{http://www.uscg.mil/pacarea/haley/noframes/shipinfo.html}
\textsuperscript{22}12/17/04 Anchorage Daily News-- Risks led to tragedy
\textsuperscript{23}Alaska Unified Plan
\textsuperscript{24}Conversations with Capt. Davin Chief of USCG MSO 17\textsuperscript{th} Dist. and Lt. Jerome MSO
\textsuperscript{25}12/9/04 Anchorage Daily News-- Rescue copter goes down
\textsuperscript{26}Conversation with Dan Magone owner of the Redeemer
intercept the drifting ship nor did they have line-throwing guns to assist in towline transfer if they could manage to safely deploy crew on deck. Both skippers decided not to attempt a tow due to weather related safety hazards\textsuperscript{27} and neither vessel could individually tow the Selendang Ayu because of a lack of sufficient horsepower even if a towline could have been attached to the ship. These vessels continued to stand by the ship in the event that their assistance in rescue of the crew from the sea was necessary.

Just before noon on the 8\textsuperscript{th}, the ship drifted into relatively shallow water a few miles off of Spray Cape so the Captain deployed his first anchor\textsuperscript{28}. This anchor held temporarily but the anchor chain broke within a half hour sending the ship adrift again. At about 3 PM the second anchor was deployed\textsuperscript{29} and it appeared to hold but the Alaska Marine Exchange, which had been contracted by the Coast Guard to remotely track the Selendang Ayu using the ship’s satellite communications system, notified the Cutter Alex Haley that the ship was indeed dragging its

\textsuperscript{27} 12/11/03 Seattle Post Intelligencer-- Dramatic rescue of ship attempted in brutal seas, conversation with Dan Magone
\textsuperscript{28} 12/12/04 Anchorage Daily News-- Tug's crew witness to tragedy
\textsuperscript{29} Ibid.
Two Coast Guard helicopters arrived on scene, (a HH-60 Jayhawk and a HH-65 Dolphin), and by 2:30 PM had airlifted 18 of the ships 26 crewmembers to safety. The eight remaining crewmembers continued to restart the ship’s engine. The ship continued to periodically drag its anchor and at some point the Cutter Alex Haley did attempt to attach a towline but the messenger line delivered by the line-throwing gun broke during towline transfer and no further attempts to pass the towline were made because the Captain of the Cutter feared his vessel was in danger of grounding itself.

If the Alex Haley had been successful in attaching its towline, it is quite possible that the combined towing power of the Cutter and the holding force of the anchor would have held the ship in position and averted the grounding. It is questionable whether the Cutter by itself could have generated enough power to prevent the ship from drifting to ground, but the minimal strength and durability of its towline would have likely caused a towline failure if the Cutter had been required to maintain its tow in the severe sea conditions over several hours. The ship finally grounded at about 6 PM and at 6:20 PM the Jayhawk helicopter evacuating six of the last eight crewmembers crashed after sea spray from the ship’s bow was ingested into the helicopter engine intake. The Dolphin helicopter rescued the four Coast Guard aircrew but the six ship’s crewmen aboard the Jayhawk were lost at sea. The Selendang Ayu broke in half at about 7:14 PM releasing 40,000 gallons of heavy fuel from its center fuel tank. The Captain of the Selendang Ayu and a Coast Guard airman was still aboard the bow of the vessel but were rescued by the Dolphin by 8:30 PM. Frequent storms continued to batter the grounded halves of the ship, successively breaching additional fuel tanks and eventually completely sinking the bow section by 12/24/04. Underwater video of the bow section taken by a Remotely Operated Vehicle in January revealed that the bottom of the bow section had been crushed, thereby insuring that the 176,000-gallon fuel tank at the keel of the bow section was fully breached and all of its persistent oil released.

The ship eventually released at least 321,000 gallons of IFO 380 and more than 14,600 gallons of diesel and other oils for a total of more than 335,000 gallons, making this the largest in Alaska.

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30 Conversation with Capt. Ed Page Executive Director Alaska Marine Exchange
31 Conversation With Capt. Davin Chief of USCG MSO 17th Dist.
32 ADEC Situation Reports
33 Ibid.
34 Ibid.
35 Conversation with Leslie Pearson ADEC Response Manager
spill since the Exxon Valdez Oil Spill in 1989. Approximately 140,000 gal. of fuels, (125,000 gal. of IFO 380 and 17,000 gal. of diesel), were considered successfully lightered from the grounded ship between 1/4/05 and 2/15/05. Significant oil slicks were reported emanating from the stern section of the wreck into March, well after lightering operations were completed. Light oil slicks continue to emanate from the stern section of the ship.\(^{36}\)

Although none of the spilled oil was contained, intercepted or recovered on water, more than 125,000 bags of oily waste has been recovered from area beaches, constituting a combined volume of 1,407 cubic yards. The spilled oil has been reported as drifting hundreds of miles from the wreck impacting many shorelines along the way on 800 identified beach segments totaling 469 miles with varying degrees of oiling. Shoreline Cleanup Assessment Technique teams, (SCAT teams), have surveyed 343 miles of shoreline divided into 610 beach segments as of May 26, 2005. Two hundred seventy three miles of shoreline divided into 488 segments have been designated as needing no further treatment. Seventy-one miles of shoreline divided into 122 segments have been designated as requiring additional oil removal.\(^{37}\) Cleanup is expected to continue on many of these beaches until next winter. Spill recovery costs have exceeded $49 million to date and are expected to approach $100 million.\(^{38}\) Wreck removal operations are expected to commence in July and would incur significant costs independent of spill cleanup that has been estimated to cost between $70 and $100 million for total wreck removal.\(^{39}\) The combined costs could approach $200 million with approximately $75 million paid to IMC Shipping as a public subsidy of cleanup costs paid by IMC above its $24 million liability limits and subject to claim from the Oil Spill Liability Trust Fund. The costs of wreck removal, mandated by state authorities, is not qualified for reimbursement from OSLTF as spill removal costs.

More than 1,600 dead, oiled birds and 6 dead oiled marine mammals have been recovered. An additional 781 oiled birds and 18 oiled mammals were observed. Twenty-nine live oiled birds were captured but only 10 were cleaned and released. Commercial and subsistence halibut,

\(^{36}\) ADEC Situation Reports
\(^{37}\) Unified Command Press Release
\(^{38}\) 6/4/05 Anchorage Daily News-- State seeks (Selendang Ayu) shipwreck's removal, conversation with Leslie Pearson ADEC Response manager
\(^{39}\) Ibid.
ground fish and crab fisheries in adjoining bays and nearby offshore waters have been canceled due to the severe threat of oiling and the area remains closed to vessel traffic. At least 11 anadromous fish streams, (salmon spawning streams), were heavily oiled despite efforts to protect sensitive areas with boom to deflect oil slicks\textsuperscript{40}. Dozens of bird and marine mammal species in the area have been threatened by the spill, (including endangered, threatened and declining species), and the actual numbers of animal deaths are expected to be well above the numbers reported. Extraordinary measures were undertaken to insure that fishing vessels returning from the rich crab and Pollack fisheries of the Bering Sea and fish processors in Dutch Harbor did not contaminate their catches by ingesting contaminated seawater into their process water intakes\textsuperscript{41}. A natural resource damage assessment commissioned by the National Pollution Fund Center is still underway. Total costs for spill response, wreck removal, commercial fishing and subsistence losses and resource damages are expected to exceed $100 million, but the liability of the ship’s owner is limited to about $24 million unless the spill is found to be caused by criminal action or gross negligence.

Regional Resources at Risk from Spills

The entire Aleutian Chain includes lands that are part of the Alaska Maritime National Wildlife Refuge administered by the U.S. Fish and Wildlife Service. The Refuge hosts an estimated 40 million seabirds constituting 80% of the population in North America and includes the endangered Aleutian Albatross and the threatened Speckled and Steller’s Eiders\textsuperscript{42}. Other avian species include: Eagles, Auklets, Murres, Cormorants, Puffins, Geese, Terns, Petrels, Gulls, Eiders, Murrelets, Loons, Guillemots, Kittiwakes, Mergansers, and numerous other diving sea ducks. Many marine mammals either reside or migrate through the area and include the endangered Steller Sea Lion and the rapidly declining Sea Otter that has been proposed for listing. Killer Whales, Harbor Seals, Northern Fur Seals and porpoise reside in the area and most other Pacific whales migrate through the area. The Bering Sea and North Pacific fisheries in the region are the most productive fisheries in North America and among the largest worldwide. The valuable commercial and subsistence species include salmon, halibut, pollock, crab, cod, mackerel, herring, rockfish and flounder. The value of the cod and pollock fisheries alone is about

\textsuperscript{40} Unified Command Pres Release
\textsuperscript{41} Ibid.
\textsuperscript{42} U.S. Fish and Wildlife Service Alaska Maritime National Wildlife Refuge Website
\url{http://refuges.fws.gov/profiles/index.cfm?id=74500}
$1.5 billion annually\textsuperscript{43}. Most of the terrestrial mammals, like the area’s residents, subsist on species collected in the inter-tidal zone. Subsistence fishing and gathering by the area’s residents has strong cultural roots and provides a necessary supplement to very expensive imported food.

The area contains many types of habitats designated for exceptional protection measures including: National Wilderness Areas, National Wilderness Study Areas, Wild and Scenic Rivers, National and State Wildlife Refuges, National and State Parks, and National and State Forests or other multiple use areas\textsuperscript{44}. There are significant land holdings by Alaska Native Corporations with additional lands to be transferred pursuant to the Alaska Native Claims Settlement Act. There are also limited municipal and private properties scattered throughout the region\textsuperscript{45}. There are rich archeological resources and historic cites from more than 9,000 years of Native Alaskan communities residing along the Aleutian Island shorelines.

\textsuperscript{43} Vessel Traffic in the Aleutians Subarea, Nuka Research and Planning Group April 29, 2005

\textsuperscript{44} U.S. Fish and Wildlife Service Alaska Maritime National Wildlife Refuge Website http://refuges.fws.gov/profiles/index.cfm?id=74500

\textsuperscript{45} Aleutians Subarea Contingency Plan

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One of 15 Most Environmentally Sensitive Area Maps

(Primary Aleutian fishing grounds, excerpted from *Vessel Traffic in the Aleutians Subarea*, Nuka Research and Planning Group April 29, 2005)
Regulatory Environment

There are many potential sources of catastrophic oil spills along the Aleutians with each source having its own type of associated oil product in widely varying quantities. Persistent oils that float on water, such as crude oil and the refined products with complex hydrocarbon chains, (residual oil, Bunker C, IFO 380, and other heavy fuel oils), are considered the most damaging. They do not easily disperse in the water column or quickly evaporate\(^{46}\), leaving the majority of the spill on the surface to drift long distances while disrupting fisheries, contaminating animals and fouling shorelines along the way. These complex hydrocarbons also biodegrade very slowly creating long-term adverse effects on the entire marine ecosystem food chain\(^{47}\). The less complex refined products, (gasoline, aviation fuel, diesel, etc), are actually more acutely toxic to marine life but a large percentage of the product quickly evaporates and most of the remaining spill tends to disperse in the water column with a little wave action, removing most of the impact from direct observation and allowing for dilution of harmful effects if the water column is deep enough and

\(^{46}\) Vessel Traffic in the Aleutians Subarea, Nuka Research and Planning Group April 29, 2005

\(^{47}\) Sound Truth and Corporate Myths, Dr. Riki Ott
mixing thorough. Spill prevention and response regulations are very complex documents with state and federal requirements varying widely depending upon the type of oil, the amount of oil, and whether the oil is tank vessel cargo, non-tank vessel fuel or stored in a shore-side tank farm.\textsuperscript{48} In general, regulations are most demanding for tank vessels carrying persistent oil cargo and are progressively less demanding for tank vessels carrying non-persistent cargo, non-tank vessels using persistent fuel and then non-persistent vessel fuel.

These extensive regulations are not directly applied to the thousands of annual Transpacific vessel transits threatening the Aleutians due to the “innocent passage” exemption to regulation. “Innocent passage” is a central issue raised by regulators in consideration of any or all of the suggested corrective measures. The argument is that the United Nations Convention on the Law of the Sea, (UNCLOS), limits the options for any nation to regulate non-military foreign flag vessels when they are simply transiting a seaway for the purpose of international trade. Hence the term of art “innocent passage” was developed to describe this particular exemption from regulation that is used to preclude requirements for bonds to secure financial responsibility, the planning for oil spill prevention and response, and funding of appropriate assets to implement the plans. The Selendang Ayu did have a Certificate of Financial Responsibility and a Vessel Response Plan with a contracted Oil Spill Response Organization, but only for the Puget Sound area, where it entered a U.S. port.

The issue of “innocent passage” is a “Red Herring” for several reasons, but primarily because both federal and state law, 42 USC 9605 and AS 46.04.200 respectively, require the respective government pollution agencies to cooperate in formulation of regional area contingency plans that must be designed to plan and effect spill prevention and response actions for unregulated or unidentified spill sources consistent with those plans constructed for regulated vessels and facilities. Both the USCG and ADEC were legislatively provided dedicated funds, primarily derived from taxes on oil imports and/or domestic oil production, to pay for spill planning and response efforts, including efforts to prevent imminent spills, (the Oil Spill Liability Trust Fund, OSLTF, and the Oil & Hazardous Substance Release Prevention and Response Fund, OHSRPRP, respectively). Thus, any inability to require the vessel owner to plan for the Selendang Ayu incident with pre-positioned appropriate assets was directly transferred to the

\textsuperscript{48} Alaska Oil Spill Regulations 18 AAC 75.430-.443
USCG and ADEC in the *Aleutians Subarea Contingency Plan for Oil and Hazardous Substances Discharges/Releases* as a subset of the *Unified Plan for the State of Alaska*.

The regulatory agencies were well aware of the international vessel traffic through the Aleutians\(^{49}\) but failed to plan for, or acquire appropriate assets to timely respond to the threatened and actual spill largely due to lobbying pressure from the oil industry not to seek access to the dedicated funds, which upon depletion below established size caps could result in additional taxation of their industry. The OSLTF size cap was set at $1 billion and the legislation included a sunset clause that eliminated the tax at the end of 1994\(^{50}\). The Fund was able to maintain adequate funds to implement its numerous uses but the recent report from the Fund administrator indicated that monies will be depleted to the extent that by 1997 various competing uses of the Fund will be in conflict and that the Fund may be totally depleted by FY 2009. The OHSRPRP has a size cap of $50 million with no equivalent sunset clause. The USCG and ADEC, administrators of these funds, both claim that access to these monies for oil spill prevention and response assets is controlled by legislative appropriation and although the issue is not entirely clear, neither agency has appropriately assessed needed assets nor sought legislative appropriations for the full complement of assets needed to prevent and respond to spills from unregulated sources.

Moreover, the UNCLOS provisions limiting regulation of innocent passage vessels is not comprehensive and explicitly allows for protection of natural resources in all waters under the jurisdiction of nations, including out to 200 nm in their Exclusive Economic Zones\(^{51}\) and most definitely within the 12 nm territorial sea\(^{52}\), so long as those environmental regulations do not affect the construction of the vessel, its manning, or onboard equipment above and beyond that required by international standards such as 1974 International Convention on Safety of Life at Sea, (SOLAS) and the 1973/78 International Convention for the Prevention of Pollution from Ships, (MARPOL). Many federal and state regulations, including some oil spill and safety regulations, take advantage of this exemption requiring a multitude of restrictions upon international vessels operating anywhere in the U.S. EEZ. Some of the reluctance to apply the full panoply of spill regulations may be attributed to the language of the Oil Pollution Act of 1990.

\(^{49}\) Aleutians Subarea Contingency Plan  
\(^{50}\) Report on the Implementation of the Oil Pollution Act of 1990 CGMTA 2004  
\(^{51}\) UNCLOS Article 211.5  
\(^{52}\) UNCLOS Article 211.4
(OPA 90), that restricts its effect to the territorial sea defined as extending only 3 nm from shore, but even the jurisdiction for tank vessel spill regulations is defined as 12 nm by a 1988 Presidential Proclamation. USCG casualty notification requirement extend throughout the EEZ for tank vessels and throughout the 12 nm territorial sea for foreign flag non-tank vessels. The vessel flag state may regulate its flag vessel however it chooses and U.S. flag vessels must: have a spill plan everywhere; contract for spill prevention and response throughout the EEZ; notify the USCG of casualties suffered worldwide. Unfortunately, the USCG has indicated that it does not fully regulate U.S. flag vessels throughout the EEZ in order to avoid placing them at a competitive disadvantage with respect to the unregulated foreign flag vessels.

It is abundantly clear that neither the USCG nor ADEC is fully enforcing its regulations for those vessels/facilities that are indisputably within their jurisdiction. Improving the spill prevention and response assets for the regulated vessels/facilities to the mandated levels could improve response capability for all incidents where the primary regional response organization, Alaska Chadux Corporation, has donated its assets to the area contingency plan and regulators could otherwise require the responsible party to utilize the available superior equipment. Specific deficiencies in spill prevention and response capability will be discussed in detail in latter sections dealing with individual problems and solutions but the aforesaid circumstances indicate that the underlying cause of these deficiencies in public and private spill response is political pressure exerted by the regulated and taxed industries upon the regulators and legislatures to illegitimately minimize both the private and public costs of established spill prevention and response requirements. This is not to say that existing requirements would effectively or fully mitigate spill damage and that improvement of applicable laws is not necessary, but only that there is a corrosive underlying dereliction of duty that substantially impedes enforcement of laws that would substantially reduce the number of spills and damage there from.
Potential Oil Spill Sources

Although exact data on vessel traffic and the ports of origin and destination is not available, the annual Transpacific traffic through the Aleutians has been estimated at about 2,700 vessels transits per year or about 230 per month\textsuperscript{57}. These vessels enter the Bering Sea either at Unimak Pass or a pass in the vicinity of Shemya Island. It is suggested that the most traffic serves ports in Puget Sound with lesser amounts of trading with Oregon/Columbia River, Vancouver, B.C. and Alaska, but again these are only gross estimates\textsuperscript{58}. Some of the traffic entering the Bering Sea is trading at ports further south, particularly in the winter when ships divert North of the Aleutians to avoid the more severe winter storms in the North Pacific. Some traffic from the Southern ports, the San Francisco Bay Area and L.A./Long Beach and even the Panama Canal, transit the Bering Sea because their destination is on the Northern Asian Coast.

\textbf{Traditional Great Circle Routes}

\begin{figure}
\centering
\includegraphics[width=\textwidth]{Traditional_Great_Circle_Routes.png}
\caption{Figure 5: Major Ship Routes in the North Pacific Ocean}
\end{figure}

\begin{itemize}
\item 1. Panama to Vladivostok and return
\item 2. Seattle to Yokohama and return
\item 3. Seattle to Yokohama
\item 4. Yokohama to Seattle
\item 5. San Francisco to Yokohama and return
\item 6. Seattle to Yokohama, Low-power Steamers (April, May, and October)
\item 7. Seattle to Yokohama, Low-power Steamers (November to March)
\item 8. Seattle to Yokohama, Low-power Steamers (Alternate Route, November to March)
\item 9. Yokohama to Honolulu
\item 10. Honolulu to Yokohama
\item 11. Honolulu to Manila and return
\item 12. Honolulu to Panama and return
\item 13. Honolulu to San Francisco and return
\item 14. San Francisco to Yokohama
\item 15. Honolulu to Nome and return
\end{itemize}

\textit{(Excerpted from \textit{West Coast Offshore Vessel Traffic Risk Management Project Final Report 7/2002})}

\textsuperscript{57} \textit{Vessel Traffic in the Aleutians Subarea}, Nuka Research and Planning Group April 29, 2005
\textsuperscript{58} Ibid.

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Most vessel traffic from Southern Ports to central Asia travel a Great Circle Route that closely approaches the Aleutians on the southern most arch of the Chain. This traffic still presents a significant threat to the Aleutians because North Pacific storms create wind and currents that could drive oil spills Northward into the Aleutians. The volume of the traffic approaching the Aleutians on the South side has not been quantified in any study but it is estimated to greatly exceed the 2,700 vessel transits through the Aleutians because the traffic at the more Southern ports, (San Francisco, Oakland, and Los Angeles/Long Beach which handles one third of all U.S. cargo traffic and is the busiest U.S. port), is much greater than at any of the more Northern ports. These West Coast port traffic patterns could radically shift to present a much greater threat to the Aleutians as ports in China and Russia follow an increasing trend of handling more traffic. The increasing risk of a truly catastrophic persistent oil spill must be recognized with the increasing production and export of Russian Far East crude oil. Russian production at Sakhalin is rapidly expanding and a Russian pipeline to the Sea of Japan is slated for construction.

(North Pacific Great Circle Route drawn as a straight line on a Gnomonic Projection map, excerpted from Vessel Traffic in the Aleutians Subarea, Nuka Research and Planning Group April 29, 2005)
Of the approximate 2,700 vessel transits through the Aleutians, 30 to 40 estimated to be tankers that may carry persistent oil cargo and fuel\textsuperscript{62}. The annual volume of this traffic estimated in a 1991 report was as much as 800 million gallons\textsuperscript{63}. These tankers present the greatest single threat of an enormous spill and would be subject to the most specific and demanding regulations, but they presently escape virtually all regulatory requirements under “innocent passage” exemptions. There is an established trade of crude oil from Sakhalin to U.S. ports and a refined product trade both ways that includes export of residual oil from Cook Inlet. There are no restrictions on crude oil traffic traveling west from Cook Inlet with its residual and refined oil traffic. Many other tankers escape regulation by being granted innocent passage for their transits just South of the Aleutians on their trips to Southern ports and even U.S. flag tankers sailing from Valdez, Alaska with crude oil produced on Alaska’s North Slope are exempted by staying just South of the 200 nm limit of the Exclusive Economic Zone\textsuperscript{64}. If state regulations applied to these tankers carrying persistent oil, spill recovery requirements could demand the ability to recover as much as 12.6 million gallons of oil within 72 hours and all of this equipment would have to be pre-positioned in the Aleutians Region of Operation\textsuperscript{65}. Since these are unregulated vessels, the Aleutians Subarea Plan should reflect the capability to undertake the same level of response.

\begin{itemize}
\item \textsuperscript{62} \textit{Vessel Traffic in the Aleutians Subarea}, Nuka Research and Planning Group April 29, 2005
\item \textsuperscript{63} Ibid.
\item \textsuperscript{64} 15 CFR 754.2(j).
\item \textsuperscript{65} Alaska Regulations 18 AAC 75.438
\end{itemize}
Tankers carrying as much as 5 million gallons of non-persistent fuel as cargo\textsuperscript{66} and using several hundred thousand gallons of persistent fuel do visit Aleutian ports and are regulated, but neither the USCG or ADEC have fully enforced their regulations with respect to these vessels. About 300 million gallons of non-persistent fuel is annually delivered to Aleutian ports or through Aleutian passes in about 45 transits of tankers and tank barges towed by tugs\textsuperscript{67}. All of these tank vessels have been granted Agreements for Alternative Compliance by the USCG that allows them to operate with substandard Vessel Response Plans that requires no emergency towing capability, no immediately available lightering capacity and only requires spill response equipment suited for calm, current-free waters\textsuperscript{68}. Although no similar exemption from state regulations has been formally granted, state regulators have simply ignored full enforcement of regulations requiring lightering capability, response equipment that is appropriate and reliable for the environmental conditions and the best technology for stopping the spill at its source and tracking the oil spill. The state also avoids requiring spill prevention measures for those times that spill response equipment can not effectively or timely recover spills in all but two response plans.

\begin{figure}[h]
\centering
\includegraphics[width=\textwidth]{diagram.png}
\caption{Primary traffic routes for tank vessels visiting Aleutian ports, excerpted from \textit{Vessel Traffic in the Aleutians Subarea}, Nuka Research and Planning Group April 29, 2005}
\end{figure}

\textsuperscript{66} Conversation with Robert Ballesteros ADEC Vessel Contingency Plan Section
\textsuperscript{67} \textit{Vessel Traffic in the Aleutians Subarea}, Nuka Research and Planning Group April 29, 2005
\textsuperscript{68} Agreement for Compliance for Tank Barge Transport of Nonpersistent Oil in Alaska revised in 2003 by the Alaska Petroleum Distributors and Transporters and communications with Captain Ed Stanton USCG Chief of MSO
The tank vessels visiting the Aleutian ports must necessarily offload their cargo to shore side tank farms, which actually have more stringent response requirements than non-persistent tank vessels that are likewise not fully enforced. The largest of these tank farms is at Adak with a capacity of nearly 20 million gallons. The second largest is at Shemya with a capacity of 6 million gallons, and smaller storage tanks in the range of 1 million to 4 million gallons are scattered throughout the Islands at ports. As with vessel response plans, the equipment dedicated to these facilities is wholly inadequate for ocean response, much less the severe ocean environment of the Aleutians. The primary justification for allowing the reduction of response standards is that requiring full compliance would be economically infeasible, but some of these tank farms are owned and operated by the U.S. government, (Eareckson Air Force Base, Shemya and other bases surrounding the region including the USCG Base at Kodiak), that certainly could not claim economic privation and should meet or exceed regulatory requirements.

Large container ships represent the bulk of the Transpacific traffic and present the greatest threat next to the large tankers due to the great quantities of persistent fuel needed for propulsion. There are about 1,600 container vessel transits annually through the Aleutians and many more that closely approach the Aleutians on the Southern shores. The largest of the container ships transiting through the Aleutians carries 2.75 million gallons of persistent fuel, but ships from the more Southern ports are generally larger and may carry more fuel. Container ships and tankers are typically the largest ships on the route and would require the most powerful rescue towing tugs to prevent groundings. Some of the container, refrigerated and passenger ships visit Aleutian ports and vessels over 400 tons are therefore subject to Alaska Non-tank Vessel Regulations and the USCG equivalent under 2004 legislation requiring such plans by August 6, 2005. Alaska Non-tank Vessel Regulations are much less stringent than tank vessel regulations and enforcement is lax. The USCG has given notice to vessel operators larger than 300 tons that tank vessel regulations now apply to non-tank vessels, but it will not enforce the mandated non-tank regulations.

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69 Alaska Regulations 18 AAC 75.432
70 Review of equipment lists from Aleutian tank farms and Chadux Tech Manual, conversations with Bob Dreyer Tank Farm Contingency Plan Manager
71 Communications with Captain Ed Stanton USCG Chief of MSO
72 Ibid.
73 Vessel Traffic in the Aleutians Subarea, Nuka Research and Planning Group April 29, 2005
74 Alaska Regulations 18 AAC 75.441, .443
75 NVIC 01-05
76 Alaska Regulations 18 AAC 75.430-.443
vessel law until it writes new regulations specific to non-tank vessels. The USCG is still refining critical aspects of its tank vessel regulations 14 years after they were to be fully

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77 Communications with Captain Ed Stanton USCG Chief of MSO Report on the Selendang Ayu Incident Parker Associates Inc. 6/6/05
effective and wavers may be granted, as in the case of the tank vessels, despite the vastly increased number of vessels that could more effective and wavers may be granted, as in the case of the tank vessels, despite the vastly increased number of vessels that could more widely distribute the total cost of mutually available response assets.

There are a few passenger vessels that visit Aleutian ports, but these are significant in that some carry large quantities of persistent fuel and are of such size as to require powerful towing vessels to rescue the many passengers and to prevent spills.

(Passenger vessels transiting the Aleutians, excerpted from *Vessel Traffic in the Aleutians Subarea*, Nuka Research and Planning Group April 29, 2005)

There are 277 local and North Pacific fishing vessels using the area that exerted 3,000 vessel weeks of fishing effort in 2004. Although this represents a significant presence, these vessels typically carry a relatively small quantity of non-persistent fuel.

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78 Conversations with Lt. Reed Kohberger Tank Vessel Regulations Section Office of the Commandant
79 Conversations with Lt. Reed Kohberger Tank Vessel Regulations Section Office of the Commandant
80 *Vessel Traffic in the Aleutians Subarea*, Nuka Research and Planning Group April 29, 2005
There were 460 vessel casualties reported to the USCG in the Aleutians area that affected the safe navigation of vessels between June 1990 and March of 2005. U.S. flag vessels reported 415 of these and foreign flag vessels reported 45. The foreign flag incidents are suspected as grossly under-reported because casualty reporting is only required in the territorial sea and

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potentially for suspect motives. A summary of these serious incidents is summarized in the tables below.

<table>
<thead>
<tr>
<th>Initial Event</th>
<th>Number of Vessels</th>
<th>Secondary Events</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allisions (collision with fixed structure)</td>
<td>6</td>
<td>One vessel experienced subsequent flooding and material failure</td>
</tr>
<tr>
<td>Collisions between vessels</td>
<td>9</td>
<td>Two vessels had subsequent spills. One vessel reported subsequent material failure</td>
</tr>
<tr>
<td>Fire</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Flooding</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Grounding</td>
<td>9</td>
<td>Two groundings resulted in an oil spill. One grounding reported flooding and an oil spill.</td>
</tr>
<tr>
<td>Loss of Maneuverability</td>
<td>16</td>
<td>One reported an allision due to loss of steering. One vessel (Kuroshima) suffered subsequent grounding, fertility, oil spill. This data does not capture the loss of the M/V Selendang Ayu in December 2004.</td>
</tr>
<tr>
<td>Material Failure</td>
<td>2</td>
<td>One vessel sank and spilled oil, likely due to hull failure or deterioration of through-hull fittings</td>
</tr>
<tr>
<td>Total, Aleutians Subarea</td>
<td>45</td>
<td></td>
</tr>
<tr>
<td>Total, Alaska waters</td>
<td>186</td>
<td></td>
</tr>
</tbody>
</table>

Source: U.S. Coast Guard, Marine Safety Information System database.

(U.S. flag vessel casualties affecting seaworthiness between 9/12/91 and 10/28/04 excerpted from *Vessel Traffic in the Aleutians Subarea*, Nuka Research and Planning Group April 29, 2005)
### Recent Serious Spill and Potential Serious Spill History
Compiled from ADEC and USCG Records

<table>
<thead>
<tr>
<th>Date</th>
<th>Incident</th>
</tr>
</thead>
</table>
| 5 March 1981      | M/V DAE RIM, Atu Island
110,000 gallons of number 2 fuel oil                                    |
| 8 December 1986   | F/V Jamie Lynn, St. Paul Island
3,000 gallons of diesel                                                  |
| 10 December 1986  | Alaska Islands National Wildlife Refuge, Adak Island
27,000 gallons of JP-5                                                   |
| 9 February 1987   | F/V FUKUYOSHI MARU #86, Bering Sea between Unalaska and Pribilof Is.
Major fire, potential 66,000 gallons of diesel; 1,500 gallons of lube oil |
| 20 March 1987     | F/V ALL ALASKAN, St. Paul Island
Potential 140,000 gallons of diesel                                      |
| 11 May 1987       | Tank Vessel, North of Unimak Pass
2,674 gallons of diesel released in the water                            |
| 3 November 1988   | F/V CITY OF SEATTLE, Crescent Bay, Atka Island
10,000-12,000 gallons of gasoline                                         |
| 3 December 1988   | F/V OPTY, Shemya Island
16,000 gallons of diesel; 1,000 gallons of hydraulic oil; 400 gallons of lube oil |
| 10 December 1988  | M/V AOYAGI MARU, Lost Harbor, Atka Island, Alaska
Potential 78,000 gallons of Bunker C and 3,250 gallons of lube oil; 32,000 gallons of diesel released |
| 26 December 1988  | Tank Barge 283, East of Shumagin Islands, Alaska
2,041,662 gallons of diesel released into the water                       |
| 17 January 1989   | Tank Barge FOSS 236, Amchitka Island
84,000 gallons of diesel                                                  |
| 20 February 1989  | M/V YARD ARM KNOT, St. Paul Island
3,500 gallons diesel, with potential release of 97,000 gallons of diesel |
| 15 October 1989   | F/V POLAR COMMAND, Islands of Four Mountains
Several thousand gallons of diesel, with potential release of 30,000 gallons of diesel, 600 gallons of lube oil, and 150 gallons of hydraulic fluid |
| 2 February 1990   | F/V PAVLOF, St. Paul Island
Small amounts of hydraulic fluid released in the water                    |
| 22 April 1991     | M/V PRINCE WILLIAM SOUND, Dutch Harbor
Near spill, release potential of 133,000 gallons of diesel, plus oxy/acetylene/ammonia bottles |
| 13 August 1991    | F/V GREENHOPE, Atka Island
3,000 gallons of diesel pumped onboard to maintain stability              |
| 23 August 1991    | M/V SEA JADE, Dutch Harbor
Near spill, release potential of 276,300 gallons of IFO and 45,435 gallons of diesel |
| 4 September 1991  | F/V JUSTIN TIME, Cold Bay
250 gallons of diesel and 5 gallons of hydraulic fluid released           |

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Problems and Potential Solutions for Spill Prevention

The events and circumstances surrounding the grounding of the Selendang Ayu suggest there were several questionable decisions and/or equipment inadequacies that, if corrected, could have otherwise averted the grounding, loss of life and oil spill. There are, however, a much broader set of considerations associated with the broader set of pollution sources and vessel casualties mentioned above.

The first decision that ultimately proved fatal in the Selendang Ayu incident was the captain’s decision to stop the engine for repair in a building storm, particularly when there was a lee shoreline. Grounding was not the only hazard associated with a loss of power as a vessel may founder due to the decreased stability and increased structural stresses associated with improper positioning in heavy seas. It clearly would have been prudent to sail to port to conduct such major repairs, or at least anchor in safe harbor\textsuperscript{81} to isolate the cylinder with the cracked liner. The Selendang Ayu left Seattle on November 28\textsuperscript{th} and apparently was suffering engine problems for several days prior to shutting down for repairs on December 6\textsuperscript{th}, and so had ample opportunity to

\textsuperscript{81} 12/17/04 Anchorage Daily News-- Risks led to tragedy
make a port call to address this major propulsion problem. Although a comprehensive examination of SOLAS, MARPOL and USCG operational requirements would be required to reach a firm conclusion on regulatory oversight, it does not appear that propulsion repairs are required to be conducted at a port or in safe harbor. Amendment of these controlling regulations, particularly the international conventions in the case of foreign flag ships, to require proceeding to port or at least safe anchorage prior to major propulsion repair could provide some benefit in preventing future similar drift grounding and foundering incidents.

The captain of the Selendang Ayu did not broadcast a distress signal nor did he directly notify the Coast Guard that he needed assistance. Separate reports state that about 13 hours after the engine was stopped, the captain contacted the harbormaster at Dutch Harbor to request tug assistance and the harbormaster contacted the Coast Guard to report that the ship was adrift and in need of assistance. The delay in obtaining assistance allowed the sea conditions to deteriorate to the point where the rendering of towing assistance was hazardous and the connection of multiple towing vessels impossible. Although it could be argued that all available towing vessels were fatally limited by either insufficient towing power or inadequate towlines, earlier notification may have allowed connection of multiple towing vessels to provide sufficient power or otherwise allowed control of the ship to avoid grounding. Notification of the USCG whenever any vessels is disabled in the EEZ could be required, as is already required in casualty reporting regulations for foreign flag tank ships and U.S. flag ships. An increase in fines for a failure to report or untimely reporting may spur more complete compliance.

Real-time tracking of all vessels may be necessary, as timely casualty reporting is not strictly practiced. Detection of disabled ships could be accomplished through increased Coast Guard surveillance of vessels using such real-time systems as radar, Automatic Identification Systems, (AIS), transponders and satellite communications that periodically transmit vessel identity, location, speed and course. Radar and AIS tracking of ships throughout the region would be difficult and expensive given the line-of-sight limitations of these technologies. Effective use of these technologies would require dozens of remote stations throughout the Aleutian Chain, and even then detection of ships far from shore would be problematic. Transmission of necessary identification/course/location data over satellite communication systems would be eminently more practical as most of these international ships already have this equipment and satellite data
time would cost only a few dollars per day. The Selendang Ayu was tracked in this manner after the USCG contracted the Alaska Marine Exchange to perform this task in cooperation with the owners of the ship. Regulatory mandates to institute this tracking system would be confronted with the same constraints of innocent passage mentioned above, but given the circumstances of casualty notification and an added jurisdictional advantage of national security concerns, implementation could be legislated. Voluntary adoption by shippers or amendment of international SOLAS/MARPOL protocols would otherwise be available.

The captain of the Selendang Ayu also failed to accurately report the nature of his mechanical failure and refused a Coast Guard offer to render assistance in repairing the mechanical failure with Coast Guard personnel. Timely assistance may have been effective in restarting the engine but compulsory assistance is an unlikely prospect both from the aspect of regulating international shipping, due to the implication that any agency rendering such compulsory assistance might garner full liability for any subsequent damages. There is another potential associated burden upon the USCG that would likely preclude such mandates where, as a matter of due diligence, the USCG would be obligated to make experts in all possible engineering aspects immediately available with all necessary repair equipment and materials.

Four towing vessels were able to intercept the Selendang Ayu before grounding with the Sydney Foss arriving about 22 hours before grounding and the Cutter Alex Haley arriving more than 30 hours before grounding. The Sydney Foss departed from Dutch Harbor more than 6 hours after the USCG knew of the predicament and towing assistance was requested. Although it engaged in a heroic effort by successfully connecting a towline and maintaining a tow for approximately 12 hours before the tow connection failed, this tug was obviously very underpowered for the task. The tug could not turn the ship into the wind or otherwise tow upwind, and was constantly pulled backwards by the ship. The Coast Guard Cutter Alex Haley, although more than twice as powerful as the Sydney Foss, did not attempt a tow until just before the ship grounded and the attempt was unsuccessful because the Cutter could not be precisely maneuvered to prevent failure of the messenger line. The Cutter was likely underpowered in any event and the ability of its towline to maintain integrity in the rough conditions was also questionable. The crews of the 4,000 hp harbor tug James Dunlop and the 1,550 hp salvage vessel Redeemer could

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82 Conversation with Capt. Ed Page Executive Director of Alaska Marine Exchange
not safely operate on the decks of the vessels and therefore did not attempt a tow in the extremely hazardous seas that had developed by the time they arrived on scene. These two vessels were also too underpowered to successfully tow the Selendang Ayu upwind, if they were able to attach a towline. A combined tow of the Alex Haley and another vessel could have generated enough power, but the towlines were still suspect and towing with multiple vessels is hazardous and difficult to accomplish even in moderate conditions. There are many lessons to be learned from this sequence of events including: proper selection of the most powerful available towing vessel to provide assistance if there is a question of towing capability; streamlining procedures for contract and dispatch of rescue towing vessels; making line throwing guns available at ports to assist private towing efforts; making appropriate towlines available at ports with public funds to assist private towing efforts; training and using USCG or private helicopters to attach towlines when conditions are hazardous or complicated by the need to use multiple towing vessels. These are largely administrative issues to be considered during vessel and area contingency plan proceedings but direct legislative appropriations efforts may be necessary to fund these response system upgrades.

The only tugs with enough power, maneuverability and proper towlines in Alaska were in Prince William Sound, about 1,000 miles away, too far away to timely respond and were committed to oil spill prevention and response for PWS tankers in any event. Even these very capable tugs would find it difficult to attach towlines and tow to windward in the most extreme conditions just before the grounding. There are clearly no appropriate rescue tugs in the region and much more powerful and maneuverable tugs with exceptional towline systems would be required to safely, timely and effectively tow the larger disabled ships to safety in the severe weather conditions regularly experienced in and around the Aleutian Islands. Although there are towing vessels on the market that could adequately serve most ships under most conditions, ultimately purpose built tugs are needed to insure effective rescues and its construction criteria should be premised upon the most severe conditions and the demands of the largest ships that would require rescue over the expected 20 year life of the tugs. This would require some analysis of anticipated port expansions and developments in ship construction to serve the larger and deeper ports facilities.
Some guidance on rescue tug parameters can be garnered from trends in salvage/escort tug design and reports on salvage tug needs. A particularly reputable naval architect, Robert Allen in his 1995 study, A Review of Escort, Rescue and Salvage Towing Capability in Canadian Waters, studied some of the most demanding salvage tug needs. That study assessed the requirements to save a 265,000 DWT tanker Northern British Columbia Coast where North Pacific storms can reek their full strength on the exposed ship traffic. The recommended bollard pull for rescue towing in these circumstances was 220 tons, about three times the power of the Cutter Alex Haley and four times that of any private tug in the Aleutians. The French Coast Guard has commissioned two new salvage tugs and completed one, the Abeille Bourbon, in response to the Prestige incident that fouled French, Spanish and Portuguese beaches with heavy oil after foundering at sea. These tugs are 263 feet long with 21,500 hp generating a bollard pull of 201 tons and a top speed of 19.8 knots. The tugs are equipped with two 1,200 hp tunnel thrusters at the bow and two 700 hp tunnel thrusters at the stern to provide maneuverability while passing a towline. There is an exceptional firefighting system qualifying for FiFi II classification that can pump nearly 32,000 gallons per minute of fire fighting foam and water.
The most prominent salvage company in the world, Smit, designed a salvage tug purpose built for the severe seas of the coast of South Africa. The Wolraad Woltemade, built in 1976, is 310 feet long with an exceptional draft of 28 feet to resist propeller cavitation in seas exceeding 50 feet. Its 19,200 hp generates a bollard pull of 185 tons and a top speed of 20 knots to provide for rapid response. The bow thruster is 800 hp and it is equipped with fire fighting capability.

Five escort and rescue tugs were recently produced for assisting tanker traffic in Prince William Sound. The emphasis here was to design multipurpose tugs that could act as docking tugs, avert powered groundings of tankers sailing at 10 knots in constricted waterways and provide rescue towing of tankers drifting in seas exceeding 15 feet. Two tugs were developed with an emphasis on maneuverability: one tanker arrest escort was designed with Voith Schneider Propulsion units, (VSP), to provide the extreme maneuverability needed to attach a towline to a moving tanker to steer and stop it; the other also has high maneuverability and thrust using azimuthing thrusters, or Z-drives, so it could safely attach towlines to the bow of a drifting tanker in seas exceeding 15 feet. Both tugs have the same 10,000 hp engines but the Z-drives are more efficient at low speed and generate 150 tons of bollard pull while the VSP are more efficient at high speeds\textsuperscript{84} and generate 102 tons of bollard pull at the zero speed that bollard pull is measured. Both tugs have a FIFI I rating providing a 13,200 gpm pumping rate and a top speed of about 16 knots.

\textsuperscript{84} Conversations with Voith engineers
knots while the VSP tugs are 156 feet long and the Z-drive tugs are 140 feet long. The important factor here is that maneuverability was seen as a critical factor in tug effectiveness.

Tugs of at least 175 tons bollard pull will likely be necessary to insure effective rescue of the largest ships in the severe Aleutian seas. The most maneuverable tugs, utilizing Voith Schneider Propulsion systems, are preferred to provide extreme maneuverability when closely approaching to pass towlines as a matter of safety and to insure success of the operation. Voith has also developed a new Roll Stabilization System for added crew safety that provides computer control over the propeller blade pitch that virtually eliminates all deck roll in seas up to 16 feet and reduces roll by 50% in greater sea heights\textsuperscript{85}. The traditional VSP escort tug design, as used in PWS, could be modified to add a CP propeller in a Kort Nozzle for the extra bollard pull needed\textsuperscript{86}. Tugs utilizing azimuthing thrusters or high powered maneuvering thrusters may suffice given the benefit of very experienced captains, but safety and the likelihood of successfully passing towlines increases with maneuverability. These tugs would minimally have to be

\textsuperscript{85} Conversation with Voith engineers producing a preliminary design of Aleutian Rescue Tug, and conversation with Steve Scalzo of Foss Maritime, which retrofitted some of their VSP tractor tugs with a Kort Nozzle called a Booster Fin to obtain more bollard pull.

\textsuperscript{86} Conversation with Voith engineers producing a preliminary design of Aleutian Rescue Tug
stationed in the Aleutian passes to provide timely rescue where the ships pass closest to shore, but additional tugs and/or rerouting traffic further offshore would be necessary to provide timely rescue services along the entire archipelago.

Acquisition of the proper salvage tugs is by no means assured for a number of reasons. Administrative challenges to approvals of both regulated vessel response plans and the Aleutians Subarea Contingency Plan could produce results close to that desired under existing standards but certain circumstances may prove problematic to obtaining truly competent tugs. Regulatory conflicts will likely center upon the fact that state regulations regarding emergency towing are terribly vague at best and the federal regulation is under proposed amendment to provide more specificity. The proposed regulation would limit tug capability/seaworthiness to response in a 40 knot wind and would not require any response timeline standard beyond 50 nm from the Captain of the Port City, which in this case is Anchorage, Alaska, about 800 miles away. New federal standards regarding firefighting are also under revision and state regulations are nonexistent. These new federal regulations are expected to become effective within 18 months. Although public comment deadlines for this regulation expired in 2002, an additional opportunity to comment, and therefore participate in the administrative review/appeal process, is expected to arise when a new cost benefit analysis of the regulation’s effect is completed within 9 months. Incorporation of these tugs into the Subarea Plan, absent the equivalent tugs required in regulated vessel response plans, would likely necessitate both state and federal legislative appropriations. If tugs were required for regulated vessels as a result of administrative actions, they would likely be less than what is necessary for the larger unregulated vessel traffic. An effort should be pursued to arrange a conference of the regulated vessel owners, unregulated vessel owners and regulatory agencies to see if a formula or matrix could be arrived at to establish a fair rate of contribution by all parties for tugs that could best serve all interests involved.

Prior to grounding, the ship successively deployed its two main anchors, the first of which intermittently held on the bottom before the anchor line broke and the second anchor also intermittently stopped the ship from drifting but eventually failed to prevent the grounding. Anchors can fail to hold bottom for several reasons but the most common and correctable are: insufficient weight of the anchor; improper anchor design for the bottom conditions and/or

87 Federal Register / Vol. 67, No. 91 / Friday, May 10, 2002 / Proposed Rules, 33CFR 155
88 Conversations with Lt. Reed Kohberger Tank Vessel Regulations Section Office of the Commandant
insufficient length of chain/cable to provide proper scope, (i.e. angle of the chain/cable from the bottom to the ship). Improvement of anchoring capability would be desirable but the ability to regulate foreign flag shipping in the region to provide adequate anchoring capability is that type of vessel construction issue that is solely guided by the specifications set forth by IMO and its approved classification societies that certify the ship design and construction. The American Bureau of Shipping vessel construction standards are typically cross-referenced by the USCG regulation as the standard for US-flag vessels. Any proposal for upgrade of anchor system holding capability would therefore have to be submitted to these respective classification societies for adoption. Pressure and mandates to improve standards may be brought upon these societies indirectly through legislation or administrative action in the appropriate U.S. or international regulatory body.

The process for upgrading spill prevention capability tied to any similar feature of ship construction or equipment is essentially the same. The classification societies will not upgrade their compulsory standards unless an obvious defect in their rulemaking process can be exposed with expert evidence or a new, higher mandated standard is required by the controlling national or international regulatory agency. The regulatory agencies in turn will not upgrade their standards unless an obvious defect in their rulemaking process can be exposed with expert evidence or a new, higher mandated standard is required by the controlling legislative body. The applicable legislative body or a court of jurisdiction is typically loath to intervene where administrative appeal procedures or rulemaking processes before an established administrative body have not been exhausted. There are many ship design features that could produce varying degrees of spill prevention enhancement or mitigation of spill size with associated cost benefit ratios with the likely more cost effective measures mentioned above. Very costly compulsory design measures, such as double hulls, have been adopted for the limited high risk class of tank vessels but other costly spill prevention measures have been sporadically adopted by prudent shippers, (e.g. redundant propulsion systems), and may prove cost effective in the long run upon close analysis.

Problems and Potential Solutions for Effective Spill Response

Spill response to this incident must be considered a near total disaster where no spilled oil was contained at the grounding site and no oil was recovered on the water. Virtually no attempt

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89 Conversations with Captain Ed Stanton USCG Chief of MSO
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was made to recover oil on the water for the months that oil was still leaking from the ship in recoverable quantities, even when sea conditions were very favorable to such efforts. Spill recovery equipment available in the region was wholly insufficient and inappropriate for ocean conditions. The small quantity of equipment that was brought in from outside the region was delayed due to an inability to land at the local airport due to the common poor weather conditions. Efforts to protect anadromous streams and other sensitive areas with boom were largely ineffective due to late arrival of boom, use of boom and anchors inappropriate to the ambient wave and current conditions and otherwise ineffective booming configurations.

The only tangible success was the lightering of approximately 140,000 gallons of fuel and oils, but it was sheer luck that the entire vessel was not entirely destroyed prior to the commencement of lightering on 1/4/05 or by the 2/15/05 lightering completion date. Indeed the bow section of the ship was sunk and effectively destroyed by 12/24. No source control measures were undertaken until after the New Year when lightering operations commenced in direct contravention of federal lightering standards requiring arrival of lightering resources within 36 hours and state standards to commence and complete lightering in the shortest possible time. Early spill detection and trajectory analysis were limited to infrequent visual observation from aircraft in poor visibility conditions. No advanced sensor technology was utilized to quantify/qualify oil slicks or to evaluate the spill trajectory in poor weather or during the long nights. Latter efforts to employ vessel observations were sketchy at best with little data recording for current speed and direction. Water sampling methods employed a circular algae net that failed to record much of the surface oil.

These spill response failures demonstrate the immediate need to upgrade equipment and procedures to: stop the spill at its source; contain the spill in the immediate vicinity of the source; lighter oil rapidly in adverse sea conditions; detect, track and anticipate the trajectory of the spill in poor weather and at night; recover spilled oil on the water; and protect sensitive areas with

\[90\] Conversation with Leslie Pearson ADEC Response Manager, see cover photo of massive oil leak in calm water with no spill containment or response efforts.
\[91\] Conversation with ADEC On Scene Coordinator Gary Folley
\[92\] ADEC Situation Reports
\[93\] 33 CFR 155.1050(l)
\[94\] Alaska Regulations 18 AAC 75.445(d)(6)
\[95\] Communications with John Whitney NOAA spill observer
\[96\] Conversations with Nuka Research personnel on contract to perform water sampling
effective booming configurations and active oil recovery. The regulatory mandates are, for the most part, well established and are starkly in contrast to existing regional response capability. The process for improving spill response, and obstacles to such improvements, are essentially the same as those for obtaining rescue tugs. Participation in the administrative review process for regulated vessels/facilities and the Subarea Contingency Plan will be necessary followed by efforts to obtain legislative appropriations for funding of new assets in the Subarea Contingency Plan. It is this plan that must contend with the large gap in response needs between that needed for regulated plans and the unregulated vessels. The gap in response planning requirements between the largest facility at Adak and the transient oil tankers could be as much as an additional 3.6 million gallons of oil per day of oil recovery capacity, more than six times the recovery capacity that is required in any approved contingency plan. There is also an entrenched mindset of regulators that spill response in this remote region with severe weather conditions is likely to be unsuccessful in preventing any significant portion of the spill damage, and the applicable regulations will, therefore, not be enforced to any meaningful degree due to the high cost of full compliance with applicable regulations.

The “invisible elephant in the room” that appears to drive equipment selection decisions is the cost of the equipment and the ability to distribute that cost across a large number of private plan holders or public agencies. There appear to be no set provisions in law requiring an economic evaluation or guidelines for determining that any given piece of response equipment or set of regional equipment is cost effective or exorbitantly expensive. Theoretically, “the sky is the limit” when determining cost of compliance with regulations. Despite this apparent lack of authority or development of applicable guidelines, the USCG has effectively issued Alternative Compliance Agreements to all response plan holders on the tenuous premise that full compliance would not be economically feasible. There certainly could be no legitimate excuse for the federal facilities and their fuel suppliers to shirk full compliance with applicable regulations, and the most notable waiver is for the USCG facilities in Kodiak and its fuel supplier. A skeptical observer could argue that the USCG granted everyone a waiver just to reduce its own fuel storage and supply costs.

97 Comparison of 27,000 bbl Response Planning Standard in 48 hours for Adak tank farm vs 300,000 bbl RPS in 72 hours for potential tanker carrying more than 500,000 bbl of persistent oil.
The first and most important action in spill response is to stop the oil from leaving the ship\(^{98}\), as oil in the water is likely to spread quickly beyond any ability to contain or recover the spill. Source control actions are highly prioritized with state regulations requiring the use of the Best Available Technology and may include: patching leaking oil tanks; transfer of oil from the leaking tanks to other onboard tanks, temporary storage bladders/tanks or tank vessels/barges; solidification of the oil in the leaking tanks. Various types of hull/tank patches are commercially available but largely ignored in contingency planning as are oil solidification agents. Solidification agents are required in quantities of anywhere to 25% to 40% of the oil volume to be solidified and therefore present a transportation problem and volume problem where free space in the damaged tank is needed to inject the substance. Transfer of oil between ship tanks was conducted in the Selendang Ayu but this is not always possible given a lack of available tankage or loss of pumping power and was only a temporary solution where the secondary tanks were eventually breached. The use of temporary storage bladders is a risky proposition where they may be punctured fairly easily given their great mass when full in relation to the strength of the bladder material. Although the bladders are relatively easy to transport, they are not light and there is the associated need for transport of high volume, high viscosity oil pumps and power packs as well.

The traditional method of removing cargo/fuel from a stricken ship, and most secure/most rapid means, is to use a barge or tank vessel to closely approach the ship to pump off the oil using long hoses between ships. This service was offered in the case of the Selendang Ayu, albeit with an unacceptably delay, but rejected on the questionable premise that such lightering could not be timely accomplished in the anticipated foul weather. The use of a heavy lift helicopter using 2,000-gallon tanks was selected instead\(^{99}\), but the required helicopter was not available for more than two weeks and this process was very slow, requiring almost six weeks to remove about 160,000 gallons of liquids\(^{100}\). Both state and federal regulations require a much more rapid response of the lightering vessel and a more rapid removal rate of the oil. Federal regulations for tank vessels require the lightering vessel to arrive on scene in an open ocean environment within 36 hours and the vessel must have the pumping ability to remove all oil from the largest cargo tank on the stricken tank vessel within 24 hours, 33 CFR 155.1050(l). Although the volume of the

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\(^{98}\) Aleutians Subarea Contingency Plan  
\(^{99}\) Unified Command Press Release on Lightering  
\(^{100}\) ADEC Situation Reports and conversations with Gary Folley ADEC On Scene Coordinator
largest cargo tank on a regulated tank vessel in the region is not known, it likely exceeds 420,000 gallons. Again, the Selendang Ayu was not regulated but these lightering resources should have been immediately available for the regulated vessels and were not utilized even when frequent breaks in the weather would have permitted removal of all remaining oil within a day and before the bow sunk releasing 176,000 gallons of oil. State lightering regulations are more vague but do require the use of the Best Available technology to commence and complete lightering in the shortest possible time. These standards applied to tanker response plans in PWS provides a 2.5 million gallon barge and tug that can arrive on scene and fill the entire barge in less than a day\(^\text{101}\).

The next, most critical response action after securing the oil aboard the ship is to contain the leaking oil in the immediate vicinity of the stricken vessel. This is typically accomplished by anchoring oil spill boom in a continuous circle around the vessel. The booming of the Selendang Ayu was not even attempted on the questionable premise that no booming system could hold position in the severe sea states and that the conditions and the position of the ship near shore and weather precluded a safe deployment. Open ocean response boom, (most notably Ro-Boom 3500 produced by Ro-Clean Desmi Co.), is heavy duty boom about 10 feet tall that has been successfully towed and contained oil in 23 feet seas\(^\text{102}\), suggesting that properly sized and deployed anchors could have held this boom in position around the ship in the severe conditions.

\(^{101}\) Oil Discharge Prevention and Contingency Plan for PWS Tankers, Core Plan Equipment list describing Crowley Barge 570


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Deployment of the boom during peak storm conditions would have been very hazardous but the area’s fishing vessels normally work in these severe conditions and could have safely deployed the boom during any of the many periods of storm subsidence. The boom dedicated for deployment in the region is less than half the size of the largest ocean boom and most of this boom was outside the region and delayed by weather prohibiting aircraft delivery to airports. A minimum quantity of 10,000 feet of the largest, most durable, easily deployable ocean boom is clearly needed for pre-positioning in the region and locally available trawlers\textsuperscript{103} should be trained to deploy the boom around ships and facilities in adverse conditions. Additional boom of similar design should be acquired for protection of sensitive areas and detailed strategies for deployment must be developed and practiced.

The ability to effectively recover spills on the open water is also of paramount importance to prevent shoreline impacts and uncontrolled spreading and migration of the spill that would cause adverse impacts to birds, mammals and fish over a much wider area. Open water spill recovery has been grossly neglected in the applicable response plans as the vast majority of skimming systems in the response plans is designed for calm harbor conditions with sea heights less than three feet. This equipment is totally inappropriate for use in any ocean environment, much less the severe conditions of the Aleutians. Although equipment that can effectively respond in the worst-case conditions is not presently commercially available, experimental Oil Spill Response Vessel, (OSRV), designs have been proposed to recover spills in seas up to 26 feet and commercially available skimming systems and OSRVs could triple or quadruple the effective sea height of response operations in the Aleutians

There are a multitude of factors and regulatory constraints that must be considered in selecting oil recovery systems for this region. Federal regulations require 30% of the dedicated equipment be operable in 6 feet of water and only requires ocean response equipment to be capable of operating in 6-foot seas, but provision is made for upgrading this standard in areas with consistently more severe conditions. State regulations are less specific but require “appropriate and reliable” equipment with consideration of any new technology that could

\textsuperscript{103} Trawlers are the optimal design for this boom deployment as they are specifically designed to conduct deployment and retrieval of their heavy trawl nets over a sloped transom in severe sea states.
substantially advance the effectiveness or efficiency of response operations. The USCG Field Operations Guide does provide guidelines for selecting spill response equipment but there was apparently no criteria or process for assuring that the equipment acquired for use in the Aleutians, either in contingency plans or for response to this spill, was in any way appropriate to local conditions despite the regulatory requirement of such evaluations.

The most effective open water skimming systems are those that are incorporated into purpose built OSRVs, (e.g. the JBF Valdez Star, Lamor built in skimmers), as the oil is directed into a protected area inside the vessel hull where the skimming system can more efficiently recover oil without the adverse effects of wave action. These are expensive, single purpose vessels and response organizations most often resort to skimmers that can be deployed from any vessel they choose and are at least an order of magnitude less expensive. These ocean rated mobile skimmers typically weigh thousands of pounds, are difficult to safely deploy in high seas, and are granted very high recovery rates by regulators premised upon the high capacity pumps incorporated into the skimmer. The open water skimmers exampled in the Field Operations Guide include: Transrec 350; Kampers Sch. SSC-250-Oil Crab; Douglas Skim-Pak 94. Another similar skimmer is the Aqua-Guard RBS-100 DIW. These skimmers use a variety of technologies recover the oil that vary in effectiveness and versatility but all suffer the same limitations of requiring large booming systems to concentrate thin layers of oil to feed their voracious pumps and they all are subject to impairment by wave action. Rope mop systems, (e.g. OPEC Ltd. “Force-7” or the Containment Systems 8-Band Rope Mop), are much less susceptible to wave action and can clean a much broader swath of oil without boom concentration but have a much lower recovery rate that skimmers with high capacity pumps. Zero-velocity rope mops deployed in catamarans can also recover oil in very high currents, as can inclined plane skimmers. New booming systems such as the AllMaritim NOFI OceanBuster can concentrate oil at fairly high speeds and rough seas and still retain the oil in a collection basin for removal with traditional skimming systems or an incorporated skimmer. A full accounting of the range of adverse conditions must be assessed in making final decisions as to which systems are most appropriate for any given area in the Aleutians, but because of the need to cross open ocean in most response scenarios, the skimming systems would likely have to be incorporated into, deployed from and/or

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104 Alaska Regulations 18 AAC 75.445(k)(1), .447
105 Offshore Technology Website http://www.offshore-technology.com/contractors/environmental/allmaritim/
transported by vessels capable of surviving Aleutian storms such as articulated tug-barge combinations. These barges should utilize outrigger systems to allow full operation of skimming systems independent of additional booming vessel because the coordination of multiple vessels in adverse conditions is problematic, causing decreases in spill recovery rates beyond the direct impairment of skimmer efficiency by wave action.

Valdez Star OSRV

Professor Gorjunov OSRV

Force-7 Rope Mop

Zero Relative Velocity Rope Mop Cat

RBS-100 DIW w/Rotary Brushes

Current Buster
A major problem in the regulatory structure is that compliance is premised upon nameplate capacities of skimmers rather than their ability to be safely deployed and effectively operated in adverse conditions. There are few occasions where the high capacity skimmers would actually meet nameplate capacities because it would be difficult to encounter enough oil and concentrate it at the pump as fast as the pump can move fluids. Response organizations get much more “bang for the buck” with ineffective skimmers fitted with big pumps and do not suffer any consequences when spill response is ineffective. The shippers that contract the response organizations don’t really expect to ever use their response services; shippers just want the least expensive solution to regulatory compliance. Insisting upon more comprehensive response quality evaluations in administrative proceedings can provide some relief from this circumstance, particularly where state regulations apply, but improved legislative mandates would be helpful in advancing this process.

Pursuit of the above processes can easily triple the response range and effectiveness over existing Aleutian equipment but innovative new designs could double that effectiveness again. A scale model of an experimental OSRV, the Oil Sea Harvester, has been tank tested with amazing results that are shown in its caption below: 106

106 Conversations with Alstom Marine engineers

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This huge trimaran OSRV can obtain such impressive results by turning sideways in waves as high as 26 feet to maintain relatively calm water between its outer hulls where its protected skimmers can continue to effectively collect oil. The major drawback to this stunning design is its exorbitant cost >$100 million and its skimming system could be improved as well.

This basic trimaran design could also be retrofitted on an old ship shaped barge with three Z-Drives added for propulsion and inclined plane skimmers added in the protected tunnels, all for the relatively low cost of about $10-12 million. This is a price comparable to other, much smaller and less capable new built OSRVs. This barge retrofit is called the All Purpose OSRV\footnote{Proposals for the AP OSRV and a shallow water version using Schottel Pump Jets for propulsion submitted to Minerals Management Service and Oil Spill Recovery Institute by Avis Marine Consulting and BMT Designers and Planners Inc.} as it would be fitted with self cleaning ice grills on the skimmers to allow spill recovery in broken ice, as well as skimming at speeds from 0 knots to 5 knots and in seas exceeding 15 feet:

\textbf{All-Purpose Oil Spill Recovery Vessel}

\begin{table}[h]
\centering
\begin{tabular}{|c|c|}
\hline
\textbf{Principal Parameters} & \textbf{Profile, inboard of outer hull} \\
\hline
Length & 400 ft. \\
Beam & 144 ft. \\
Depth & 25 ft. \\
Recovery Rate & 3,000 bbl/hr \\
Current Speed & 0 - 5+ Knots \\
Ice Conditions & 15 ft. broken ice \\
\hline
\end{tabular}
\end{table}

Appropriations for R&D projects such as these OSRVs are already available to the USCG, the Minerals Management Service and the Oil Recovery Institute, among other agencies, under a
mandate to improve spill response in severe Arctic conditions. Pursuit of a stronger mandate and additional funding would, in the long run, provide a much more cost-effective solution to spill response problems across Alaska and in Arctic or severe sea conditions everywhere. The deployment of skimming systems would be automated to provide for minimal and safe deck operations in adverse conditions. With the outriggers and boom deployed, the combination of the wide encounter width, 220 feet, and high skimming speed, 5 knots, would provide for the needed oil concentration to truly put the high capacity viscous oil pumps to full use. The AP OSRV can also act as a static skimmer by using its three Z-Drives in a dynamic positioning mode where the aft drives are used to pull oil through the tunnels instead of advancing into the oil. This would allow the OSRV to position alongside a stricken ship and lighter oil while simultaneously recovering the majority of the oil that continues to leak from the ship.

Considerable effort may have to be extended to overcome entrenched institutional mindsets, but creative combinations of existing spill recovery technologies and rapid development of new innovative technologies could effectively tame the savage seas so that widespread spills and massive shoreline impacts are relegated to historical footnotes. The most concerted effort and expenditures should still be focused upon timely deployment of rescue tugs and establishment of a traffic control system where the lives of sailors are at stake in any vessel casualty and the prevention of spills will always be more effective than the best response efforts.

Advanced sensor technologies useful in search and rescue efforts is also adaptable to spill detection and tracking efforts and are an essential component of a comprehensive incident response plan. Aerial surveillance of vessel traffic in the Aleutians is already an important component of fishery protection efforts by the USCG but these long-range aircraft lack the advanced sensors necessary to detect and quantify oil on the water, particularly during the frequent reduced visibility conditions and long winter nights. Although federal regulations are vague on this critical aspect of spill response, state regulations require the use of the Best Available Technology to detect and track spills. In PWS ADEC requires the use of a helicopter mounted Infrared camera, spill tracking buoys deployed in the spill and sophisticated computer modeling of spill trajectories but no such efforts were expended in the Selendang Ayu incident.

The Oil Pollution Act of 1990 mandates an Interagency R&D committee for advancing spill response and created the Oil Spill Recovery Institute in Cordova, Alaska specifically to advance spill response in Arctic and Subarctic marine waters.
nor are these tools required in vessel, facility or the Subarea contingency plans. The National Oceanic and Atmospheric Administration, (NOAA), did provide aerial surveillance during this spill but it was limited to visual observations and did not avail itself of the advanced sensors used during the Exxon Valdez Oil Spill, and consequently was unable to accurately assess spill dimensions, location or trajectory for the majority of the time. This information would have necessarily been a primary element in coordinating interception of the spill with on water spill recovery efforts and protection of sensitive areas, but as reference above, there was essentially no appropriate response resources immediately available to undertake these actions if the required spill tracking information was timely available.

Many European countries have developed aircraft with a wide range of advanced sensors to detect spills, quantify the amount of oil in a given oil slick and chemically identify the oil in an effort to cope with the propensity of transient foreign shipping to not report deliberate and accidental spills. There are at least 17 aircraft patrolling European waters, some with no sensors but several with a wide array of sensors that together provide a substantially enhanced ability to locate, quantify and identify oil spills in the full range of visibility/light conditions.
Among the most sophisticated of these surveillance aircraft are the two German Dornier 228 LM aircraft\(^{109}\) that carry an integrated sensor package of: Side-Looking-Airborne-Radar, (SLAR); Infrared/Ultraviolet scanner, (IR/UV); Microwave Radiometer, (MWR); and Laser Fluorosensor, (LFS). The initial detection of suspect surface anomalies is made long-range by the SLAR at an altitude of 3,000 feet and subsequent closer analyses are conducted in a search pattern at 1,000 feet. The combined sensors: geographically locate the spill; record slick dimensions; define slick thickness within ranges of 0.1 micron to 10 mm using MWR for determination of the oil volumes; classify the substances within the spill using the LFS to confirm the spill as oil and type the oil to assist in identifying the spill source. The combined data set with observer logs are immediately sent to law enforcement and emergency response officials via satellite communication systems. Incorporation of a similar set of sensors in the existing USCG C-130 fishery patrols would not only provide essential command information for spill response but would also substantially improve capabilities for vessel tracking/traffic control, search and rescue as well as fisheries protection efforts. Legislative appropriation and administrative cooperation or legislative mandates would be necessary to acquire and deploy these assets.

The primary purpose of all of the aforementioned planning and equipment deployments is to prevent or mitigate damage to the natural, cultural and economic resources in the marine environment and on the shorelines of the region. These valuable assets are broadly distributed throughout the region and are so voluminous as to preclude absolute protection of all areas. Both federal and state law require protection of these area and a system has been developed among governmental resource agencies for identifying and classifying the most environmentally sensitive areas where extraordinary efforts must be employed to prevent encroachment of oil. Timely protection of these sensitive areas necessarily requires development of site-specific strategies for equipment deployment that has been coined as Geographic Response Strategies, (GRSs). Development of GRSs is proceeding at a rapid pace in many areas of Alaska but has been very slow in the Aleutians\(^{110}\). The process for selection of areas to be protected is cumbersome and somewhat arbitrary in relative valuation of the resources. The extent of protection measures to be employed is likewise arbitrary in that there is often insufficient information collected or considered regarding ambient conditions and oil volumes when


\(^{110}\) Conversations with Tim Robertson Nuka Research the primary contractor for GRS development in Alaska
designing strategies and selecting appropriate equipment for exclusion of oil from the sensitive area. Sensitive area protection for the Selendang Ayu incident was largely untimely and otherwise ineffective due to the poor selection of equipment and boom deployment configurations.

If any, or all, sensitive areas are to be effectively protected from encroaching spills, there must be a considerable overhaul of the process for developing GRSs. A policy must be adopted that ensures the protection measures employed are commensurate to the task of effectively excluding oil given the sea states and water currents that may be experienced at each site. Collection of sea state and current data for the area is an essential precursor to selection of response equipment and design of oil exclusion strategies. The problem of excessive sea heights can be addressed by requiring larger boom, as suggested above, but the matter of excessive currents overwhelming defensive booming strategies necessitates that a policy be adopted of assigning appropriate spill recovery resources to prevent currents from merely circumventing oil deflection booms. It must also be recognized that exclusion of oil from these areas becomes a long-term problem when the area of oil exclusion is insufficient to prevent adjacent oiled beaches from chronically releasing oil into the sensitive area. Large volumes of oil encroaching an area to be protected exacerbate the issues of problematic high current areas and chronic re-oiling from adjacent shorelines. GRSs must therefore have some factor for oil volumes incorporated into the strategy. The best strategies are useless unless they can be fully implemented before oil reaches the location. State law specifically requires that sufficient equipment and personnel resources are available to exclude oil from sensitive areas before oil reaches them but planning has been fairly insensitive to this requirement. The strategic pre-staging of equipment, establishment of in-place boom anchoring systems, construction of running lines for rapid boom deployment, automatic single-point boom inflation systems, and use of helicopters and high-speed vessels must become a necessary consideration in design of timely protection strategies. These matters are largely administrative issues but legislative appropriation for the Subarea plan would be necessary and improved mandates requiring implementation of these measures would be helpful.

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111 Personal participation in multiple GRS workshops for PWS and Northern Cook Inlet
112 ADEC Situation Reports and analysis of shoreline booming/impact photos
113 Alaska Regulation 18 AAC 75.445(d)(4)
Report Summary

The loss of life and unabated large oil spill resulting from the grounding of the Selendang Ayu has focused widespread attention upon a regulatory system that upon close examination appears to be fundamentally flawed. The touted excuses for the failure of spill prevention and response efforts proffered by state and federal regulators, that the ship was exempt from regulation under international treaties and that the weather was too severe to do much of anything in the way of response, is belied by their failure to effectuate their respective duties under law to plan for such contingencies in a regional spill prevention and response plan. The agencies responsible for formulating a regional contingency plan for the Aleutians, the USCG and ADEC, failed to properly assess the response needs for the several thousand annual transits of unregulated large ships through and around Aleutian waters and failed to utilize the public funding mechanism that is specifically dedicated to the purpose of preparing for incidents associated with unregulated and unidentified spill sources. Both state and federal law mandate cooperation in formulation of these area plans and require that the plans reflect the ability to respond consistent with the extensive regulations applicable to vessels and facilities that fall within the jurisdiction of the agencies.

The Transpacific vessel traffic serving East Asian and North American ports on the West Coast includes some Panama Canal traffic, is generally larger than local vessel traffic and carries larger quantities of persistent oil cargo and fuel than local regulated vessel or facilities. The demands for providing emergency towing of these vessels and responding to their spills places a higher demand on spill response resources than would otherwise be required for local regulated vessels and facilities. The demand on response assets for Transpacific tankers carrying persistent fuel cargo through the Aleutians is several times that required to respond to spills from local vessels and facilities that are subject to regulatory jurisdiction. The Coast Guard Cutter that intercepted the drifting Selendang Ayu did not attempt rescue towing of the ship in deference to private towing concerns and failed in its belated attempt to connect a towline just before grounding. The Cutter was likely underpowered for the task and the quality of its towline was equally suspect. Coast Guard helicopters did not attempt to assist in connection of towlines. Participation in the administrative planning process for the Aleutian Subarea Contingency Plan and pursuit of legislative appropriations to fund appropriate resources is therefore necessary to
insure that proper plans are constructed and commensurate levels of spill prevention and response assets are incorporated into this plan.

Legislative efforts to reinstate the five-cent per barrel tax on oil produced domestically and imported that sustains the federal Oil Spill Liability Trust Fund is necessary to avoid profound funding conflicts that could undercut full funding of the necessary regional response assets and spill response efforts. Conflicts in OSLTF expenditures are expected to occur as soon as FY 2007 and Fund assets may be totally exhausted by FY 2009. Another funding mechanism is an increase of liability limits that vessel owners must pay for spill damage and cleanup as actual costs have consistently exceeded liability limits, thereby draining the Fund through an inappropriate subsidy of polluters. An additional tax on cargo handled at U.S. ports has been suggested to more equitably distribute the costs among all vessels that cause the spills, enjoy liability limits and obtain response services without contributing any monies to the Fund.

Administrative and legislative efforts should be pursued to insure that state and federal regulatory agencies assert their jurisdiction over vessels in international trade to the fullest extent possible under international law. An expansion of the geographic areas where pollution and safety regulations are applicable is clearly possible for U.S. flag vessels and increasing the jurisdictional areas for foreign flag vessels, particularly those visiting U.S. ports, is likely possible as well. A legislative or administrative effort to increase penalties for failure to abide by safety and pollution regulations may assist in providing increased compliance and prevention of spills. Participation in the USCG rule-making process is strongly recommended for: casualty reporting; salvage and firefighting requirements; and non-tank vessel response plan requirements. A long-term policy of participating in International Maritime Organization and maritime classification society proceedings is suggested particularly where they regard: operational protocols for undertaking repairs to propulsion systems; standards for anchoring systems; standards for propulsion systems; standards for fire suppression.

The lack of appropriate regional response resources extends far beyond the failure to properly plan and equip Aleutian Subarea Contingency Plan as there are about 240 regulated vessels and facilities that were not required to fully comply with applicable federal or state oil pollution abatement regulations. The primary oil spill response organization for the region that is
listed in almost all private spill response plans in the Aleutians, Alaska Chadux Corporation, was contracted to respond to the Selendang Ayu spill and had otherwise voluntarily listed much of its equipment in the Subarea Contingency Plan. The state or federal on scene response coordinators could also require the party responsible for the spill to use any equipment it deemed necessary to effectively respond to the spill. The vast majority of response equipment in private response plans is, however, wholly inappropriate for use in the ocean environment where it is designed for use in calm harbors with little current and for sea heights less than 3 feet. Moreover, much of this equipment is not even in the Aleutians and is dependent upon favorable visibility conditions at local airports to allow delivery. Detailed plans to deploy this equipment to protect environmentally sensitive areas have not been fully developed and the process for this planning does not appropriately consider problematic conditions that would preclude effective protection of vital resources.

The local tugs that would be dispatched to provide rescue-towing operations are not designed to safely operate in severe sea conditions, are poorly equipped for the task and are underpowered, particularly if one of the larger regulated vessels is disabled in severe weather conditions. These tugs are also not distributed across the region in a manner that would insure timely response outside of the immediate Dutch Harbor area. Three private towing vessels intercepted the drifting ship and although one of these tugs was able to connect a towline, it was consistently pulled backward by the drifting ship and its towline eventually snapped. The other two tugs did not have line-throwing guns needed to connect a towline, could not safely operate on deck in the storm, and were otherwise too underpowered to effectively tow the ship. Participation in the administrative proceedings that are the basis for authorization of vessel response plans or facility contingency plans could substantially improve the quality and quantity of spill prevention and response assets that would be immediately available for response to any incident. Legislative efforts to improve and clarify spill prevention and response requirements could also help to improve response capability and the degree of regulatory oversight.

Although there is substantial room for improvement using commercially available response equipment, there is a clear need and a federal legislative mandate to advance spill response technologies for problematic conditions such as those that are often experienced in the severe weather and tidal fluctuations of Alaska. A legislative effort to obtain appropriations and a
concerted effort by the affected communities to oversee the administrative selection process of appropriate technologies is recommended.

Specific acquisitions and measures to improve spill prevention and response for private and/or public response plans to include:

- Immediate acquisition of a maneuverable rescue tug with about 175 tons bollard pull for deployment in the vicinity of Unimak Pass, (e.g. Ross Chouest).
- Conduct further investigation to discern the largest ships in the trade over next 20 years and the greatest quantity of persistent oil cargo transported to establish criteria for purpose-built salvage tugs and to determine quantity of response assets needed.
- Construction of two exceptionally maneuverable and seaworthy purpose-built salvage tugs >175 tons bollard pull for strategic deployment along the Aleutian Chain. These vessels must have a full complement of firefighting and salvage equipment including: an A-frame crane, cargo crane; diving equipment; ROV; structural, stability and loading assessment capability; source control and spill containment equipment.
- Implementation of a vessel tracking/traffic management system that can: detect disabled ships; insure enough lee drift time for a tug respond before grounding; prevent vessel collisions.
- Improve tow gear and rescue procedures for public towing vessels stationed in the area with supplemental tow gear depots made available for private tugs of opportunity.
- Acquire at least two maneuverable lightering vessels appropriate to the severe conditions for strategic deployment along the Chain. The equipment complement should include: cargo cranes; hot tapping equipment for pump insertion; multiple viscous oil pumps with a total of capacity of about 5,000 bbl/hr.; sufficient anchoring systems and hose lengths to maintain a safe standoff position in severe weather; oil solidification agents.
- Acquire and strategically deploy at least 10,000 feet of the most durable and largest ocean boom with appropriate anchoring systems to use for spill containment, (e.g. Ro-boom 3500 or equivalent single-point inflation boom). Contract and train local fishing trawlers for spill containment operations in foul weather.
- Acquire and strategically deploy spill recovery equipment appropriate to conditions, (e.g. All Purpose OSRV, JBF DIP-7000 OSRV, Force-7 rope mop system, NOFI OceanBuster w/built in skimmer or RBS-50 or 100 DIW, additional high current skimmers and boom
Mobile skimming systems should be deployed from barges, preferably articulated tug barges, using outrigger systems to allow operation independent of additional boom towing vessels.

- Acquire an integrated spill sensor and high data rate satellite communication package for the USCG C-130 fisheries patrol to include: (FLIR w/UV sensor, targeting and video capability, SLAR, Microwave Radiometer, Laser Fluorosensor).
- Conduct accelerated development of Geographic Response Strategies with collection of pertinent data on ambient environmental conditions, acquire oil exclusion equipment appropriate to conditions, and establish appropriate deployment logistics and train response crews on proper deployment.
- Conduct belated Spill of National Significance exercises until responders are proficient.
- Promote the development of a cost contribution matrix that equitably distributes the cost of the above assets and actions among: federal facilities and their fuel suppliers; USCG under Unified Plan obligations; ADEC under Regional Contingency Plan obligations; unregulated tank vessel owners; regulated tank vessel owners; non-public facilities; unregulated non-tank vessel owners; regulated non-tank vessel owners.

Appendices to this report are available in an electronic format on CD-R that contains: the vast majority of relevant information from the Unified Command Website on the Selendang Ayu Incident including Situation Reports, Incident Action Plans, maps, photos, surveys, etc.; the Alaska Unified Plan; Aleutians Subarea Plan; spill prevention and response equipment information, reports referenced herein and other relevant documents.