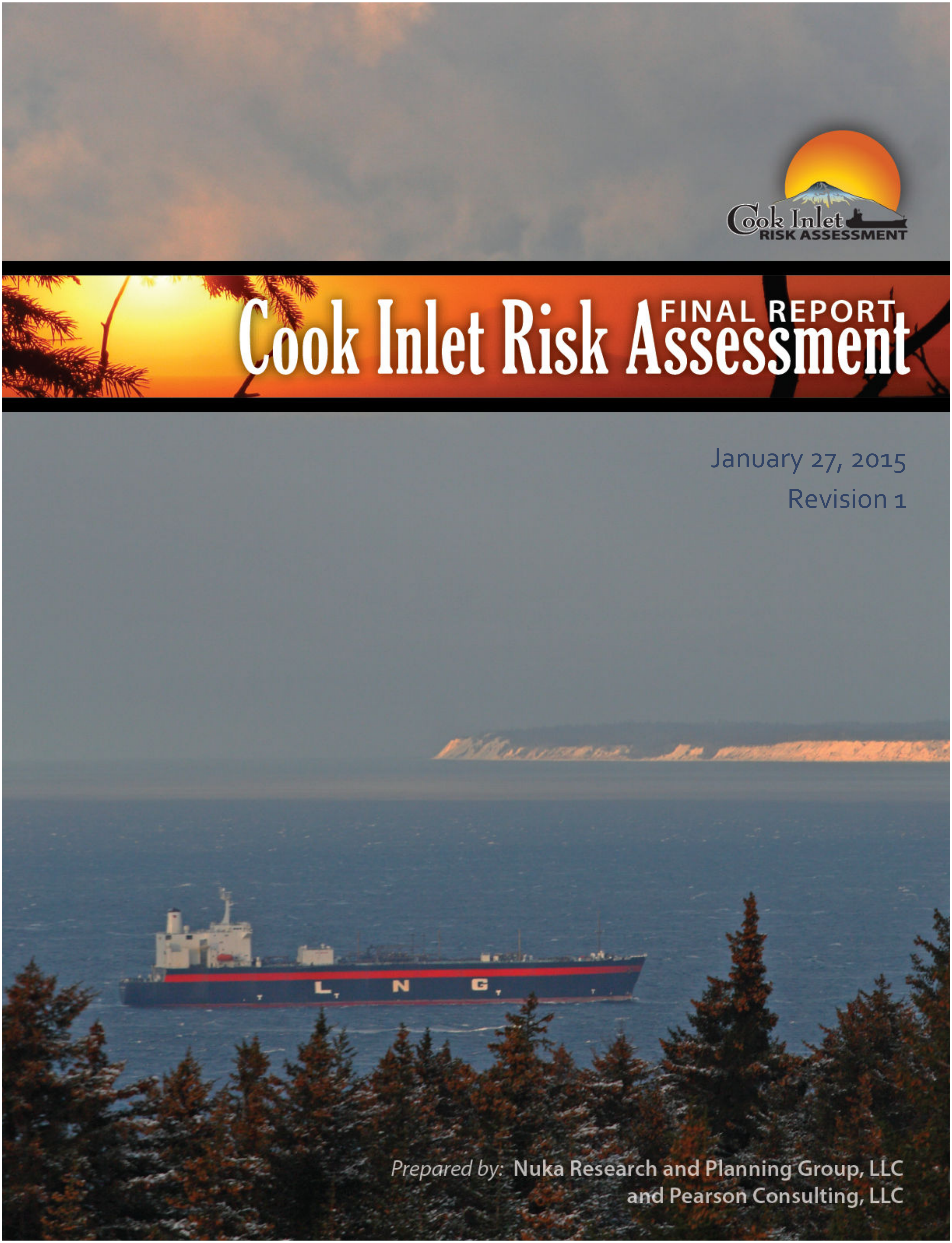

Cook Inlet Risk Assessment

FINAL REPORT

January 27, 2015

Revision 1

Prepared by: **Nuka Research and Planning Group, LLC**
and Pearson Consulting, LLC

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Executive Summary

The Cook Inlet Risk Assessment (CIRA) was initiated and led by the Alaska Department of Environmental Conservation, U.S. Coast Guard, and Cook Inlet Regional Citizens Advisory Council (Cook Inlet RCAC) from 2011-2014. These parties comprised the Management Team for the project. A multi-stakeholder Advisory Panel provided input throughout the process.

The risk assessment was conducted in two phases. The first phase involved collecting baseline information about the risks of marine accidents in Cook Inlet, including studies of vessel traffic, accident causality, and potential spill consequences. This information informed the Advisory Panel's consideration of potential risk reduction options. The second phase of the risk assessment included technical analyses to provide more information regarding selected risk reduction options. This report summarizes the technical analyses and describes the final recommendations of the Advisory Panel. All recommendations were developed based on group consensus.

The Advisory Panel considered 21 potential risk reduction options compiled through a public solicitation process as part of the CIRA, Advisory Panel members, and previous processes and forums related to navigational safety on Cook Inlet. This multi-stakeholder group ultimately recommended 13 risk reduction options to maintain and enhance the level of risk mitigation already achieved on Cook Inlet's waters. Where these efforts are already underway, they should be sustained and, in some cases, enhanced or expanded within the Inlet.

CIRA risk reduction options:

1. Construct subsea pipeline across Cook Inlet
2. Establish Harbor Safety Committee
3. Sustain/enhance training for pilots, captains, and crew
4. Harbormasters notify U.S. Coast Guard of unsafe vessels, and identify and communicate facility or equipment limits to all users
5. Maintain project depth at Knik Arm
6. Expand cellular and very high frequency (VHF) radio coverage
7. Use Automated Identification System (AIS) broadcasts to enhance situational awareness
8. Conduct third party inspections of workboats
9. Enhance emergency towing
10. Enhance vessel self-arrest
11. Promulgate federal non-tank vessel response planning regulations
12. Update and improve Subarea Contingency Plan
13. Continue to improve oil spill response equipment as proven options are developed

The State of Alaska secured initial funding for the CIRA through legislative appropriation, administered by the Kenai Peninsula Borough and Cook Inlet RCAC. The U.S. Coast Guard, National Fish & Wildlife Foundation, Tesoro Alaska, and Prince William Sound Regional Citizens' Advisory Council provided additional funding. The relatively modest budget of $870,000 limited the scope of analysis.

Acronyms

ADEC	Alaska Department of Environmental Conservation
AIS	Automated Identification System
AOOS	Alaska Ocean Observing System
ATON	Aid to navigation
AVTEC	Alaska Vocational Technical Center
AWOIS	Automated Wrecks and Obstructions Information System
CINC	Cook Inlet Navigation Channel
CIRA	Cook Inlet Risk Assessment
CISPRI	Cook Inlet Spill Prevention and Response, Inc.
Cook Inlet RCAC	Cook Inlet Regional Citizens Advisory Council
ETC	Eligible telecommunications carrier
ETS	Emergency towing system
HSC	Harbor Safety Committee
MXAK	Marine Exchange of Alaska
NOAA	National Oceanic and Atmospheric Administration
NVIC	Navigation and Vessel Inspection Circular
PWSRCAC	Prince William Sound Regional Citizens' Advisory Council
SMS	Safety Management System
TOO	Tug of opportunity
TRB	Transportation Research Board
USACE	U.S. Army Corps of Engineers
VHF	Very high frequency

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1. Introduction

The Cook Inlet Risk Assessment (CIRA) was a multi-year, multi-stakeholder project designed to assess the risks of oil spills to Cook Inlet from marine vessels and recommend risk reduction options. The project was launched in 2011 as a combined effort of the Cook Inlet Regional Citizens Advisory Council (RCAC), Alaska Department of Environmental Conservation (ADEC), and the U.S. Coast Guard.

1.1 CIRA Background

The safety of maritime transportation in Cook Inlet has been a heightened concern of the Cook Inlet RCAC, ADEC, and the U.S. Coast Guard since the grounding of the *T/V Seabulk Pride* in 2006 (ADEC, 2006). A series of efforts dating back 15 years laid the groundwork for the CIRA. In 2007, the Cook Inlet RCAC convened the Cook Inlet Navigational Safety Forum, which resulted in a consensus agreement that a more formal risk assessment should be conducted (Cook Inlet RCAC, 2007). Cook Inlet RCAC held another forum in 1999 (Cook Inlet RCAC, 1999). The U.S. Coast Guard had also convened a Ports and Waterways Safety Assessment of the region in 2000 (USCG, 2000a).

The State of Alaska secured initial funding for the CIRA through legislative appropriation, administered by the Kenai Peninsula Borough and Cook Inlet RCAC. The U.S. Coast Guard, National Fish & Wildlife Foundation, Tesoro Alaska, and Prince William Sound Regional Citizens' Advisory Council (PWSRCAC) provided additional funding. The relatively modest budget of $870,000 limited the scope of analysis.

The risk assessment was conducted in two phases. The first phase was to collect baseline information about the risks of marine accidents in Cook Inlet. This information was used to guide the selection of potential risk reduction options. The second phase of the risk assessment was to conduct technical analysis for selected risk reduction options and provide final recommendations from the Advisory Panel.

1.2 Purpose and Scope

The purpose of this report is to summarize the technical studies and additional analysis conducted to inform the Advisory Panel's recommendations on risk reduction options. This report was completed by Nuka Research and Planning Group, LLC (Nuka Research) and Pearson Consulting, LLC as a final deliverable for the CIRA.

This report synthesizes the key analyses and findings from the interim studies completed during the CIRA. The Advisory Panel reviewed these studies and considered the results in developing the final recommendations presented in this report. These studies, listed below, are referenced throughout this report. Some are also included as appendices to this report, as noted below. The following technical studies were conducted for the CIRA:

1. Cook Inlet Vessel Traffic Study (2012), by Cape International
2. Spill Baseline and Accident Causality Study (2012), by Glosten Associates, Inc. in collaboration with Environmental Research Consulting
3. Consequence Analysis Report (2013), by Nuka Research and Planning Group, LLC
4. Reduced Risk of Oil Spill with a Cross Inlet Pipeline (2013), by The Glosten Associates *(included as Appendix A)*

5. Evaluation of 2012 Tugboat Response Times (2013), by The Glosten Associates *(included in Appendix B, along with comments)*
6. Evaluate Drifting Vessel's Ability to Self-arrest (2013), by The Glosten Associates *(included in Appendix B, along with comments)*
7. Benefit-Cost Analysis of the Trans-Foreland Pipeline as an Oil Spill Risk Reduction Option (2014), by Northern Economics, Inc. *(included as Appendix C)*

The authors updated the report in early 2015 by adding the comments received from during a public comment period in September and October 2014 as well as the Management Team's response to those comments. These can be found in Appendix D.

1.3 Organization of this Report

This report provides a high-level summary of the CIRA process and participants, as well as the technical studies completed during Phase A (Section 2). The report describes the Advisory Panel's recommendation of risk reduction options for further study (Section 3) and presents additional technical analyses to support the evaluation of risk reduction measures that eliminate or reduce root causes (Section 4), decrease frequency of immediate causes and exposure to hazardous situations (Section 5), prevent an accident if an incident occurs (Section 6), and reduce oil outflow and spill impacts if an accident occurs (Section 7). Based on these analyses, the Advisory Panel makes a series of recommendations for risk reduction options in Cook Inlet, which are described with each risk reduction option and summarized in Section 8.

2. Risk Assessment Process

Collaboration of all essential, decision-making parties was crucial to the success of the CIRA and critical to the future implementation and continuous improvement of risk reduction efforts. The CIRA engaged stakeholders in defining and analyzing risks and identifying risk reduction measures through a multi-stakeholder Advisory Panel and a Management Team comprised of representatives from Cook Inlet RCAC, ADEC, and the U.S Coast Guard. There were also opportunities for public comment at meetings and on draft documents.

2.1 Risk Assessment Approach

The CIRA focused on potential oil spills associated with large vessel traffic in Cook Inlet, Alaska. It followed a risk assessment process outlined by the Transportation Research Board (TRB) of the National Academies, with some modifications due to funding limits.

2.1.1 Transportation Research Board Process

The CIRA follows the TRB's recommendations from the 2008 Special Report 293, "Risk of Vessel Accidents and Spills in the Aleutian Islands: Designing a Comprehensive Risk Assessment." The TRB report recommends a two-phase process for conducting a maritime risk assessment and recommending risk reduction options based on both technical analysis and stakeholder input. Phase A included studying vessel traffic, analyzing spills and incidents to develop scenarios of likely future incidents, and considering the consequences of potential future spills. Phase B included identifying and evaluating potential risk reduction options, and recommending one or more priorities. The Aleutian Islands Risk Assessment, for which analyses and stakeholder meetings were completed in 2014, also followed the TRB process.[1] The CIRA followed a similar approach to the Aleutian Islands project, but was conducted with an abbreviated timeline and smaller budget.

The TRB's approach prescribed a management structure consisting of a Management Team, Advisory Panel, and Peer Review Panel. This structure was also used for the CIRA with the modification of having a single expert in marine risk assessment instead of the Peer Review Panel (Section 2.2).

2.1.2 Project Scope

The CIRA focused on the marine waters and coastal areas of Cook Inlet as defined in regulation[2] and shown in Figure 1. Cook Inlet has some of the most extreme tides in the world and is home to commercial and recreational fisheries; petroleum exploration, extraction, and transport; tourism; subsistence use; and both endemic and migratory birds and wildlife. More than 40% of Alaska's population lives in the Cook Inlet region and the vast majority of the state's commodities and goods are shipped through its ports. Conditions and activities vary across the Inlet's operating areas, which are defined as: Lower, Middle, and Upper. These are shown in Figure 1.

The CIRA considered potential impacts associated with oil spilled from marine vessels of more than 300 gross tons (excluding military and research vessels for which there are limited traffic data) and smaller vessels with a fuel capacity of at least 10,000 gallons. Tugboats and fuel barges were included regardless of their gross tonnage and fuel capacity. The CIRA considered the following major accident types: collisions, allisions, powered groundings, drift groundings, foundering, structural failures, mooring failures, and fires and explosions.

Operational and intentional discharges from ships were not considered, nor were releases associated with Cook Inlet's petroleum exploration and production operations.[3]

2.2 Participants

The CIRA was implemented by a Management Team, Advisory Panel, and Facilitation and Analysis Team, with input from technical analysts, the public, and a Subject Matter Expert in risk assessment.

2.2.1 Management Team

The Management Team was comprised of representatives from the U.S. Coast Guard, ADEC, and Cook Inlet RCAC as the relevant funding agencies (see Appendix E). The Management Team made

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[1] www.aleutianislandsriskassment.com

[2] U.S. Coast Guard regulations at 46 CFR 7.165 define Cook Inlet's water boundaries as, "A line drawn from the southernmost extremity of Kenai Peninsula at longitude 151° 44.0 W to East Amatuli Island Light; thence to the northwestern extremity of Shuyak Island at Party Cape; thence to the eastern most extremity of Cape Douglas."

[3] Operational spills include spills that occur during cargo transfer or other routine operations. While spills from exploration and production infrastructure (drilling rigs and platforms) were excluded, spills from marine vessels associated with oil and gas production infrastructure were included in this study.

decisions for the project, reviewed and approved all project deliverables, and guided the expenditure of project resources. They also chartered and appointed members to the Advisory Panel.

2.2.2 Advisory Panel

The Advisory Panel was comprised of stakeholders and experts with local knowledge and expertise on issues critical to the success of the CIRA, including local infrastructure, relevant industries, waterways and their navigation, weather, subsistence use, and wildlife and habitat. The Advisory Panel consisted of a primary and alternate member for each stakeholder category (see Appendix E). The members represented their stakeholder groups generally, although many also work professionally in the area they represented. The recommendations described here represent the consensus of the Advisory Panel members.

Figure 1. Map of Cook Inlet, including study area boundaries and operating areas

2.2.3 Public

Public involvement occurred in two forms: (1) dissemination of ongoing project updates; and (2) public comment opportunities. All interested parties were invited to join a public email list for project updates, in addition to the information posted on the project website.[4] Input from the public has also been invited for specific project deliverables. These opportunities have included: recommending risk reduction options for consideration (via an online comment form), providing comments at meetings during comment periods on the agenda, and providing comments on studies or other deliverables. All key project deliverables, including this report, were released in draft form for public review (see Appendix D), and all public comments were posted on the project website. Comments were directly incorporated to the deliverables as appropriate and under the Management Team's guidance. In addition, materials provided by the public are often posted on the project website.

2.2.4 Facilitation and Analysis

Nuka Research and Planning Group, LLC and Pearson Consulting, LLC managed the project on behalf of the Management Team, facilitated the Advisory Panel, and procured sub-contract services necessary for some of the technical analyses. The Glosten Associates, Inc., Northern Economics, Inc., Cape International, Inc., and Environmental Research Consulting delivered analytical support in the form of key analyses conducted for the project (see Section 2.3).

The project also benefitted from the review and input of Dr. John Harrald as a subject matter expert on maritime risk assessments.

2.3 Initial Technical Studies (Phase A)

During Phase A, three initial technical studies were performed to explore marine vessel oil spill risks and inform the consideration of various risk reduction options. These included: a vessel traffic study estimated current and potential future vessel traffic patterns; a spill baseline study estimated the potential frequency, severity, and cause of spills from marine vessels; and a consequence analysis report compared the potential consequences of hypothetical spill scenarios based on stakeholder and expert input. The Advisory Panel considered these studies when developing their recommended risk reduction options.

2.3.1 Vessel Traffic Study

The *Cook Inlet Vessel Traffic Study* analyzed 2010 data on port calls and transits in Cook Inlet by vessels within the project scope (Cape International, 2012). Data were compared to a previous study of vessel traffic in 2005-2006 (Cape International and Nuka Research, 2006). Vessel traffic patterns and densities were not found to have changed substantially since this earlier study.

In 2010, 15 vessels made 80% of the estimated 480 transits of Cook Inlet by self-propelled vessels large enough to be included in the scope of this study. Most of these were state ferries or non-tank vessels. Most of the oil moving through Cook Inlet was transported via 102 oil barge transits and

[4] www.cookinletriskassessment.com

tank ships calling at Nikiski and Drift River that year (Cape International, 2012). Figure 2 shows the routes taken by different types of vessels based on data collected for the study.

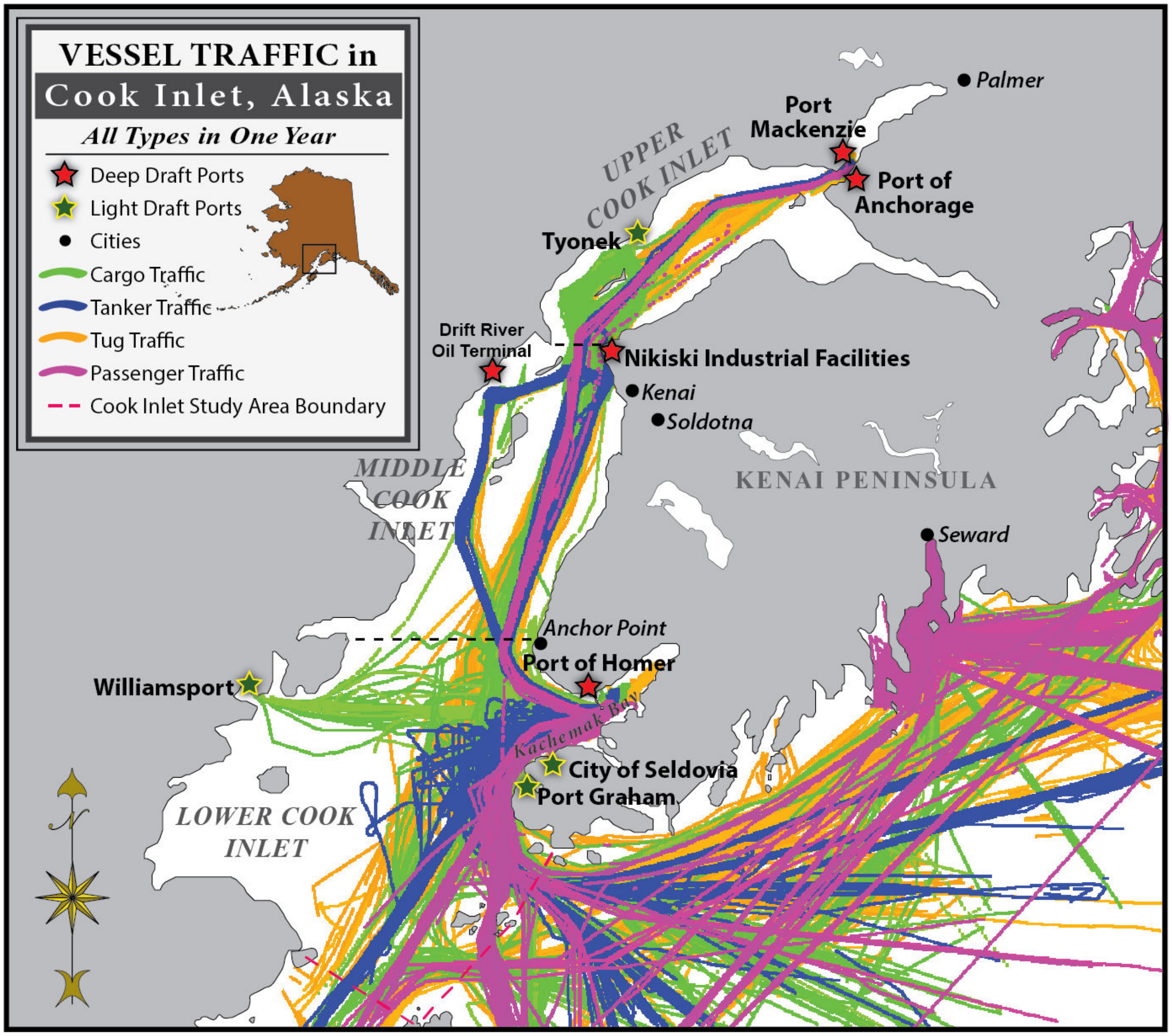

Figure 2. Vessel traffic in Cook Inlet by vessel type, 2010 (Cape International, 2012)

Several factors may impact future vessel activity in Cook Inlet, including planned and proposed changes to the Port of Anchorage and expansion opportunities at Port MacKenzie. The study also reviewed potential changes in import and export activities, including proposed coal projects, low sulfur diesel imports, the Alaska gas pipeline, and forest product and mineral extraction. Cook Inlet oil production forecasts included in the report indicate an overall downward trend in oil production volumes. However, oil movement by vessel through Cook Inlet may remain steady due to increased imports for Alaskan consumers and activity at the Nikiski refinery. Gas production is also trending downward, although recent exploratory drilling may increase available Cook Inlet gas reserves. Population and economic growth projections indicate only moderate potential impact on vessel activity. Over the next 10 years, it is reasonable to forecast that vessel traffic will remain flat or show only moderate increases (1.5-2.5% annually) due to population growth and post-recession improvements to the economy (Cape International, 2012).

2.3.2 Spill Baseline and Accident Causality Study

The *Spill Baseline and Accident Causality Study* established incident rates for tank ships, tank barges, non-tank/non-workboat vessels (ferries, cruise ships, container ships, bulk carriers, general cargo vessels, and gas carriers), and workboats (tugs, offshore supply vessels, and spill response vessels) (The Glosten Associates and ERC, 2012). Overall, the study estimated a historical spill rate of 3.4 spills (regardless of size) per year, with 3.9 spills per year forecasted for the years 2015 through 2020 across all vessel categories. Historical rates ranged from 0.7 spills per year for tank ships to 1.3 spills per year for non-tank/non-workboat vessels (The Glosten Associates and ERC, 2012). Table 1 shows the estimated 50th and 90th percentile spill volumes by vessel and incident type resulting from the study.

Table 1. 50th and 95th percentile spill volumes by vessel type and incident type (based on the The Glosten Associates and ERC, 2012)

Vessel Type	Incident Type	Oil Volume (gallons)	
		Moderate (50th percentile)	Large (95th percentile)
Tank Ship (Product Carrier)	Impact	5,000	4,000,000
	Non-impact	1,000	150,000
	Transfer Error	10	2,000
Tank Ship (Crude Carrier)	Impact	20,000	15,000,000
	Non-impact	2,000	8,000,000
	Transfer Error	10	2,000
Tank Barge	Impact	500	300,000
	Non-impact	200	300,000
	Transfer Error	10	2,000
Non-tank Vessel	Impact	1,000	300,000
	Non-impact	100	300,000
	Transfer Error	10	2,000
Workboat	Impact	100	20,000
	Non-impact	10	20,000
	Transfer Error	10	1,000

3.3.3 Consequence Analysis Workshop and Report

Subject matter experts, selected for their experience with Cook Inlet's environmental and socioeconomic resources, convened for a two-day workshop in Anchorage, AK on October 30-31, 2012. The results of this expert-led, qualitative analysis of potential spill consequences in Cook Inlet were described in the *Consequence Analysis Report* (Nuka Research, 2013). At the workshop, participating experts applied scores ranging from 1 (very low) to 5 (very high) to characterize the impacts of seven spill scenarios[5] on the following receptors:

[5] Spill scenarios were selected based on the Spill Baseline and Accident Causality Study (The Glosten Associates and ERC, 2012). The Spill Baseline and Accident Causality Study (2012) developed and categorized 2,112 scenarios based on historical and forecasted data for vessel traffic and reported incidents. The return period was calculated for each scenario based on historical spill rates. The return period of a spill describes how likely it is that a spill of equal or greater size will

- Cook Inlet habitat (pelagic, littoral, and benthic),
- Fish (shellfish and fin fish),
- Birds (waterfowl, shorebirds, and seabirds),
- Mammals (pinnipeds, whales and porpoises, and terrestrial),
- Commercial fishing,
- Subsistence uses,
- Recreation and tourism,
- General commerce, and
- Oil industry operations.

Participants considered the following factors known to influence the impacts of a spill: type of oil; spill size; and seasonality and environmental conditions that affect the movement of the spill (wind, temperature, currents or tides, and ice). The scenarios presented seven hypothetical spills with different locations, oil types, spill size, and season. Table 2 identifies the scenario parameters. The ranking of the scenarios based on subject matter expert input is shown in the middle column of Table 2. A preliminary analysis used oil spill volume as a single proxy for consequence, with the resulting rankings in the right-hand column.

Table 2. Comparison of rankings from subject matter experts and based on preliminary analysis (1 = Most Significant Impact)

Scenario					Ranking Based on Subject Matter Expert Input	Ranking based on Preliminary Analysis
Number	Location	Volume (bbl)	Product	Month		
1	Drift River	30,000	Crude oil	July	1	2
2	Nikiski	1,000	Diesel	November	6	5
3	Knik Shoal	48,000	Jet A	June	4	3
4	Anchorage	1,000	Heavy Fuel Oil (HFO)	February	7	6
5	Barrens	20,000	No. 2 Fuel Oil	May	2	1
6	Homer	100	Diesel	July	5	7
7	Anchor Point	1,000	Crude oil	September	3	4

occur in a given year, but expresses this likelihood using an inverse probability; therefore, a 1000 year return period for a spill has a 0.001 or 0.1% chance of happening in any given year. Each scenario was also given a preliminary estimate of consequence (based solely on the type and amount of oil spilled). Six scenarios used in the Consequence Analysis Workshop were considered to be representative of possible events and resulting consequences by the Advisory Panel with input from the technical consultants who conducted the initial study. Workshop participants added a seventh scenario representing a low probability/high consequence event.

When considering the full range of potential direct impacts from an oil spill to Cook Inlet, it was clear that even relatively small spills of non-persistent fuel may have significant negative impact. For example, Scenario #6, a 100 bbl diesel spill, still had a mid-level impact score of three for Commercial Fishing and Recreation/Tourism. Each of the scenarios resulted in a significant (maximum score of three or above) impact to at least one of the receptors considered. Four of the seven scenarios resulted in a major impact (maximum score of five) to at least one of the receptors considered.

The conclusion of the workshop was that any of the spills considered would have significant impacts to the environment and socioeconomics of Cook Inlet. All areas of Cook Inlet are vulnerable to significant consequences from marine oil spills of any type in all seasons. Transferring risk from one area to another would have little or no benefits in terms of reducing consequences.

3. Risk Reduction Options (Phase B)

The Advisory Panel met in February 2013 to review and consider potential risk reduction options that served as the focus for Phase B. Potential risk reduction options were compiled through a public solicitation process as part of the CIRA (December 2012 – February 2013), options included in the Coast Guard Authorization Act of 2010, recommendations from the Cook Inlet Safety of Navigation Forum in 1999, and items identified through the Ports and Waterways Safety Assessment in 2000. During the meeting, four additional options were suggested by Advisory Panel members.

From the potential risk reduction options, the Advisory Panel and Management Team identified those that they agreed warranted immediate or sustained implementation, and those that warranted further consideration. Thirteen risk reduction measures were ultimately recommended and eight were eliminated.[6] In some cases, the activity or intervention is already underway and should be maintained, or the activity was already on track to be implemented and should be encouraged. In the case of items that were resource intensive or for which the qualitative balance of benefits and costs was unclear, further research and analysis were conducted.

Figure 3 shows each option in the context of a generic accident chain (Harrald et al., 1998), and Sections 4 through 7 describe these options. This presentation highlights the project's efforts to reduce risk throughout the accident chain, or to reduce risk *differently* even when two or more interventions focus on the same point in the accident chain. This avoids redundancy in risk reduction and ensures that efforts address not only accident and/or spill prevention but also acknowledge the potential for sufficient failures to require consequence mitigation. Overall, the greatest attention was paid to interventions that target the early stages of the accident chain.

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[6] The following risk reduction options were eliminated at the February 2013 meeting: (1) traffic separation scheme, (2) establishing a Particularly Sensitive Sea Area through the International Maritime Organization, (3) satellite tracking of vessels, (4) use of long-range identification and tracking (LRIT), (5) improving aids to navigation, (6) removing out-of-service platforms and subsea pipelines, (7) placing quick-release mooring line hooks at the Port of Anchorage, and (8) positioning or pre-approving the use of the Oil Spill Eater Product.

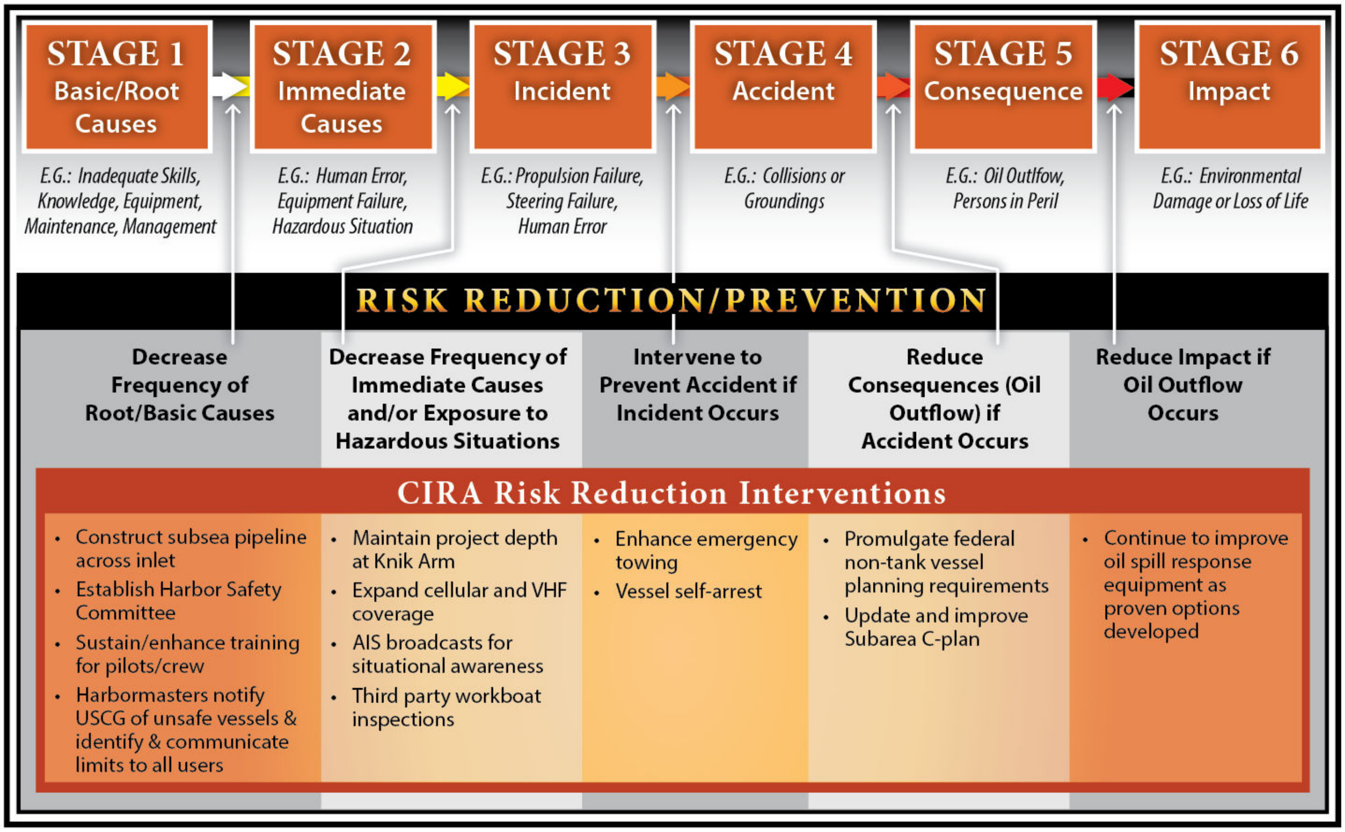

Figure 3. Risk reduction options considered in CIRA, in context of stages of accident chain (based on Harrald et al.,1998)

The recommendation to promulgate the final regulations regarding non-tank vessel response planning requirements was accomplished in July 2013 with new regulations released at 33 CFR 155. This item is not discussed further in the report.

4. Risk Reduction Options Related to Eliminating or Reducing Root Causes

The Advisory Panel supported either continuation or further consideration of several risk reduction options that relate to the elimination of root causes of accidents and spills. The displacement of cross-Inlet tanker traffic by constructing a subsea pipeline is the most resource-intensive of these options, and has the most readily quantified reduction of risk (see Section 4.1). Other risk reduction options in this category relate to reducing the potential risk by improving communication and coordination among the marine community by establishing a Harbor Safety Committee (Section 4.2) ; enhance maritime safety overall through rigorous training of captains, pilots, and crew to a high standard and in Cook Inlet-specific conditions (Section 4.3); and encouraging harbormasters to share certain information with the U.S. Coast Guard and harbor users (Section 4.4).

4.1 Construct Subsea Pipeline Across Cook Inlet

Currently, oil produced on the west side of Cook Inlet, either on land or from platforms in the Inlet, is transported via pipeline to the Drift River Terminal where it is loaded on to tank vessels and shipped across the Inlet to the Tesoro Refinery in Nikiski. There is a pending proposal submitted to state and federal regulators by Cook Inlet Energy to replace this tanker traffic with a subsea pipeline that would move oil produced from both onshore and offshore drilling sites on the western side of the Inlet to the Nikiski Industrial Facilities. This change would result in the removal of tank vessels from the system, thereby reducing the risk of vessel spill.

4.1.1 Overview of Proposed Project

In 2012, Cook Inlet Energy proposed the Trans-Foreland Pipeline Project that would consist of a 29-mile, subsea pipeline built to transport up to 90,000 barrels of crude oil per day along the bottom of Cook Inlet from Kustatan to Nikiski. At the federal level, the project qualifies for a nationwide permit from the U.S. Army Corps of Engineers, pending a review by other agencies. Permitting by the Alaska Department of Natural Resources is also required for the right-of-way. Figure 4 shows the proposed pipeline route, which was modified in 2012 after consultation with the Southwest Alaska Pilots Association to avoid the strong currents and deep areas in the immediate vicinity of the Forelands (Baker, 2013). The project is estimated to cost $50 million (Loy, 2012).

4.1.2 Potential for Subsea Pipeline to Reduce Overall Spill Risks

The construction of a subsea pipeline across Cook Inlet would reduce the number of tanker transits, and therefore would also reduce the potential for a tanker spill because the exposure, or total volume of oil transported by tanker, would be reduced. However, oil would still be transported across the Inlet by pipeline, so spill risk is not entirely eliminated. The probability of a spill and potential spill volume were compared for tankers and subsea pipelines.

The Glosten Associates estimated the extent to which the potential number and size of tanker spills would be reduced if tankers were no longer transporting oil across Cook Inlet (The Glosten Associates, 2013a). This estimate was developed based on the *Cook Inlet Vessel Traffic Study* (Cape International, 2012) and *Spill Baseline and Accident Causality Study* (The Glosten Associates and ERC, 2012). Assuming the pipeline displaced all cross-Inlet tanker traffic, 38 one-way crude tanker transits would be eliminated each year.[7] This translates to removing 35.1 traffic-days per year from the system, and would reduce spills by an estimated 0.105 per year (The Glosten Associates, 2013a).[8] The potential size of these spills does not change from the sizes estimated in the *Spill*

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[7] The vessel traffic study was conducted using 2010 data. At that time, activity at the Drift River Terminal had changed significantly due to the 2009 eruption of Mt. Redoubt. Because the Drift River oil storage tanks were not in service in 2010, actual numbers of tank vessels transits from the West to the East side of Cook Inlet are now lower though not quantified for the study. (Information provided by Jack Jensen, Tesoro Alaska and Advisory Panel member.)

[8] In addition to displacing tanker traffic, the pipeline would presumably eliminate the need to store oil at the Drift River Terminal prior to vessel loading. This would reduce the potential for spills from the storage terminal which is currently at a capacity of 1,080,000 bbl capacity per the operating company's state-approved oil spill contingency plan (CIPL, 2013). This risk reduction was not quantified as the terminal and associated storage are outside the scope of the CIRA.

Baseline and Causality Study (The Glosten Associates and ERC, 2012) because the tanker size and construction do not change.[9]

Based on leak frequencies found in the literature for subsea pipelines (IAOGP, 2010; Mott McDonald Ltd, 2003; Baker, 2013), the pipeline has the potential to add 0.0018 spills per year.[10] This results in a net reduction in spill risk of 0.103 spills per year, or 98%.

This comparison illustrates a clear reduction in the potential for oil spills by transferring the oil transportation from tankers to a subsea pipeline. However, the pipeline data is derived from U.S. statistics and not specific to Alaska or Cook Inlet, while the tanker spill return estimates are Cook Inlet-specific. There are currently no subsea pipelines in Cook Inlet from which to derive data. The Northstar pipeline on the North Slope of Alaska has been operating for 13 years without a spill, so this could not be used to corroborate the U.S. Outer Continental Shelf estimates. A query of the ADEC SPILL database shows during that same time, there were three crude oil spills from tankers operating in Cook Inlet.[11] This supports the general observation that tanker spills occur more frequently than subsea pipeline spills.

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[9] See Appendix A for The Glosten Associates' estimated reduction in spill risk from tankers that are displaced by a subsea pipeline.

[10] The leak frequency for processed oil or gas, with a pipeline diameter of ≤ 24 inch, is 5.1×10^{-5} per km-year (IAOGP, 2010). This was used to calculate the return rate: 5.1e10-5 x 35.4 = 1.81E10-3 or .00181 spills per year, a return rate of 553.89 years.

[11] These were the *T/V Seabulk Arctic* (3/2/03), *T/V Seabulk Arctic* (3/14/04), and *T/V Seabulk Pride* (12/17/04) (ADEC, 2013).

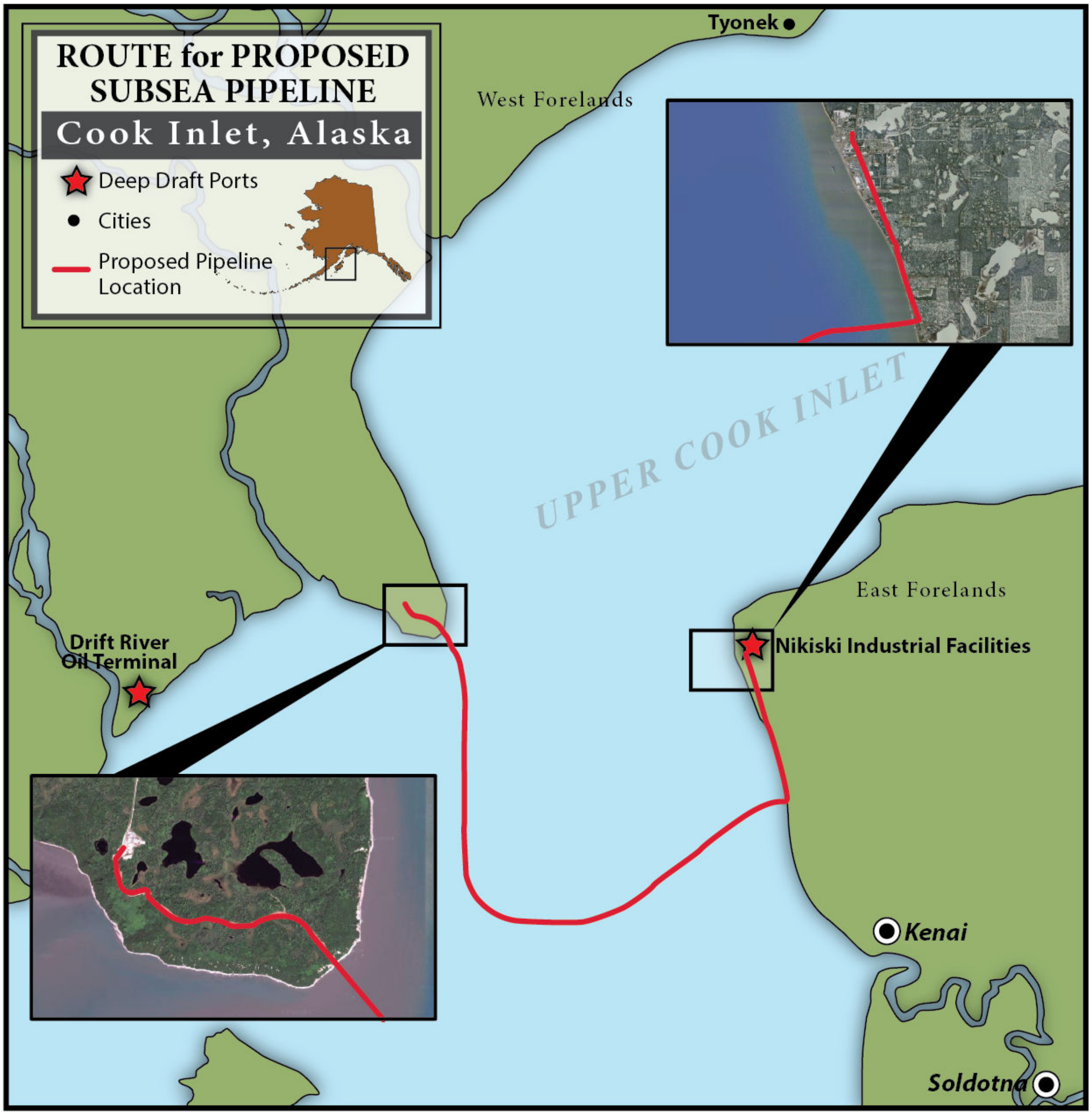

Figure 4. Map of proposed subsea pipeline route from Drift River to Nikiski (based on Baker, 2013)

Spills from pipelines also tend to be *smaller* than spills from tankers (Etkin, 2001). A study of U.S. Outer Continental Shelf pipeline spills from 1996 to 2010 indicates an average spill size of 928.2 gallons (Anderson et al., 2012). Data from this study were used to develop a spill size distribution for subsea pipelines similar in length and diameter to those described in the cross-Inlet pipeline project materials. These estimates are compared to the potential spill volume distribution from tankers developed in the CIRA Phase A study (The Glosten Associates and ERC, 2012). Table 3 compares the subsea pipeline and tanker spill size distributions. For all spill sizes, the subsea pipeline leak rates show a 99% reduction in potential spill volume when compared to tanker impact spills (spills from groundings, collisions, and allisions, which result in the highest potential spill volumes).

Table 3. Comparison of potential spill volumes from a double-hulled crude tanker and subsea pipeline

Spill Cause	Small 25th percentile (gallons)	Moderate 50th percentile (gallons)	Large 95th percentile (gallons)	Worst Case Discharge (gallons)
Tanker Spills				
Impact spill (resulting from allusion, collision, or grounding)	500	20,000	15,000,000	28,500,000
Non-impact spill (resulting from fire, equipment failure, or operator error)	100	2,000	8,000,000	28,500,000
Transfer error	1	10	2,000	75,000,000
Pipeline Spills				
Subsea pipeline	< 1	5	571	232,227[12]
Comparison of Spill Size Distribution				
%Reduction in spill rates: Tanker impact spills compared to subsea pipeline spills	>99%	>99%	>99%	99%

4.1.4 Benefit-cost Analysis of Cross-Inlet Pipeline

A benefit-cost analysis of the proposed pipeline was developed based on the information described in this section as well as other assumptions and inputs from the project description provided to the state and a review of published literature. The full report is included as Appendix C (Northern Economics, Inc., 2014).

A benefit-cost analysis results in a ratio of benefits (primarily representing avoided impacts by reducing the probability of a spill) to costs (primarily associated with the construction and operation of the subsea portion of the pipeline itself). In this case, the resulting ratio was relatively low (0.05) if only median size spills were considered, but rose to 5.8 if the potential for a large oil spill was considered. While smaller spills are more likely to occur, it is the desire to avoid larger or even worst-case spills that drives the recommendation to implement a significant infrastructure development as a risk reduction option. If a worst-case spill and its associated impacts and costs are considered, the benefit-cost ratio rises to 18.1 (Northern Economics, Inc., 2014)[13].

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[12] Worst Case Discharge for proposed subsea portion of pipeline is considered to be 100% of the total volume. Volume is calculated based on: 116,160 feet x 0.0476 bbl/ft (7" inside diameter) x 42 gal/bbl = 232,227 gallons.

[13] The Drift River Terminal is excluded from this analysis, both in terms of the potential size and frequency of spills and the consideration of benefits and costs. Thus, the operating costs, costs associated with a potential spill from the terminal's storage facilities, potential decommissioning costs, or other costs or benefits associated with the terminal was not included in this analysis. Northern Economics, Inc. also notes that the costs of using low sulfur fuel oil for tankers was incorporated into the analysis, but the cost of using marine gas oil for tanker generators is not included. If this information was included, the benefit-cost ratio would be expected to increase. (Northern Economics, Inc., 2014)

4.1.5 Recommendation

The Advisory Panel recommends that the subsea pipeline should be developed to reduce the potential for large spills from cross-Inlet tanker traffic between Drift River and Nikiski. The pipeline will have the ancillary benefit of reducing the need for storage of oil at the Drift River facility, though this benefit is not quantified here.

This recommendation is based on the Advisory Panel's charge to develop and recommend oil spill risk reduction options related to marine transport, and the Panel's consideration of analysis related to spill risks and a benefit-cost analysis focused on the same. The Panel acknowledges that there are economic factors and other considerations that fall outside its scope but warrant careful consideration by decision-makers in approving and developing this significant new infrastructure.

4.2 Establishing a Cook Inlet Harbor Safety Committee

The complexity of port areas and heavily used waterways means that there are multiple groups with different perspectives and information about risks and potential safety improvements in any given location. Harbor Safety Committees (HSC) provide a venue for groups with an interest in safe maritime operations to share information and develop and implement policy. They can also play a key role in ensuring that changes in risk resulting from changes in operations or conditions are identified and addressed. HSCs are widely implemented around the U.S., require no regulatory changes, and require minimal expenditures, assuming the key parties are willing to commit their participation. There are HSCs in many coastal and inland waterways around the country, although their level of activity varies widely.

Currently, there is an ad-hoc Safety and Navigation Committee that meets prior to the winter ice season to discuss operations pertaining to the Kenai Pipeline Dock, but not necessarily operations within the entire Inlet.

4.2.1 HSC Operations

HSCs typically operate at two levels:

- **Coordination.** An HSC can provide a basic forum for the exchange of information among people who rely on the resources of a waterway, whether for transport, resource extraction, or other activities. These groups can, if they choose, seek input from the public on certain issues. Keys to successful coordination include: (1) clear expectations for participation that includes representatives of the needed stakeholder groups; (2) regular means of communication, whether meetings (sometimes as often as once a month, but can be less frequent), website, email lists/listservs, and/or newsletter updates; and (3) high quality information that is understood and trusted by all key participants.

- **Policy development and implementation.** Even when operating outside of the regulatory process, HSCs may develop voluntary policies and procedures. These may include establishing standards of care or voluntary guidelines for certain operations, or identifying and clarifying important safety messages to waterway users (ranging from tanker operators to recreational boaters). HSCs often develop Harbor Safety Plans that encompass the practices that they develop to mitigate the potential for accidents or other unsafe operations. In addition to the items described for coordination, above, keys to successful policy development and coordination include: (1) establishing a clear and transparent process for prioritizing problems or policies to be addressed, and (2) establishing a method for gaining feedback on policy implementation and modifying the approach as needed for improvement.

4.2.2 HSC Organization

HSCs have many different structures. They may be housed within an existing organization, rely on staffing from an existing organization (essentially providing financial and administrative support), or be an independent organization. Funds may be raised through either required or voluntary annual dues or for support specific projects or needs.

Typically, HSCs operate in a manner that is complementary to but outside of the regulatory structure, so an HSC would not be housed in a state or federal agency. Instead, these agencies tend to serve in an advisory or observer capacity depending on the issues being discussed. The U.S. Coast Guard encouraged the creation of HSCs over the last decade with the issuance of a Navigation and Vessel Inspection Circular (NVIC) 1-00 and creation of a blog designed to encourage HSCs to exchange information, among other tools. However, as made clear in the NVIC, the Coast Guard neither mandates the establishment of HSCs nor does it take a direct management role within an HSC (USCG, 2000b).

4.2.3 Potential Priority Issues for HSC

Several mitigation measures emerged through the course of the CIRA, which are fitting near-term items for a new HSC. These mitigation measures deserve input from the maritime community, and also represent topics requiring ongoing attention:

- Consider enhanced ice monitoring to inform vessel operations
- Participate in the update to winter ice guidelines issued by the U.S. Coast Guard
- Update the National Oceanic and Atmospheric Administration's (NOAA) Automated Wreck and Obstruction Information System (AWOIS) for the area
- Update the Coast Pilot for the area, also maintained by NOAA
- Consider future needs related to vessel self-arrest and emergency towing (see Section 6)

Consider Enhanced Ice Monitoring to Inform Vessel Operations

Navigating the ice-infested waters of Cook Inlet has always been a challenge to mariners. Understanding and enhancing ice-monitoring capabilities has been a priority for agencies and operators with the goal of reducing accidents. The Cook Inlet RCAC has worked with the NOAA Ice Forecaster to organize observers operating in the Inlet to provide information about ice conditions. Ice observers provide daily observations to NOAA, sometimes including a digital photograph. Observations may include the extent of ice coverage, composition, pan dimensions, and thickness. Cook Inlet RCAC has also installed eight high-resolution digital cameras on platforms at key locations in Upper and Middle Cook Inlet (Loy, 2014). These sea ice web cameras are essential for NOAA's sea ice analysis on days when visual satellite imagery is not available due to cloud cover and greatly contribute to accurate ice advisory information for Cook Inlet.

In other locations in Alaska, radar imaging has been used for maritime navigational safety and environmental security including Prince William Sound and the U.S. Arctic Ocean.

- **Prince William Sound:** In 2002, PWSRCAC led a multi-stakeholder effort to install an ice detection radar system on Reef Island[14] to provide the USCG with real-time information regarding ice conditions in the shipping lanes near the Columbia Glacier and promote the research and development of new radar technologies. The Rutter Sigma S6 Ice Navigator radar system is used for iceberg detection (Arvidson and Jones, 2003). The radar signal is transmitted from Reef Island to Alyeska's Ship Escort Response System duty office, where the ice radar display is used to verify conditions received from tankers and tug escorts. The system continues to operate efficiently with minimal upkeep.

- **Arctic Ocean:** The University of Alaska Fairbanks' Sea Ice Group at the Geophysical Institute installed two coastal web camera/radar systems in Barrow and Wales. Both systems are land-based and consist of a webcam and marine band high frequency radar. The prototype system in Barrow was used to identify tactical and operational information needs for monitoring environmental hazards and effective emergency response in sea-ice environments (Eicken et al., 2011), gathering high-resolution data of ice distributions, movement and deformation, as well as ice characteristics and dynamics. Nearshore ice is monitored with commercially-available Furuno 10kW, X-band marine radars mounted on rooftops that can operate at ranges up to approximately seven miles (UAF, 2014). Data are transferred to Fairbanks at five minute intervals, geo-located, and archived by the Alaska Ocean Observing System (AOOS) (Druckenmiller et al., 2009). The radar and webcam images are recorded also available online for near-real time viewing.

Based on the existing operational radar systems, the Cook Inlet region would benefit from integrating the oil platform webcam ice observations with a marine band high frequency radar and satellite imagery to provide near-real time ice conditions to mariners. A multi-stakeholder effort involving entities such as the maritime industry, AOOS, Cook Inlet Spill Prevention and Response, Inc. (CISPRI), Cook Inlet RCAC, the Oil Spill Recovery Institute, University of Alaska Fairbanks, and government agencies could provide a cost-effective means for conducting a pilot project. The Cook Inlet ice radar pilot project could include the installation of one radar system on an oil platform located near the East and West Foreland. The estimated cost for establishing seasonal sea ice radar observing systems ranges from $41,000 to $122,000 (Rutter, Inc., 2013) depending on the type of radar and component add-ons.

Participate in Update to Winter Ice Guidelines as Needed

Ice conditions in Cook Inlet have long been identified as a navigational safety concern. The U.S. Coast Guarddeveloped the current guidelines in 2012 with input from the Southwest Alaska Pilots Association and Cook Inlet maritime operators. The "Operating Procedures for Ice Conditions in Cook Inlet" (November 20, 2012) establish procedures for the Upper Inlet (Phase I) and Lower Inlet (Phase II) based on the U.S. Coast Guard's determination that ice conditions warrant activation of the guidelines (USCG, 2012).

The U.S. Coast Guard also has the authority to stop cargo operations or close a terminal or port due to ice or other hazardous conditions under 33 CFR 160.111.

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[14] http://www.pwsrcac.org/programs/maritime/ice-detection/

Update NOAA's Automated Wreck and Obstruction Information System (AWOIS) Database
There are numerous subsea wells and pipelines in Cook Inlet, both those currently in use and those that are not being used at this time. There is the potential for vessels to hit underwater wellheads,[15] or to drop anchor onto a pipeline or other infrastructure. Some operators in the Inlet conduct their own subsea surveys prior to dropping anchor.

NOAA's Office of Coast Survey directs field programs for ship- and shore-based hydrographic survey units. The information gathered during NOAA surveys is entered into AWOIS and can be accessed online at: http://www.nauticalcharts.noaa.gov/hsd/hydrog.htm. The database identifies the locations of submerged wrecks or other obstructions. Mariners can also provide updated or additional information to NOAA.

Update NOAA Coast Pilot
NOAA's Coast Pilot, updated weekly, describes ports, harbors, and other waterway features, including information about potential hazards and recommended routing. Although these guidelines are non-regulatory, large vessels are required to have the Coast Pilot on board [33 CFR 164.33(a)(2)(i)]. If a vessel operator ignores the Coast Pilot recommendations, they are essentially violating a standard of care and increasing their liability if something goes wrong as a result of that choice. The Coast Pilot that includes Cook Inlet was most recently published August 17, 2014 (U.S. Coast Pilot 9, Chapter 4). NOAA's Office of Coast Survey welcomes information from mariners.[16] Pilots are required to memorize the relevant sections of the Coast Pilot for their pilotage areas, and frequently suggest updates to NOAA.

4.2.4 Recommendation

The Advisory Panel recommends that an HSC be established for Cook Inlet. A Cook Inlet HSC would provide a continuum started by the CIRA by gathering a group of individuals with diverse perspectives to identify potential problems, develop or recommend non-regulatory mitigation measures, and evaluate the success or areas of improvement. The Cook Inlet HSC would provide a means of prioritizing the consideration of relevant topics and mitigation measures. HSCs can also provide collective input on issues at both the Captain of the Port level and related regulations. While HSC participation will be determined as the group forms, the Advisory Panel recommends that participants should at minimum include representatives of maritime industry and Cook Inlet operators, tribes, and local communities.

The HSC should consider the following activities as part of its initial and ongoing efforts:

- Enhancing ice monitoring to inform vessel operations in Cook Inlet
- Participate in updating the winter ice guidelines as needed

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[15] Soon after the Advisory Panel met on February 22, 2013 a workboat collided with an inactive, subsea wellhead off the coast of Louisiana. See: http://abcnews.go.com/US/coast-guard-responds-oil-spill-off-louisiana-shore/story?id=18609482
[16] For the relevant section of the Coast Pilot, see: http://www.nauticalcharts.noaa.gov/nsd/coastpilot/files/cp9/CPB9_E30_C04_20130420_1212_WEB.pdf To suggest updates, see: http://ocsdata.ncd.noaa.gov/idrs/discrepancy.aspx

- Updating NOAA's Coast Pilot and Automated Wreck and Obstruction Information System (AWOIS)
- Additional study related to vessel self-arrest and emergency towing, as described under that risk reduction option (see Section 6).

4.3 Sustain and Enhance Training for Pilots, Captains, and Crew

Well-trained captains, pilots, and crew are critical to the operation of large vessels. U.S. Coast Guard and Alaska Department of Commerce, Community and Economic Development regulations establish the basic training and/or licensing requirements for marine pilots, deputy marine pilots, vessel masters, and crew. (International requirements are codified in the U.S. at the federal level.) These requirements vary depending on the role being played, but, for pilots, they include years of experience as a mariner, simulations, supervised operations on-water, and extensive oral and written tests.[17] At the state level, the Board of Marine Pilots establishes specific training requirements, including training related to the operating conditions in the region in which in the pilot will operate.

In addition to licensing and training mandated by the State or U.S. Coast Guard (which oversees adherence to international training standards in the U.S.), the pilots and shippers are conducting additional training together. This training, along with as much of the mandated training, is conducted at Alaska Vocational Technical Center (AVTEC) Maritime Training Facility in Seward where they have state-of-the-art simulators that allow personnel to safely practice anchoring, docking and other procedures in challenging conditions at specific docks or other areas of Cook Inlet. AVTEC offers a Coast Guard-approved ice navigation course based on 2010 updates to the International Maritime Organization's Standards for Training, Certification, and Watchkeeping, known as the Manila amendments, which include requirements for training in ice conditions.

4.3.1 Recommendation

The Advisory Panel recommends that Cook Inlet pilots, vessel officers and shoreside vessel managers engage in simulator training above and beyond normal qualifications specifically focused on the Cook Inlet operations and ice navigation. This recommendation does not imply a change in the required qualifications for vessel operators.

4.4 Harbormasters Notify U.S. Coast Guard of Unsafe Vessels and Identify and Communicate Limits to all Users

The Advisory Panel identified two items related to port and harbor operations as best practices for implementation at ports and harbors throughout the Inlet: (1) harbormasters should notify the U.S. Coast Guard if they turn away a vessel because it appears unsafe or unseaworthy, and (2)

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[17] See "Statutes and Regulations: Marine Pilots" (June 2012) from the Alaska Department of Commerce, Community, and Economic Development.

harbormasters should ensure that they have the best possible understanding of the limits of their facilities and equipment, and clearly communicate these to vessels entering the port or harbor.

4.4.1 Notifying the U.S. Coast Guard if Unsafe Vessels are Turned Away

It is common practice for harbormasters and port directors to turn away vessels that they determine to be unsafe or unseaworthy.[18] When these vessels are denied moorage in a safe harbor, they may seek moorage or anchorage at a place that is less safe, more environmentally sensitive, and/or has less oversight from authorities. By promptly contacting the U.S. Coast Guard's Sector Anchorage Command Center or Marine Safety Detachment in Homer when they deny access to a "vessel of concern," harbormasters will facilitate the Coast Guard's ability to mitigate or address mechanical problems (such as poorly functioning radar or steering) or potential pollution. The U.S. Coast Guard would then proceed to contact the vessel owner and seek to address the situation.

A task force has been formed that is considering this and other issues related to abandoned and derelict vessels in Cook Inlet.

4.4.2 Understanding and Communicating Limits Associated with Safe Operations at their Facilities

Vessels casualties can occur when a vessel is at or approaching/departing a mooring or dock. In particular, attention has been paid to the impact of moving sea ice on mooring given the experience of the *T/V Seabulk Pride* in 2006. Ports and harbors throughout the Inlet should have a clear understanding of the potential hazards that vessels may face in terms of water depth, current, sea ice, high winds, or underwater facilities (pipelines, communication facilities, etc). These hazards can be translated into an understanding of the limits on vessel size, approach speed, mooring line requirements, and/or other equipment limitations. These limits, and desired or required procedures to be implemented if these limits are approached or exceeded, should be clearly communicated to vessels by port and harbor personnel.

4.4.3 Recommendation

The Advisory Panel recommends that Harbormasters and Port Directors in Cook Inlet establish procedures to help them identify unsafe and unseaworthy vessels, and to contact the U.S. Coast Guard when they turn such vessel away. This procedure should be included in port/harbor Standard Operating Procedures and/or included in the certification criteria for the Alaska Clean Harbors Program.

This recommendation does not involve additional regulations or costs, but simply encourages improved communications between harbormasters or port directors and the U.S. Coast Guard. This recommendation seeks to reduce accidents associated with vessels of concern by facilitating action from the U.S. Coast Guard based on harbormaster observations.

In addition, many ports and harbors in Cook Inlet already have achieved a strong understanding and communications plan regarding the limits of their equipment and facilities. Where these do not

[18] This risk reduction option focuses primarily on smaller vessels.

exist, they should be developed through a mooring study or other analysis and incorporated into the communications practices used by port and harbor personnel in their verbal and written interactions with vessels calling at their docks or moorings.

5. Risk Reduction Options Related to Decreasing Frequency of Immediate Causes and Decreasing Exposure to Hazardous Situations

Reducing the frequency of immediate causes or exposure to hazardous situations covers a wide range of risk reduction options. In the CIRA, related risk reduction measures include dredging Knik Arm Shoal (Section 5.1), near Anchorage, to reduce large vessel exposure to the hazard of grounding. The safety of workboat operations throughout the Inlet was considered, with the use of safety management systems, including third party inspections, as a key means of reducing potential immediate causes of incidents or accidents (Section 5.4).

Communications between vessels or between vessels and shore can be critical for sharing information about known or potential hazards, or for hastening a response to mitigate an incident or accident. In Cook Inlet, as elsewhere, vessels may rely on one or more of the following to share and receive information: satellite and cell phone (including Internet access) and very high frequency (VHF) radio (both discussed in Section 5.2), and Automated Identification System (AIS), discussed in Section 5.3. The supporting infrastructure for all of these modes of communication relies on equipment on the vessel itself, as well as a shore-based resources maintained by a combination of public and private entities. All three modes of communication can *also* be used to prevent an incident from occurring, if, for example, a vessel notifies rescue resources that it requires assistance (or if this is observed on the AIS, prompting a rescue).

5.1 Maintain Project Depth at Knik Arm

A substantial amount of glacial silt flows into Cook Inlet, including silt from the Knik Glacier and the Mat-Su river drainages. In addition, one of the highest tidal ranges in the world scours and re-deposits prodigious amounts of this silt every tide cycle. In recent years, Knik Arm Shoal and Port McKenzie Shoal have been growing much more quickly and have required increased dredging. The U.S. Army Corps of Engineers (USACE), which is responsible under Section 10 of the Rivers and Harbors Act of 1899 for maintaining vessel access to the Port of Anchorage,[19] has gone from dredging 300,000 cubic yards of material annually from the channel to nearly two million cubic yards. When first dredged in 2000, the area dredged was 1,017 feet wide, 38 feet deep and 6,500 feet long. Approximately 2.6 million metric tons of material was removed at a cost of $8.7 million U.S.

[19] Anchorage is by far the largest port in Alaska, with upwards of 85% of the cargo coming into the state. In August 2004, the Port of Anchorage became one of 19 ports in the U.S. designated a "Strategic Port" by the Dept. of Defense because of the extensive and strategically important military presence in the area that requires immense logistical support, much of which passes through the port.

dollars. The work area has increased since 2000: approximately 11 million cubic yards of material now has to be removed.[20]

The USACE identifies dredging projects that need funding under the Water Resources Development Act. The federal government cost shares with state and/or local governments in obtaining project funds. The annual cost for dredging the Port of Anchorage is now $15.4 million. The USACE plans to dredge 10 million cubic yards of sand, gravel, cobbles and silty sediment that have accumulated in the Knik Arm portion of the existing Cook Inlet Navigation Channel (CINC) between 2013 and 2017. Annual maintenance dredging of the existing channel to the specified project depth of 43 feet below mean low-low water, width of 1,100 feet, and length of 11,000 feet will consist of hydraulic and/or mechanical dredging. Figure 5 shows the CINC and proposed dredging area. Funding for maintenance dredging of the CINC beyond 2017 is uncertain,[21] yet it is critical to maintain minimum project depth for safe navigation of this waterway.

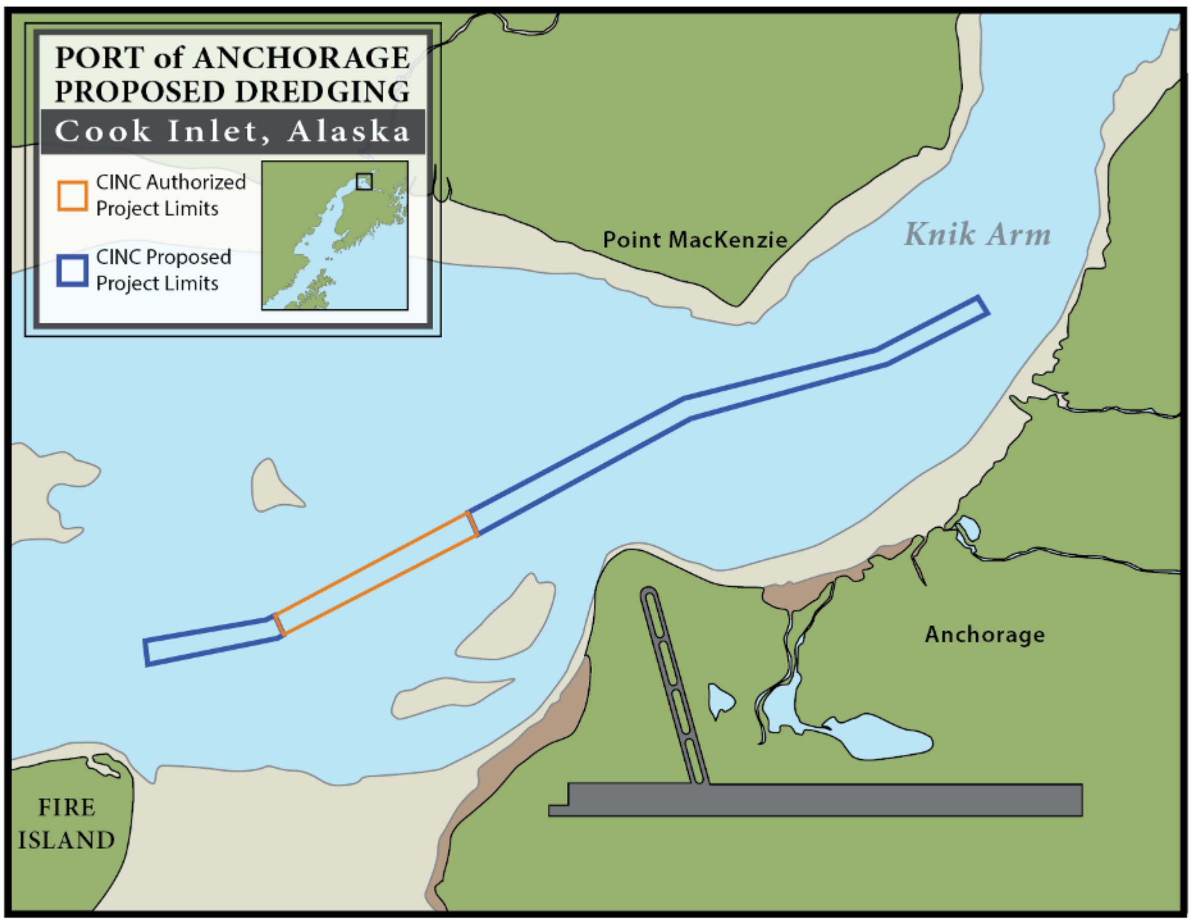

Figure 5. Cook Inlet Navigation Channel (CINC) as authorized by the Water Resources Development Act of 1996 (Based on USACE, 2013)

[20] Public Notice #ER-13-02 USACE AK. Dist.

[21] Obtaining annual funding from the federal government for dredging the critical navigation areas of Upper Cook Inlet has become a challenge. In 1986, Congress enacted the Harbor Maintenance Tax to recover the federal costs of dredging. The tax is paid by the shipper at a rate of 0.125% of the cargo value. Alaska's ports are exempt from this tax.

5.1.1 Recommendation

The Advisory Panel recommends that Knik Arm shoal be dredged as needed to maintain project depth, thereby reducing the potential for vessel grounding in this area.

5.2 Expand Cellular and VHF Coverage

Communications between vessels or between vessels and shore can be critical for sharing information about known or potential hazards, or for hastening a response to mitigate and incident or accident. This section discusses the gaps that currently exist in both cellular and VHF coverage; Section 5.4 describes the next step for enhancing situational awareness using AIS.

5.2.1 Cellular Coverage

When all towers are functioning, there is cell phone coverage in most of Cook Inlet north of Homer. However, there is a dead spot along shipping route from Middle Ground Shoal to Fire Island. The extent of cell coverage in this area is determined by the location and number of towers placed by the cellular service providers (as well as terrain, number of users, and other conditions that can limit coverage), and is essentially a corporate business decision made by the service provider (ACS, AT&T, GCI, or Verizon).[22]

[22] Service providers who want to access government funding that is intended to ease access for underserved populations must meet certain standards established by the Regulatory Commission of Alaska and the Federal Communications Commission. The Regulatory Commission of Alaska designates "eligible telecommunications carriers" (ETC) and sets the standards they must meet in order to receive this designation. The requirements include providing coverage maps, allowing a trial period, transparent costs and the presentation of charges on the billing statement, and customer service. They are currently set at 3 AAC 53.450, though may be changed in the near future to align with rule changes at the federal level. A telecommunications company will be a designated ETC in certain geographic areas; currently, there are not companies designated as ETCs between Anchorage and Homer. (Communication with John Paul Manaois, Regulatory Commission of Alaska, April 16, 2013.)

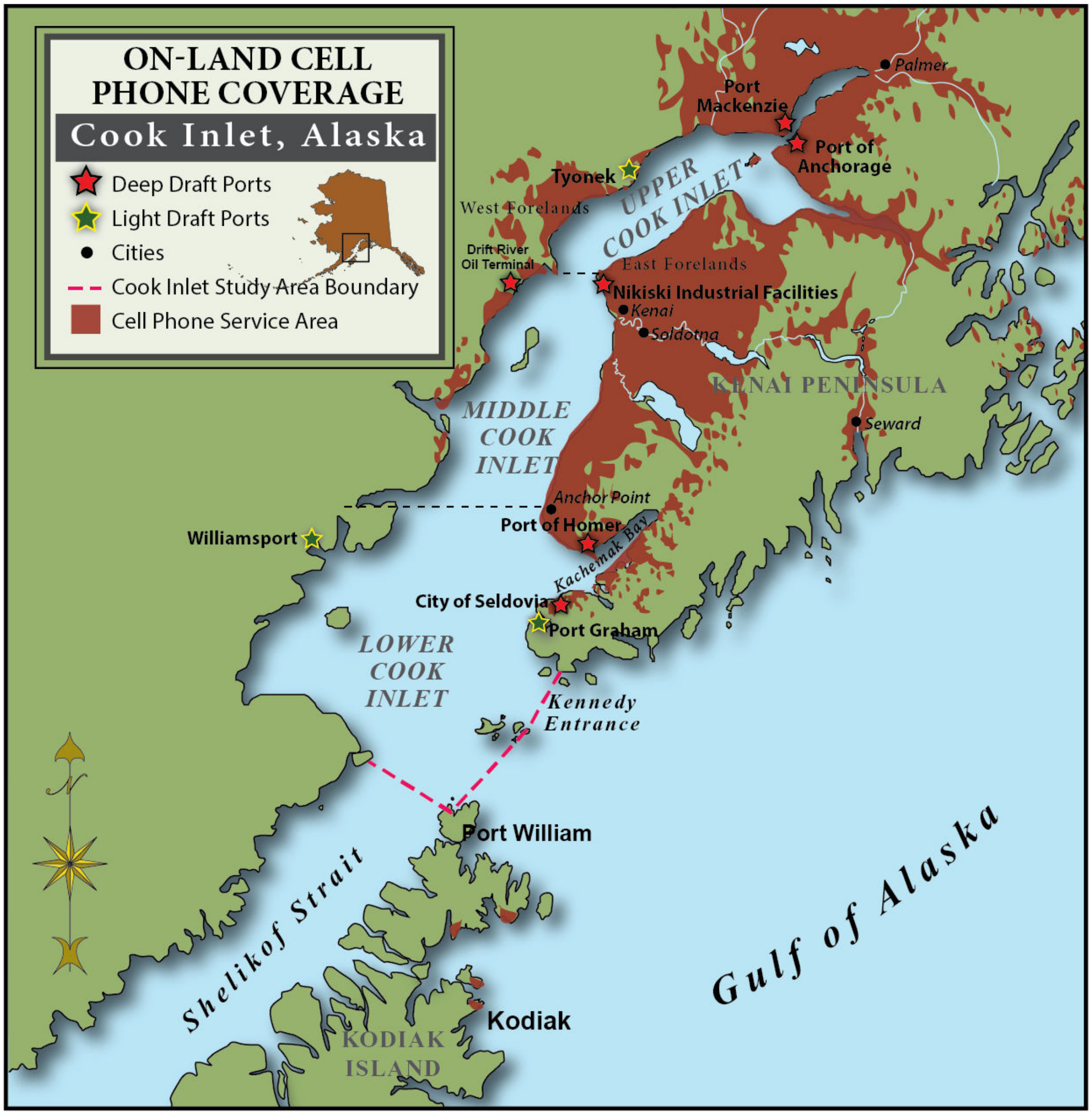

Figure 6. Generalized on-land cell coverage area, based on Verizon Wireless (Verizon, 2013)

The cellular providers decide to put in new towers or enhance existing towers if they believe it will expand their customer base. One option for expanding coverage is to use a repeater either on a vessel or (if coverage reaches far enough) a platform near the shipping route. Currently, vessels do not use repeaters as use of cellular phones is discouraged in safety management systems.

5.2.2 U.S. Coast Guard VHF Coverage

The U.S. Coast Guard maintains VHF stations on shore to facilitate communications between vessels and shore-based resources. Stations serving the Inlet provide coverage for much of the Upper and Lower Cook Inlet areas. However, there is a gap in coverage for vessels operating in the northern part of the Middle Cook Inlet area, up to and just past the Forelands. The gap, portrayed in Figure 7, will vary depending on the size and the power of the vessel's VHF radio.

Figure 7. U.S. Coast Guard VHF coverage in Cook Inlet based on a vessel with one watt (based on information provided by USCG Sector Anchorage)

5.2.3 Recommendation

The Advisory Panel recommends that communications infrastructure should be enhanced to fill gaps in cellular and VHF coverage for vessels operating on Cook Inlet waters.

While policies prohibiting the use of email or text messages for personal reasons are critical and must remain in place, having access to information (including visual information) via cellular coverage will help to enhance mariners' situational awareness and facilitate communications. All vessels using VHF should be able to communicate readily with both shore and other vessels to facilitate prompt assistance when needed.

5.3 Using AIS Broadcast to Enhance Situational Awareness

The International Maritime Organization and U.S. Coast Guard require most large, commercial vessels operating in Cook Inlet to be equipped with AIS equipment. [23] On vessels equipped with AIS, a VHF transponder transmits the vessel's location, size, type, course, speed, and destination to other AIS equipped vessels, shore-based receiving stations, and satellites equipped with AIS receivers. Vessel AIS equipment can also receive digital messages from other vessels and authorized shore stations if the software is appropriately configured.

The Marine Exchange of Alaska (MXAK) maintains and operates a network of more than 110 AIS stations in Alaska. These stations provide real-time vessel data to the U.S. Coast Guard, the State of Alaska, and various commercial operators and others in the maritime community authorized to have access for a fee. The five MXAK AIS receiving stations in Cook Inlet are located in Homer, Anchorage, Nikiski, and Anchor Point. These stations provide comprehensive vessel tracking coverage of the Inlet's navigable waters (see Figure 8).

The next step for the use of AIS to enhance situational awareness in Cook Inlet is to deliver weather information directly to the bridge of a vessel. The MXAK and AOOS have undertaken a project that provides the capability to transmit temperature, wind, and other environmental data via the AIS station on the Homer Spit. Homer is the first station in Cook Inlet to be upgraded to be able to transmit information via AIS in addition to receiving signals from vessels.

Information from the MXAK weather stations installed in Nikiski and Anchorage is also transmitted from the Homer site. An ATON (Aid to Navigation) AIS transmitter will be installed in Anchorage in 2014 and an additional weather station is planned for installation in Kenai in 2014. The broadcasts from Homer and other Alaska locations outside of Cook Inlet are now conducted under Cooperative Research and Development Agreement between MXAK and the U.S. Coast Guard's Research and Development Center that was announced to mariners in March 2014.[24] In the future, safety information including sea ice conditions could also be communicated via AIS as to vessels operating in the area.

While progress is being made to generate and transmit the weather data, not all vessels with AIS are able to receive it. For a vessel to *receive* weather (or other) information transmitted via AIS, the AIS software used onboard must receive and display the information. This requires a new capability, and one that most AIS software does not currently have. In the meantime, the weather sensors generating information for transmittal over AIS also transmit the data to the National Weather Service and AOOS, who disseminate the information over their websites. Additionally, MXAK posts the real time environmental data on the MXAK website[25] and has configured the data so that is also readily accessible on mobile devices. Thus, the weather information being translated currently is most accessible on handheld devices such as personal digital assistants, iPhones, or

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[23] U.S. Coast Guard regulations are at: http://www.uscg.mil/d11/vtssf/aisregs.asp. Additionally, smaller U.S. commercial vessels (i.e., tugs and cargo vessels) operating in a Vessel Traffic Service Area (e.g. Prince William Sound and Puget Sound) are also required to be equipped with AIS.

[24] http://www.navcen.uscg.gov/pdf/lnms/lnm17092014.pdf

[25] www.mxak.org

iPads. Due to gaps in cellular coverage in Cook Inlet and seaward approaches, information received on these types of devices will not always be accessible (see Section 5.2).

5.3.1 Recommendation

The Advisory Panel recommends that AIS software companies should upgrade software to allow vessel operators to receive information transmitted via AIS on board when requested. This upgrade should be widely disseminated to current users and included in new software sales.

Information transmitted from shore to vessels using AIS should relate to conditions in the immediate area only, so as to avoid providing irrelevant or distracting information. The AIS transmittals can also be used to contact individual vessels identified as being in the area in order to engage their assistance to another vessel and/or alert them of known or anticipated hazards.

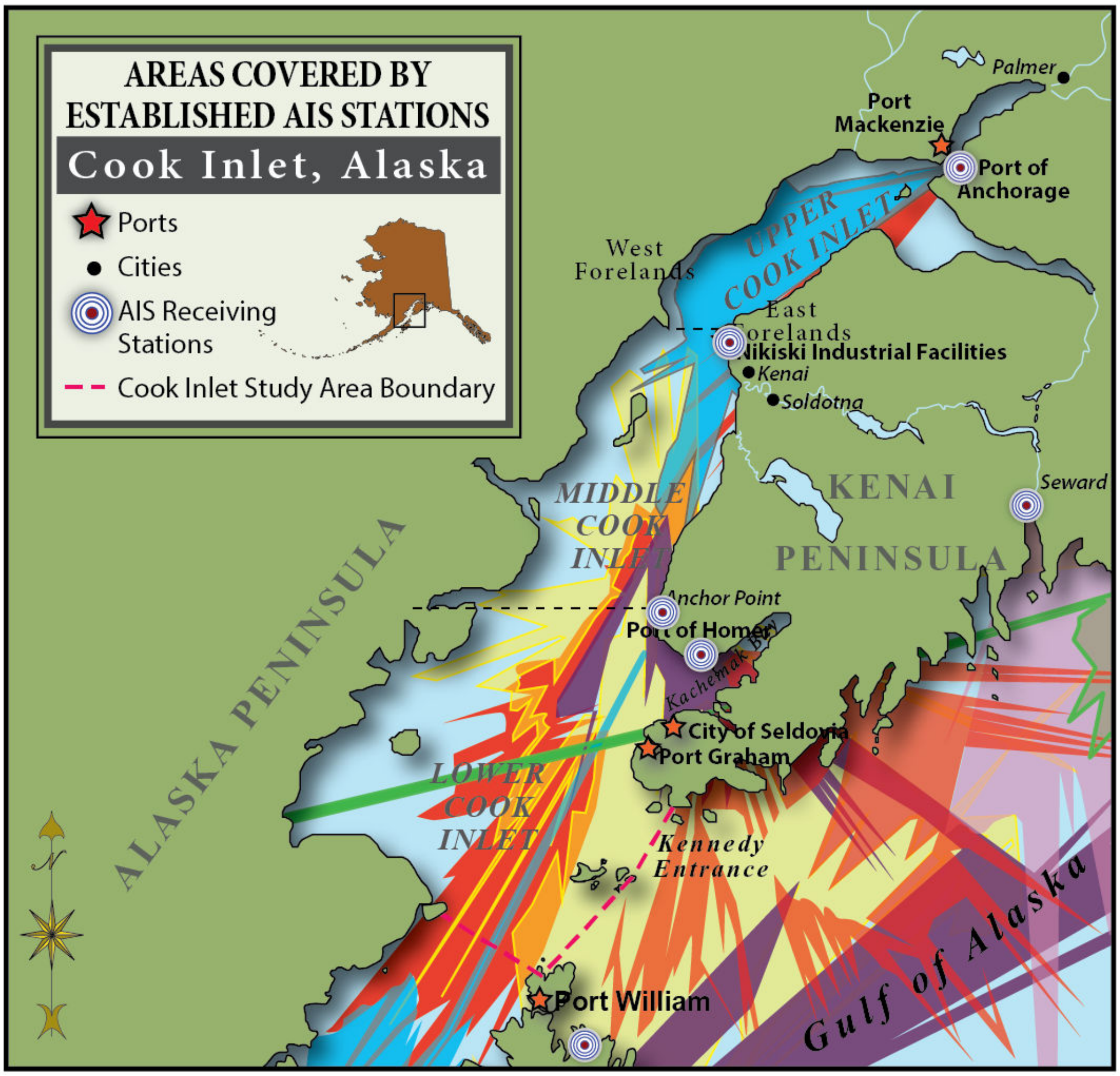

Figure 8. Cook Inlet areas covered by AIS shore stations (provided by the Marine Exchange of Alaska)

5.4 Third Party Workboat Inspections

After several maritime accidents were attributed to human error, the International Maritime Organization developed the International Safety Management Code "to provide an international standard for the safe management and operation of ships and for pollution prevention" (IMO, 2010). International Safety Management guidelines are functional management requirements for vessel operators, including assigning responsibilities for safety to the shore-side part of the company. The primary approach to meeting the standards is to establish a Safety Management System (SMS).[26]

Some vessels – typically large ones or those engaged in international trade or transport - are required to establish SMS, while others may choose to do so voluntarily.[27] The Cook Inlet resident vessel fleet includes a number of workboats, or resident commercial vessels such as offshore supply vessels, oil spill recovery vessels, and general freight vessels that service local communities, such a landing craft. Workboat operators may choose to meet the standard voluntarily through their own internal audits, which can highlight neglected practices, equipment, knowledge gaps and near misses in daily operations, or through audits by a recognized third party, such as a marine surveyor. Commitment to this or a similar program may result in fewer claims, lower premiums, and enhanced competitiveness.[28]

To learn more about the Cook Inlet workboat community's use of third party audits of their SMS, the CIRA project team developed a brief survey that was sent with an introductory letter to the workboat operators in Cook Inlet.[29] The seven survey questions and responses are summarized in Table 4. Questions were in multiple-choice format with prompts on several questions to explain their answers. Initial contact was made via email with follow up emails and phone calls to all possible respondents. Seven letters and surveys were sent out to the Cook Inlet workboat community members identified with input from the Management Team and Advisory Panel. Five of the seven surveys were completed and returned.

Survey results show that most current Cook Inlet workboat operators participate in voluntary third party inspections and audits. Many of the operators indicated that SMS inspections and audits were often "mandatory" within their company. These inspections and audits were found to contribute to improvements in safety and loss, better company-wide communication, and they have made operational changes as a result of such inspections and audits. Most importantly, the majority agreed that participation does make for a safer workplace.

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[26] The required components of a SMS can be found in 33 CFR section 96.250.

[27] Under 33 CFR 96.20, *mandatory* certification is required for all passenger vessels engaged on a foreign voyage, carrying more than 12 passengers; and tank vessels, bulk freight vessels, or high speed, freight vessels of at least 500 gross tons or more engaged on a foreign voyage. As of July 1, 2002, mandatory certification is required for all other freight vessels and self-propelled, mobile offshore drilling units of at least 500 gross tons or more engaged on a foreign voyage. The U.S. Coast Guard enforces this requirement.

[28] NVIC5-99 from the U.S. Coast Guard describes the voluntary approach to establishing SMS.

[29] CISPRI, Metson Blue Water Navigation, Sause Brothers Inc., Ocean Marine Services, Cook Inlet Tug and Barge, Alaskan Coastal Freight, Kirby Offshore Marine

Table 4. Survey questions and summary of responses related to SMS use by Cook Inlet workboat operators

Survey Questions	Summary of Responses
Do the operators use a CFR Part 96.250-compliant voluntary (SMS)?	Four respondents indicated that their company participates in a voluntary SMS. One respondent did not know for sure, but did say that they are subject to third party audits.
What factors encouraged the use of voluntary safety management systems?	Four respondents answered this question. All indicated that, "the system was mandatory" for certain vessels. One respondent did not answer this question.
What might inhibit participation?	Most respondents did not answer this question, likely due to the fact that many of them are participating in some sort of system. The one respondent who answered this question stated, " There is no expense to comply with our member's Offshore Vessel Inspection Database (OVID) inspection requirements, [as] this expense is borne by the member company."
Were they found to be helpful with safety and loss improvements?	Four of five respondents indicated that participating in a scheduled inspection/audit program has contributed to improvements in safety and loss. One respondent indicated it did not.
Did company-wide communication improve because of use?	All respondents agreed that participation in SMS audits and inspections has improved company-wide communication.
Did use contribute to an overall safer workplace?	All but one respondent agreed that the use of a SMS and third party audits/inspections make a safer workplace. That one respondent replied, "I would say yes if we're talking about an uninspected boat. I'd say no if the vessel is USCG and American Bureau of Shipping inspected already, which is what we have going."
Have these audits contributed to changes made in operations due to discoveries made during audits?	All respondents agreed that they have made changes in operations due to third party audits/inspections.

5.4.1 Recommendation

Both local and occasional workboat operators in Cook Inlet should continue to use third party audits/inspections of their vessels and procedures to promote safe operations. The workboat community should be represented in the HSC to facilitate identifying and addressing any future safety issues associated with workboat operations on Cook Inlet waters. New vessels working in Cook Inlet for the first time should have a way to check in with HSC to facilitate the identification of vessels with less experience operating in Cook Inlet conditions.

6. Risk Reduction Options Related to Preventing an Accident if an Incident Occurs

Some CIRA risk reduction options seek to prevent an accident if an incident occurs. This includes rescuing a distressed vessel to prior to its grounding or allision. A ship without power will drift with the wind and current until repairs are affected or a rescue vessel capable of securing a tow arrives. Much of the coastline of Cook Inlet is rocky, and the Upper Inlet is quite narrow, presenting a number of hazards for a disabled vessel. Whether a rescue prior to grounding is possible depends on the location of the distressed vessel, location and capability of rescue tug(s), and the wind, sea state, currents, and other conditions at the time of the incident.

Two types of risk reduction measures in this category are considered. First, the potential for emergency towing is considered by evaluating the availability, minimum capability requirements, and window of opportunity for tugs of opportunity to assist a distressed vessel in Cook Inlet (Section 6.1). In the event that emergency towing was not available, suitable, or able to reach a distressed vessel in time, the capability for a disabled deep draft vessel to self-arrest (deploy an anchor to secure its position) is considered (Section 6.2).

Emergency towing and vessel self-arrest are influenced by a wide range of factors, including, but not limited to, the exact conditions at the time (wind, tide, currents, or other complicating factors such as ice, temperature, and visibility); the size of the distressed vessel and nature of the problem; the location of potential rescue vessels and their location, speed, power, equipment, willingness to respond, and whether they have a tow underway; and the skills and abilities of personnel involved on both vessels as well as any shore support required. Because of the complexity and variability involved in these operations, it was not possible to develop general estimates for emergency towing or vessel self-arrest. Instead, these risk reduction options were explored through a series of representative scenarios, considering a range of environmental conditions, and relying heavily on the input of the subject matter expertise of the Advisory Panel. In some cases, the analysis points to the need for further study. Table 5 summarizes the tug scenario parameters.

Table 5. Tug scenario parameters

Locations	Vessel Types[30]	Environmental Conditions[31]
Upper Cook Inlet in the shipping lanes 13 nm north of the East Forelands Kachemak Bay in the shipping lanes along the route to the Homer Pilot Station Kennedy Entrance on the vessel route midway between the Barren Islands and Point Adams	338,000 bbl oil tanker similar to those calling at Nikiski 1,500 TEU containership similar to those calling at the Port of Anchorage	Median (common) wind, sea state, currents, and ice conditions 90th percentile (adverse) conditions for the same environmental factors

[30] Representative deep draft vessels based on Eley, 2012

[31] The Glosten Associates, 2013b

6.1 Potential for Tug of Opportunity Rescue

The potential need for additional emergency towing vessels to assist a disabled ship in Cook Inlet was highlighted by the 2006 grounding of the *T/V Seabulk Pride* and has been raised in the Cook Inlet Navigational Safety Forum in 2007 (Cook Inlet RCAC, 2007). Partly, because of this concern, and prior to the start of the CIRA, a docking assist tug was added at Nikiski in 2005.[32] Coincidentally, increasing oil and gas activity in the Inlet has brought more offshore supply vessels with secondary towing capability to the Inlet.

This section considers the potential for a tug or towing-capable vessel already present in Cook Inlet and surrounds to be able to rescue a drifting deep draft vessel.

6.1.1 Estimated Minimum Tug Size Required

The *Evaluation of 2012 Tugboat Response Times* (The Glosten Associates, 2013b) estimated the minimum bollard pull required to control a disabled vessel, assuming the rescue vessel arrests the drift of the disabled vessel and turns it into the direction of the prevailing drift (gain control and arrest its drift). The estimated minimum bollard pull is derived from the scenario conditions summarized in Table 6 and depicted in Figure 9.

When considering scenarios *without* sea ice present, the analysis calculated that the greatest required tug bollard pull at approximately 30 MT for both vessels in the Kennedy Entrance case during winter (90th percentile conditions). Tables 6 and 7 summarize the required tug bollard pull calculated in each load case for the containership and oil tanker, respectively. Some Advisory Panel members with experience operating towing vessels on Cook Inlet indicated that they believed that 30 MT would be inadequate in many conditions.

When considering the scenario with 70% ice coverage (the 90th percentile condition for sea ice) in Upper Cook Inlet, however, the analysis showed that it would not be feasible to turn and arrest a disabled vessel and instead calculated the maximum required tug bollard pull to arrest only (without turning) for the containership and oil tanker at 72 MT and 67 MT of bollard pull, respectively. Several members of the Advisory Panel noted the there might be other solutions available to rescue a disabled vessel in ice, such as turning and towing the vessel with the current. Thus, we use the 30 MT for no-ice conditions as the minimum required tug for the remaining analysis, and acknowledge that while the bollard pull required in ice conditions would likely be significantly higher, a firm estimate is not available for the months and locations of the Inlet when sea ice is present in high concentrations. Further study may be warranted to determine the range of bollard pull necessary during winter ice conditions.

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[32] In addition to the docking assist tug, following the *T/V Seabulk Pride* incident the U.S. Coast Guard modified the winter ice guidelines discussed in Section 4.2. Ice was involved in dislodging the vessel from its mooring.

Figure 9. Three scenario locations for Cook Inlet towing analysis

Table 6. Estimated required bollard pull for example containership (The Glosten Associates, 2013b)

Load Case	Environmental Condition					
	50th percentile			90th percentile		
Region	**Upper**	**Kachemak**	**Kennedy**	**Upper**	**Kachemak**	**Kennedy**
Turning and Arresting (MT)	70.60	3.20	20.70	-	11.90	47.50
Turning Load Only (MT)	0.80	0.80	2.60	-	4.30	7.70
Arresting Load Only (MT)	15.00	0.80	5.40	-	3.10	23.60
Tug Efficiency	0.80	0.80	0.80	-	0.80	0.78
Required Tug Bollard Pull (MT)	18.70	1.00	6.70	-	5.40	30.30

Table 7. Estimated required tug bollard pull for example tanker (The Glosten Associates, 2013b)

Load Case	Environmental Condition					
	50th percentile			90th percentile		
Region	**Upper**	**Kachemak**	**Kennedy**	**Upper**	**Kachemak**	**Kennedy**
Turning and Arresting (MT)	69.90	3.20	20.40	-	11.70	46.60
Turning Load Only (MT)	0.80	0.70	2.60	-	4.30	8.40
Arresting Load Only (MT)	14.80	0.80	5.20	-	3.00	21.30
Tug Efficiency	0.80	0.80	0.80	-	0.80	0.78
Required Tug Bollard Pull (MT)	18.50	1.00	6.50	-	5.40	27.30

6.1.2 Estimated Response Times for Potential Tugs of Opportunity

The same locations, ships, and environmental conditions that were used in the evaluation of tugboat response times were also used to estimate how long it would take tugs or other towing-capable vessels in Cook Inlet to reach a distressed vessel. For this analysis, the term, "tugs of opportunity" is used to refer to all tugs and towing-capable vessels, including offshore supply vessels, escort vessels in Prince William Sound, harbor tugs, and U.S. Coast Guard vessels.

A total of 107 potential tugs of opportunity was identified using MXAK AIS data showing the location of self-identified tugs and offshore supply vessels in Cook Inlet, Kodiak, Seward and Prince William Sound at noon on Wednesdays in 2012. In total, there were 1,044 data points, or times when a tug was in the area at the designated time. It was assumed that tugs in tow would have to drop their tow at the closest port – either Port Graham, Seldovia, Homer, Drift River, Nikiski, or Anchorage - prior to going to the distressed vessel.

Using the same locations from the 2012 tug study and considering only tugs with at least 30 MT bollard pull operating in no ice, and based on the dataset from 2012, the average, worst, and best times for the first capable tug to arrive on scene are presented in Table 8.

Table 8. Average, worst, and best length of time (in hours) required for the first capable emergency tow vessel to reach the three scenario locations in Cook Inlet

Scenario Location	Average	Worst	Best
Upper Cook Inlet	3.6	7.1	2.2
Kachemak Bay	5.4	13.0	2.6
Kennedy Entrance	7.4	10.2	3.5

Figure 10 shows the breakdown of first response tugs to arrive at each location.

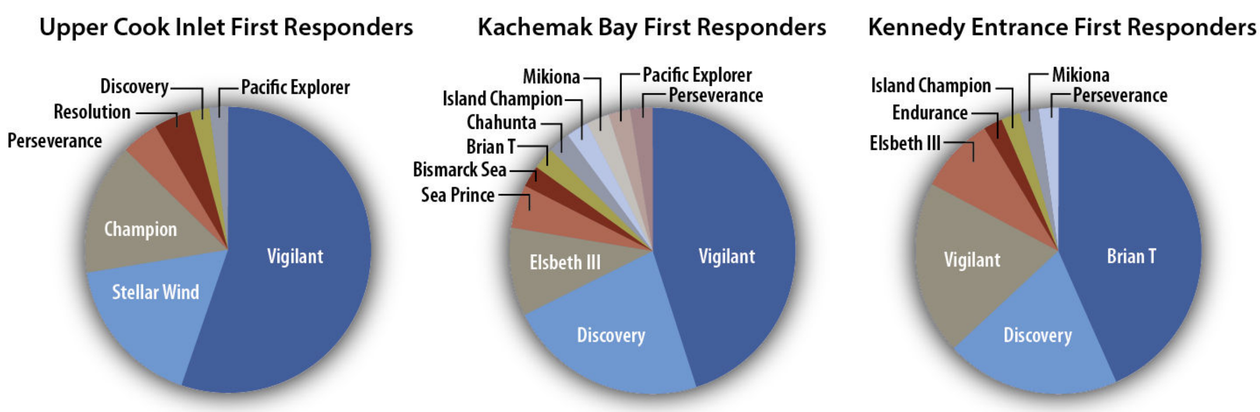

Figure 10. Tugs arriving first on scene at three scenario locations

The average time for the first capable towing vessel to reach the Upper Cook Inlet scenario location was 3.6 hours. Due to the uncertainty of tug travel times in ice, only the 50th percentile (common) weather conditions were considered for this scenario. The most frequent first responders include the Vigilant (a Nikiski based docking tug), the Stellar Wind (an Anchorage based docking tug), the Champion (a Nikiski based offshore supply vessel), and the Resolution and Perseverance (both oil spill response vessels based in Nikiski). The best response time was 2.2 hours when the Vigilant responded from her location in Upper Cook Inlet under favorable tides and 50th percentile (common) weather conditions. The worst response time was 7.1 hours when the Stellar Wind responded from the Port of Anchorage under adverse tides and common weather conditions.

The average time for the first capable towing vessel to reach the Kachemak Bay scenario location was 5.4 hours. Both the 50th percentile (common) and 95th (adverse) weather conditions were considered for this scenario. The most frequent first responders include the Vigilant (a Nikiski based docking tug), the Discovery (an offshore supply vessel present to attend to an exploration jack-up rig), and the Elsbeth III (a tug that was moored in Homer in 2012). The best response time was 2.6 hours when the Discovery responded from her location in Port Graham under favorable tides and common weather conditions. The worst response time was 13.0 hours when the Brian T responded from Kodiak under adverse tides and weather conditions.

The average time for the first capable towing vessel to reach the Kennedy Entrance scenario location was 7.4 hours. Both the 50th percentile (common) and 95th (adverse) weather conditions were considered for this scenario. The most frequent first responders include the Brian T (a Kodiak based docking tug), the Discovery (an offshore supply vessel present to attend to an exploration jack-up rig), and the Elsbeth III (a tug that was moored in Homer in 2012). The best response time was 3.5 hours when the Discovery responded from her location in Port Graham under favorable tides and common weather conditions. The worst response time was 10.2 hours when the Viligant responded from Nikiski under adverse tides and weather conditions.

The availability of potential rescue tugs was not consistent in every part of the Inlet or throughout the year studied. Generally, there were fewer potential rescue tugs in Lower Cook Inlet as compared to Middle and Upper Cook Inlet. There are times when transient tow vessels were in Homer, but in 40% of the weeks studied there were no tow vessels with a bollard pull >30 MT south of Anchor Point, including tugs towing barges. When considering only emergency towing vessels without barges this number increases to 64% of the weeks during which there was no first responder tow vessels available in Lower Cook Inlet.

These results are a snapshot of tugs available in 2012; the potential emergency tow vessels change over time, but the results are informative. The Vigilant[33], the Nikiski based docking tug, emerges as the most consistent first responder. The docking tugs stationed in Anchorage often are the first responders in Upper Cook Inlet. The Brian T, another docking assist tug based in Kodiak, appears the most common first responder in the Kennedy Entrance scenario. This tug is stationed 84 nm from the Kennedy Entrance scenario location, which is almost twice the distance from Homer. The fact that it is often the first responder speaks to the inconsistent availability of tugs of opportunity in Lower Cook Inlet. In this analysis it is assumed that docking tugs are always available to assist, which is not always true.

Offshore supply vessels and oil spill response vessels are also often the first responders. These vessels are usually in Central Cook Inlet, but in recent years offshore supply vessel activities associated with oil exploration in Lower Cook Inlet and drilling rig anchorage in Kachemak Bay or Port Graham have led to more offshore supply vessel activity in Lower Cook Inlet. The continued availability of these vessels in the Lower Inlet is uncertain.

Tugs with barges in tow were seldom first responders, due to the time necessary to secure their tow in a safe harbor or dock. Advisory Panel members have also pointed out that there are numerous contract, liability, and port requirement issues with assuming that a tug in tow can be counted on to drop its tow and assist a distressed vessel. Other than the Brian T, located in Kodiak, emergency tow vessels outside Cook Inlet were not able to reach the scenario locations before a capable tow vessel from within the Inlet. This indicates that vessels from Seward or Prince William Sound will likely not play a role in assisting disabled vessels in Cook Inlet.

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[33] The Vigilant has since been replaced by the Bob Franco, which was used in the Zone of No Save Analysis (see Section 6.1.3).

6.1.3 Estimating How Likely a Tug is to Reach a Distressed Vessel Before It Drifts Aground

Risk of a drift grounding varies dramatically as a ship transits Cook Inlet:

- As a ship traverses the route from Kennedy Entrance to the Port of Anchorage, the shipping lanes vary considerably in terms of sea room, shoreline hazards, wind, and currents. Kennedy Entrance at the south end of the Inlet is 13 nm wide and 300 feet deep, and experiences the worst sea and winds of the entire Inlet. The steep, rocky shorelines present extreme hazards should the ship become disabled. Results of the tug arrival time study indicate it will on average take more than seven hours for a rescue towing vessel to arrive at the Kennedy Entrance scenario location.

- Kachemak Bay is also wide and deep but with smaller seas. The prevailing northerly winter winds blow at right angles across the shipping lanes onto the southern rocky shoreline. Summer winds tend to blow along the length of the bay. On average it takes more than five hours for an emergency tow vessel to arrive at the Kachemak Bay scenario location.

- North of Anchor Point, the Central Inlet shoreline presents long tidal flats with a low sloping bottom and shoals that become more friendly to drift groundings, yet rock outcropping and boulder erratics still pose hazards. The channel gradually becomes narrower with depth restrictions and the tidal current begins to grow stronger. From this location on, the currents and prevailing winds are oriented in the same north-south direction as the channels. At the Forelands, the tidal current can exceed six knots. Low angle shorelines and high currents, with the additional drifting hazard of oil production platforms, also characterize Northern Cook Inlet. The average response time to the Northern Cook Inlet scenario is more than 3 hours. Near Anchorage, the channel becomes tidally restricted and ships can only proceed at high tide.

To compare the relative likelihood of a vessel incident, the amount of time required for a disabled to drift aground was analyzed for different locations. The first step was to estimate the length of time it would take for a disabled vessel at each scenario location to drift into shoal water. The drift rate for a given wind condition was taken from drift speed calculations for a typical containership (The Glosten Associates, 2012). The wind strength used was the 90th percentile wind in the direction of the hazard taken from the wind rose produced for the nearest wind station. Thus, 90% of time it will take *at least* the amount of time calculated for the vessel to drift to the hazard from the scenario location. Currents are not considered in this calculation. The distance drift time from each scenario location to the nearest grounding hazards is presented in Table 9, where the estimated time to grounding and estimated time for a response tug to arrive can be compared for different locations.

Table 9. Distance and estimated drift time to nearest hazard, and average response time for three scenario locations in Cook Inlet

Scenario Location *Hazard*	Wind speed (knots)	Distance to Hazard (NM)	Time to Grounding/ Impact (Hours)	Average Time for First Response Tug to Arrive (Hours)
Upper Cook Inlet				
Rocky shoal near Boulder Point	11	5.7	5.1	3.6
Granite Point Platform	7	5.7	6.3	3.6
Kachemak Bay				
Naskowhak Reef	14	2.3	1.3	5.4
Kennedy Entrance				
West Amatuli Island	16	7.2	3.3	7.4
Nord Island	17	8.5	3.6	7.4
Elizabeth Island	10	6.5	4.4	7.4

This approach can be generalized to the entire study area using the concept of a Zone of No Save (ZONS): an area in which a rescue tug might not arrive before a disable vessel could drift aground. The ZONS is contrived to show an area with a boundary. When a vessel is at the zone boundary there is a 90% chance that a rescue tug would arrive on-scene before a disabled vessel would be blown ashore by the winds that typically occur at that location. Inside this zone there is a proportionately lower chance that the tug arrives before grounding. Outside the zone there is a proportionately higher chance that the tug arrives before grounding. Note that the ZONS analysis does not consider the effect of currents, which might increase, decrease, or have no effect on the time to grounding. The assumptions made in this analysis represent favorable estimates of the time it will take for a tug to get underway. Actual response times are likely to be longer, and the ZONS is likely to be larger.

To conduct this analysis, hazards (rocky shorelines, isolated rocks, reefs, and oil platforms) were mapped along the entire coastline of Cook Inlet, and wind strength and direction data for each location were assembled from the nearest weather station. To create the ZONS, the 90th percentile wind conditions were calculated in every direction, at each hazard, and converted wind speed into drift speed for the example container ship. We then compared the time it would take the vessel to drift into a hazard to the time it would take a rescue tug to reach this hazard (Figure 11). Outside the zone, a tug could reach the ship before it impacted the hazard. Inside the zone, the ship could impact the hazard before a tug could reach it. The methods used to calculate the ZONS are included in Appendix F.

This analysis considers four tugs located in four different Cook Inlet ports: Anchorage, Nikiski, Homer, and Port Graham. The analysis was performed separately with each tug, and with all four together. Figure 11 presents two different ZONS cases--one assuming a tug is present in four ports and the nearest will respond and one assuming that the only available tug is at Nikiski.

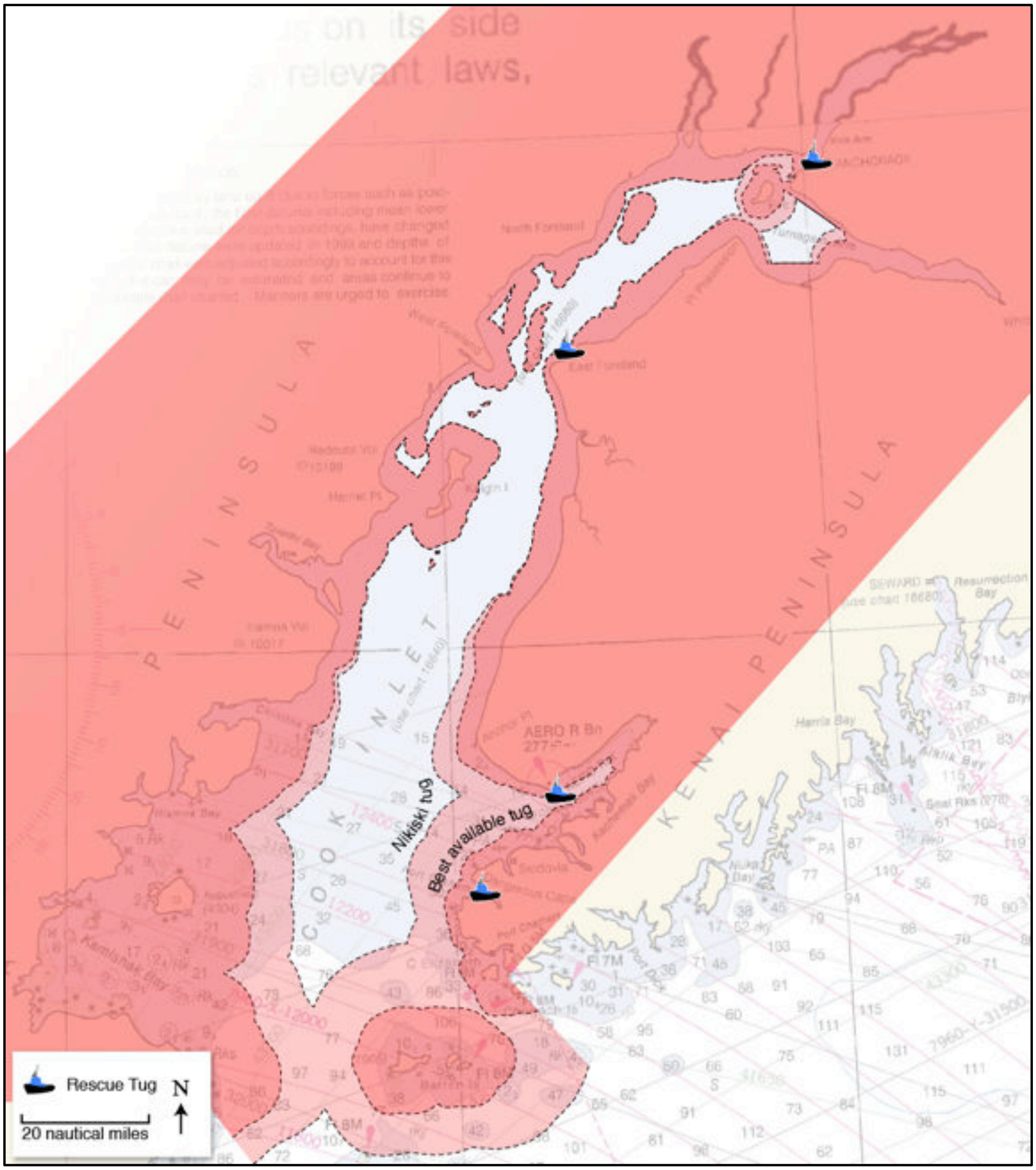

Figure 11. Zone of No Save analysis for Cook Inlet, considering two cases: tugs available in *four* ports, and a tug available *only* at Nikiski

The darker pink area over water is the ZONS for the best available tug, assuming a tug is present in each port in the study (noted as tug icons), and the lighter pink area assumes that only the Nikiski docking tug is available for response. Figure 12 focuses on Lower Cook Inlet including Kachemak Bay and Kennedy Entrance and depicts the ZONS for each tug location.

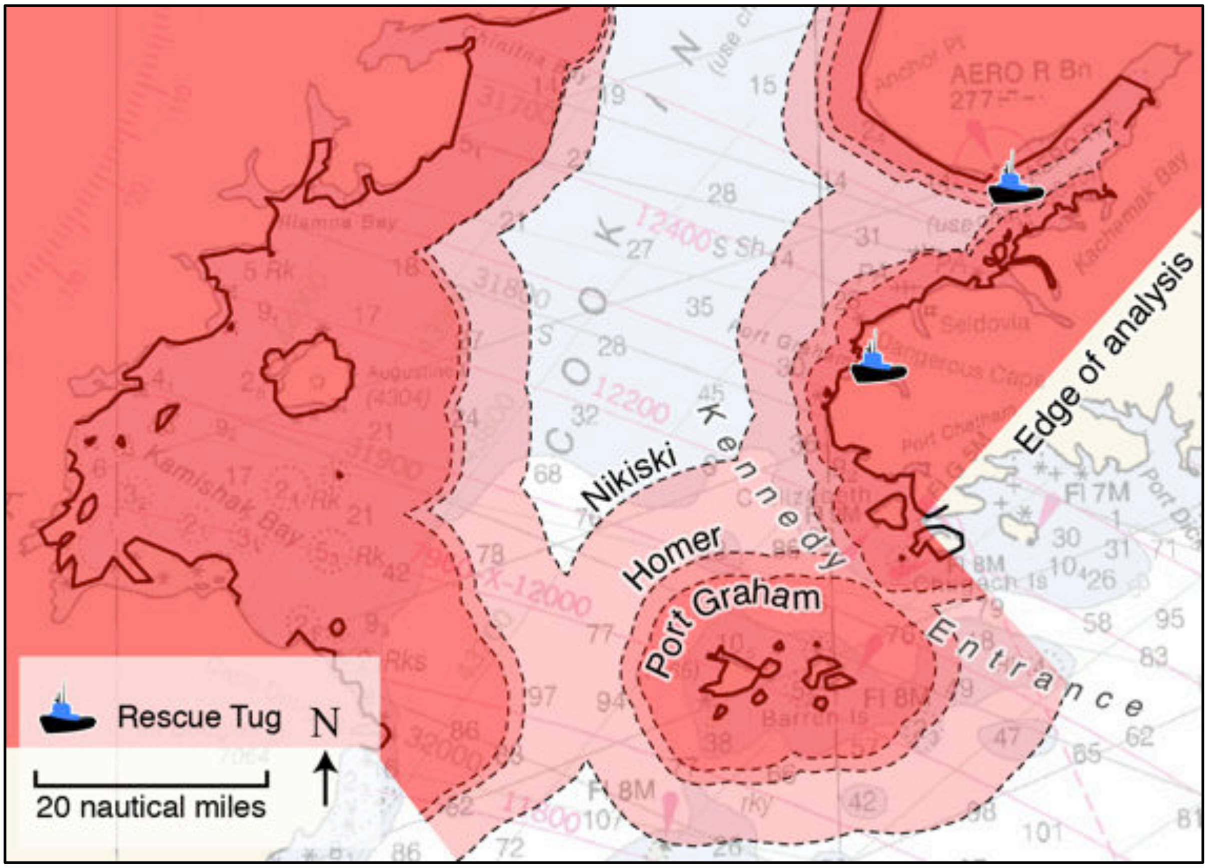

Figure 12. Zone of No Save analysis for Lower Cook Inlet and Kennedy Entrance for tugs stationed at Nikiski, Homer, and/or Port Graham

It is difficult to generalize the length of time a distressed vessel will have before drifting into a hazard because every incident has unique circumstances, but the ZONS analysis provides a standardized look at the vulnerability of a distressed vessel to drift grounding. The analysis shows that large portions of Cook Inlet are outside the ZONS and thus an emergency towing vessel would likely reach a distressed vessel prior to grounding, but there are areas where ships are vulnerable.

Areas where the ZONS encompasses much of the waterway include the Forelands, the area near Anchorage and Fire Island, Kamishak Bay, and Kennedy Entrance. If no tug is available in Lower Cook Inlet, Kachemak Bay is also completely within the ZONS. The waterway is very narrow and draft restricted near Anchorage and the ZONS around Fire Island covers most of the shipping route to Anchorage. This is true even when a response is mounted from Anchorage. If the Nikiski tug is the first responder, the zone encompasses all of Knik Arm and the entrance to Turnagain Arm.

In Central Cook Inlet the inlet is narrow, shallow, and contains both shoals and offshore oil platforms. Even with the Nikiski tug responding from very nearby, there is a significant chance that a ship would impact a hazard before it could be rescued.

In Kachemak Bay, the shipping lanes are generally outside the ZONS when a towing vessel is available in Homer or Port Graham, but if there is no rescue vessel in these ports, the entire bay is within the ZONS.

In Kennedy Entrance, the ZONS encompasses almost the entire waterway, even when a suitable emergency towing vessel is located in Port Graham. Any ship transiting Kennedy Entrance that becomes disabled, is vulnerable to a drift grounding before a rescue tug arrives.

6.2 Potential for Vessel Self-arrest

If a tug is not available, or in order to allow the tug more time to reach a distressed vessel, the distressed vessel may deploy its anchor or anchors to slow or stop its movement towards grounding or other hazards. In most of Cook Inlet, the water depth and bottom type are favorable for a ship's anchor to reach bottom with enough scope to set the anchor before grounding. A literature review was completed to inform the discussion about the feasibility of this option in an emergency (The Glosten Associates, 2013c; Appendix B). Advisory Panel members offered subject matter expertise to this qualitative assessment.

There are widely varying opinions on using a ship's anchor to perform a self-arrest. While a successful self-arrest could make the difference between an oil spill and a vessel simply waiting in place for further assistance, there are some potential consequences to attempting a self-arrest procedure. These include injury or death caused by the improper deployment of the anchor or faulty equipment, or rupturing a subsea pipeline or otherwise damaging subsea equipment (The Glosten Associates, 2013c).

Local mariners, including marine pilots, consider self-arrest practical and safe, and in Cook Inlet, dredging an anchor is a common docking maneuver.[34] Unlike this docking maneuver, which is performed under controlled conditions, using an anchor to self-arrest a vessel that has lost power can be more complex. Self-arrest was used during the 2006 grounding of the *T/V Seabulk Pride*, and although the tanker grounded, the use of the anchor allowed for a much more controlled grounding and likely minimized damage. A literature review revealed mixed results when this procedure was deployed in other waterways.

It was not within the scope of this analysis to quantify the circumstances where self-arrest anchoring will be successful. However, one approach to achieve this would be to conduct a more comprehensive study of the issue through simulations. More research into the efficacy of using an anchor to self-arrest in Cook Inlet is needed if this procedure is to be relied on as a risk reduction method for preventing grounding or similar incidents that could result in casualties or oil spills.

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[34] In this situation, the Pilot sets the ship up into the current and takes way off of the vessel, at the appropriate time the anchor is realized and set as the ship drifts back with the current.

6.3 Recommendation

The Advisory Panel recommends that continued study is warranted in two areas related to self-arrest and emergency towing, and that the proposed HSC could coordinate the implementation of the following:

1) Demonstrate or otherwise qualitatively study the ability to arrest and control a large, deep-draft vessel in Upper Cook Inlet sea ice conditions, with input from large vessel mariners and local marine pilots, and, as needed, experts in materials, engineering, simulations, and ship dynamics.

2) Demonstrate or otherwise qualitatively study the ability of a large, deep-draft vessel to self-arrest in different parts of Cook Inlet, including identifying areas where this practice is more or less likely to be successful; identifying areas where this should *not* be conducted due to pipe, power, or communication lines located on the seabed floor; identifying best practices for implementation, and estimating the amount of time – and therefore associated vessel drift – that this would take. This effort should also involve large vessel mariners and local pilots, as well as experts in sea ice, ship and ice dynamics, and simulations.

While further information is needed to build a shared understanding related to the above topics, the Advisory Panel has identified the critical role that local, resident tugs can play in assisting a distressed vessel. Due to the number of tugs and the fact that many are believed to have sufficient power to be able to assist ships of the size typically traveling through Cook Inlet, while the estimated response times vary among different parts of the Inlet, a tug of opportunity (TOO) is likely to be available to assist in some way. To maximize the effectiveness of these potential tugs of opportunity, which include docking and assist tugs, tugs transporting barges, and oil spill response vessels, a program should be created that:

1) Identifies and works with the owners and operators of likely TOO to address procedures, potential obstacles, and legal arrangements associated with that vessel engaging on short notice in a rescue effort.

2) Monitors the availability and location of TOO and contacts them quickly when a rescue is needed. (This could be conducted in coordination with the monitoring of some deep draft, non-tank vessels already in place.)

3) Conducts training exercises or otherwise coordinates with potential TOO operators to ensure that tug/towing vessel crews are prepared to implement a vessel arrest mission if called upon to do so. This may include practicing the deployment of an emergency towing system (ETS) as described below, and should include training specific to the tow packages likely to be on vessels transiting the Inlet.

Finally, large, deep-draft vessels operating in Lower Cook Inlet outside the pilotage area require special attention as these vessels are operating in the most exposed waters with the longest response times, and will not have a marine pilot on board. The HSC should document and communicate best practices and standards of care for this area. An ETS should be located in Homer to further facilitate rescue in this area, especially as the initial deployment of the ETS by aircraft could start the process and save time until a TOO arrives on scene.

7. Risk Reduction Options Related to Reducing Oil Outflow and Spill Impacts if an Accident Occurs

Three risk reduction options relate to reducing the oil outflow and spill impacts if an accident occurs. One option was already addressed with the promulgation of the federal vessel response planning requirements for non-tank vessels greater than 400 gross tons. Both of the other options – updating and improving the Subarea Oil and Hazardous Substance Contingency Plan (Section 7.1), and ensuring use of the best possible response equipment for Cook Inlet conditions (Section 7.2) – were items that the Advisory Panel considered to be already planned or underway.

7.1 Update and Improve the Subarea Oil and Hazardous Substance Contingency Plan

The Cook Inlet Subarea Contingency Plan supplements the Alaska Federal/State Preparedness Plan for Response to Oil and Hazardous Substance Discharges/Releases (Unified Plan). The Subarea Contingency Plan, in conjunction with the Unified Plan, describes the strategy for a coordinated federal, state, and local response to a discharge or substantial threat of discharge of oil or a release of a hazardous substance from a vessel, offshore or onshore facility, or vehicle operating within the boundaries of the subarea. The Subarea Contingency Plan is used as a framework for response mechanisms and as a pre-incident guide to identify weaknesses and to evaluate shortfalls in the response structure before an incident. The plan also offers parameters for vessel and facility response plans under the Oil Pollution Act of 1990.

The Subarea Contingency Plan is slated for review and update beginning as soon as winter 2015 as a joint effort led by the U.S. Coast Guard and ADEC. The last update was completed in December 2010. The 2015 update should incorporate information and findings from the CIRA project reports. It will also identify any new section(s) to be developed, such as a prevention section that includes general ice rules and guidelines or nearshore operations response strategies. The Subarea Committee should also review the need for additional geographic response strategies, updates to infrastructure maps and hazard/vulnerability analysis, and the potential need to update Cook Inlet Environmental Sensitivity Index ESI maps.

7.1.1 Recommendation

The Advisory Panel recommends that the Cook Inlet Subarea Contingency Plan be reviewed and updated as needed. This will enhance response preparedness for the region, and is on track to begin in 2015. An update to the Subarea Contingency Plan provides the opportunity to ensure that the information in it regarding sensitive resources is widely shared and accessed by those operating port, docking, and other facilities whose localized planning could incorporate information about spill potential impacts and targeted mitigation measures.

7.2 Continuous Improvements in Spill Response Equipment for Cook Inlet Conditions

CISPRI and the Alaska Chadux Corporation are the two federally certified Oil Spill Response Organizations and State of Alaska Primary Response Action Contractors for the region. Both organizations are member-owned, non-profit corporations providing oil spill planning, training, and response services to facilities and vessels throughout the Cook Inlet region. CISPRI is certified to operate in the offshore, nearshore, ocean, inland and river/canal environments. Alaska Chadux is certified for the inland and river/canal environments. Each organization has mutual aid agreements in place with other Alaska OSROs to supplement response capabilities. Both CISPRI and Alaska Chadux maintain response resources strategically located in caches or warehouses throughout the Cook Inlet region, which they are ready to deploy on behalf of their member companies.

Both CISPRI and Alaska Chadux participate in ongoing activities aimed at exercising their existing capacity and investigating potential new technologies that will improve on-water oil spill containment and recovery.

7.2.1 Recommendation

The Advisory Panel recommends that response resources in Cook Inlet be continually tested and assessed to validate and improve on its effectiveness and to ensure that the best available, proven technology is being utilized in the Cook Inlet operating environment.

8. Conclusion

Cook Inlet benefits from an experienced maritime community with both a proven commitment to working together to improve safety and relatively ready access to response resources and infrastructure. Large, deep draft vessels operating on the Inlet are subject to both federal and state spill prevention and response requirements and are typically smaller than those vessels passing through U.S. waters off Alaska's shores to and from Asia. Cook Inlet also has two resident oil spill response organizations. Finally, Cook Inlet benefits from risk reduction measures that are already in place, including many of the items recommended by the Advisory Panel to continue or expand.

At the same time, there is widespread acknowledgement of the challenges that maritime operations in the Inlet can face, such as strong tidal currents and quickly changing sea ice coverage and thickness during winter. While there are many vessels and crew familiar with the Inlet, there is also a diverse array of vessel types and operations and occasional visits from vessels unfamiliar with local condition. Although less remote than other parts of Alaska, Cook Inlet has many areas that are inaccessible by road and hours or days from assistance or response services especially in unfavorable conditions. Cook Inlet also has valuable commercial, recreational, and subsistence fisheries and other harvests in addition to other ecological and wildlife resources that warrant protection.

The CIRA Advisory Panel recommended the risk reduction options discussed in this report to maintain and enhance the level of risk mitigation already achieved on Cook Inlet's waters. Where these efforts are already underway, they should be sustained and, in some cases, enhanced or expanded within the Inlet.

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Appendices

Appendix A – Reduced Risk of Oil Spill with a Cross Inlet Pipeline (2013), by The Glosten Associates

Appendix B – Evaluate Drifting Vessel's Ability to Self-arrest (2013), by The Glosten Associates and Evaluation of 2012 Tugboat Response Times (2013), by The Glosten Associates with Comments

Appendix C – Benefit-cost Analysis of the Trans-Foreland Pipeline as an Oil Spill Risk Reduction Option (2014), by Northern Economics, Inc.

Appendix D – Public Comments on Final Report and Response from Management Team

Appendix E – CIRA Management Team and Advisory Panel Members

Appendix F – Methodology for Zone of No Save Analysis

THE GLOSTEN ASSOCIATES
Consulting Engineers Serving the Marine Community

COOK INLET RISK ASSESSMENT: PROJECT MEMORANDUM

Task 7.2 Reduced Risk of Oil Spill with a Cross Inlet Pipeline

TO: Nuka Research: Sierra Fletcher, Tim Robertson

DATE: 13 September 2013

FILE NO. 11054.03.0020

FROM: Eleanor Kirtley

References

1. *Cook Inlet Maritime Risk Assessment Spill Baseline and Accident Causality Study*, Rev. -, 29 June 2012.
2. *Cook Inlet Vessel Traffic Study Report to Cook Inlet Risk Assessment Advisory Panel*, January 2012.
3. Cook Inlet Risk Assessment Advisory Panel Meeting for Task 6, 22 February 2013.
4. Email and phone call from Dave Eley, Cape International, Inc., 11 September 2013.

Summary

This memorandum assesses the reduction in oil spill risk with the addition of a subsea pipeline between Drift River and Nikiski. The pipeline would displace 38 one-way crude carrier transits across the inlet per year, or about 3 per month. There would be 35.1 less traffic-days in the system per year. The spill rate for tankers is 0.0030 spills per traffic-day. There would be an estimated 0.105 less spills per year without the crude carrier traffic displaced by the addition of the subsea pipeline.

This memo follows the assumptions and formulations as applied in the *Cook Inlet Risk Assessment* (CIRA) *Task 4 Spill Baseline and Accident Causality Study* to formulate the number of spills, and the following presents an estimated distribution of spills sizes for a double hulled crude carrier (Reference 1). The reduced spill volume with the addition of a subsea pipeline is not forecast. The purpose of this memorandum is to provide input to a benefit cost analysis to be performed by Northern Economics.

Background

The Cook Inlet Risk Assessment (CIRA) launched in 2011 to address the risk of oil spills from marine vessels. The Glosten Associates calculated a baseline spill rate and forecasted an annual number of spills in Task 4. Risk reduction options (RROs) were identified in Task 6. The subsea pipeline was selected for further study in Task 7, *Evaluate RROs*. This memorandum studies the reduced risk associated with the pipeline. Baseline or remaining risk is not addressed. The increased risk from the pipeline is studied separately. Both the reduced and increased risk of an oil spill from the pipeline are input to a benefit cost analysis for the RRO.

Reduced Number of Spills

<u>Inputs</u>

Traffic Days

The pipeline would displace 38 one-way crude carrier transits across the inlet between the Drift River Terminal and Nikiski per year. There are 12 roundtrips (24 one-way transits) and 14 one-way transits, annually. Per Reference 2, "The Drift River Terminal supplies crude oil collected from the various Cook Inlet oil production platforms on the west side of the Inlet." The Tesoro facility and refinery and Kenai Pipeline dock are in Nikiski. Both ballast voyages from Nikiski to Drift River and laden voyages from Drift River to Nikiski are included. Both time in transit and time at the dock are included. The sum of transit and docked time represents the total exposure time in the system.

Risk is a function of exposure time. It is counted in the unit of a traffic-day (24 hours). The 38 transits translate to 35.1 traffic-days per year. There are 2.6 less traffic-days in transit and 32.5 less traffic-days at the dock. Annual transits and traffic days were provided by David Eley, Reference 4. Adding in a subsea pipeline removes these 35.1 traffic-days and their associated risk.

Spill Rate

For every traffic-day, there is an associated probability of a spill. This probability is defined by the spill rate. The spill rate is the number of spills per traffic-day. It is calculated from historical spills and traffic during the years 1995 through 2010. The tank ship spill rate groups both product tankers and crude carriers. The spill rate for tank ships is 0.0030 spills per traffic day, per Reference 1, Tables 3 and 4. This tank ship spill rate is applied to estimate the reduced number of spills.

<u>Output</u>

The number of spills is found by multiplying the traffic-days and the spill rate. The baseline number of spills from tank ships forecast for the 2010-2014 time period in the CIRA Task 4 was 0.72 spills per year, Reference 1 Table 3. Adding in a subsea pipeline removes an estimated 35.1 x 0.0030 = 0.105 spills per year.

Spill Volume

Spill volumes for small, medium, large, and worst case discharges are estimated in the event of a spill. Small, medium, and large are defined as the 25^{th}, 50^{th}, and 95^{th} percentile spills. A percentile spill is the spill volume associated with the n^{th} probability. In other words, the volume for the n^{th} percentile is larger than n% of spills. The n^{th} percentile is smaller than 100 – n% of spills. The 25^{th} percentile spill volume is larger than one quarter of spills, and smaller than three quarters of all spills for that vessel type and cause. The 50^{th} percentile spills is the median. Only 1 in 20 spills (5%) is larger than the 95^{th} spill. The estimated spill volume distribution is derived from historical spills.

Spill sizes for a double hulled crude carrier by incident type are presented in Table 1. An impact incident is an allision, collision, or grounding. A non-impact incident includes fire, equipment failure, and operations error. The transfer error incident type includes both cargo transfer and bunker error. These volumes are repeated from the *Task 4 Appendix Cook Inlet Maritime Risk Assessment*, Table A53 (Reference 1). Given that a spill has occurred, Table 1 presents the spill size probability distribution.

Table 1 Spill Volumes from a Double-Hulled Crude Tanker

	Small 25th %ile (gallons)	Moderate 50th %ile (gallons)	Large 95th %ile (gallons)	Worst Case Discharge (gallons)
Impact	500	20,000	15,000,000	28,500,000
Non-Impact	100	2,000	8,000,000	28,500,000
Transfer Error	1	10	2,000	75,000,000

Appendix B – Vessel Self-arrest and Tug of Opportunity Studies and Comments

The Glosten Associates, Inc. conducted two related studies for the Cook Inlet Risk Assessment, which are included in this appendix:

- Evaluate Drifting Vessel's Ability to Self-arrest (2013)
- Evaluation of 2012 Tugboat Response Times (2013)

Elements of these studies are used, and attributed, in the report. Upon reviewing the studies, the Advisory Panel and Management Team expressed several concerns, which are summarized here. In addition, the Management Team invited Safeguard Marine LLC to provide input. That input follows the comments from the Advisory Panel, below.

Summary of comments from the Advisory Panel on *Evaluate Drifting Vessel's Ability to Self-arrest:*

- The qualitative review did not consider examples where self-arrest was successful. This is a relatively common practice, though is rarely documented when it succeeds. The reasons why self-arrest *can* work in Cook Inlet should have been considered.
- Mariners commonly dredge an anchor while coming alongside long berths in Cook Inlet, but this is not considered.
- Conditions in Upper Cook Inlet and Kachemak Bay are suited to successful self-arrest, due to the composition of the seabed, angle of the sea floor, and linear tidal current. These conditions are less suitable in much of Lower Cook Inlet, but there is extensive sea room and the dominant tidal currents do not trend towards hazards.
- Claims that a vessel's ground tackle will be lost or damaged in a self-arrest attempt are over-stated, as is the claim that such damage could cause of breach of the cargo holds.
- Active subsea pipelines and cables may be damaged by a self-arrest, but active ones in Cook Inlet are charted. A vessel could drift with the current until free of underwater obstructions.
- A simulated study would provide the opportunity to gain a shared understanding of the feasibility of self-arrest in different conditions typical of the Inlet and to identify best practices and procedures. A study combined with additional analysis could help to identify areas where a ship should, or should not, attempt to anchor due to underwater obstructions or other conditions.

Summary of comments from the Advisory Panel on *Evaluation of 2012 Tugboat Response Times:*

- The report assumes that a vessel would need to be turned in heavy ice concentrations and strong currents in the Upper Inlet. This would be very difficult, and it is unlikely to be the approach used when heavy ice is present. Alternatively, the vessel may be towed from the stern to hold position; towed from the bow, continuing to use the towing vessel as steerage and the current to move the vessel to a safe harbor; or hold the distressed vessel in place until additional support arrives (which would be expected from Cook Inlet's extensive resident vessels).
- The assumption that a tug towing a barge could leave that barge at a Cook Inlet port is flawed. There are requirements regarding whether or not personnel can remain on board a barge without a vessel, and safety and security concerns if a barge is unattended. Lines must be tended as tides change, and there are times when weather conditions require the docks to be cleared so a different and adequate towing vessel would need to be present if such conditions arose. While operators may be able to transfer their responsibility for a barge to another tug and crew, this will not always be available.
- It is unclear whether a USCG cutter would be dispatched to rescue a vessel of greater than 300 GT (the study size) in the Upper Inlet.
- The CISPRI response vessels *Perseverance* and *Endeavour* are not included from the dataset used for most of the year. This significantly affects the results, and does not reflect the fact that both vessels work year-round in Cook Inlet, in particular north of the Forelands. Both vessels represent significant response assets, as they are manned and equipped for offshore response and towing, and suitable for work in ice conditions. (They could also arrive on scene in the Upper Inlet in less than 6 hours, with additional support to come from tugs stationed in Anchorage and/or Nikiski.)
- Wave forces should be disregarded in ice conditions, as they are minimal.
- Mariners in Cook Inlet understand the currents and are experienced in minimizing their negative impact or maximizing their positive impact, depending on the situation.

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Statement Regarding Cook Inlet Risk Assessment Seven

Safeguard Marine LLC[1]

February 27, 2014

Executive Summary

Based on a review of "Cook Inlet Risk Assessment Task 7; Evaluating Drifting Vessel's Ability to Self-Arrest" conducted by Glosten Associates for Nuka Research and Planning, December 3, 2013, we discuss the conclusions that were presented. The focus of this statement is on the interviews and literature review of a vessel capable of self-arresting within Cook Inlet and the data presented concerning a tug of opportunity. Specifically, we discuss a highly publicized incident of a vessel actually self-arresting within Cook Inlet that was high in risk, and such practices cannot be considered a reliable risk reduction option. The data for the tug of opportunity discussed in the report was not representative of the maritime assets capability. We propose Cook Inlet Regional Citizens Advisory Committee request an analysis be performed by Safeguard Marine utilizing ship simulation in Cook Inlet including self-arrest and a tug of opportunity. We provide a report documenting the feasibility of vessel self-arrest in Cook Inlet by utilizing highly experienced licensed marine pilots with local knowledge who perform actual ship maneuverers within Cook Inlet.

[1] Safeguard Marine is an Alaskan owned and operated LLC providing independent maritime Consulting specializing in the responsible development of Alaskan resources.

Statement

This comment made use of Glosten and Associates report including data, interviews and literature review. Glosten and Associates is a respected engineering and consulting service operating from Seattle, Washington who prepared the documents for Nuka Research, contracted with Cook Inlet Regional Citizens Advisory Committee (CIRCAC). Cook Inlet Risk Assessment Management Team contacted Safeguard Marine and requested our input and comment concerning these documents.

The purpose of this statement is twofold. First, it is to discuss the statements and conclusions surrounding vessel self-arrest capability and tug of opportunity data. Second, it demonstrates the importance of using local practitioners when seeking to create an accurate depiction or an analysis which addresses maritime navigational risk within Cook Inlet and the State of Alaska.

Vessel Self-Arresting Cook Inlet

The personal interviewed were not listed other than "in house experts". The Glosten web site depicts many highly qualified engineers, however no experienced, licensed deck officer. The literature review was based upon incidents and report reviews (*The incident report review was not exhaustive*; footnote page 6), G Captain (internet site for "captains" to write in and share their experiences and some case studies) and several resources reference anchoring. Text referencing anchoring of a vessel depicted the vessel needed to be stopped with minimal movement or the anchor gear or vessel would be exposed to damage or personal injury. Contrary to this representation it is common practice by all Southwest Alaska Pilots to utilize the anchor when maneuvering a vessel in Cook Inlet. This is done with the engines running and the ship making way. The dredging of an anchor is an accepted practice within the maritime industry. Accomplished mariners consider the anchor an invaluable tool which they may utilize in maneuvering the vessel while making way. The use of anchors are also commonly utilized by pilots and masters alike in emergency ship handling situations. To do otherwise has been construed by the courts and USCG on more than one occasion as being negligent.

Scope of the study states a qualitative probability of self-arrest is estimated, however the factors utilized in contribution to the conclusion didn't include the mariners' capability to compensate for propulsion failure. Several of the incidents sited were based upon the inability of the particular mariner to execute the self-arrest maneuver.

The report also quoted Standard P&I club "**anchors can be very effective in stopping a ship".**
"In an emergency, anchors can be very effective in stopping a ship, *provided the anchor is lowered to the seabed and the cable progressively paid out. Initially, the anchor should be allowed to dredge and gradually build up its holding power until its braking effect begins to reduce the ship's speed. Care should be taken when trying to stop any ship in this way, especially a large ship, as the anchor and its equipment may 'carry away' causing damage or injury, if the anchor should snag." Page 6*

Drifting scenarios for Cook Inlet were posed, and a qualitative probability of self-arrest was stated as not a reliable risk reduction option.

“Self-arrest is not a reliable risk reduction option. While it is regularly attempted, it does not usually succeed. Under some conditions, it is not even appropriate to attempt. Factors of the waterway, vessel, and environmental conditions can cause failure. Attempting to self-arrest has risks, potentially great ones, and an overall low probability of success.” Conclusion page 9

The conclusion was based upon reference statements such as these listed below, which are in direct contrast to what professional mariners perform when dredging anchors within Cook Inlet.

Broken Equipment

Dropping the anchor in an emergency situation typically loads the anchor system components in excess of their usual use. The load on the anchor when it develops its embedded load capacity translates up the anchor chain, windlass, anchor shackles, deck gear, and even to the vessel foundation. It is probable that one (or more) components in the system will break if the vessel is drifting faster than normal, essentially stopped, anchoring speed. Page 3

Drift Rate

In our judgment, (Glosten and Associates) the upper speed limit above which there is near zero probability of self-arrest is around 5 knots. Consequently, anchors should be deployed before high drift speeds are developed. A vessel with a faster drift rate and ideal seabed conditions may have the same probability of success as a slower vessel with poorer seabed conditions. Page 4

CIRCAC has based some of their studies, decisions to advocate for change regarding large vessel operations within Cook Inlet, upon grounding of Sea Bulk Pride. This highly publicized event was not part of the literature review concerning vessels capability to self-arrest within Cook Inlet. Partially loaded tanker Sea Bulk Pride broke from her moorings which resulted in mooring wires fouling her propeller, preventing the use of her own propulsion to stop the vessel. The vessel deployed her anchor to self-arrest her motion for the period of a current in excess of 5 knots, after the ships speed was over 5 knots. The vessel was capable of self-arresting as a result of deploying the anchor. She came to rest safely at anchor without grounding or striking the shoreline due to the anchor self-arresting the vessel without damaging the vessel or injuring personal. This action is in direct conflict with the Glosten Associates statement. Unfortunately the vessel was unable to maneuver herself away from her anchor position due to lack of propulsion prior to the tide retreating and leaving her aground. In this case using the anchor may well have prevented a maritime catastrophe which was recognized by the Alaska State legislature, awarding those involved a letter of commendation.

Tug of Opportunity

Disabled vessel position for northern Cook Inlet scenario was established North of Boulder Point and Southeast of Middle Ground Shoal which is in close proximity to Nikiski Bay. This area has significant oil supply vessel traffic including Perseverance and Endeavour, which were indicated as being available for three weeks and six months respectively. The data was based upon Wednesdays, for 52 weeks of 2012. The data appears inconsistent with local knowledge that these vessels, or others similar, are in the area servicing oil platforms. Number of vessels in this trade has increased dramatically this last year due to the locally publicized increase in Cook Inlet oil and gas industry.

Running time to the scene of the disabled vessel was calculated utilizing current as either in favor of the tug or against the tug of opportunity. The calculation was being determined based upon the six hour tidal cycle with no allowance for the actual dynamics of Cook Inlet. Example of the dynamics involved when transiting this body of water is a tug of opportunity departing Anchorage against the current, will actually have the current with them, prior to arriving at the northern Cook Inlet scenario location.

300 tons of bollard pull was required to be considered a viable vessel of opportunity for Northern Cook Inlet based upon the stipulation to turn a vessel around against the ice and current. This calculation was derived from an assumption the tug would be required to pull at 90 degree angle from the disabled vessel. This is not how a tug of opportunity would pull on a disabled vessel, utilizing this stipulation is contrary to practice of good seamanship. Three day simulations and instruction were conducted at Seward AVTEC 2011 with expert tug boat consultant Captain Brooks. This involved instruction concerning the emergency towing of a disabled tanker. These indicated even a minimal bollard pull tug would have an effect on disabled vessel if performed correctly which doesn't involve pulling perpendicular to the disabled vessel.

Conclusion

This statement argues the study of a vessels capability to self-arrest within Cook Inlet and the use of a tug of opportunity was inadequate. More specifically, the study was inadequate due to its dependence on the use of a literature review and interviews that were not specific and concise to the maritime practices in Cook Inlet Alaska. The data discussed in relation to the tug of opportunity was not based on common maritime experience required, and this directly impacted the results and conclusions of the material. This study should have been conducted or material analysed with the assistance of local based experts within the field of maritime risk mitigation. Under future work subtitle Glosten stated the work was as a "cursory study" and future work is appropriate to validate the probability estimates. Maritime simulations are capable of providing reliable data of vessel capability to self-arrest within Cook Inlet by measuring the tonnage exerted on the ground tackle gear when deployed in an emergency. Safeguard Marine is prepared to provide a proposal for CIRCAC based on the use of simulations to provide a more comprehensive analysis. We would be willing to propose the opportunity for members of your group to observe simulations in Seward, Alaska that could be conducted to assist in answering these very important questions for the benefit of all Alaskans.

COOK INLET RISK ASSESSMENT TASK 7

Evaluate Drifting Vessel's Ability to Self-Arrest

PREPARED FOR:			BY:
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Summary

Self-arrest is the act of deploying a ship's anchor or anchors to stop the vessel in an emergency situation. The probability and contributing factors of self-arrest to prevent a drift grounding were studied in a literature review and interviews. Primary factors are drift rate, anchor embedment conditions, vessel size, and ground tackle load capacity. The combination of factors at the specific time, location, and environmental conditions for the specific drifting vessel affect the outcome. There is no standard protocol to decide when to self-arrest. Nor is there a single effective procedure to self-arrest. Because of the situational variability and uncertainty, it is not easy to predict when self-arrest will succeed. In this report, a successful self-arrest scenario is described, and scenarios for commercial, deep draft vessels in Cook Inlet are posed. Their estimated probability of self-arrest is low. Self-arrest has risks, potentially great ones, and variable predictability; consequently, it cannot be considered a reliable risk reduction option.

Introduction

Self-arrest is the act of deploying a ship's anchor or anchors to stop the vessel in an emergency situation. Self-arrest is attempted to prevent grounding or collision. An emergency situation when another rescue vessel arrests or stops the distressed vessel is not self-arrest. Self-arrest is not considered an available risk reduction measures if the vessel has dragged its anchor(s)[1] or has lost its anchor(s)[2]. This maneuver differs from a non-emergency situation when a stationary vessel deploys its anchor to keep within a watch circle. It was identified as a Risk Reduction Option for further study in Task 6 of the *Cook Inlet Risk Assessment*; self-arrest is the subject of study for CIRA Task 7 as presented in this report.

Scope

A literature review and interviews were conducted to study the probability of self-arrest to prevent drift groundings. Past successes and failures help inform what factors affect the outcome. Factors contributing to the probability of a successful self-arrest and how they relate to one another are discussed. Scenarios for Cook Inlet are posed, and a qualitative probability of self-arrest is estimated.

[1] This condition is similar to the *M/V Steward Island* near miss (Reference 1).
[2] This condition is similar to the *Fisherman's Paradise* incident (Reference 2).

Decision to Self-Arrest

The choice to attempt a self-arrest comes down to the Captain's judgment at the time of the emergency, because it is so dependent on the conditions. The amount of time available before a possible grounding affects the decision and timing to attempt the maneuver. The water depth decreases closer to shore, and the available time decreases for a rescue vessel to arrive or for the crew to fix the failure that caused the vessel to drift. The *Selendang Ayu* drifted 100 miles before attempting to self-arrest when it neared shore (Reference 3). In this case, the decision to self-arrest was made after other rescue measures failed and water depths permitted anchor deployment.

Conditions to consider in deciding to self-arrest include the consequence of attempting a self-arrest and the consequence of grounding. If the vessel is headed to soft, flat, unoccupied ground, and the consequences of grounding are not serious, then the risk of deploying the anchors for self-arrest may not be acceptable. However if grounding is potentially on a rocky shoreline or a sensitive habitat, then the decision to self-arrest may be appropriate. Other vessel-specific factors that may influence a Captain's decision are: cargo (e.g. sand vs. oil), liability, and risk tolerance.

Self-Arrest Consequence Factors

The risks of self-arrest are dependent on the situation; and vary from mild to severe. The self-arrest attempt may simply fail to prevent the drift grounding, or the attempt may cause further incidents and damage in addition to the unprevented grounding. The most common consequence is broken anchoring tackle, and the most severe consequence is loss of life.

Broken Equipment

Dropping the anchor in an emergency situation typically loads the anchor system components in excess of their usual use. The load on the anchor when it develops its embedded load capacity translates up the anchor chain, windlass, anchor shackles, deck gear, and even to the vessel foundation. It is probable that one (or more) components in the system will break if the vessel is drifting faster than normal, essentially stopped, anchoring speed.. The windlass is a typical failure point. In the case of the 385' *FV Paradise*, the connection between the anchor chain and the anchor failed (Reference 2). The loss of one set of ground tackle might still allow a second anchor to be deployed, as time and distance permits. Failure of the windlass or supporting structure would preclude further anchoring. Inadequate foundations for the windlass, anchor stopper attachments, and chocks can cause damage to the vessel that potentially includes breaches of the watertight integrity. If equipment breaks, then the self-arrest is likely a failure.

Risk to Vessel, Subsea Assets, and Vessel Personnel

The equipment may stay intact, but still cause harm depending on where it lands on the seabed. If the anchor is deployed in shallow water, then there is a risk that the vessel may run over it and puncture the hull (Reference 4). Cook Inlet has many inactive and active pipelines. If the anchor is deployed over a pipeline or other undersea asset, then there is a risk of a spill or asset damage.

Even if the equipment does not fail, the deployment may injure or kill crew members. In the case of the *Planet V* self-arrest attempt, the anchor was deployed with uncontrolled speed. The anchor chain entirely ran out and broke free of its end attachment in the chain locker.

The loose-flying anchor chain then fatally injured a crew member (Reference 5). The self-arrest both resulted in a fatality and failed to prevent the collision.

In summary, self-arrest presents risks to the seabed, to the vessel, and to the vessel personnel.

Self-Arrest Probability Factors

One factor limiting the probability of self-arrest for the *Planet V* was its speed, as described in Reference 5, "At a speed over ground of 7.5 knots emergency anchoring is a highly unusual and extremely risky procedure." Speed (or drift rate) and seabed conditions are two primary factors in determining success of the self-arrest maneuver, followed by vessel equipment, vessel location, and environmental conditions.

Drift Rate

Drift rate is a primary factor in the probability of self-arrest success. Currents significantly influence the drift speed and direction. Drift Rate is also a function of vessel displacement, exposed windage area, and the environmental conditions. The larger the displacement and windage, the faster the vessel will drift with waves and wind. A vessel with a faster drift rate will be less able to self-arrest. The vessel may be moving even faster following an instigating failure at transit speed, like in the mechanical failure mid-transit on the *Planet V*. In our judgment, the upper speed limit above which there is near zero probability of self-arrest is around 5 kts. Consequently, anchors should be deployed before high drift speeds are developed. A vessel with a faster drift rate and ideal seabed conditions may have the same probability of success as a slower vessel with poorer seabed conditions.

Seabed Conditions

Seabed conditions are another primary factor in the probability of self-arrest success. Ideal seabed conditions are soft with good holding capacity. Hard, rocky seabed conditions have a higher probability of breaking the ground tackle than holding the anchor and arresting the vessel. Soupy, loose bottom conditions are unlikely to develop full anchor load capacity. Some combinations of anchor types and sediment prevent full anchor embedment or provide intermittent holding capacity due to complex geotechnical processes.

Vessel Equipment

The anchoring system includes the anchor, anchor chain, windlass, anchor shackles, deck gear, and the supporting vessel structure. The system will likely be sized by regulatory requirements; for example, ABS Guidelines (Reference 6). The minimum required size is sufficient for anchoring under non-emergency situations at an anchorage. An anchorage will typically be in an area sheltered from environmental loads and with favorable seabed conditions. A larger, heavier anchor may impose a larger shock loading in the system when deployed in an emergency. A heavy anchor increases the probability of damage to the vessel during emergency deployment; however, the heavy anchor will be more effective at slowing down the vessel. A heavier anchor can also be more effective than a lighter anchor with less scope, as a lighter anchor needs a longer scope for equivalent holding. To increase the probability of self-arrest, it is better to have a heavier anchor and a longer, heavier, and stronger anchor chain with deck gear and vessel structure designed to support the breaking strength of the ground tackle.

Well maintained equipment contributes to the probability of self-arrest success. If tackle is corroded or fatigued, then its holding strength is reduced. In the case of the *Queen of Oak Bay* (Reference 7), the anchor windlass had recently been painted. The equipment was not tested after maintenance and, as it was stuck, could not be deployed for the self-arrest attempt. Similarly, in the case of the *Baltic Commander I*, the Captain attempted to self-arrest but the anchor could not be deployed for reasons that the US Coast Guard could not determine (Reference 8).

Vessel Location

The vessel location determines the depths and seabed conditions available for anchoring . Seabed condition was discussed above as a primary factor. The seabed depth, along with anchor road length deployed, determines scope.

> *A common rule of seamanship is "to use a length of chain equal to 5 to 7 times the depth of the water. This is satisfactory in depths of water not exceeding 18 fathoms. This amount of chain is perhaps enough for a ship riding steadily and without any greater tension on her cable." (Reference 9.)*

There is a trade-off in between too deep or too shallow water depth. Deeper water requires a longer chain to achieve scope. A longer chain requirement limits the ability to self-arrest in deep water. Dragging the suspended anchor and/or anchor chain through deep water will slow, but not stop, the vessel. Short scope increases uplift on the anchor and limits the ability to self-arrest. Water depth is shallower over a shoal or near shore. At best, anchors would be deployed in deep water, incrementally building load capacity and shedding vessel speed as the vessel moves into shallower water and road scope becomes more favorable.

Environmental Conditions

Vessel location and time determine tide height and environmental conditions. Wind, current, and wave conditions determine environmental loads on the vessel and its drift rate. Bad weather decreases the probability of success. The *Selengang Ayo* had arrested, seemingly successfully, on one and then on both anchors, before the severe environmental conditions continued to push the vessel ashore (Reference 3). Environmental conditions also affect other rescue measures and emergency procedures. Worse conditions reduce the probability of any risk reduction measure attempted.

No single factor dictates success or failure; the combination of multiple factors at the specific time, location, and environmental conditions for the specific vessel affect the outcome.

Self-Arrest Guidance

Because of the situational variability and uncertainty, there is no standard protocol to decide when to self-arrest or a single effective procedure to perform a self-arrest. The literature review found no such formalized or endorsed instructions for carrying out a self-arrest. Emergency anchoring is mentioned in guidelines and may even be part of a vessel's Safety Management Plan, but there is little protocol on when or how to attempt the maneuver. Capt. John Konrad (Reference 10) says that "the sin of grounding is letting it happen with an anchor in the hawespipe." He recommends attempting self-arrest despite the risk of broken or lost equipment and deploying more than one anchor, if necessary. An article by

ShipsBusiness.com (Reference 11) advises on when to ready anchors and how many to deploy in a critical situation, as follows:

> *Anchors should be ready for letting go on arrival and departure port, when in anchoring depths. At least, any wire lashings are to be removed and the anchors held on brake. In critical situations, to arrest the movement of the vessel, after stopping/reversing the main engine, it is preferable to let go both anchors simultaneously instead of one.*

The Standard P&I Club issues guidance for loss and accident prevention; their publication, *A Master's Guide to Berthing* (Reference 12), advises that emergency anchoring can be effective given specific circumstances with caution, as follows:

> *In an emergency, anchors can be very effective in stopping a ship, provided the anchor is lowered to the seabed and the cable progressively paid out. Initially, the anchor should be allowed to dredge and gradually build up its holding power until its braking effect begins to reduce the ship's speed. Care should be taken when trying to stop any ship in this way, especially a large ship, as the anchor and its equipment may 'carry away' causing damage or injury, if the anchor should snag.*

Before dragging the anchor along the seabed, the anchor, anchor chain, and even mooring lines can be used as a 'sea anchor' or drogue. The purpose of the drogue is both to point the bow into weather and to slow the drifting vessel. This method is called "improvisation, at best," by D.J. House (Reference 13).

Even though self-arrest is attempted in an emergency, which is usually time-critical, it should be attempted slowly and carefully. To reduce the time-critical nature of the emergency, Captain Kent Dresser (Reference14) suggests deploying anchors as soon as possible after the vessel begins to drift. A quick response gives the self-arrest attempt more time to be done, take hold, and stop the vessel before excessive drift speeds are developed. More time between the decision to self-arrest and the potential grounding decreases the likelihood of grounding, and increases the probability of a successful self-arrest.

Successful Self-Arrest Scenario

In a successful self-arrest, the drifting vessel's kinetic energy is dissipated by dragging and embedding the anchor and the vessel stops drifting at least long enough for a rescue vessel to arrive that can tow the distressed vessel to safety. For example, a successful self-arrest was made by dragging just the vessel's anchor chain while drifting for several hours and over about 15 miles. The 385' fishing barge *Fisherman's Paradise* broke free from its anchor, causing it to drift. The crew deployed the rest of the anchor chain which eventually caught the seabed[3] (Reference 2). The vessel held until a towboat arrived and brought it to a nearby yard for repair. A responsive crew, time, luck, and a heavy anchor chain, along with the

[3] Because the anchor chain acted like an anchor, this scenario is considered a self-arrest.

influence of other factors, prevented the grounding. No other incident reports were found for a successful self-arrest by a drifting vessel[4].

A longer narrative of a hypothetical successful self-arrest scenario is compiled from brief incident reports, guidance documents, and in-house interviews. After the captain decides to self-arrest, the anchor is deployed in a slow, controlled matter, to just above the seabed depth. At this depth, the anchor acts as a drogue to help slow the boat. Decreasing boat speed decreases the likelihood of breaking anchor tackle when the anchor hits the seabed. When the anchor hits the seabed on a short scope, it will dredge though the seabed as the vessel continues to drift. This will continue to slow down the vessel. The anchor road is paid out faster than the speed that the vessel is drifting in an attempt to lightly embed the anchor and increase the catenary weight in the anchor chain. The anchor embeds deeper and scope increases while the anchor line is paid out. As the speed drops towards zero, the anchor fully embeds, and the self-arrest holds. Self-arrest is possible given favorable conditions. This hypothetical scenario had the following, qualitative conditions:

1. Long enough chain.
2. Adequate hardware load capacity in the load path from anchor to vessel structure.
3. Long enough distance to shore.
4. Mild enough environmental conditions.
5. Soft seabed with sufficient holding power.
6. Adequate water depth.
7. Well trained crew and knowledgeable captain.

Scenarios for Cook Inlet

Drifting scenarios for Cook Inlet are posed, and a qualitative probability of self-arrest is estimated. Drifting scenarios are based on the distressed vessel scenarios studied in the *CIRA Task 7 Tug of Opportunity Study* (Reference 16). Representative vessels, drifting vessel locations, and environmental condition were prescribed. The *Horizon Consumer*, a containership, and the *Overseas Boston*, an oil tanker, were representative distressed vessels. The three locations are given in Table 1. Environmental conditions at these locations for annual 50th (median) and 90th percentiles are given in Table 2 (Reference 17). Approximate depth, seabed conditions, and subsea assets for these locations were found on NOAA Charts 16640 and 16663 (References 18 and 19). These additional factors in the probability of self-arrest are summarized in Table 3. It is presumed that this is the extent of information available to a captain.

Table 1 Cook Inlet Drifting Vessel Scenario Locations

	Latitude	Longitude
Upper Cook Inlet	60.888264	-151.235733
Kachemak Bay	59.489567	-151.766220
Kennedy Entrance	59.074158	-151.996857

[4] The incident report review was not exhaustive. There may very well be other successful self-arrests which prevented a drift grounding that are unknown to the author. Near-misses and successful self-arrests may be less likely to be reported than failed attempts. There has been at least one successful self-arrest from an underway vessel. An underway containership dropped anchor and successfully avoided a collision (Reference 15) .

Table 2 Cook Inlet Drifting Vessel Scenario Environmental Conditions by Location and by Percentile

Environmental Condition	**Location**					
	50th Percentile			**90th Percentile**		
Parameter	Upper	Kachemak	Kennedy	Upper	Kachemak	Kennedy
Ice coverage (%)	0.0	0.0	0.0	70.0	0.0	0.0
Ice thickness (mm)	0.0	0.0	0.0	300.0	0.0	0.0
Current speed (kts)	3.8	0.6	1.8	5.2	0.8	2.5
Wave height Hs (m)	0.5	0.5	1.6	0.0	1.4	3.8
Wave period Tm (s)	4.6	4.6	5.6	0.0	4.8	7.7
Wind speed (kts)	7.4	7.2	12.2	14.9	17.1	25.8

Table 3 Factors in Probability of Self-Arrest available from NOAA Chart

Parameter	**Upper Inlet**	**Kachemak Bay**	**Kennedy Entrance**
Approximate Depth (ft)	120	120	630
Seabed Condition	Pebbles, Gravel	Pebbles, Sand, Kelp	Rocky
Subsea Assets	Pipeline Area	None	Submarine Cable

Additional information could be available to the captain. A knowledgeable captain would also be familiar with his vessel's equipment. A captain familiar with Cook Inlet may have additional knowledge on the seabed, bottom obstructions, shoreline, and current direction. These secondary factors are not specified in this qualitative assessment.

Predictions for drift rate, drift direction, and in turn, time to shore are made with simple assumptions for these three scenario locations. The vessel will likely drift with the current. Tidal current direction in Cook Inlet is along the inlet length, approximately NE-SW in Upper Cook Inlet. The Upper Cook Inlet emergency site is in the middle of the inlet, exposed to current. The shortest northerly fetch is approximately 11 nm to East Foreland.

Kachemak Bay is off the inlet length, less exposed to current. Its closest shore is only 2 nm away, at Seldovia Point. With a 0.6 kt drift speed, a vessel could be blown aground into the Point in under 4 hours.

A vessel drifting from the Kennedy Entrance emergency site would not anchor in place due to the great depth. The vessel would likely first drift to shallower waters before attempting to self-arrest. The Kennedy Entrance emergency site is fully exposed to the current, approximately NW-SE at the inlet entrance. This trajectory may or may not displace the vessel away from the subsea cables, also running approximately NW-SE. There is shallower, open water along the inlet to the northwest. However, there are rocks and a reef approximately 5 nm to the northeast and rocks and islands approximately 6 nm to the south. With a 1.0 kt drift speed, a vessel could ground in under six hours. Four to six hours to ground is a relatively short, but not necessarily a prohibitively short period in which to self-arrest.

Drifting vessels may have a higher probability to self-arrest as it drifts away from the initial emergency scenario locations due to the depth or subsea obstructions at the site. The probability of self-arrest for the six scenarios is estimated in Table 4.

Table 4 Cook Inlet Scenario Self-Arrest Probability Estimates

Scenario	Environmental Condition	Location	Probability
1	50th	Upper	Near Zero
2		Kachemak	Low
3		Kennedy	Very Low
4	90th	Upper	Near Zero
5		Kachemak	Low
6		Kennedy	Very Very Low

The Upper Cook Inlet emergency site it is directly above a Pipeline Area. Three pipelines cross the Upper Cook Inlet. Although seabed conditions and depth are relatively favorable, dropping anchor at this site would require highly specific information about pipeline locations. Without this information dropping anchor in a pipeline area would risk significant oil pollution. Because of the pipelines and the high current speed, it is estimated that there is near zero probability of self-arrest from the northernmost emergency site.

Self-arrest probability from Kachemak Bay is low, but the highest of the three locations. While seabed conditions may be too loosely packed for adequate anchor holding, there is less risk of breaking equipment. There is no risk of damaging subsea assets. A drifting vessel could attempt self-arrest in an emergency, particularly with the risk of grounding against the steep coast on the eastern shoreline.

Vessels adrift from the Kennedy Entrance have greater uncertainty in drift speed and direction and therefore greater uncertainty as to when and where a self-arrest can be attempted. Higher uncertainty is estimated to reduce the probability of success. The probability of a successful self-arrest in Kennedy Entrance at the 50th and 90th percentile is estimated to be very low and very very low, respectively.

Conclusions

Self-arrest is not a reliable risk reduction option. While it is regularly attempted, it does not usually succeed. Under some conditions, it is not even appropriate to attempt. Factors of the waterway, vessel, and environmental conditions can cause failure. Attempting to self-arrest has risks, potentially great ones, and an overall low probability of success.

Future Work

Future work is appropriate to validate the probability estimates. This memo reports findings from a cursory study, including a literature review and interviews with in-house experts. Incident reports from the Alaska Department of Environmental Conservation (ADEC) and the US Coast Guard, along with expertise gathered from pilots familiar with the inlet and with the self-arrest maneuver, could help support and quantify the estimates.

CIRA: TUG OF OPPORTUNITY SUBTASK

Evaluation of 2012 Tugboat Response Times

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Summary

This report details the procedure developed by The Glosten Associates (Glosten) to estimate the availability of tugs around Cook Inlet, Alaska, to assist a vessel in distress. Twelve distressed vessel cases were studied, including two environmental conditions and three incident locations. For each case, response time and capability are estimated for 1,044 potential tug of opportunity

Automated Information System (AIS) position data points from Wednesdays in Cook Inlet in 2012. The resident tugs in Cook Inlet exhibit the fastest response times. Most response times exceed 18 hours. There is no capability to turn a vessel in ice or to tow a vessel in ice against at 5 kt current. This sample shows lower availability to rescue a vessel in Upper Cook Inlet as compared to southern regions with milder environmental conditions, closer to potentially available tugs.

Objective

The Tug of Opportunity study evaluates the availability of underway and stand-by tugs, and the capability of available tugs to rescue a distressed vessel. Availability is estimated by calculating tug response time to the distressed vessel. Capability is estimated by comparing the available tug's bollard pull with the required bollard pull to turn or arrest the distressed vessel; assuming the agreed upon representative vessel, vessel location, and environmental conditions. This study is part of Glosten's scope of work for the risk assessment of Cook Inlet facilitated by Nuka Research.

Case Matrix

Availability and capability are estimated for all the potential rescue vessels in and around Cook Inlet and Prince William Sound, as recorded in Automated Information System (AIS) position data for each Wednesday at noon in the 2012 calendar year. AIS data points are provided by Nuka Research, along with principal characteristics of the vessels (References 1 and 2). Potential rescue vessel types include harbor tugs, escort tugs, offshore supply vessels, and US Coast Guard vessels; however, the potential rescue vessels are all referred to as 'tugs' in this report. There are 107 tugs with 1,044 AIS points in the analyzed dataset.

Response time and capability calculations are made for multiple incident sites, representative distressed vessels, and environmental conditions. There is one incident site located in each of the major environmental regions in Cook Inlet: Upper Cook Inlet, Kachemak Bay, and Kennedy Entrance. A tanker and a containership are used as the representative vessels that are frequently in the Inlet. The two environmental conditions are the 50^{th} (median) and 90^{th} (extreme) percentiles of annual statistics. Capability is estimated for 12 cases (3 sites, 2 environmental conditions, and 2 vessels). Response time is estimated for these same 12 cases plus two cases for effects with and against (assisting and opposing) currents. Response time and capability are estimated for 1,044 AIS points.

Route Distance Methodology and Assumptions

Simplifying assumptions are made in order to automate the calculations as much as possible to reduce the complexity of each of the several parts of this analysis. This section details these assumptions.

It is assumed that the tug of opportunity had enough fuel and water to complete the voyages necessary to get to the incident site. Since one of the purposes of this analysis is to identify the spectrum of response times for all the tugs in the Cook Inlet area, this assumption may not always be valid for tugs located far away from the incident site.

The data provided in Reference 2 is reviewed and modified as follows. Maritime Mobile Service Identity (MMSI) IDs are corrected, and vessels that are unable to perform tug of opportunity tasks culled out, for example science and anti-pollution vessels. US Coast Guard vessels are included in the analysis because it was assumed that, in an emergency, they would be made available to assist in efforts. The bollard pull of the two US Coast Guard vessels with gas-turbines are assumed to be limited by the tow line strength and are set to equal the bollard pull of the largest tugboats. The Ship Escort/Response Vessel System (SERVS) Tugboats starting in Prince William Sound (PWS) are included in the dataset. All other tug boats in PSW are assumed to be towing, and thus are culled from the analysis because it is assumed that at the towing transit speed they would not be able to respond quickly enough to be effective for incidents in Cook Inlet. After culling, there are 107 tugs and 1,044 points remaining in the analyzed AIS dataset.

Tugs are routed from their AIS starting point, to a Barge Drop-Off Port (BDOP) if applicable, and to the incident site. Resident tugs of Cook Inlet and the PWS SERVS tugs are assumed to proceed directly to the incident site. All other tugs are assumed to be in or near the inlet because they are towing a barge, which would need to be dropped off prior to proceeding to the incident site.

It is assumed that it takes 2 hours to hand off the barge after arriving at the BDOP, 1.5 hours to get a towline to the distressed vessel at the site, and another 0.5 hours before the tug can effectively pull on the distressed vessel. These extra times are added to each voyage as appropriate.

Route Distance Calculation

Routes are charted along waypoints through navigable waters. All the provided AIS latitude and longitude starting points are contained within the area in and around Cook Inlet and Prince William Sound. This area is subdivided into seven Initial Position Zones, as shown in Figure 1, which largely coincide with the environmental regions. The three environmental regions coincide with the seven Initial Position Zones:

- Upper Cook Inlet, north of the East and West Forelands, Zone 1.
- Middle Inlet and Kachemak Bay, between Nikiski and Point Adams on the Kenai Peninsula, Zone 2.
- Kennedy Entrance, south of Point Adams to north of the Barren Islands, Part of Zone 3.
- Open Ocean, outside of Cook Inlet, the remainder of Zone 3 and Zones 4-7.

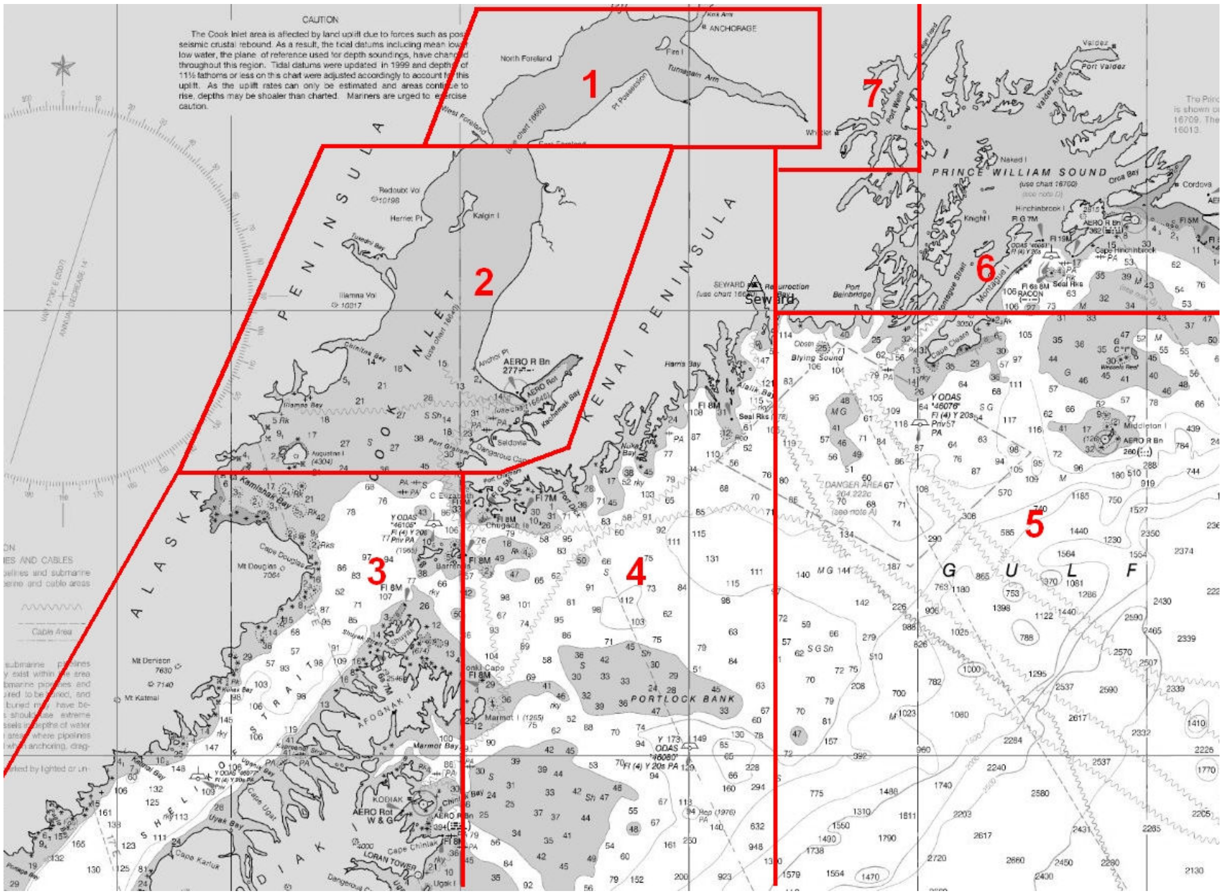

Figure 1: Cook Inlet tug of opportunity initial position zone definitions

The six Barge Drop-Off Ports (BDOPs)are:

- Anchorage
- Nikiski
- Drift River
- Homer
- Seldovia
- Port Graham

Figure 2 shows an example waypoint route for a tug starting in Zone 4 at Seward and towing a barge to the Nikiski BDOP. The distance between the Seward Inlet Waypoint and Nikiski is 196 nautical miles (nm): 92 nm in Open Ocean, 11 nm through the Kennedy Entrance environmental region, 90 nm through the Middle Inlet region, and 3 nm through the Upper Cook Inlet region. Not shown are the first leg to the Seward Inlet Waypoint and the last leg from the BDOP to the incident site.

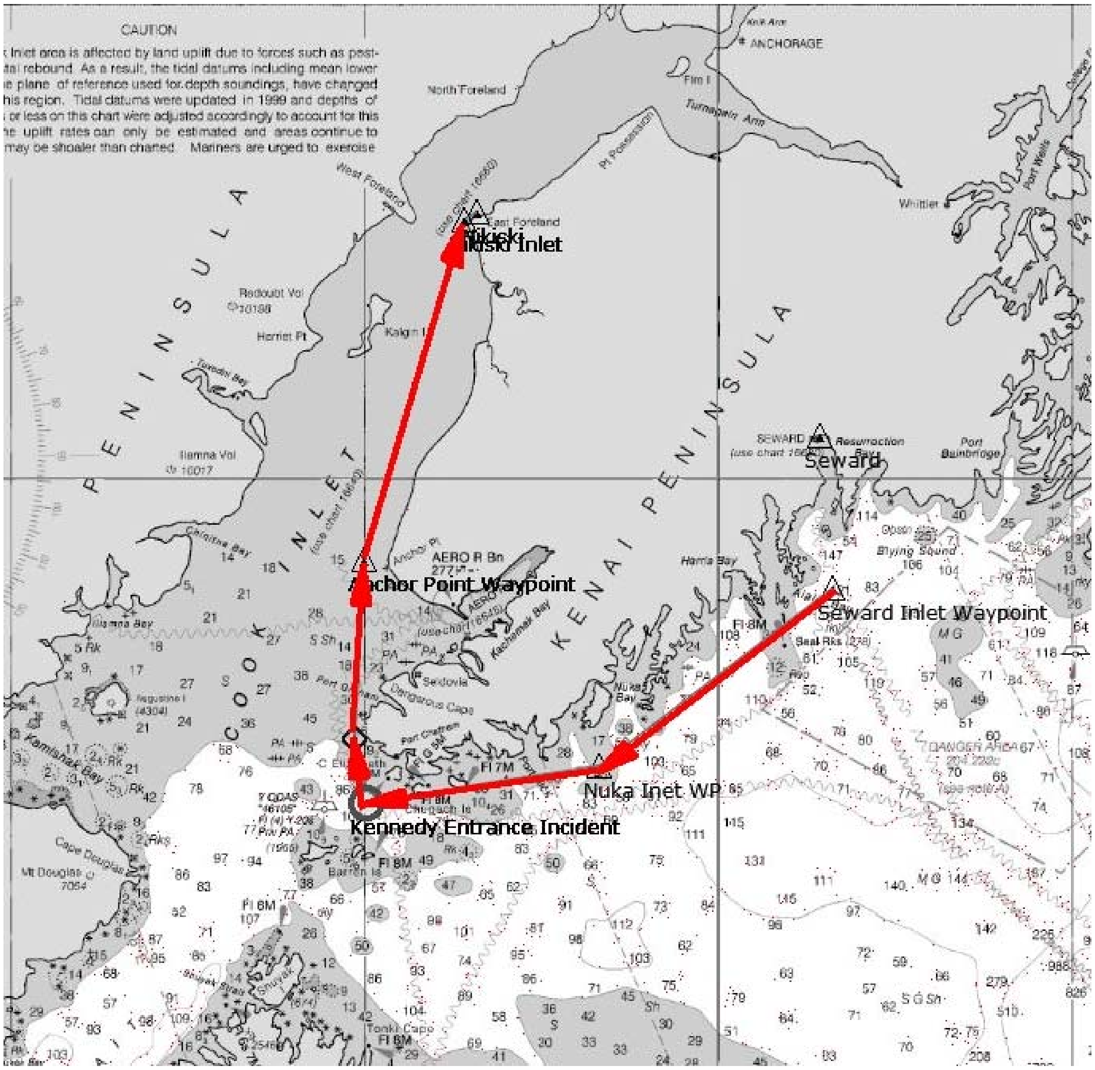

Figure 2 Example pre-planned route from Zone 4 to Nikiski

Voyage distance is calculated as the total of three legs:

1) The Great Circle distance from the tug's initial position in its initial position zone to the closest zone waypoint on a pre-planned fixed route.
2) The distance along the defined routes to the destination (the BDOP or incident site).
3) If towing, the distance from the BDOP to the incident site.

Total response time for tugs engaged in towing is calculated to each of the six BDOPs, and then from the BDOP free-running to each of the three incident sites. The minimum time from the six BDOPs is reported.

Anchorage and Nikiski BDOPs and the Upper Cook Inlet incident site are in Zone 1 and are subject to ice loads. The remaining BDOPs and the Kachemak Bay incident site fall into Zone 2. The Kennedy Entrance incident site is at the boundary of Zones 3 and 4. The open ocean environmental conditions are assumed to have the same sea state as defined for the Kennedy Entrance environmental region, but with no current. All vessels outside of Cook Inlet in Zones 3-7 are assumed to transit to the Kennedy Entrance in the open ocean weather prior to proceeding to their Cook Inlet destination.

Reference 2 details the 50th (median) and 90th percentile environmental conditions for each of the three Cook Inlet environmental regions, which are necessary for voyage speed estimation.

Vessel Speed Estimation

The maximum free-running in calm weather speed is estimated from the reported horsepower of the tug, unless it is given for the tug in the area traffic data file (Reference 2). A polynomial relationship was interpolated from the reported horsepower and speed data pairs provided during the Aleutian Island Risk Assessment (AIRA). Similarly, if not reported directly from the references, the tug bollard pull was estimated using the same technique, except for the two previously specified USCG vessels.

Maximum free-running speed is scaled down for higher sea states and for towing a barge. Two sources are used. Nobel-Denton is a general approach to account for sea state and barge towage (Reference 5). This formula is plotted in green in Figure 3. The second source is three data points from Little River consultants, specifically for operating in Alaska (Reference 6). The AIRA Little River speed knockdowns are 75% of the Nobel-Denton towage speed knockdowns, in the relevant speed range for this analysis. These points are plotted in purple. This source governs, because it is more conservative and more specific to this project's application. The Nobel-Denton formula was scaled down to align with the Little River Data, and this formula was used to calculate the speed knockdown factor by significant wave height.

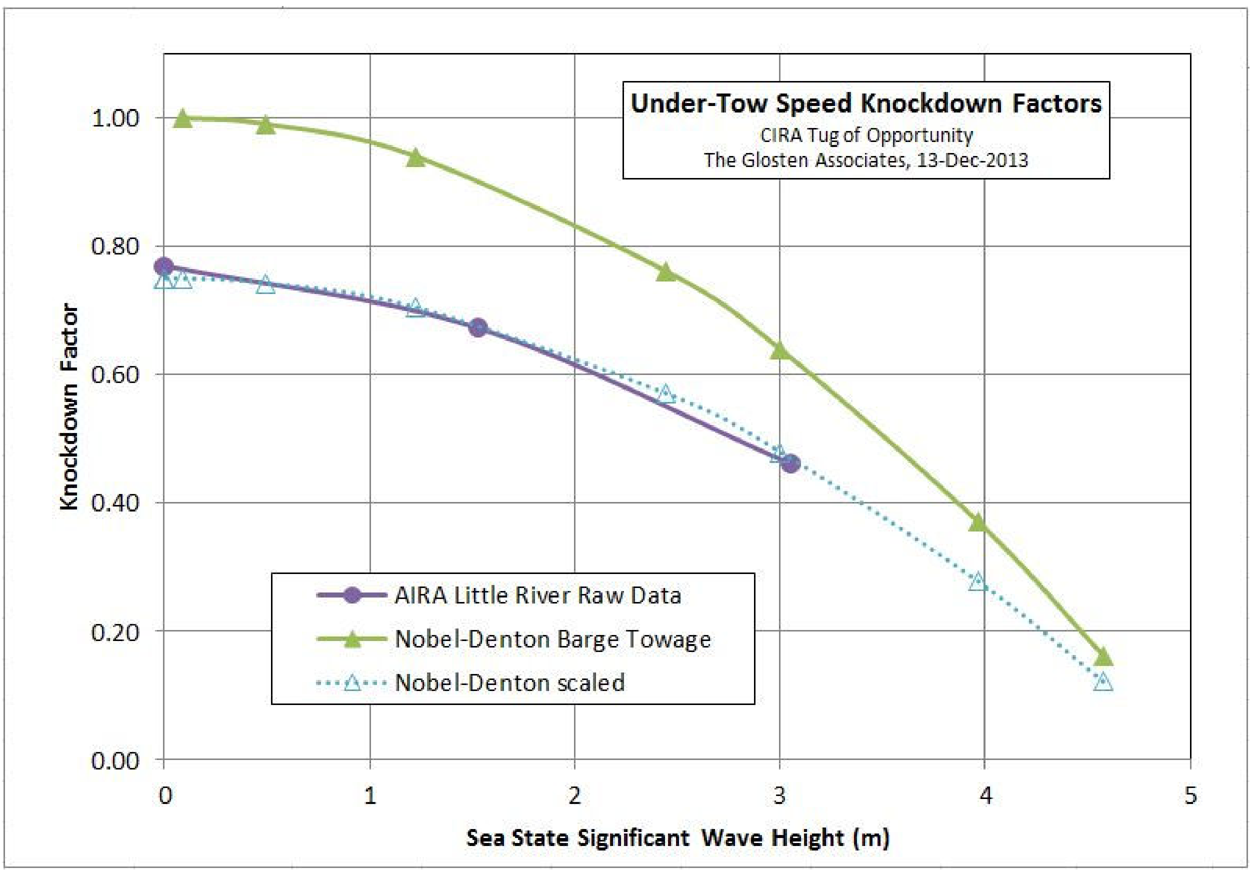

Figure 3 Comparison of Nobel-Denton and Little River under-tow speed knockdown factors

With respect to speed reduction in ice, during a teleconference (Reference 4), Captain Audette stated that a typical speed knockdown for a tug under tow through 7/10 coverage, 30 cm thick, first-year ice was from 4-5 knots to 1.5-2.5 knots through the water for a 4,000 horsepower tugboat. The average of these values is used to estimate speed knockdowns on free-running in ice and towing in ice for a similarly sized tugboat, which under the polynomial approximation used prior has a maximum free-running speed of 13 knots. These speed-in-ice proportional relationships are assumed to hold for tugs of all horsepower. This generalization is appropriate because the estimated tug response times through ice-infested Upper Cook Inlet match the observation stated by Capt. Audette that, when towing barges through ice, voyages are planned for travel with the tide direction only. Cook Inlet has the highest tidal variation in the United States resulting in currents that, when combined with ice, make it nearly impossible to maneuver barges against it. The effects of tidal currents are included as a direct addition or subtraction to the tug speed while transiting through each of the three environmental regions in Cook Inlet. Since Cook Inlet currents vary with semidiurnal frequency, voyage times that are not even multiples of 12 hours are affected. The tidal current effect is accounted for by calculating the current exposure time, which is the remainder of the voyage time from a 12-hour multiple. For a less than six hour remainder, the current effect is added/subtracted for the exposure time. When the remainder time is greater than six hours, exposure is reduced by the amount of time over six hours as shown in Figure 4. This accounts for the period of time over six hours where the current has again reversed.

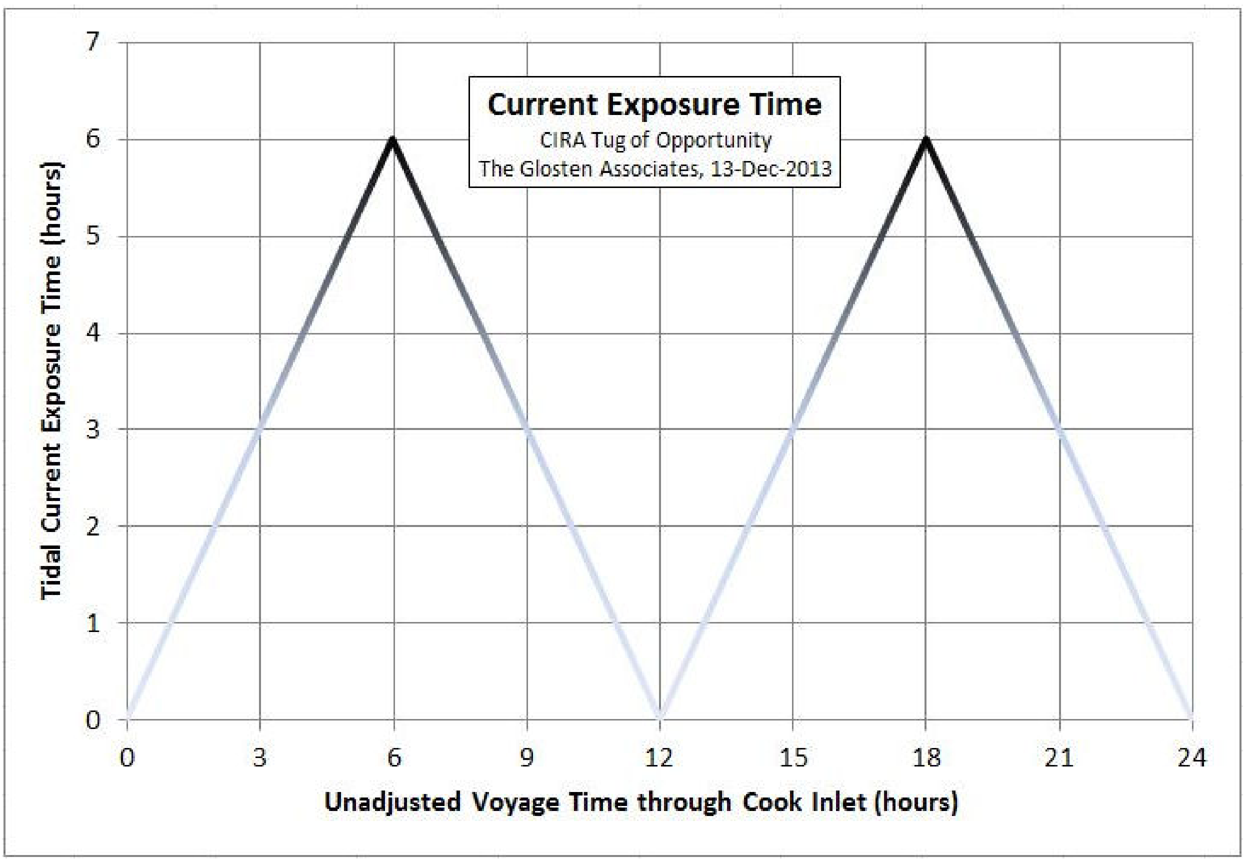

Figure 4 Cumulative tidal current exposure time versus voyage time through Cook Inlet

The environmental conditions that effect the tug response times, and also are input to calculate the tug capability required to assist a distressed vessel.

Required Tug Bollard Pull Estimate

The towing performance capacity required of a tug to arrest distressed vessels in the prevailing weather conditions is estimated using a methodology for calculating environmental loading developed for the *Minimum Required Tug Analysis* of the AIRA (Reference 7). Tow loads for turning and arresting, turning only, and arresting only are calculated for two representative vessels in a series of load cases. The minimum required tug bollard pull is the greater of the turning only load or the arresting only load, divided by an efficiency factor. The efficiency factor is the degradation of bollard pull as a function of wave height (Reference 14).

Representative Vessels

Fifteen (15) specific vessels made 81% of the ~500 light and deep draft port calls in Cook Inlet in 2010 (Reference 8). These included three passenger vessels, six cargo ships, and six tank vessels. Two of the largest of these vessels, a 25,750 MT containership and a 338,220 BBL crude oil tanker, were selected as representative vessels for calculating the tug bollard pull rating required to arrest vessels of the type typically found operating in Cook Inlet. Particulars of the representative vessels are summarized in Table 1.

Table 1 Representative Vessel Particulars

		Containership Particulars	Oil Tanker Particulars
Capacity		1,476 TEU	338,220 BBL
Vessel name		*Horizon Consumer*	*Overseas Boston*
LOA	m	219.58	183.20
LBP	m	206.34	174.00
Beam, molded	m	28.95	32.20
Depth, molded	m	16.46	18.80
Draft, full load	m	10.39	12.20
Displacement, full load	MT	25729	56242
Gross tonnage	GT	25644	29242

Assumptions

Environmental loads consist of forces imposed on the distressed vessel by current, waves, wind, and ice (when applicable). The assumptions governing the required tug calculation are as follows:

- The tug is required to arrest the distressed vessel, but not tow it (i.e., the towing speed with respect to land is 0 m/s).
- The tug turns the distressed vessel by towing the vessel from the bow at a right angle to the vessel's heading.
- Current and ice forces are co-linear.
- The arrest heading of the distressed vessel is directly opposed to the direction of current and ice flow ($\theta_{current,ice} = 180°$) .
- Wind and wave forces are co-linear and heading-independent of current/ice forces.

- When calculating turning only load, the coupled tug and distressed vessel are assumed to drift with the current until the vessel is aligned with the flow.

Environmental Conditions

Six (6) load cases are specified, with each load case describing one of the three (3) regions of Cook Inlet during one of two (2) environmental conditions. The three regions, in order of northernmost to southernmost, are Upper Inlet, Kachemak Bay, and Kennedy Entrance. The two environmental conditions are the 50th and 90th percentiles of annual statistics. Six (6) parameters define the environmental loads (current, waves, wind, and ice) on the representative vessels, which are:

i. Ice coverage (% of water area covered)
ii. Ice thickness (centimeters)
iii. Current (knots)
iv. Wave height (meters)
v. Wave period (seconds)
vi. Wind speed (knots)

The environmental parameter inputs for each load case, as given by NUKA in Reference 1, are summarized in Table 2.

Table 2 Environmental Conditions for Each Load Case

Environmental Condition	Load Case					
(percentile)	50th	50th	50th	90th	90th	90th
Region	Upper	Kachemak	Kennedy	Upper	Kachemak	Kennedy
Parameter						
Ice coverage (%)	0%	0%	0%	70%	0%	0%
Ice thickness (cm)	0	0	0	30	0	0
Current (kts)	3.8	0.6	1.8	5.2	0.8	2.5
Wave height Hs (m)	0.5	0.5	1.6	0.0	1.4	3.8
Wave period Tm (s)	4.6	4.6	5.6	0.0	4.8	7.7
Wind speed (kts)	7.4	7.2	12.2	14.9	17.1	25.8

Methodology

The minimum required tug rating for each load case represents the greater of the calculated turning only load, or arresting only load divided by tug efficiency. Each type of load is calculated as the sum of the current, wave, wind, and ice loads upon the vessel, during either turning or arresting, at each 10° increment of a 360° range of wind/wave incident angles. The calculated environmental load is the maximum of all wind/wave heading angles. Current, wave, wind, and ice forces are calculated using the methods presented in References 9, 10, 11, and 12, respectively.

Ice Load Case

The minimum tug bollard pull required to turn an incident vessel in ice is estimated by rotating by 90° the axis system of the ice resistance calculation presented in Reference 12, to simulate a sideways tow through ice. The substantial sideways tow load developed using this methodology is corroborated by the experimental results presented in Reference 13. The sideways-tow load is then distributed along the length of the vessel, and the moment required to turn the vessel by towing the bow at a right angle is calculated.

Calculations performed for the 90th Percentile Upper Inlet load case indicate that the required tug bollard pull for turning the representative vessels in 30 cm of ice would be approximately 300 MT for the containership and 210 MT for the oil tanker. These demands greatly exceed the towing performance of any available tug. This finding agrees with Captain Audette's evaluation of available tug towing performance in ice; namely, that even smaller barges towed through Cook Inlet cannot be turned in ice (Reference 4). In the event that a vessel begins drifting in ice in the Upper Inlet area, a tug will not be capable of turning the vessel into the bow-on, 0° heading required to arrest.

If the drifting vessel is already aligned against the direction of current/ice flow when the tug arrives, then the tug may tow it. The arresting only load is 58 MT in the 90th Upper Inlet load case. Maximum tug efficiency for towing with no waves is 80% (Reference 14), but efficiency decreases for towing with no waves in ice.

Capt Audette stated that tug under-tow speed in ice is 1.5-2.5 kts through the water (Reference 4). A tug towing in ice with a max speed of 2.5 kts through the water cannot overcome a 5.2 knot current. Therefore, there is no capability to turn or to tow a distressed vessel for the 90th Percentile Upper Cook Inlet load case.

Summary of Required Tug Bollard Pull

The maximum required tug bollard pulls for the containership and oil tanker are 72 MT and 67 MT of bollard pull, respectively, in the 90th percentile condition in Upper Cook Inlet. For both vessels, this load case represents the worst case as a result of the 7/10 coverage of 30 cm pan ice. When considering non-ice load cases, the greatest required tug bollard pull is no more than approximately 30 MT for both vessels in the Winter Kennedy Entrance case. Tables 3a and 3b summarize the required tug bollard pulls calculated in each load case for the containership and oil tanker, respectively.

Table 3a Required Tug Bollard Pull by Load Case for Containership

Environmental Condition (percentile)	Load Case					
	50th	**50th**	**50th**	**90th**	**90th**	**90th**
Region	**Upper**	**Kachemak**	**Kennedy**	**Upper**	**Kachemak**	**Kennedy**
Turning and Arresting (MT)	70.60	3.20	20.70	–	11.90	47.50
Turning Load Only (MT)	0.80	0.80	2.60	–	4.30	7.70
Arresting Load Only (MT)	15.00	0.80	5.40	–	3.10	23.60
Tug Efficiency	0.80	0.80	0.80	–	0.80	0.78
Required Tug Bollard Pull (MT)	18.70	1.00	6.70	–	5.40	30.30

Note: No tug is capable of meeting the load case marked: - .

Table 3b Required Tug Bollard Pull by Load Case for Oil Tanker

Environmental Condition (percentile)	Load Case					
	50th	50th	50th	90th	90th	90th
Region	Upper	Kachemak	Kennedy	Upper	Kachemak	Kennedy
Turning and Arresting (MT)	69.90	3.20	20.40	–	11.70	46.60
Turning Load Only (MT)	0.80	0.70	2.60	–	4.30	8.40
Arresting Load Only (MT)	14.80	0.80	5.20	–	3.00	21.30
Tug Efficiency	0.80	0.80	0.80	–	0.80	0.78
Required Tug Bollard Pull (MT)	18.50	1.00	6.50	–	5.40	27.30

Note: No tug is capable of meeting the load case marked: - .

While variation in each environmental parameter has a measurable impact on tug requirement, current and ice thickness are the more significant drivers of the required tug rating.

Results

AIS data points from Wednesdays in 2012 represent a sample of potential tugs of opportunity. The analyzed dataset contained 1,044 data points from these 52 days. Tug availability and capability may vary in future years. Data points are not distributed evenly throughout the year. Seasonal or daily availability is not considered. Results are presented as percentages of the 1,044 potential tug of opportunity data points sampled in 2012.

The tug of opportunity capability is evaluated based on whether the bollard pull of the tug is greater than the estimated minimum required bollard pull for each of the representative vessels, in each of the two specified environmental conditions, and for each of the three incident sites. All tugs in the sample are capable of assisting both representative distressed vessels in the 50th percentile environmental condition load cases, with a small exception for the Upper Inlet. Upper Inlet at the 90th percentile load case showed the least capability. Table 4 summarizes the percentage of AIS tug data points capable of rescuing both, neither, and either one of the representative vessels.

Table 4 Percentage of Sample Tugs of Opportunity Capable of Assisting Distressed Vessel

Environmental Condition (percentile)	Load Case					
	50th	50th	50th	90th	90th	90th
Region	Upper	Kachemak	Kennedy	Upper	Kachemak	Kennedy
Tanker	97%	100%	100%	0%	100%	83%
Containership	97%	100%	100%	0%	100%	82%
Neither Representative Vessel	3%	0%	0%	100%	0%	17%

While most tugs in and around Cook Inlet are capable in most load cases, most response times are greater than 18 hours. The response time from the AIS tug data points capable of rescuing both representative vessels in each of the six load cases is summarized in Table 5 and Figure 5. Appendix A gives response time and capability for all 12 cases and for all 1,044 AIS points. This sample shows no availability to turn or arrest a vessel in ice, and lower availability to rescue a vessel in Upper Cook Inlet, as compared to southern regions, which are closer to the Initial Position Zones and have milder environmental conditions.

Table 5 Total Voyage Time of Tugs That Can Assist Both Representative Vessels

Environmental Condition (percentile)	Load Case					
	50th	50th	50th	90th	90th	90th
Incident Site	**Upper**	**Kachemak**	**Kennedy**	**Upper**	**Kachemak**	**Kennedy**
< 6 hours:	5%	7%	2%	0%	8%	2%
6-12 hours:	18%	14%	17%	0%	8%	15%
12-18 hours:	10%	29%	43%	0%	8%	6%
> 18 hours:	64%	50%	38%	0%	76%	59%
Sum:	97%	100%	100%	0%	100%	82%

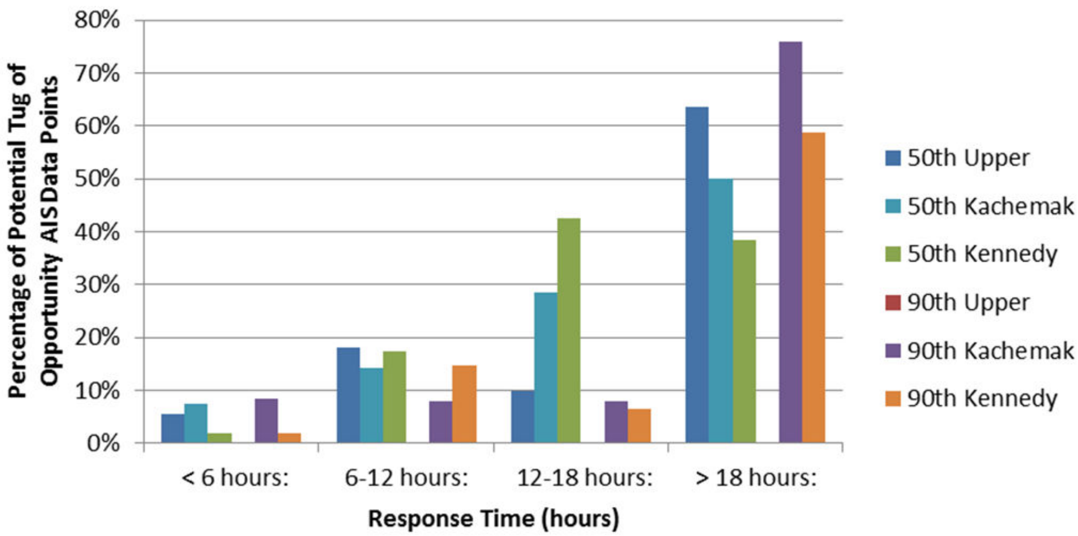

Figure 5 Voyage time histogram of Sample Tugs of Opportunity that can assist both representative vessels by environmental condition and incident site

Appendix A Adjusted Voyage Time and Capability Table

Summary Results
Tug of Opportunity Study
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	Upper		Kachemak Bay		Kennedy Entrance	
Incident Vessel: Tanker or Containership (Cont.)	Tanker	Cont.	Tanker	Cont.	Tanker	Cont.
Bollard Pull Required for Median Conditions (MT):	18.5	18.7	1.0	1.0	6.5	6.7
Bollard Pull Required for 90% Conditions (MT):	210	300	5.4	5.4	27.3	30.3

N/A result for:
- Non-SERVS Vessels in Prince William Sound (Zones 6 and 7) (SERVS = Ship Escort/Response Vessel System)
- Vessels with reported Bollard Pull < 1 MT

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 01 04	366779440	ATTENTIVE	61.1217	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 01 04	366779440	ATTENTIVE	61.1217	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 01 18	366779440	ATTENTIVE	60.2949	-146.734	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 01 25	366779440	ATTENTIVE	60.9822	-146.782	N	14.335	6	150	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 02 01	366779440	ATTENTIVE	61.1143	-146.292	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 02 08	366779440	ATTENTIVE	60.3015	-146.676	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 02 15	366779440	ATTENTIVE	61.1136	-146.357	N	14.335	6	150	24	27	30	33	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 02 22	366779440	ATTENTIVE	61.11	-146.283	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 02 29	366779440	ATTENTIVE	61.1112	-146.286	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 03 07	366779440	ATTENTIVE	60.7993	-147.029	N	14.335	6	150	22	25	28	30	Both	Neither	18	19	22	22	Both	Both	16	16	20	20	Both	Both
2012 03 14	366779440	ATTENTIVE	61.1217	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 03 21	366779440	ATTENTIVE	61.0206	-146.726	N	14.335	6	150	24	26	29	32	Both	Neither	20	20	23	24	Both	Both	17	17	21	21	Both	Both
2012 04 04	366779440	ATTENTIVE	61.1112	-146.285	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 04 18	366779440	ATTENTIVE	61.111	-146.282	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 04 25	366779440	ATTENTIVE	61.0875	-146.426	N	14.335	6	150	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 05 02	366779440	ATTENTIVE	60.3445	-146.555	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 05 16	366779440	ATTENTIVE	60.588	-146.898	N	14.335	6	150	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 05 23	366779440	ATTENTIVE	61.1218	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 05 30	366779440	ATTENTIVE	61.1216	-146.344	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 06 06	366779440	ATTENTIVE	60.6074	-147.185	N	14.335	6	150	22	24	27	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 06 13	366779440	ATTENTIVE	60.6612	-147.284	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 06 20	366779440	ATTENTIVE	61.1108	-146.281	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 07 11	366779440	ATTENTIVE	60.339	-146.574	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 07 18	366779440	ATTENTIVE	60.5838	-147.168	N	14.335	6	150	21	24	27	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 07 25	366779440	ATTENTIVE	60.3014	-146.667	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 08 01	366779440	ATTENTIVE	60.3024	-146.673	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 08 08	366779440	ATTENTIVE	60.3445	-146.554	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 08 15	366779440	ATTENTIVE	61.1137	-146.29	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 08 22	366779440	ATTENTIVE	60.3392	-146.574	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 08 29	366779440	ATTENTIVE	61.1097	-146.285	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 09 05	366779440	ATTENTIVE	60.4172	-146.835	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	21	21	Both	Both	15	15	18	18	Both	Both
2012 09 12	366779440	ATTENTIVE	60.461	-146.93	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	21	21	Both	Both	15	15	18	18	Both	Both
2012 09 19	366779440	ATTENTIVE	60.307	-147.016	N	14.335	6	150	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 09 26	366779440	ATTENTIVE	60.3057	-147.025	N	14.335	6	150	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	17	17	Both	Both
2012 10 05	366779440	ATTENTIVE	60.449	-146.851	N	14.335	6	150	21	24	27	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 10 12	366779440	ATTENTIVE	60.5079	-146.947	N	14.335	6	150	22	24	27	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 10 19	366779440	ATTENTIVE	60.3076	-147.013	N	14.335	6	150	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 10 25	366779440	ATTENTIVE	61.0908	-146.37	N	14.335	6	150	24	27	30	33	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 11 07	366779440	ATTENTIVE	60.3438	-146.556	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 11 14	366779440	ATTENTIVE	61.1136	-146.295	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 11 21	366779440	ATTENTIVE	61.1143	-146.295	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 11 28	366779440	ATTENTIVE	61.1215	-146.308	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 12 05	366779440	ATTENTIVE	61.1215	-146.308	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 12 12	366779440	ATTENTIVE	60.9481	-146.813	N	14.335	6	150	23	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 12 19	366779440	ATTENTIVE	61.1215	-146.309	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 12 26	366779440	ATTENTIVE	61.1217	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 01 04	366779430	AWARE	60.3446	-146.558	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 01 04	366779430	AWARE	60.3446	-146.558	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 01 18	366779430	AWARE	61.0375	-146.696	N	14.335	6	150	24	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 25	366779430	AWARE	60.3291	-146.604	N	14.335	6	150	22	24	27	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 02 01	366779430	AWARE	60.3439	-146.558	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 02 08	366779430	AWARE	61.1217	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 02 15	366779430	AWARE	60.3393	-146.574	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 02 22	366779430	AWARE	60.4154	-147.015	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 02 29	366779430	AWARE	61.0893	-146.394	N	14.335	6	150	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 03 07	366779430	AWARE	60.3384	-146.573	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 03 21	366779430	AWARE	61.1217	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 03 28	366779430	AWARE	61.0165	-146.726	N	14.335	6	150	24	26	29	32	Both	Neither	20	20	23	24	Both	Both	17	17	21	21	Both	Both
2012 04 04	366779430	AWARE	61.1037	-146.278	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 04 18	366779430	AWARE	61.1041	-146.273	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 04 25	366779430	AWARE	61.1235	-146.358	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 05 02	366779430	AWARE	60.2183	-146.657	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 05 16	366779430	AWARE	61.1218	-146.342	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 05 23	366779430	AWARE	61.1142	-146.29	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 05 30	366779430	AWARE	60.344	-146.559	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 06 06	366779430	AWARE	61.1215	-146.308	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 06 13	366779430	AWARE	61.0871	-146.426	N	14.335	6	150	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 06 20	366779430	AWARE	61.111	-146.28	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 06 27	366779430	AWARE	61.0961	-146.594	N	14.335	6	150	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 07 11	366779430	AWARE	61.1214	-146.345	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 07 18	366779430	AWARE	60.6003	-146.865	N	14.335	6	150	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 08 01	366779430	AWARE	61.122	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 08 08	366779430	AWARE	60.2073	-146.634	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 08 15	366779430	AWARE	60.3424	-146.593	N	14.335	6	150	22	24	27	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 08 22	366779430	AWARE	60.5563	-146.958	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 08 29	366779430	AWARE	60.3438	-146.555	N	14.335	6	150	22	24	27	29	Both	Neither	18	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 09 12	366779430	AWARE	60.462	-146.923	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	21	21	Both	Both	15	15	18	18	Both	Both
2012 09 19	366779430	AWARE	61.1103	-146.282	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 09 26	366779430	AWARE	61.1219	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 10 05	366779430	AWARE	61.1149	-146.29	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 10 12	366779430	AWARE	60.5095	-146.941	N	14.335	6	150	22	24	27	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 10 19	366779430	AWARE	61.1103	-146.282	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 10 25	366779430	AWARE	60.3053	-146.834	N	14.335	6	150	21	24	26	29	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 11 07	366779430	AWARE	61.1146	-146.295	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 11 14	366779430	AWARE	61.1028	-146.568	N	14.335	6	150	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 11 21	366779430	AWARE	61.1113	-146.286	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 12 05	366779430	AWARE	61.1112	-146.286	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 12 12	366779430	AWARE	61.0942	-146.41	N	14.335	6	150	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 12 19	366779430	AWARE	60.9663	-146.784	N	14.335	6	150	23	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 12 26	366779430	AWARE	61.1219	-146.343	N	14.335	6	150	24	27	30	33	Both	Neither	20	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 08 15	369890000	USCG BERTHOLF	60.1187	-149.427	Y	28	4	150	14	15	22	24	Both	Neither	12	12	19	19	Both	Both	12	12	19	20	Both	Both
2012 08 22	369890000	USCG BERTHOLF	57.7298	-152.516	Y	28	3	150	13	14	19	21	Both	Neither	10	10	16	16	Both	Both	10	11	16	16	Both	Both
2012 02 29	367278000	USCG MUNRO	58.0524	-151.723	Y	27	4	150	12	13	17	18	Both	Neither	9	9	13	13	Both	Both	9	9	14	14	Both	Both
2012 02 29	367278000	USCG MUNRO	58.0524	-151.723	Y	27	4	150	12	13	17	18	Both	Neither	9	9	13	13	Both	Both	9	9	14	14	Both	Both
2012 06 06	367278000	USCG MUNRO	57.7296	-152.516	Y	27	3	150	13	14	19	21	Both	Neither	10	10	16	16	Both	Both	11	11	17	17	Both	Both
2012 06 06	367278000	USCG MUNRO	57.7296	-152.516	Y	27	3	150	13	14	19	21	Both	Neither	10	10	16	16	Both	Both	11	11	17	17	Both	Both
2012 12 05	367278000	USCG MUNRO	57.7298	-152.516	Y	27	3	150	13	14	19	21	Both	Neither	10	10	16	16	Both	Both	11	11	17	17	Both	Both
2012 12 12	367278000	USCG MUNRO	57.7298	-152.516	Y	27	3	150	13	14	19	21	Both	Neither	10	10	16	16	Both	Both	11	11	17	17	Both	Both
2012 01 04	366779420	ALERT	61.1028	-146.278	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 04	366779420	ALERT	61.1028	-146.278	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 18	366779420	ALERT	61.1036	-146.278	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 25	366779420	ALERT	60.3297	-146.605	N	15	6	110	21	23	25	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 02 01	366779420	ALERT	61.1217	-146.344	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 02 08	366779420	ALERT	60.597	-146.969	N	15	6	110	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 02 15	366779420	ALERT	60.9598	-146.789	N	15	6	110	22	25	28	30	Both	Neither	18	19	22	22	Both	Both	16	16	20	20	Both	Both
2012 02 22	366779420	ALERT	60.3383	-146.574	N	15	6	110	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 02 29	366779420	ALERT	60.3384	-146.575	N	15	6	110	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 03 07	366779420	ALERT	61.1216	-146.343	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 03 14	366779420	ALERT	61.1217	-146.344	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 03 21	366779420	ALERT	61.1217	-146.308	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 03 28	366779420	ALERT	61.1134	-146.291	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 04 04	366779420	ALERT	61.1216	-146.344	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 04 18	366779420	ALERT	60.344	-146.559	N	15	6	110	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 04 25	366779420	ALERT	61.1217	-146.344	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 02	366779420	ALERT	61.1101	-146.282	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 16	366779420	ALERT	60.5867	-146.906	N	15	6	110	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 05 23	366779420	ALERT	60.3423	-146.558	N	15	6	110	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 05 30	366779420	ALERT	61.1144	-146.29	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 06	366779420	ALERT	61.1216	-146.343	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 13	366779420	ALERT	61.1103	-146.282	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 20	366779420	ALERT	61.1216	-146.343	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 27	366779420	ALERT	60.9561	-146.788	N	15	6	110	22	25	28	30	Both	Neither	18	19	22	22	Both	Both	16	16	20	20	Both	Both
2012 07 11	366779420	ALERT	61.0908	-146.406	N	15	6	110	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 07 18	366779420	ALERT	61.0875	-146.424	N	15	6	110	23	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 07 25	366779420	ALERT	61.1216	-146.343	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 01	366779420	ALERT	61.1214	-146.308	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 08	366779420	ALERT	61.1102	-146.282	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 15	366779420	ALERT	61.1214	-146.344	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 22	366779420	ALERT	61.0654	-146.668	N	15	6	110	23	26	28	31	Both	Neither	19	19	23	23	Both	Both	17	17	20	20	Both	Both
2012 08 29	366779420	ALERT	60.9228	-146.826	N	15	6	110	22	25	27	30	Both	Neither	18	18	22	22	Both	Both	16	16	20	20	Both	Both
2012 09 05	366779420	ALERT	60.3482	-146.546	N	15	6	110	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 09 12	366779420	ALERT	60.3437	-146.558	N	15	6	110	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 09 19	366779420	ALERT	61.089	-146.393	N	15	6	110	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 09 26	366779420	ALERT	61.114	-146.292	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 10 05	366779420	ALERT	60.3482	-146.546	N	15	6	110	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 10 12	366779420	ALERT	60.3438	-146.558	N	15	6	110	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 10 19	366779420	ALERT	61.089	-146.393	N	15	6	110	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 12 26	366779420	ALERT	61.122	-146.343	N	15	6	110	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 04	366888840	SEA VOYAGER	61.1218	-146.344	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 01 04	366888840	SEA VOYAGER	61.1218	-146.344	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 01 18	366888840	SEA VOYAGER	60.3434	-146.557	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 01 25	366888840	SEA VOYAGER	60.3438	-146.558	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 02 01	366888840	SEA VOYAGER	61.1215	-146.307	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 02 08	366888840	SEA VOYAGER	60.6437	-147.454	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 03 07	366888840	SEA VOYAGER	61.1218	-146.344	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 03 21	366888840	SEA VOYAGER	60.3383	-146.573	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 03 28	366888840	SEA VOYAGER	60.3436	-146.558	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 04 04	366888840	SEA VOYAGER	61.111	-146.286	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 04 18	366888840	SEA VOYAGER	61.1219	-146.341	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 04 25	366888840	SEA VOYAGER	60.3444	-146.554	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 05 02	366888840	SEA VOYAGER	61.1221	-146.343	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 05 16	366888840	SEA VOYAGER	60.339	-146.574	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 05 23	366888840	SEA VOYAGER	60.3434	-146.555	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 05 30	366888840	SEA VOYAGER	60.3436	-146.558	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 06 06	366888840	SEA VOYAGER	60.3388	-146.573	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 06 13	366888840	SEA VOYAGER	60.339	-146.574	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 06 20	366888840	SEA VOYAGER	60.3445	-146.555	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 06 27	366888840	SEA VOYAGER	60.3445	-146.555	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 07 11	366888840	SEA VOYAGER	60.7115	-147.018	N	14.022	6	109	23	25	28	30	Both	Neither	18	19	22	22	Both	Both	16	16	20	20	Both	Both
2012 07 18	366888840	SEA VOYAGER	60.3391	-146.571	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 08 01	366888840	SEA VOYAGER	61.1216	-146.307	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 08 08	366888840	SEA VOYAGER	61.1219	-146.343	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 08 15	366888840	SEA VOYAGER	61.1215	-146.307	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 08 22	366888840	SEA VOYAGER	61.1064	-146.433	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 08 29	366888840	SEA VOYAGER	61.0935	-146.358	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 09 05	366888840	SEA VOYAGER	61.1144	-146.29	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 09 12	366888840	SEA VOYAGER	61.1145	-146.291	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 09 19	366888840	SEA VOYAGER	60.5388	-147.768	N	14.022	6	109	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 09 26	366888840	SEA VOYAGER	60.4891	-147.857	N	14.022	6	109	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 10 05	366888840	SEA VOYAGER	61.1146	-146.29	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 10 12	366888840	SEA VOYAGER	61.1147	-146.291	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 10 19	366888840	SEA VOYAGER	60.5401	-147.766	N	14.022	6	109	21	24	26	29	Both	Neither	17	17	20	21	Both	Both	15	15	18	18	Both	Both
2012 10 25	366888840	SEA VOYAGER	60.3439	-146.558	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 11 07	366888840	SEA VOYAGER	61.1218	-146.344	N	14.022	6	109	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 11 14	366888840	SEA VOYAGER	60.3432	-146.557	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 11 21	366888840	SEA VOYAGER	60.3382	-146.575	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 11 28	366888840	SEA VOYAGER	60.3434	-146.557	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 12 05	366888840	SEA VOYAGER	60.3451	-146.557	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 12 12	366888840	SEA VOYAGER	60.3445	-146.558	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 12 19	366888840	SEA VOYAGER	60.3434	-146.558	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 12 26	366888840	SEA VOYAGER	60.3386	-146.576	N	14.022	6	109	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 01 04	366760680	NANUQ (PWS)	61.1031	-146.279	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 04	366760680	NANUQ (PWS)	61.1031	-146.279	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 18	366760680	NANUQ (PWS)	61.1145	-146.295	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 25	366760680	NANUQ (PWS)	61.1135	-146.295	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 02 01	366760680	NANUQ (PWS)	61.1108	-146.285	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 02 08	366760680	NANUQ (PWS)	61.1132	-146.294	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 02 15	366760680	NANUQ (PWS)	61.0318	-146.708	N	15	6	96	23	25	28	31	Both	Neither	19	19	22	23	Both	Both	17	17	20	20	Both	Both
2012 02 22	366760680	NANUQ (PWS)	61.1216	-146.308	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 02 29	366760680	NANUQ (PWS)	61.0898	-146.398	N	15	6	96	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 03 07	366760680	NANUQ (PWS)	61.1197	-146.342	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 03 14	366760680	NANUQ (PWS)	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 03 21	366760680	NANUQ (PWS)	61.0228	-146.726	N	15	6	96	23	25	28	31	Both	Neither	19	19	22	23	Both	Both	17	17	20	20	Both	Both
2012 04 04	366760680	NANUQ (PWS)	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 04 18	366760680	NANUQ (PWS)	61.1125	-146.314	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 04 25	366760680	NANUQ (PWS)	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 02	366760680	NANUQ (PWS)	61.1134	-146.29	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 16	366760680	NANUQ (PWS)	61.114	-146.29	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 23	366760680	NANUQ (PWS)	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 30	366760680	NANUQ (PWS)	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 06	366760680	NANUQ (PWS)	60.7041	-146.944	N	15	6	96	21	24	26	29	Both	Neither	17	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 06 13	366760680	NANUQ (PWS)	61.1215	-146.345	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 20	366760680	NANUQ (PWS)	61.088	-146.424	N	15	6	96	23	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 06 27	366760680	NANUQ (PWS)	61.0958	-146.597	N	15	6	96	23	26	28	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 07 11	366760680	NANUQ (PWS)	61.0903	-146.401	N	15	6	96	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 07 18	366760680	NANUQ (PWS)	61.1138	-146.289	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 07 25	366760680	NANUQ (PWS)	61.114	-146.289	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 01	366760680	NANUQ (PWS)	61.1137	-146.29	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 08	366760680	NANUQ (PWS)	61.1134	-146.29	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 15	366760680	NANUQ (PWS)	61.1219	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 22	366760680	NANUQ (PWS)	61.1077	-146.451	N	15	6	96	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 09 12	366760680	NANUQ (PWS)	61.1219	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 09 19	366760680	NANUQ (PWS)	61.0897	-146.398	N	15	6	96	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 09 26	366760680	NANUQ (PWS)	61.1106	-146.282	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 10 05	366760680	NANUQ (PWS)	61.1147	-146.292	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 10 12	366760680	NANUQ (PWS)	61.1219	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 10 19	366760680	NANUQ (PWS)	61.0897	-146.398	N	15	6	96	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 10 25	366760680	NANUQ (PWS)	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 11 07	366760680	NANUQ (PWS)	61.1146	-146.294	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 11 14	366760680	NANUQ (PWS)	61.1035	-146.564	N	15	6	96	23	26	28	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 11 21	366760680	NANUQ (PWS)	61.0886	-146.382	N	15	6	96	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 11 28	366760680	NANUQ (PWS)	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 12 05	366760680	NANUQ (PWS)	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 12 12	366760680	NANUQ (PWS)	61.1118	-146.307	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 12 26	366760680	NANUQ (PWS)	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 04	366760670	TANERLIQ	61.1218	-146.342	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 04	366760670	TANERLIQ	61.1218	-146.342	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 18	366760670	TANERLIQ	60.379	-146.829	N	15	6	96	20	23	25	28	Both	Neither	17	17	20	20	Both	Both	15	15	17	17	Both	Both
2012 01 25	366760670	TANERLIQ	60.9817	-146.788	N	15	6	96	22	25	28	30	Both	Neither	19	19	22	22	Both	Both	17	17	20	20	Both	Both
2012 02 01	366760670	TANERLIQ	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 02 08	366760670	TANERLIQ	60.5971	-146.977	N	15	6	96	21	24	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 02 15	366760670	TANERLIQ	61.099	-146.429	N	15	6	96	23	26	29	31	Both	Neither	19	20	23	23	Both	Both	17	17	21	21	Both	Both
2012 02 22	366760670	TANERLIQ	60.6837	-146.943	N	15	6	96	21	24	26	29	Both	Neither	17	18	21	21	Both	Both	15	15	18	18	Both	Both
2012 02 29	366760670	TANERLIQ	61.0801	-146.64	N	15	6	96	23	26	28	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 03 07	366760670	TANERLIQ	60.8003	-147.042	N	15	6	96	21	24	27	29	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 03 21	366760670	TANERLIQ	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 03 28	366760670	TANERLIQ	61.1137	-146.29	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 04 04	366760670	TANERLIQ	61.1219	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 04 18	366760670	TANERLIQ	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 04 25	366760670	TANERLIQ	61.1217	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 02	366760670	TANERLIQ	60.2098	-146.672	N	15	6	96	20	23	25	28	Both	Neither	16	17	19	20	Both	Both	14	14	17	17	Both	Both
2012 05 16	366760670	TANERLIQ	61.1107	-146.281	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 05 23	366760670	TANERLIQ	60.3382	-146.575	N	15	6	96	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 05 30	366760670	TANERLIQ	60.3383	-146.576	N	15	6	96	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 06 06	366760670	TANERLIQ	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 13	366760670	TANERLIQ	61.1108	-146.282	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 20	366760670	TANERLIQ	61.1214	-146.345	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 06 27	366760670	TANERLIQ	61.0461	-146.691	N	15	6	96	23	25	28	31	Both	Neither	19	19	23	23	Both	Both	17	17	20	20	Both	Both
2012 07 11	366760670	TANERLIQ	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 07 18	366760670	TANERLIQ	61.1214	-146.345	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 07 25	366760670	TANERLIQ	61.0875	-146.425	N	15	6	96	23	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 08 01	366760670	TANERLIQ	61.1132	-146.29	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 08 08	366760670	TANERLIQ	60.21	-146.673	N	15	6	96	20	23	25	28	Both	Neither	16	17	19	20	Both	Both	14	14	17	17	Both	Both
2012 08 15	366760670	TANERLIQ	60.6489	-146.602	N	15	6	96	21	24	27	29	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 08 22	366760670	TANERLIQ	60.5555	-146.965	N	15	6	96	21	23	26	28	Both	Neither	17	17	20	20	Both	Both	15	15	18	18	Both	Both
2012 08 29	366760670	TANERLIQ	61.1216	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 09 05	366760670	TANERLIQ	60.7311	-146.964	N	15	6	96	21	24	26	29	Both	Neither	17	18	21	21	Both	Both	15	15	19	19	Both	Both
2012 09 12	366760670	TANERLIQ	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 09 19	366760670	TANERLIQ	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 09 26	366760670	TANERLIQ	61.1219	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 10 05	366760670	TANERLIQ	60.7643	-146.97	N	15	6	96	21	24	26	29	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 10 12	366760670	TANERLIQ	61.122	-146.343	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 10 19	366760670	TANERLIQ	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 10 25	366760670	TANERLIQ	60.3108	-146.848	N	15	6	96	20	23	25	28	Both	Neither	16	16	19	20	Both	Both	14	14	17	17	Both	Both
2012 11 07	366760670	TANERLIQ	61.1218	-146.342	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 11 21	366760670	TANERLIQ	61.1218	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 11 28	366760670	TANERLIQ	61.1217	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 12 12	366760670	TANERLIQ	61.1215	-146.309	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 12 19	366760670	TANERLIQ	61.1148	-146.294	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 12 26	366760670	TANERLIQ	61.1217	-146.344	N	15	6	96	23	26	29	32	Both	Neither	20	20	23	24	Both	Both	18	18	21	21	Both	Both
2012 01 04	367328780	VIGILANT	60.6724	-151.411	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 01 04	367328780	VIGILANT	60.6724	-151.411	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 01 25	367328780	VIGILANT	60.6839	-151.4	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 02 01	367328780	VIGILANT	60.6839	-151.406	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 02 08	367328780	VIGILANT	59.6063	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 02 22	367328780	VIGILANT	59.6027	-151.41	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 02 29	367328780	VIGILANT	60.683	-151.403	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 03 07	367328780	VIGILANT	60.6122	-151.431	N	14	2	91	3	4	4	7	Both	Neither	7	7	7	8	Both	Both	8	10	8	10	Both	Both
2012 03 14	367328780	VIGILANT	60.683	-151.403	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 03 21	367328780	VIGILANT	60.6834	-151.403	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 03 28	367328780	VIGILANT	60.6697	-151.405	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 04 04	367328780	VIGILANT	60.6868	-151.41	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 04 18	367328780	VIGILANT	60.6827	-151.405	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 04 25	367328780	VIGILANT	60.9352	-151.154	N	14	1	91	2	2	3	3	Both	Neither	8	9	11	11	Both	Both	10	11	13	13	Both	Both
2012 05 02	367328780	VIGILANT	60.6603	-151.404	N	14	2	91	3	4	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 05 16	367328780	VIGILANT	60.679	-151.404	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 05 23	367328780	VIGILANT	60.6869	-151.41	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 05 30	367328780	VIGILANT	60.6814	-151.404	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 06 06	367328780	VIGILANT	60.7609	-151.3	N	14	1	91	2	3	3	5	Both	Neither	8	8	8	9	Both	Both	9	10	10	11	Both	Both
2012 06 13	367328780	VIGILANT	60.6725	-151.401	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 06 20	367328780	VIGILANT	60.6816	-151.404	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 06 27	367328780	VIGILANT	60.7607	-151.3	N	14	1	91	2	3	3	5	Both	Neither	8	8	8	9	Both	Both	9	10	10	11	Both	Both
2012 07 11	367328780	VIGILANT	60.6851	-151.406	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 07 25	367328780	VIGILANT	60.7617	-151.295	N	14	1	91	2	3	3	5	Both	Neither	8	8	8	9	Both	Both	9	10	10	11	Both	Both
2012 08 01	367328780	VIGILANT	60.6807	-151.404	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 08 08	367328780	VIGILANT	60.6104	-151.384	N	14	2	91	3	4	4	7	Both	Neither	7	7	7	8	Both	Both	8	10	9	10	Both	Both
2012 08 15	367328780	VIGILANT	60.7647	-151.305	N	14	1	91	2	3	3	5	Both	Neither	8	8	8	9	Both	Both	9	10	10	11	Both	Both
2012 08 22	367328780	VIGILANT	59.6062	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 08 29	367328780	VIGILANT	60.7643	-151.305	N	14	1	91	2	3	3	5	Both	Neither	8	8	8	9	Both	Both	9	10	10	11	Both	Both
2012 09 05	367328780	VIGILANT	59.6063	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 09 12	367328780	VIGILANT	59.6062	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 09 19	367328780	VIGILANT	59.6063	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 09 26	367328780	VIGILANT	60.6742	-151.403	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 10 05	367328780	VIGILANT	59.6062	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 10 12	367328780	VIGILANT	59.6063	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 10 19	367328780	VIGILANT	59.6063	-151.415	N	14	2	91	7	11	9	12	Both	Neither	3	3	3	3	Both	Both	5	5	5	6	Both	Both
2012 10 25	367328780	VIGILANT	60.5488	-152.138	N	14	2	91	4	5	5	8	Both	Neither	6	7	7	7	Both	Both	8	9	8	10	Both	Both
2012 11 07	367328780	VIGILANT	60.6793	-151.402	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 11 14	367328780	VIGILANT	60.6811	-151.403	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 11 21	367328780	VIGILANT	59.6561	-151.818	N	14	2	91	7	10	8	12	Both	Neither	3	3	3	3	Both	Both	4	5	4	5	Both	Both
2012 12 05	367328780	VIGILANT	60.6823	-151.404	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 12 12	367328780	VIGILANT	60.6801	-151.402	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 12 19	367328780	VIGILANT	60.6845	-151.412	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 12 26	367328780	VIGILANT	60.6704	-151.399	N	14	2	91	3	3	4	6	Both	Neither	7	8	7	8	Both	Both	9	10	9	10	Both	Both
2012 05 16	366284000	NANUQ	61.1217	-146.309	Y	15	6	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 05 23	366284000	NANUQ	61.1217	-146.31	Y	15	6	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 30	366284000	NANUQ	60.164	-146.632	Y	15	6	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 06	366284000	NANUQ	61.1127	-146.507	Y	15	6	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 13	366284000	NANUQ	61.1217	-146.31	Y	15	6	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 20	366284000	NANUQ	61.1217	-146.311	Y	15	6	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	366284000	NANUQ	61.0928	-146.287	Y	15	6	87	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 28	366284000	NANUQ	60.1185	-149.429	Y	15	4	87	23	26	38	42	Both	Neither	18	19	32	32	Both	Both	19	20	33	33	Both	Both
2012 12 05	366284000	NANUQ	60.1185	-149.429	Y	15	4	87	23	26	38	42	Both	Neither	18	19	32	32	Both	Both	19	20	33	33	Both	Both
2012 12 12	366284000	NANUQ	60.1185	-149.429	Y	15	4	87	23	26	38	42	Both	Neither	18	19	32	32	Both	Both	19	20	33	33	Both	Both
2012 12 19	366284000	NANUQ	60.1183	-149.429	Y	15	4	87	23	26	38	42	Both	Neither	18	19	32	32	Both	Both	19	20	33	33	Both	Both
2012 12 26	366284000	NANUQ	60.1183	-149.428	Y	15	4	87	23	26	38	42	Both	Neither	18	19	32	32	Both	Both	19	20	33	33	Both	Both
2012 02 15	366833610	PHYLLIS DUNLAP	59.2112	-150.148	Y	9	4	82	27	29	41	45	Both	Neither	18	18	30	31	Both	Both	19	20	31	33	Both	Both
2012 03 28	366833610	PHYLLIS DUNLAP	56.8969	-154.249	Y	9	3	82	42	44	72	76	Both	Neither	33	34	61	62	Both	Both	34	35	62	64	Both	Both
2012 04 04	338945000	USCG ALEX HALEY	57.7303	-152.515	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 04 18	338945000	USCG ALEX HALEY	57.7303	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 04 25	338945000	USCG ALEX HALEY	57.7303	-152.515	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 05 02	338945000	USCG ALEX HALEY	57.7303	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 05 16	338945000	USCG ALEX HALEY	57.7303	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 05 23	338945000	USCG ALEX HALEY	57.7303	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 05 30	338945000	USCG ALEX HALEY	57.7304	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 06 06	338945000	USCG ALEX HALEY	57.7304	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 06 13	338945000	USCG ALEX HALEY	57.7306	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 06 20	338945000	USCG ALEX HALEY	57.7305	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 07 11	338945000	USCG ALEX HALEY	57.7306	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 08 08	338945000	USCG ALEX HALEY	57.7303	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 09 26	338945000	USCG ALEX HALEY	57.7305	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 10 25	338945000	USCG ALEX HALEY	57.7305	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 11 07	338945000	USCG ALEX HALEY	57.7306	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 11 14	338945000	USCG ALEX HALEY	57.7306	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 11 21	338945000	USCG ALEX HALEY	57.7306	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 11 28	338945000	USCG ALEX HALEY	57.5937	-151.881	Y	18	4	82	17	20	27	31	Both	Neither	14	14	22	23	Both	Both	14	15	23	24	Both	Both
2012 12 05	338945000	USCG ALEX HALEY	57.7305	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 12 26	338945000	USCG ALEX HALEY	57.7305	-152.514	Y	18	3	82	17	20	27	31	Both	Neither	13	14	22	22	Both	Both	14	14	23	23	Both	Both
2012 02 01	367357890	ALASKA TITAN	60.7776	-148.673	Y	11	7	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 29	367357890	ALASKA TITAN	60.7776	-148.673	Y	11	7	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 28	367357890	ALASKA TITAN	59.9901	-145.763	Y	11	5	80	41	44	74	75	Both	Neither	34	35	64	65	Both	Both	35	36	65	67	Both	Both
2012 07 25	367357890	ALASKA TITAN	60.7584	-148.111	Y	11	7	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 15	367357890	ALASKA TITAN	60.7725	-148.206	Y	11	7	80	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 25	366797540	ENDURANCE	61.1218	-146.308	N	13.614	6	80	26	28	32	34	Both	Neither	21	22	26	26	Both	Both	19	19	23	23	Both	Both
2012 02 01	366797540	ENDURANCE	61.1217	-146.342	N	13.614	6	80	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 02 08	366797540	ENDURANCE	60.3376	-146.574	N	13.614	6	80	23	25	28	30	Both	Neither	18	19	22	22	Both	Both	16	16	19	19	Both	Both
2012 02 22	366797540	ENDURANCE	60.6433	-147.452	N	13.614	6	80	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 02 29	366797540	ENDURANCE	60.6438	-147.451	N	13.614	6	80	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 03 07	366797540	ENDURANCE	60.6449	-147.45	N	13.614	6	80	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 03 21	366797540	ENDURANCE	61.1218	-146.307	N	13.614	6	80	26	28	32	34	Both	Neither	21	22	26	26	Both	Both	19	19	23	23	Both	Both
2012 03 28	366797540	ENDURANCE	61.1217	-146.31	N	13.614	6	80	26	28	32	34	Both	Neither	21	22	26	26	Both	Both	19	19	23	23	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 04 04	366797540	ENDURANCE	57.7836	-152.427	N	13.614	3	80	15	18	19	21	Both	Neither	11	11	12	13	Both	Both	8	8	10	10	Both	Both
2012 04 18	366797540	ENDURANCE	60.1192	-149.427	N	13.614	4	80	18	20	22	24	Both	Neither	13	13	16	16	Both	Both	11	11	13	13	Both	Both
2012 06 06	366797540	ENDURANCE	60.6449	-147.451	N	13.614	6	80	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 06 27	366797540	ENDURANCE	60.8917	-147.547	N	13.614	6	80	24	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	20	20	Both	Both
2012 07 25	366797540	ENDURANCE	61.0718	-146.66	N	13.614	6	80	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 06 13	367309260	SIRIUS	61.2355	-149.902	Y	13.614	1	80	7	9	13	17	Both	Neither	14	14	22	24	Both	Both	15	16	23	26	Both	Both
2012 01 04	366888040	BULWARK	61.1217	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 01 04	366888040	BULWARK	61.1217	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 01 18	366888040	BULWARK	61.1118	-146.286	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 01 25	366888040	BULWARK	60.6439	-147.452	N	14.022	6	75	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 02 01	366888040	BULWARK	61.1032	-146.278	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 02 08	366888040	BULWARK	61.0882	-146.426	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 02 15	366888040	BULWARK	60.6443	-147.467	N	14.022	6	75	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 02 22	366888040	BULWARK	61.1217	-146.343	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 02 29	366888040	BULWARK	61.0895	-146.395	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 03 07	366888040	BULWARK	61.0907	-146.404	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 03 14	366888040	BULWARK	60.6255	-145.754	N	14.022	6	75	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 03 21	366888040	BULWARK	60.6439	-147.449	N	14.022	6	75	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 03 28	366888040	BULWARK	60.6438	-147.454	N	14.022	6	75	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 04 04	366888040	BULWARK	61.1217	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 04 18	366888040	BULWARK	61.1217	-146.341	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 04 25	366888040	BULWARK	61.1146	-146.291	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 05 02	366888040	BULWARK	60.5581	-145.756	N	14.022	6	75	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	21	21	Both	Both
2012 06 13	366888040	BULWARK	60.6923	-147.339	N	14.022	6	75	22	25	28	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 06 20	366888040	BULWARK	60.6737	-147.354	N	14.022	6	75	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 06 27	366888040	BULWARK	60.6731	-147.355	N	14.022	6	75	22	25	27	30	Both	Neither	18	18	21	22	Both	Both	16	16	19	19	Both	Both
2012 07 11	366888040	BULWARK	61.1137	-146.291	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 07 18	366888040	BULWARK	61.1136	-146.29	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 07 25	366888040	BULWARK	61.1137	-146.289	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 08 08	366888040	BULWARK	60.5581	-145.756	N	14.022	6	75	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	21	21	Both	Both
2012 09 12	366888040	BULWARK	61.0885	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 09 19	366888040	BULWARK	61.0449	-146.664	N	14.022	6	75	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 09 26	366888040	BULWARK	61.1219	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 10 12	366888040	BULWARK	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 10 19	366888040	BULWARK	61.0449	-146.664	N	14.022	6	75	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 10 25	366888040	BULWARK	61.0457	-146.664	N	14.022	6	75	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 11 07	366888040	BULWARK	61.1149	-146.295	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 11 14	366888040	BULWARK	60.8892	-146.862	N	14.022	6	75	23	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 11 21	366888040	BULWARK	61.1217	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 11 28	366888040	BULWARK	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 12 05	366888040	BULWARK	61.1217	-146.342	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 12 12	366888040	BULWARK	61.1133	-146.294	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 04 25	366887950	GUARDSMAN	61.1239	-146.362	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 02	366887950	GUARDSMAN	61.1239	-146.362	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 16	366887950	GUARDSMAN	61.1238	-146.362	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	366887950	GUARDSMAN	61.1238	-146.362	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 05 30	366887950	GUARDSMAN	61.1238	-146.362	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 13	366887950	GUARDSMAN	61.1256	-146.466	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 20	366887950	GUARDSMAN	61.1216	-146.308	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	366887950	GUARDSMAN	61.1238	-146.362	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 08	366887950	GUARDSMAN	61.1239	-146.362	Y	11	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 26	366887950	GUARDSMAN	60.1186	-149.427	Y	11	4	75	31	33	52	53	Both	Neither	24	24	42	43	Both	Both	24	25	43	45	Both	Both
2012 09 19	366770250	HUNTER	60.5889	-146.056	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	366770250	HUNTER	60.6476	-145.655	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 19	366770250	HUNTER	60.5886	-146.064	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 21	366770250	HUNTER	60.8835	-146.934	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 28	366770250	HUNTER	61.1217	-146.343	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 12	366770250	HUNTER	61.1219	-146.344	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 19	366770250	HUNTER	61.1108	-146.285	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 26	366770250	HUNTER	61.1215	-146.308	Y	14	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 04	366766890	INVADER	61.0873	-146.428	N	14	6	75	25	27	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 01 04	366766890	INVADER	61.0873	-146.428	N	14	6	75	25	27	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 01 18	366766890	INVADER	61.1219	-146.344	N	14	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 01 25	366766890	INVADER	60.6431	-147.464	N	14	6	75	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 02 01	366766890	INVADER	61.0885	-146.382	N	14	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 02 08	366766890	INVADER	61.0886	-146.426	N	14	6	75	25	27	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 02 15	366766890	INVADER	61.1217	-146.344	N	14	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 02 22	366766890	INVADER	60.6428	-147.464	N	14	6	75	22	25	27	30	Both	Neither	18	18	21	21	Both	Both	16	16	19	19	Both	Both
2012 01 04	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 01 04	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 01 18	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 01 25	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 02 01	366888850	STALWART	61.0876	-146.428	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 02 08	366888850	STALWART	61.1216	-146.343	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 02 15	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 02 22	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 02 29	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 03 07	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 03 14	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 03 21	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 04 04	366888850	STALWART	61.122	-146.343	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 04 18	366888850	STALWART	61.1044	-146.274	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 04 25	366888850	STALWART	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 05 02	366888850	STALWART	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 05 16	366888850	STALWART	61.1217	-146.343	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 05 23	366888850	STALWART	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 05 30	366888850	STALWART	61.1038	-146.273	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 06 06	366888850	STALWART	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 06 13	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 06 20	366888850	STALWART	61.1138	-146.291	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 06 27	366888850	STALWART	61.094	-146.432	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 07 11	366888850	STALWART	61.0881	-146.424	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 07 18	366888850	STALWART	61.0877	-146.423	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 07 25	366888850	STALWART	61.0879	-146.424	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 08 01	366888850	STALWART	61.087	-146.426	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 08 08	366888850	STALWART	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 08 15	366888850	STALWART	61.0878	-146.424	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 08 22	366888850	STALWART	61.1216	-146.343	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 08 29	366888850	STALWART	61.1215	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 09 05	366888850	STALWART	61.1216	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 09 12	366888850	STALWART	61.0872	-146.427	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 09 19	366888850	STALWART	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 09 26	366888850	STALWART	60.8778	-146.915	N	14.022	6	75	23	26	29	31	Both	Neither	19	19	23	23	Both	Both	17	17	21	21	Both	Both
2012 10 05	366888850	STALWART	61.1216	-146.343	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 10 12	366888850	STALWART	61.0872	-146.427	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 10 19	366888850	STALWART	61.0884	-146.382	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 10 25	366888850	STALWART	61.09	-146.385	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 11 07	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 11 14	366888850	STALWART	61.088	-146.426	N	14.022	6	75	25	27	31	33	Both	Neither	21	21	24	25	Both	Both	18	18	22	22	Both	Both
2012 11 21	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 11 28	366888850	STALWART	61.1218	-146.342	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 12 05	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 12 12	366888850	STALWART	61.1217	-146.344	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 12 19	366888850	STALWART	61.0884	-146.381	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	18	18	22	22	Both	Both
2012 12 26	366888850	STALWART	61.1216	-146.343	N	14.022	6	75	25	28	31	33	Both	Neither	21	21	25	25	Both	Both	19	19	22	22	Both	Both
2012 02 29	366887190	WARRIOR	60.6429	-147.463	Y	14.022	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 07	366887190	WARRIOR	60.6439	-147.463	Y	14.022	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 14	366887190	WARRIOR	61.0879	-146.426	Y	14.022	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 21	366887190	WARRIOR	61.0946	-146.383	Y	14.022	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 28	366887190	WARRIOR	61.1218	-146.342	Y	14.022	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 04	366887190	WARRIOR	61.1041	-146.279	Y	14.022	6	75	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 25	366887190	WARRIOR	60.9349	-151.156	Y	14.022	1	75	6	7	10	17	Both	Neither	10	12	14	20	Both	Both	12	14	16	22	Both	Both
2012 11 28	366887190	WARRIOR	60.1185	-149.427	Y	14.022	4	75	24	28	41	44	Both	Neither	19	20	34	34	Both	Both	20	21	35	36	Both	Both
2012 12 05	366887190	WARRIOR	60.1186	-149.426	Y	14.022	4	75	24	28	41	44	Both	Neither	19	20	34	34	Both	Both	20	21	35	36	Both	Both
2012 12 12	366887190	WARRIOR	60.1185	-149.427	Y	14.022	4	75	24	28	41	44	Both	Neither	19	20	34	34	Both	Both	20	21	35	36	Both	Both
2012 12 19	366887190	WARRIOR	60.1187	-149.427	Y	14.022	4	75	24	28	41	44	Both	Neither	19	20	34	34	Both	Both	20	21	35	36	Both	Both
2012 04 25	369916000	USCG HICKORY	60.55	-151.628	Y	13.696	2	73	6	7	7	11	Both	Neither	10	11	10	12	Both	Both	11	13	11	14	Both	Both
2012 09 12	369916000	USCG Hickory	60.7777	-148.693	Y	13.696	7	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 12	369916000	USCG Hickory	60.7777	-148.693	Y	13.696	7	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 07	369916000	USCG HICKORY	60.9276	-151.217	Y	13.696	1	73	5	7	9	16	Both	Neither	11	12	14	20	Both	Both	12	14	16	22	Both	Both
2012 11 07	368856000	USCG SPAR	57.7272	-152.523	Y	13.696	3	73	22	25	35	38	Both	Neither	16	17	28	28	Both	Both	17	18	29	30	Both	Both
2012 01 04	368014000	USCG SYCAMORE	60.5517	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 04	368014000	USCG SYCAMORE	60.5517	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 18	368014000	USCG SYCAMORE	61.0992	-146.432	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 25	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 01	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 08	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 15	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 02 22	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 29	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 07	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 04	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 18	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 25	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 02	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 20	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 11	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 18	368014000	USCG SYCAMORE	60.3779	-147.409	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 08	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 29	368014000	USCG SYCAMORE	60.7958	-148.277	Y	13.696	7	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 12	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 19	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 12	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 19	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 07	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 05	368014000	USCG SYCAMORE	60.5517	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 12	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 19	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 26	368014000	USCG SYCAMORE	60.5518	-145.764	Y	13.696	6	73	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 14	367365030	Perseverance	60.6896	-151.422	N	15	2	73	3	3	4	6	Both	Neither	7	7	7	8	Both	Both	8	9	8	10	Both	Both
2012 03 21	367365030	Perseverance	60.6636	-151.394	N	15	2	73	3	3	4	6	Both	Neither	7	7	7	7	Both	Both	8	9	8	10	Both	Both
2012 04 25	367365030	Perseverance	61.0294	-151.218	N	15	1	73	2	3	3	4	Both	Neither	8	9	11	11	Both	Both	10	11	13	13	Both	Both
2012 01 18	366932130	BARBARA FOSS	60.7778	-148.673	Y	13	7	71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 01	366932130	BARBARA FOSS	60.8145	-148.545	Y	13	7	71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 29	366932130	BARBARA FOSS	60.5998	-147.864	Y	13	6	71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 14	366932130	BARBARA FOSS	60.8147	-148.543	Y	13	7	71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 26	366932130	BARBARA FOSS	60.4659	-147.836	Y	13	6	71	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 04	366887210	GUARDIAN	60.6427	-147.463	N	13.614	6	68	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 01 04	366887210	GUARDIAN	60.6427	-147.463	N	13.614	6	68	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 01 18	366887210	GUARDIAN	60.6425	-147.467	N	13.614	6	68	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 01 25	366887210	GUARDIAN	61.1037	-146.285	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 02 01	366887210	GUARDIAN	60.6423	-147.465	N	13.614	6	68	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 02 08	366887210	GUARDIAN	60.644	-147.466	N	13.614	6	68	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 02 15	366887210	GUARDIAN	61.1218	-146.344	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 02 22	366887210	GUARDIAN	61.1218	-146.342	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 02 29	366887210	GUARDIAN	61.1218	-146.342	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 03 07	366887210	GUARDIAN	61.0907	-146.402	N	13.614	6	68	26	28	32	34	Both	Neither	21	21	25	26	Both	Both	19	19	23	23	Both	Both
2012 03 14	366887210	GUARDIAN	60.6428	-147.468	N	13.614	6	68	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 03 21	366887210	GUARDIAN	60.6425	-147.464	N	13.614	6	68	23	25	28	30	Both	Neither	18	18	22	22	Both	Both	16	16	19	19	Both	Both
2012 03 28	366887210	GUARDIAN	60.9322	-146.888	N	13.614	6	68	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	21	21	Both	Both
2012 04 04	366887210	GUARDIAN	61.1217	-146.343	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 05 16	366887210	GUARDIAN	61.1185	-146.35	N	13.614	6	68	26	28	32	34	Both	Neither	21	21	25	26	Both	Both	19	19	23	23	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 05 23	366887210	GUARDIAN	60.9888	-146.797	N	13.614	6	68	25	27	31	33	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 05 30	366887210	GUARDIAN	61.1215	-146.344	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 07 25	366887210	GUARDIAN	61.122	-146.343	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 08 01	366887210	GUARDIAN	60.6732	-147.354	N	13.614	6	68	23	25	28	31	Both	Neither	18	19	22	22	Both	Both	16	16	19	19	Both	Both
2012 08 15	366887210	GUARDIAN	61.0884	-146.381	N	13.614	6	68	26	28	32	34	Both	Neither	21	21	25	26	Both	Both	19	19	23	23	Both	Both
2012 08 22	366887210	GUARDIAN	61.1034	-146.275	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	25	26	Both	Both	19	19	23	23	Both	Both
2012 08 29	366887210	GUARDIAN	60.9845	-146.803	N	13.614	6	68	25	27	31	33	Both	Neither	20	20	24	24	Both	Both	18	18	22	22	Both	Both
2012 09 05	366887210	GUARDIAN	61.0978	-146.535	N	13.614	6	68	25	28	31	34	Both	Neither	21	21	25	25	Both	Both	19	19	23	23	Both	Both
2012 09 12	366887210	GUARDIAN	60.6716	-147.354	N	13.614	6	68	23	25	28	31	Both	Neither	18	19	22	22	Both	Both	16	16	19	19	Both	Both
2012 10 05	366887210	GUARDIAN	61.0925	-146.599	N	13.614	6	68	25	28	31	34	Both	Neither	21	21	25	25	Both	Both	19	19	23	23	Both	Both
2012 10 12	366887210	GUARDIAN	60.6716	-147.354	N	13.614	6	68	23	25	28	31	Both	Neither	18	19	22	22	Both	Both	16	16	19	19	Both	Both
2012 10 25	366887210	GUARDIAN	61.0884	-146.381	N	13.614	6	68	26	28	32	34	Both	Neither	21	21	25	26	Both	Both	19	19	23	23	Both	Both
2012 11 07	366887210	GUARDIAN	61.0884	-146.382	N	13.614	6	68	26	28	32	34	Both	Neither	21	21	25	26	Both	Both	19	19	23	23	Both	Both
2012 11 14	366887210	GUARDIAN	61.0884	-146.381	N	13.614	6	68	26	28	32	34	Both	Neither	21	21	25	26	Both	Both	19	19	23	23	Both	Both
2012 12 05	366887210	GUARDIAN	61.1217	-146.309	N	13.614	6	68	26	28	32	34	Both	Neither	21	22	26	26	Both	Both	19	19	23	23	Both	Both
2012 12 19	366887210	GUARDIAN	61.0885	-146.381	N	13.614	6	68	26	28	32	34	Both	Neither	21	21	25	26	Both	Both	19	19	23	23	Both	Both
2012 12 26	366887210	GUARDIAN	60.906	-146.93	N	13.614	6	68	24	27	30	32	Both	Neither	20	20	24	24	Both	Both	18	18	21	21	Both	Both
2012 05 23	367910000	USCG LONG ISLAND	61.1254	-146.352	Y	13.512	6	67	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	367910000	USCG LONG ISLAND	61.1254	-146.352	Y	13.512	6	67	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 12	367910000	USCG LONG ISLAND	57.7838	-152.424	Y	13.512	3	67	21	25	34	38	Both	Neither	16	16	27	28	Both	Both	17	17	28	29	Both	Both
2012 09 12	367910000	USCG LONG ISLAND	57.7838	-152.424	Y	13.512	3	67	21	25	34	38	Both	Neither	16	16	27	28	Both	Both	17	17	28	29	Both	Both
2012 10 12	367910000	USCG LONG ISLAND	57.7839	-152.424	Y	13.512	3	67	21	25	34	38	Both	Neither	16	16	27	28	Both	Both	17	17	28	29	Both	Both
2012 10 12	367910000	USCG LONG ISLAND	57.7839	-152.424	Y	13.512	3	67	21	25	34	38	Both	Neither	16	16	27	28	Both	Both	17	17	28	29	Both	Both
2012 01 18	369514000	GULF TITAN	60.8049	-148.618	Y	9	7	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 08	369514000	GULF TITAN	60.1866	-146.633	Y	9	6	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 21	369514000	GULF TITAN	60.1772	-146.483	Y	9	6	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 20	369514000	GULF TITAN	60.7778	-148.673	Y	9	7	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 25	369514000	GULF TITAN	60.7777	-148.673	Y	9	7	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 07	369514000	GULF TITAN	61.2246	-149.91	Y	9	1	64	8	13	18	23	Both	Neither	19	19	31	34	Both	Both	21	23	33	39	Both	Both
2012 12 05	369514000	GULF TITAN	60.7816	-148.278	Y	9	7	64	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 26	366971980	MILLENNIUM STAR	59.6028	-151.41	Y	13.082	2	64	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 08 15	367519450	ARCTIC TITAN	61.2248	-149.91	Y	13.336	1	61	7	9	13	17	Both	Neither	14	14	22	24	Both	Both	15	16	24	26	Both	Both
2012 11 07	367519450	ARCTIC TITAN	60.8868	-151.221	Y	13.336	1	61	5	6	9	15	Both	Neither	11	12	14	18	Both	Both	12	14	15	21	Both	Both
2012 11 14	367519450	ARCTIC TITAN	60.6758	-151.395	Y	13.336	2	61	5	6	7	10	Both	Neither	10	11	11	13	Both	Both	12	13	12	15	Both	Both
2012 11 21	367519450	ARCTIC TITAN	59.5964	-148.882	Y	13.336	5	61	24	27	39	42	Both	Neither	18	18	31	32	Both	Both	19	20	32	33	Both	Both
2012 08 29	367017460	ELSBETH III	59.6046	-151.421	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 09 05	367017460	ELSBETH III	59.6056	-151.415	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 09 12	367017460	ELSBETH III	59.6056	-151.415	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 09 19	367017460	ELSBETH III	59.6056	-151.415	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 09 26	367017460	ELSBETH III	59.6056	-151.415	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 10 05	367017460	ELSBETH III	59.6056	-151.415	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 10 12	367017460	ELSBETH III	59.6056	-151.415	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 10 19	367017460	ELSBETH III	59.6056	-151.415	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 10 25	367017460	ELSBETH III	59.6047	-151.421	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 11 07	367017460	ELSBETH III	59.6034	-151.419	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 11 14	367017460	ELSBETH III	59.6034	-151.419	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 11 21	367017460	ELSBETH III	59.6035	-151.419	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 11 28	367017460	ELSBETH III	59.6034	-151.419	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 12 05	367017460	ELSBETH III	59.6035	-151.419	Y	13.336	2	61	11	12	13	14	Both	Neither	5	5	5	5	Both	Both	7	8	7	9	Both	Both
2012 02 22	366980180	OCEAN TITAN	60.8126	-148.461	Y	12	7	61	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 25	366980180	OCEAN TITAN	60.2802	-146.798	Y	12	6	61	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	366980180	OCEAN TITAN	60.3052	-147.954	Y	12	6	61	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	367269000	USCG ACTIVE	57.3004	-151.956	Y	13.336	4	61	24	27	40	43	Both	Neither	19	19	33	33	Both	Both	20	20	33	35	Both	Both
2012 08 01	367269000	USCG ACTIVE	57.7255	-152.489	Y	13.336	3	61	22	25	36	39	Both	Neither	17	17	28	29	Both	Both	17	18	29	30	Both	Both
2012 01 04	367360890	BISMARCK SEA	59.8872	-147.989	Y	8	5	60	44	45	74	81	Both	Neither	33	34	61	62	Both	Both	34	36	62	66	Both	Both
2012 01 04	367360890	BISMARCK SEA	59.8872	-147.989	Y	8	5	60	44	45	74	81	Both	Neither	33	34	61	62	Both	Both	34	36	62	66	Both	Both
2012 01 18	367360890	BISMARCK SEA	61.2389	-149.89	Y	8	1	60	8	15	19	32	Both	Neither	20	22	34	41	Both	Both	23	26	37	45	Both	Both
2012 02 15	367360890	BISMARCK SEA	61.1279	-146.439	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 22	367360890	BISMARCK SEA	61.2385	-149.89	Y	8	1	60	8	15	19	32	Both	Neither	20	22	34	41	Both	Both	23	26	37	45	Both	Both
2012 03 14	367360890	BISMARCK SEA	61.1234	-146.358	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 28	367360890	BISMARCK SEA	61.1234	-146.358	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 04	367360890	BISMARCK SEA	61.1233	-146.358	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 25	367360890	BISMARCK SEA	61.0912	-150.594	Y	8	1	60	8	16	30	40	Both	Neither	17	24	39	41	Both	Both	20	27	42	45	Both	Both
2012 05 02	367360890	BISMARCK SEA	61.1834	-150.202	Y	8	1	60	8	16	21	39	Both	Neither	20	23	36	49	Both	Both	23	27	39	53	Both	Both
2012 05 16	367360890	BISMARCK SEA	59.7473	-152.032	Y	8	2	60	15	18	18	25	Both	Neither	8	8	8	9	Both	Both	10	12	10	13	Both	Both
2012 06 13	367360890	BISMARCK SEA	59.609	-152.144	Y	8	2	60	17	19	20	25	Both	Neither	7	7	7	8	Both	Both	9	11	9	12	Both	Both
2012 07 25	367360890	BISMARCK SEA	60.6539	-146.562	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 01	367360890	BISMARCK SEA	57.7324	-152.354	Y	8	3	60	35	36	56	63	Both	Neither	25	25	43	45	Both	Both	26	28	44	48	Both	Both
2012 08 08	367360890	BISMARCK SEA	61.1777	-150.251	Y	8	1	60	8	17	22	41	Both	Neither	19	23	37	50	Both	Both	22	27	40	55	Both	Both
2012 08 15	367360890	BISMARCK SEA	61.1234	-146.358	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 29	367360890	BISMARCK SEA	57.7835	-152.425	Y	8	3	60	35	36	55	63	Both	Neither	24	25	43	44	Both	Both	25	27	44	47	Both	Both
2012 09 05	367360890	BISMARCK SEA	61.1234	-146.358	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	367360890	BISMARCK SEA	61.2391	-149.893	Y	8	1	60	8	15	19	31	Both	Neither	20	22	34	41	Both	Both	23	26	37	45	Both	Both
2012 10 05	367360890	BISMARCK SEA	61.1234	-146.358	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 28	367360890	BISMARCK SEA	61.1262	-146.45	Y	8	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 01	368150000	POLAR CLOUD	60.1189	-149.426	Y	13	4	60	26	29	44	47	Both	Neither	21	21	36	37	Both	Both	21	22	37	38	Both	Both
2012 02 22	368150000	POLAR CLOUD	59.4047	-149.671	Y	13	4	60	21	24	33	37	Both	Neither	16	16	26	26	Both	Both	16	17	27	28	Both	Both
2012 03 14	368150000	POLAR CLOUD	60.119	-149.426	Y	13	4	60	26	29	44	47	Both	Neither	21	21	36	37	Both	Both	21	22	37	38	Both	Both
2012 07 11	368150000	POLAR CLOUD	60.9404	-151.181	Y	13	1	60	6	7	10	18	Both	Neither	11	12	15	21	Both	Both	13	15	17	24	Both	Both
2012 08 29	368150000	POLAR CLOUD	61.2248	-149.909	Y	13	1	60	7	9	13	17	Both	Neither	14	15	22	24	Both	Both	16	16	24	27	Both	Both
2012 12 26	368150000	POLAR CLOUD	60.1197	-149.426	Y	13	4	60	26	29	44	47	Both	Neither	21	21	36	37	Both	Both	21	22	37	38	Both	Both
2012 06 06	303144000	Polar Endurance	58.5458	-153.477	Y	13.336	3	60	19	22	28	32	Both	Neither	13	14	21	22	Both	Both	14	15	22	23	Both	Both
2012 06 27	303144000	Polar Endurance	57.851	-150.863	Y	13.336	4	60	22	25	34	38	Both	Neither	16	16	27	27	Both	Both	17	17	28	29	Both	Both
2012 09 05	303144000	Polar Endurance	57.6832	-154.029	Y	13.336	3	60	24	27	40	43	Both	Neither	19	19	32	33	Both	Both	19	20	33	34	Both	Both
2012 09 26	303144000	Polar Endurance	60.3775	-147.945	Y	13.336	6	60	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 05	303144000	Polar Endurance	57.6749	-154.002	Y	13.336	3	60	24	27	40	43	Both	Neither	19	19	32	33	Both	Both	19	20	33	34	Both	Both
2012 02 29	367090860	POLAR RANGER	59.5418	-149.516	Y	13	4	60	22	25	35	38	Both	Neither	16	17	27	28	Both	Both	17	18	28	29	Both	Both
2012 06 27	367090860	POLAR RANGER	61.239	-149.89	Y	13	1	60	7	9	13	18	Both	Neither	14	15	23	25	Both	Both	16	16	24	28	Both	Both
2012 08 01	367090860	POLAR RANGER	57.702	-154.393	Y	13	3	60	25	29	42	45	Both	Neither	20	20	35	35	Both	Both	21	21	35	37	Both	Both
2012 08 22	367090860	POLAR RANGER	60.7756	-151.515	Y	13	1	60	5	6	7	11	Both	Neither	10	11	12	15	Both	Both	12	13	14	17	Both	Both
2012 01 18	367151000	POLAR VIKING	60.119	-149.426	Y	7	4	60	46	50	77	87	Both	Neither	35	36	63	65	Both	Both	36	38	65	69	Both	Both
2012 07 25	367151000	POLAR VIKING	60.8918	-151.254	Y	7	1	60	6	11	13	37	Both	Neither	17	20	24	32	Both	Both	20	24	26	38	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 08 29	367151000	POLAR VIKING	56.9493	-155.882	Y	7	3	60	59	63	103	113	Both	Neither	47	48	89	91	Both	Both	48	51	90	95	Both	Both
2012 09 19	367151000	POLAR VIKING	61.2248	-149.91	Y	7	1	60	8	18	20	44	Both	Neither	23	24	38	46	Both	Both	26	28	42	50	Both	Both
2012 10 19	367151000	POLAR VIKING	61.2248	-149.91	Y	7	1	60	8	18	20	44	Both	Neither	23	24	38	46	Both	Both	26	28	42	50	Both	Both
2012 04 25	366744920	PACIFIC EXPLORER	60.9336	-151.15	Y	11	1	59	6	8	12	20	Both	Neither	12	14	18	23	Both	Both	14	16	20	26	Both	Both
2012 08 15	366744920	PACIFIC EXPLORER	61.2247	-149.91	Y	11	1	59	7	10	15	18	Both	Neither	16	16	26	28	Both	Both	18	19	28	30	Both	Both
2012 08 22	366744920	PACIFIC EXPLORER	60.7583	-151.32	Y	11	1	59	5	6	6	10	Both	Neither	11	12	12	14	Both	Both	13	14	15	17	Both	Both
2012 08 29	366744920	PACIFIC EXPLORER	59.6064	-151.414	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 09 05	366744920	PACIFIC EXPLORER	59.6063	-151.413	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 09 12	366744920	PACIFIC EXPLORER	59.6064	-151.413	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 09 19	366744920	PACIFIC EXPLORER	59.6063	-151.415	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 09 26	366744920	PACIFIC EXPLORER	59.6062	-151.415	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 10 05	366744920	PACIFIC EXPLORER	59.6063	-151.413	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 10 12	366744920	PACIFIC EXPLORER	59.6063	-151.413	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 10 19	366744920	PACIFIC EXPLORER	59.6063	-151.415	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 10 25	366744920	PACIFIC EXPLORER	59.6046	-151.421	Y	11	2	59	13	14	15	16	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 11 07	366744920	PACIFIC EXPLORER	59.6035	-151.419	Y	11	2	59	13	14	15	16	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 11 14	366744920	PACIFIC EXPLORER	59.6057	-151.415	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 11 21	366744920	PACIFIC EXPLORER	59.6035	-151.419	Y	11	2	59	13	14	15	16	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 11 28	366744920	PACIFIC EXPLORER	59.6064	-151.415	Y	11	2	59	13	14	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 12 05	366744920	PACIFIC EXPLORER	59.6035	-151.419	Y	11	2	59	13	14	15	16	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 12 12	366744920	PACIFIC EXPLORER	59.6034	-151.42	Y	11	2	59	13	14	15	16	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 12 19	366744920	PACIFIC EXPLORER	59.6035	-151.42	Y	11	2	59	13	14	15	16	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 12 26	366744920	PACIFIC EXPLORER	59.6035	-151.42	Y	11	2	59	13	14	15	16	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Both
2012 03 28	367153070	Mikiona	59.6643	-152.043	Y	12.774	2	57	11	14	12	16	Both	Neither	6	6	6	6	Both	Both	7	8	8	9	Both	Both
2012 02 08	303233000	ALASKA MARINER	60.7776	-148.673	Y	13	7	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 25	303233000	ALASKA MARINER	58.7845	-151.023	Y	13	4	55	17	20	24	27	Both	Neither	11	11	17	17	Both	Both	12	12	17	19	Both	Both
2012 05 30	367309390	PACIFIC FREEDOM	57.4989	-153.905	Y	13.126	3	55	25	28	42	45	Both	Neither	20	20	34	35	Both	Both	20	21	35	36	Both	Both
2012 07 11	367309390	PACIFIC FREEDOM	61.1259	-146.462	Y	13.126	6	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 18	367309390	PACIFIC FREEDOM	61.1233	-146.358	Y	13.126	6	55	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	367309390	PACIFIC FREEDOM	60.7081	-151.435	Y	13.126	2	55	5	6	6	10	Both	Neither	10	11	11	13	Both	Both	12	13	12	16	Both	Both
2012 01 04	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 01 04	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 01 18	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 01 25	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 02 01	367406560	BRIAN T	57.7836	-152.427	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 02 08	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 02 15	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 02 22	367406560	BRIAN T	57.7835	-152.429	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 02 29	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 03 07	367406560	BRIAN T	60.1184	-149.427	N	13.082	4	54	18	21	23	25	Both	Neither	14	14	16	16	Both	Both	11	11	14	14	Both	Both
2012 03 14	367406560	BRIAN T	60.0847	-149.353	N	13.082	4	54	18	21	23	25	Both	Neither	14	14	16	16	Both	Both	11	11	13	13	Both	Both
2012 03 21	367406560	BRIAN T	60.1195	-149.426	N	13.082	4	54	18	21	23	25	Both	Neither	14	14	16	16	Both	Both	11	11	14	14	Both	Both
2012 03 28	367406560	BRIAN T	57.7768	-152.415	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 04 04	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 04 18	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 04 25	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 05 02	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 05 16	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 05 23	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 05 30	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 06 06	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 06 13	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 06 20	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 06 27	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 07 11	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 07 18	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 07 25	367406560	BRIAN T	57.7742	-152.417	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 08 01	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 08 08	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 08 15	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 08 22	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 08 29	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 09 05	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 09 12	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 09 19	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 09 26	367406560	BRIAN T	57.7132	-152.54	N	13.082	3	54	16	19	20	22	Both	Neither	11	12	13	14	Both	Both	9	9	11	11	Both	Both
2012 10 05	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 10 12	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 10 19	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 10 25	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 11 14	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 11 21	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 11 28	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 12 05	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 12 12	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 12 19	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 12 26	367406560	BRIAN T	57.7762	-152.414	N	13.082	3	54	16	18	19	21	Both	Neither	11	11	13	13	Both	Both	9	9	10	10	Both	Both
2012 05 23	367413000	JAMES DUNLAP	57.2115	-155.373	Y	13.036	3	54	30	33	52	55	Both	Neither	25	25	45	45	Both	Both	25	26	45	47	Both	Both
2012 09 12	338752000	OCEAN RANGER	61.0396	-151.16	Y	7.8	1	52	7	13	20	37	Both	Neither	16	21	29	37	Both	Both	19	24	32	42	Both	Both
2012 09 19	338752000	OCEAN RANGER	59.6422	-151.3	Y	7.8	2	52	17	17	19	22	Both	Neither	6	7	6	7	Both	Both	9	12	9	14	Both	Both
2012 09 26	338752000	OCEAN RANGER	61.2249	-149.91	Y	7.8	1	52	8	15	19	32	Both	Neither	21	22	34	40	Both	Both	23	26	38	44	Both	Both
2012 10 12	338752000	OCEAN RANGER	61.0335	-151.167	Y	7.8	1	52	7	13	20	36	Both	Neither	16	21	29	37	Both	Both	19	24	32	41	Both	Both
2012 10 19	338752000	OCEAN RANGER	59.643	-151.298	Y	7.8	2	52	17	17	19	22	Both	Neither	6	7	6	7	Both	Both	9	12	9	14	Both	Both
2012 11 07	338752000	OCEAN RANGER	60.8981	-151.221	Y	7.8	1	52	6	10	13	30	Both	Neither	15	18	22	30	Both	Both	18	21	25	35	Both	Both
2012 11 14	338752000	OCEAN RANGER	60.1188	-149.427	Y	7.8	4	52	42	44	70	78	Both	Neither	31	32	57	59	Both	Both	32	35	58	62	Both	Both
2012 01 25	366888750	SEA PRINCE	59.6417	-148.208	Y	7.5	5	51	44	46	74	82	Both	Neither	33	34	60	62	Both	Both	34	36	62	65	Both	Both
2012 02 15	366888750	SEA PRINCE	60.6824	-151.444	Y	7.5	2	51	5	8	8	24	Both	Neither	15	17	16	20	Both	Both	18	20	19	25	Both	Both
2012 02 22	366888750	SEA PRINCE	60.3724	-147.923	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 14	366888750	SEA PRINCE	58.4878	-151.698	Y	7.5	4	51	28	30	39	48	Both	Neither	16	17	26	28	Both	Both	17	20	27	31	Both	Both
2012 03 28	366888750	SEA PRINCE	60.0527	-147.952	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 18	366888750	SEA PRINCE	61.0493	-146.683	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 25	366888750	SEA PRINCE	61.1286	-146.445	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 05 02	366888750	SEA PRINCE	61.1292	-146.445	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 16	366888750	SEA PRINCE	61.1284	-146.443	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	366888750	SEA PRINCE	61.2363	-149.893	Y	7.5	1	51	8	16	20	37	Both	Neither	21	23	36	44	Both	Both	24	27	40	48	Both	Both
2012 05 30	366888750	SEA PRINCE	61.2367	-149.892	Y	7.5	1	51	8	16	20	37	Both	Neither	21	23	36	44	Both	Both	24	27	40	48	Both	Both
2012 06 20	366888750	SEA PRINCE	61.1234	-146.358	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	366888750	SEA PRINCE	61.2366	-149.892	Y	7.5	1	51	8	16	20	37	Both	Neither	21	23	36	44	Both	Both	24	27	40	48	Both	Both
2012 07 11	366888750	SEA PRINCE	60.6652	-147.145	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 18	366888750	SEA PRINCE	59.6243	-151.389	Y	7.5	2	51	17	17	19	22	Both	Neither	6	6	6	6	Both	Both	9	12	9	13	Both	Both
2012 07 25	366888750	SEA PRINCE	61.1234	-146.358	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 08	366888750	SEA PRINCE	61.1293	-146.445	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 15	366888750	SEA PRINCE	59.7264	-152.08	Y	7.5	2	51	16	19	19	27	Both	Neither	8	8	8	9	Both	Both	10	12	10	14	Both	Both
2012 08 22	366888750	SEA PRINCE	60.5805	-147.181	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 29	366888750	SEA PRINCE	61.1234	-146.358	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 05	366888750	SEA PRINCE	61.2363	-149.893	Y	7.5	1	51	8	16	20	37	Both	Neither	21	23	36	44	Both	Both	24	27	40	48	Both	Both
2012 09 12	366888750	SEA PRINCE	61.1234	-146.358	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 19	366888750	SEA PRINCE	59.5962	-151.324	Y	7.5	2	51	17	18	20	23	Both	Neither	6	7	6	7	Both	Both	9	12	10	14	Both	Both
2012 09 26	366888750	SEA PRINCE	61.1233	-146.358	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 05	366888750	SEA PRINCE	61.2362	-149.893	Y	7.5	1	51	8	16	20	37	Both	Neither	21	23	36	44	Both	Both	24	27	40	48	Both	Both
2012 10 12	366888750	SEA PRINCE	61.1234	-146.358	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 19	366888750	SEA PRINCE	59.5974	-151.321	Y	7.5	2	51	17	18	20	23	Both	Neither	6	7	6	7	Both	Both	9	12	10	14	Both	Both
2012 11 07	366888750	SEA PRINCE	61.2363	-149.893	Y	7.5	1	51	8	16	20	37	Both	Neither	21	23	36	44	Both	Both	24	27	40	48	Both	Both
2012 11 14	366888750	SEA PRINCE	59.6071	-151.206	Y	7.5	2	51	18	18	20	23	Both	Neither	7	7	7	7	Both	Both	10	13	10	14	Both	Both
2012 11 21	366888750	SEA PRINCE	59.386	-152.08	Y	7.5	2	51	18	19	20	28	Both	Neither	6	7	6	7	Both	Both	7	9	8	10	Both	Both
2012 11 28	366888750	SEA PRINCE	61.1234	-146.358	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 05	366888750	SEA PRINCE	59.6835	-151.19	Y	7.5	2	51	18	19	20	24	Both	Neither	7	7	7	8	Both	Both	10	13	10	15	Both	Both
2012 12 26	366888750	SEA PRINCE	61.1295	-146.449	Y	7.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 18	367309430	PACIFIC WOLF	57.7869	-152.402	Y	8.5	3	51	33	34	52	58	Both	Neither	23	24	40	42	Both	Both	24	26	41	44	Both	Both
2012 02 01	367309430	PACIFIC WOLF	60.5584	-145.755	Y	8.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 08	367309430	PACIFIC WOLF	57.964	-152.315	Y	8.5	3	51	31	33	49	54	Both	Neither	21	22	37	38	Both	Both	22	24	38	41	Both	Both
2012 02 15	367309430	PACIFIC WOLF	61.1234	-146.358	Y	8.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 29	367309430	PACIFIC WOLF	60.6836	-151.4	Y	8.5	2	51	5	7	7	18	Both	Neither	14	15	14	18	Both	Both	17	18	18	22	Both	Both
2012 03 07	367309430	PACIFIC WOLF	58.129	-152.566	Y	8.5	3	51	32	34	51	56	Both	Neither	22	23	39	40	Both	Both	23	25	40	43	Both	Both
2012 03 14	367309430	PACIFIC WOLF	59.6023	-151.409	Y	8.5	2	51	16	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 03 21	367309430	PACIFIC WOLF	58.0242	-152.06	Y	8.5	3	51	30	31	46	51	Both	Neither	20	21	34	35	Both	Both	21	23	35	38	Both	Both
2012 03 28	367309430	PACIFIC WOLF	57.7815	-152.426	Y	8.5	3	51	33	34	53	58	Both	Neither	23	24	40	42	Both	Both	24	26	42	45	Both	Both
2012 04 18	367309430	PACIFIC WOLF	57.9011	-152.757	Y	8.5	3	51	34	35	54	59	Both	Neither	24	25	42	43	Both	Both	25	27	43	46	Both	Both
2012 04 25	367309430	PACIFIC WOLF	59.6111	-151.408	Y	8.5	2	51	15	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 05 02	367309430	PACIFIC WOLF	59.603	-151.411	Y	8.5	2	51	16	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 05 16	367309430	PACIFIC WOLF	59.6106	-151.403	Y	8.5	2	51	15	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 05 23	367309430	PACIFIC WOLF	59.7051	-148.674	Y	8.5	5	51	38	39	62	67	Both	Neither	28	28	49	51	Both	Both	29	30	50	53	Both	Both
2012 05 30	367309430	PACIFIC WOLF	59.6054	-151.408	Y	8.5	2	51	16	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 06 06	367309430	PACIFIC WOLF	60.5585	-145.755	Y	8.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 13	367309430	PACIFIC WOLF	60.6135	-151.436	Y	8.5	2	51	6	9	8	20	Both	Neither	14	16	14	17	Both	Both	17	19	17	22	Both	Both
2012 06 27	367309430	PACIFIC WOLF	59.6992	-151.959	Y	8.5	2	51	15	18	17	22	Both	Neither	7	7	7	8	Both	Both	9	11	9	12	Both	Both
2012 07 11	367309430	PACIFIC WOLF	59.6186	-151.412	Y	8.5	2	51	15	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 07 18	367309430	PACIFIC WOLF	57.7868	-152.402	Y	8.5	3	51	33	34	52	58	Both	Neither	23	24	40	42	Both	Both	24	26	41	44	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 07 25	367309430	PACIFIC WOLF	60.6834	-151.4	Y	8.5	2	51	5	7	7	18	Both	Neither	14	15	14	18	Both	Both	17	18	18	22	Both	Both
2012 08 01	367309430	PACIFIC WOLF	59.2429	-152.157	Y	8.5	3	51	17	18	20	25	Both	Neither	7	8	8	9	Both	Both	8	10	9	12	Both	Both
2012 08 08	367309430	PACIFIC WOLF	59.603	-151.411	Y	8.5	2	51	16	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 08 15	367309430	PACIFIC WOLF	57.6164	-153.949	Y	8.5	3	51	37	38	61	66	Both	Neither	27	28	49	50	Both	Both	28	30	50	53	Both	Both
2012 08 22	367309430	PACIFIC WOLF	59.6027	-151.409	Y	8.5	2	51	16	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 08 29	367309430	PACIFIC WOLF	59.6108	-151.404	Y	8.5	2	51	15	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 09 05	367309430	PACIFIC WOLF	59.6253	-151.401	Y	8.5	2	51	15	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 09 26	367309430	PACIFIC WOLF	57.9202	-152.5	Y	8.5	3	51	33	34	51	57	Both	Neither	23	23	39	40	Both	Both	24	25	40	43	Both	Both
2012 10 05	367309430	PACIFIC WOLF	59.6252	-151.401	Y	8.5	2	51	15	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 10 25	367309430	PACIFIC WOLF	59.6171	-151.405	Y	8.5	2	51	15	16	18	19	Both	Neither	6	6	6	6	Both	Both	9	11	9	12	Both	Both
2012 11 07	367309430	PACIFIC WOLF	60.1272	-151.794	Y	8.5	2	51	9	17	12	26	Both	Neither	11	12	11	12	Both	Both	13	15	14	17	Both	Both
2012 11 14	367309430	PACIFIC WOLF	60.7712	-151.3	Y	8.5	1	51	5	7	7	17	Both	Neither	14	14	15	19	Both	Both	17	17	18	23	Both	Both
2012 11 21	367309430	PACIFIC WOLF	60.6761	-151.434	Y	8.5	2	51	5	8	7	18	Both	Neither	14	15	14	18	Both	Both	17	18	17	22	Both	Both
2012 11 28	367309430	PACIFIC WOLF	60.6	-145.869	Y	8.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 19	367309430	PACIFIC WOLF	60.6784	-151.415	Y	8.5	2	51	5	8	7	18	Both	Neither	14	15	14	18	Both	Both	17	18	17	22	Both	Both
2012 12 26	367309430	PACIFIC WOLF	60.5586	-145.755	Y	8.5	6	51	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 18	366887970	PROTECTOR	61.1216	-146.343	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 25	366887970	PROTECTOR	60.7788	-148.667	Y	13.526	7	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 02	366887970	PROTECTOR	60.5586	-145.755	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 16	366887970	PROTECTOR	61.0892	-146.396	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	366887970	PROTECTOR	61.1038	-146.273	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 30	366887970	PROTECTOR	61.1218	-146.343	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 06	366887970	PROTECTOR	61.1145	-146.291	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 13	366887970	PROTECTOR	61.1216	-146.343	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 20	366887970	PROTECTOR	61.1104	-146.281	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	366887970	PROTECTOR	61.0958	-146.436	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 11	366887970	PROTECTOR	60.6733	-147.354	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 25	366887970	PROTECTOR	60.6727	-147.352	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 01	366887970	PROTECTOR	61.1216	-146.344	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 08	366887970	PROTECTOR	60.5586	-145.755	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 15	366887970	PROTECTOR	60.6725	-147.352	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 22	366887970	PROTECTOR	60.6721	-147.352	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 05	366887970	PROTECTOR	60.8317	-147.021	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 05	366887970	PROTECTOR	60.8389	-146.977	Y	13.526	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	368403000	POLAR STORM	61.2383	-149.891	Y	13	1	50	7	9	13	18	Both	Neither	14	15	23	25	Both	Both	16	16	24	28	Both	Both
2012 06 13	368403000	POLAR STORM	61.1067	-150.842	Y	13	1	50	7	9	18	21	Both	Neither	12	14	23	25	Both	Both	14	17	25	28	Both	Both
2012 09 12	368403000	POLAR STORM	61.2248	-149.91	Y	13	1	50	7	9	13	17	Both	Neither	14	15	22	24	Both	Both	16	16	24	27	Both	Both
2012 09 19	368403000	POLAR STORM	57.5833	-153.919	Y	13	3	50	25	28	41	44	Both	Neither	19	20	34	34	Both	Both	20	21	35	36	Both	Both
2012 10 12	368403000	POLAR STORM	61.2247	-149.91	Y	13	1	50	7	9	13	17	Both	Neither	14	15	22	24	Both	Both	16	16	24	27	Both	Both
2012 10 19	368403000	POLAR STORM	57.5835	-153.92	Y	13	3	50	25	28	41	44	Both	Neither	19	20	34	34	Both	Both	20	21	35	36	Both	Both
2012 11 14	368403000	POLAR STORM	60.1189	-149.426	Y	13	4	50	26	29	44	47	Both	Neither	21	21	36	37	Both	Both	21	22	37	38	Both	Both
2012 03 14	367400220	Resolution	60.6038	-151.45	Y	13	2	50	5	6	7	11	Both	Neither	11	12	11	13	Both	Both	12	14	12	15	Both	Both
2012 09 05	367400220	Resolution	60.7566	-151.311	Y	13	1	50	5	5	6	9	Both	Neither	10	11	11	13	Both	Both	12	13	13	15	Both	Both
2012 09 26	367400220	Resolution	60.6342	-151.364	Y	13	2	50	5	6	7	11	Both	Neither	11	12	11	13	Both	Both	12	14	12	16	Both	Both
2012 10 05	367400220	Resolution	60.7566	-151.311	Y	13	1	50	5	5	6	9	Both	Neither	10	11	11	13	Both	Both	12	13	13	15	Both	Both
2012 11 07	367400220	Resolution	60.9394	-151.266	Y	13	1	50	6	7	10	17	Both	Neither	11	12	15	20	Both	Both	13	14	17	23	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 11 14	367400220	Resolution	60.9763	-151.316	Y	13	1	50	6	7	11	18	Both	Neither	11	13	16	21	Both	Both	13	15	18	24	Both	Both
2012 12 19	367400220	Resolution	60.6442	-151.366	Y	13	2	50	5	6	7	11	Both	Neither	11	12	11	13	Both	Both	12	14	12	16	Both	Both
2012 05 23	367579000	WESTERN RANGER	57.7303	-152.371	Y	9.5	3	50	30	32	49	51	Both	Neither	21	22	37	38	Both	Both	22	24	38	41	Both	Both
2012 08 22	367579000	WESTERN RANGER	60.7645	-151.362	Y	9.5	1	50	5	6	6	12	Both	Neither	12	13	13	15	Both	Both	15	16	17	18	Both	Both
2012 09 12	367579000	WESTERN RANGER	61.1031	-150.895	Y	9.5	1	50	7	12	21	34	Both	Neither	15	19	28	36	Both	Both	17	21	31	39	Both	Both
2012 09 19	367579000	WESTERN RANGER	59.6326	-151.403	Y	9.5	2	50	14	15	17	17	Both	Neither	5	6	5	6	Both	Both	8	10	8	11	Both	Both
2012 09 26	367579000	WESTERN RANGER	60.2449	-147.987	Y	9.5	6	50	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 12	367579000	WESTERN RANGER	61.1219	-150.816	Y	9.5	1	50	8	12	23	35	Both	Neither	15	19	30	36	Both	Both	18	22	33	39	Both	Both
2012 10 19	367579000	WESTERN RANGER	59.6326	-151.403	Y	9.5	2	50	14	15	17	17	Both	Neither	5	6	5	6	Both	Both	8	10	8	11	Both	Both
2012 01 04	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 01 04	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 01 18	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 01 25	367186610	STELLAR WIND	61.2264	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 02 01	367186610	STELLAR WIND	61.2248	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 02 08	367186610	STELLAR WIND	61.2249	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 02 15	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 02 22	367186610	STELLAR WIND	61.225	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 02 29	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 03 07	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 03 14	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 03 21	367186610	STELLAR WIND	61.2406	-149.915	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 03 28	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 04 04	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 04 18	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 04 25	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 05 02	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 05 16	367186610	STELLAR WIND	61.2292	-149.902	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 05 23	367186610	STELLAR WIND	61.2252	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 05 30	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 06 06	367186610	STELLAR WIND	61.2311	-149.908	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 06 13	367186610	STELLAR WIND	61.2276	-149.908	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 06 20	367186610	STELLAR WIND	61.225	-149.911	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 06 27	367186610	STELLAR WIND	61.2248	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 07 11	367186610	STELLAR WIND	61.2248	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 07 18	367186610	STELLAR WIND	61.2442	-149.886	N	12.646	1	49	5	7	12	13	Both	Neither	12	13	20	21	Both	Both	14	15	22	24	Both	Both
2012 07 25	367186610	STELLAR WIND	61.2253	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 08 01	367186610	STELLAR WIND	61.2446	-149.887	N	12.646	1	49	5	7	12	13	Both	Neither	12	13	20	21	Both	Both	14	15	22	24	Both	Both
2012 08 08	367186610	STELLAR WIND	61.2251	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 08 15	367186610	STELLAR WIND	61.225	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 08 22	367186610	STELLAR WIND	61.225	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 08 29	367186610	STELLAR WIND	61.2249	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 09 05	367186610	STELLAR WIND	61.225	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 09 12	367186610	STELLAR WIND	61.2315	-149.9	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 09 19	367186610	STELLAR WIND	61.2315	-149.906	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 09 26	367186610	STELLAR WIND	61.238	-149.893	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	15	22	24	Both	Both
2012 10 05	367186610	STELLAR WIND	61.225	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both

Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	Upper Cook Inlet Incident: Total Time To Incident				Upper Cook Inlet Incident: Capability		Kachemak Bay Incident: Total Time To Incident				Kachemak Bay Incident: Capability		Kennedy Entrance Incident: Total Time To Incident				Kennedy Entrance Incident: Capability	
								Environmental Condition:	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
								Current: With or Against (Ag.)	With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
									(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 10 12	367186610	STELLAR WIND	61.2315	-149.9	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 10 19	367186610	STELLAR WIND	61.2289	-149.909	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	24	Both	Both
2012 10 25	367186610	STELLAR WIND	61.2249	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 11 07	367186610	STELLAR WIND	61.2442	-149.886	N	12.646	1	49	5	7	12	13	Both	Neither	12	13	20	21	Both	Both	14	15	22	24	Both	Both
2012 11 14	367186610	STELLAR WIND	61.2414	-149.888	N	12.646	1	49	5	7	12	13	Both	Neither	12	13	20	21	Both	Both	14	15	22	24	Both	Both
2012 11 21	367186610	STELLAR WIND	61.2249	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 11 28	367186610	STELLAR WIND	61.2248	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 12 05	367186610	STELLAR WIND	61.2246	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 12 12	367186610	STELLAR WIND	61.2248	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 12 19	367186610	STELLAR WIND	61.2246	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 12 26	367186610	STELLAR WIND	61.2248	-149.91	N	12.646	1	49	5	7	11	13	Both	Neither	12	13	20	21	Both	Both	14	14	22	23	Both	Both
2012 04 25	303275000	JUSTINE FOSS	60.9321	-151.152	Y	13	1	49	6	7	10	18	Both	Neither	11	12	15	21	Both	Both	13	15	17	24	Both	Both
2012 06 06	303275000	JUSTINE FOSS	59.4379	-143.597	Y	13	5	49	42	45	77	80	Both	Neither	37	37	69	70	Both	Both	37	38	70	71	Both	Both
2012 06 27	303275000	JUSTINE FOSS	60.1685	-146.464	Y	13	6	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 11	303275000	JUSTINE FOSS	60.1753	-146.661	Y	13	6	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 15	303275000	JUSTINE FOSS	60.7777	-148.673	Y	13	7	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 05	303275000	JUSTINE FOSS	60.7777	-148.673	Y	13	7	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 19	303275000	JUSTINE FOSS	60.1564	-146.447	Y	13	6	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	303275000	JUSTINE FOSS	60.3488	-147.919	Y	13	6	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 05	303275000	JUSTINE FOSS	60.7777	-148.673	Y	13	7	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 19	303275000	JUSTINE FOSS	60.1553	-146.443	Y	13	6	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 21	303275000	JUSTINE FOSS	60.1829	-146.555	Y	13	6	49	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 19	367309320	JOHN BRIX	59.7051	-151.144	Y	12	2	49	12	14	15	16	Both	Neither	6	6	6	6	Both	Both	8	10	8	10	Both	Both
2012 12 26	367309320	JOHN BRIX	57.8824	-153.924	Y	12	3	49	25	28	41	44	Both	Neither	19	19	33	33	Both	Both	20	21	33	35	Both	Both
2012 06 20	303231480	MANFRED NYSTROM	61.2364	-149.892	Y	12.848	1	49	7	9	14	18	Both	Neither	14	15	23	25	Both	Both	16	17	25	28	Both	Both
2012 09 05	303231480	MANFRED NYSTROM	61.2248	-149.91	Y	12.848	1	49	7	9	13	17	Both	Neither	14	15	23	24	Both	Both	16	16	24	27	Both	Both
2012 10 05	303231480	MANFRED NYSTROM	61.2247	-149.91	Y	12.848	1	49	7	9	13	17	Both	Neither	14	15	23	24	Both	Both	16	16	24	27	Both	Both
2012 05 02	367309440	SEA HAWK	60.6578	-151.412	Y	6	2	49	6	12	8	47	Both	Neither	18	22	18	24	Both	Both	21	28	22	31	Both	Both
2012 08 08	367309440	SEA HAWK	60.6603	-151.407	Y	6	2	49	6	12	8	47	Both	Neither	18	22	18	24	Both	Both	21	28	22	32	Both	Both
2012 08 22	367309440	SEA HAWK	59.6063	-151.414	Y	6	2	49	19	22	23	27	Both	Neither	7	7	7	7	Both	Both	11	14	11	15	Both	Both
2012 08 29	367309440	SEA HAWK	60.5339	-151.623	Y	6	2	49	7	18	9	45	Both	Neither	18	20	18	22	Both	Both	21	26	21	29	Both	Both
2012 09 26	367309220	ALTAIR	61.2365	-149.901	Y	12	1	47	7	10	14	18	Both	Neither	15	15	24	26	Both	Both	17	18	26	29	Both	Both
2012 06 20	366934290	SANDRA FOSS	57.9203	-152.807	Y	13	3	46	23	26	37	40	Both	Neither	17	17	29	30	Both	Both	18	19	30	31	Both	Both
2012 06 20	366932970	STACEY FOSS	57.5964	-154.566	Y	11.5	3	46	30	33	50	52	Both	Neither	23	23	41	41	Both	Both	24	25	42	43	Both	Both
2012 02 08	367190440	LE CHEVAL ROUGE	57.777	-152.415	Y	12.594	3	43	23	26	37	40	Both	Neither	17	17	29	29	Both	Both	18	19	30	31	Both	Both
2012 02 15	367190440	LE CHEVAL ROUGE	57.777	-152.415	Y	12.594	3	43	23	26	37	40	Both	Neither	17	17	29	29	Both	Both	18	19	30	31	Both	Both
2012 02 29	367190440	LE CHEVAL ROUGE	57.777	-152.415	Y	12.594	3	43	23	26	37	40	Both	Neither	17	17	29	29	Both	Both	18	19	30	31	Both	Both
2012 03 07	367190440	LE CHEVAL ROUGE	57.777	-152.415	Y	12.594	3	43	23	26	37	40	Both	Neither	17	17	29	29	Both	Both	18	19	30	31	Both	Both
2012 03 14	367190440	LE CHEVAL ROUGE	57.777	-152.415	Y	12.594	3	43	23	26	37	40	Both	Neither	17	17	29	29	Both	Both	18	19	30	31	Both	Both
2012 03 21	367190440	LE CHEVAL ROUGE	57.777	-152.415	Y	12.594	3	43	23	26	37	40	Both	Neither	17	17	29	29	Both	Both	18	19	30	31	Both	Both
2012 05 23	303304000	OCEAN MARINER	57.9203	-152.5	Y	9.2	3	40	30	32	48	51	Both	Neither	21	22	36	38	Both	Both	22	24	38	40	Both	Both
2012 05 30	303304000	OCEAN MARINER	60.1186	-149.426	Y	9.2	4	40	36	38	61	64	Both	Neither	27	28	49	50	Both	Both	28	30	50	53	Both	Both
2012 09 05	303304000	OCEAN MARINER	61.2249	-149.91	Y	9.2	1	40	7	12	18	22	Both	Neither	18	19	30	33	Both	Both	20	23	32	37	Both	Both
2012 09 12	303304000	OCEAN MARINER	56.9214	-155.964	Y	9.2	3	40	46	48	81	84	Both	Neither	37	38	70	71	Both	Both	38	40	71	73	Both	Both
2012 10 05	303304000	OCEAN MARINER	61.2249	-149.91	Y	9.2	1	40	7	12	18	22	Both	Neither	18	19	30	33	Both	Both	20	23	32	37	Both	Both
2012 10 12	303304000	OCEAN MARINER	56.941	-155.918	Y	9.2	3	40	46	48	81	84	Both	Neither	37	38	69	70	Both	Both	38	39	70	73	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 02 29	369959000	OSCAR DYSON	57.7837	-152.426	Y	12.386	3	38	23	26	37	40	Both	Neither	17	18	29	30	Both	Both	18	19	30	31	Both	Both
2012 03 28	369959000	OSCAR DYSON	57.7837	-152.426	Y	12.386	3	38	23	26	37	40	Both	Neither	17	18	29	30	Both	Both	18	19	30	31	Both	Both
2012 04 04	369959000	OSCAR DYSON	57.7837	-152.426	Y	12.386	3	38	23	26	37	40	Both	Neither	17	18	29	30	Both	Both	18	19	30	31	Both	Both
2012 04 18	369959000	OSCAR DYSON	57.7837	-152.426	Y	12.386	3	38	23	26	37	40	Both	Neither	17	18	29	30	Both	Both	18	19	30	31	Both	Both
2012 04 25	369959000	OSCAR DYSON	57.731	-152.513	Y	12.386	3	38	24	27	38	41	Both	Neither	18	18	30	31	Both	Both	18	19	31	32	Both	Both
2012 01 04	366864250	CHAHUNTA	59.7466	-149.427	Y	12.376	4	38	25	28	41	43	Both	Neither	19	19	32	33	Both	Both	20	20	33	35	Both	Both
2012 01 04	366864250	CHAHUNTA	59.7466	-149.427	Y	12.376	4	38	25	28	41	43	Both	Neither	19	19	32	33	Both	Both	20	20	33	35	Both	Both
2012 02 22	366864250	CHAHUNTA	60.1192	-149.432	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 03 21	366864250	CHAHUNTA	61.2391	-149.916	Y	12.376	1	38	7	9	14	18	Both	Neither	15	15	23	25	Both	Both	16	17	25	28	Both	Both
2012 06 06	366864250	CHAHUNTA	60.1176	-149.427	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	38	40	Both	Both
2012 06 27	366864250	CHAHUNTA	59.7885	-152.041	Y	12.376	2	38	10	14	11	18	Both	Neither	7	7	7	7	Both	Both	8	9	9	10	Both	Both
2012 07 18	366864250	CHAHUNTA	60.5818	-151.851	Y	12.376	2	38	6	8	8	13	Both	Neither	10	11	10	12	Both	Both	12	13	12	14	Both	Both
2012 07 25	366864250	CHAHUNTA	61.2135	-149.955	Y	12.376	1	38	7	9	13	16	Both	Neither	14	15	23	24	Both	Both	16	17	25	27	Both	Both
2012 08 29	366864250	CHAHUNTA	60.1191	-149.432	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 09 05	366864250	CHAHUNTA	60.1191	-149.432	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 10 05	366864250	CHAHUNTA	60.1191	-149.432	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 10 25	366864250	CHAHUNTA	60.1193	-149.433	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 11 07	366864250	CHAHUNTA	60.1192	-149.432	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 12 12	366864250	CHAHUNTA	60.1194	-149.426	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 12 19	366864250	CHAHUNTA	60.1192	-149.432	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 02 08	367048010	CHAMPION	60.7421	-151.311	N	12	1	38	3	3	4	6	Both	Neither	9	9	9	10	Both	Both	10	11	12	12	Both	Both
2012 03 14	367048010	CHAMPION	60.5888	-151.449	N	12	2	38	3	4	4	8	Both	Neither	8	8	8	8	Both	Both	9	11	10	11	Both	Both
2012 03 28	367048010	CHAMPION	60.6368	-151.365	N	12	2	38	3	4	4	8	Both	Neither	8	8	8	9	Both	Both	10	11	10	11	Both	Both
2012 11 14	367048010	CHAMPION	60.7543	-151.311	N	12	1	38	3	3	3	6	Both	Neither	9	9	9	10	Both	Both	10	11	12	12	Both	Both
2012 11 21	367048010	CHAMPION	60.8299	-151.606	N	12	1	38	3	3	4	7	Both	Neither	9	9	10	11	Both	Both	11	12	13	13	Both	Both
2012 11 28	367048010	CHAMPION	60.8314	-151.603	N	12	1	38	3	3	4	7	Both	Neither	9	9	10	11	Both	Both	11	12	13	13	Both	Both
2012 12 05	367048010	CHAMPION	60.7421	-151.311	N	12	1	38	3	3	4	6	Both	Neither	9	9	9	10	Both	Both	10	11	12	12	Both	Both
2012 12 12	367048010	CHAMPION	60.7527	-151.309	N	12	1	38	3	3	3	6	Both	Neither	9	9	9	10	Both	Both	10	11	12	12	Both	Both
2012 12 19	367048010	CHAMPION	60.8292	-151.486	N	12	1	38	3	3	3	5	Both	Neither	9	9	10	10	Both	Both	11	12	12	13	Both	Both
2012 12 26	367048010	CHAMPION	60.6383	-151.365	N	12	2	38	3	4	4	8	Both	Neither	8	8	8	9	Both	Both	10	11	10	11	Both	Both
2012 02 08	367098550	HEIDI L BRUSCO	57.7317	-152.523	Y	12.376	3	38	24	27	38	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	32	Both	Both
2012 05 02	367098550	HEIDI L BRUSCO	58.2681	-151.437	Y	12.376	4	38	19	22	29	32	Both	Neither	13	14	21	22	Both	Both	14	15	22	23	Both	Both
2012 05 30	367098550	HEIDI L BRUSCO	57.7312	-152.524	Y	12.376	3	38	24	27	38	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	32	Both	Both
2012 06 13	367098550	HEIDI L BRUSCO	57.731	-152.524	Y	12.376	3	38	24	27	38	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	32	Both	Both
2012 07 18	367098550	HEIDI L BRUSCO	60.1189	-149.426	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 07 25	367098550	HEIDI L BRUSCO	60.6157	-146.469	Y	12.376	6	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 08	367098550	HEIDI L BRUSCO	58.2633	-151.442	Y	12.376	4	38	19	23	30	32	Both	Neither	13	14	21	22	Both	Both	14	15	22	24	Both	Both
2012 08 15	367098550	HEIDI L BRUSCO	61.0743	-146.659	Y	12.376	6	38	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 22	367098550	HEIDI L BRUSCO	57.731	-152.523	Y	12.376	3	38	24	27	38	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	32	Both	Both
2012 04 25	366622140	MAIA H	60.1192	-149.426	Y	11	4	38	31	33	52	53	Both	Neither	24	24	42	43	Both	Both	24	25	43	45	Both	Both
2012 05 23	366622140	MAIA H	60.1193	-149.426	Y	11	4	38	31	33	52	53	Both	Neither	24	24	42	43	Both	Both	24	25	43	45	Both	Both
2012 11 07	366622140	MAIA H	57.7771	-152.415	Y	11	3	38	26	29	42	44	Both	Neither	19	19	32	33	Both	Both	20	21	33	35	Both	Both
2012 06 13	367522510	OCEAN EAGLE	60.0425	-149.379	Y	12.376	4	38	27	30	45	48	Both	Neither	21	21	36	37	Both	Both	22	22	37	39	Both	Both
2012 06 20	367522510	OCEAN EAGLE	60.1188	-149.426	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 08 01	367522510	OCEAN EAGLE	60.119	-149.426	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 08 29	367522510	OCEAN EAGLE	57.7315	-152.523	Y	12.376	3	38	24	27	38	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	32	Both	Both

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 09 05	367522510	OCEAN EAGLE	60.1191	-149.427	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 10 05	367522510	OCEAN EAGLE	60.1192	-149.427	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 11 21	367522510	OCEAN EAGLE	60.119	-149.426	Y	12.376	4	38	27	30	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Both
2012 06 27	367131980	POLAR WIND	56.8969	-154.249	Y	12.32	3	37	31	34	54	57	Both	Neither	25	26	45	46	Both	Both	26	27	46	48	Both	Both
2012 08 01	367131980	POLAR WIND	58.076	-153.996	Y	12.32	3	37	24	27	38	41	Both	Neither	18	18	30	31	Both	Both	18	19	31	32	Both	Both
2012 08 22	367131980	POLAR WIND	56.8969	-154.249	Y	12.32	3	37	31	34	54	57	Both	Neither	25	26	45	46	Both	Both	26	27	46	48	Both	Both
2012 09 12	367131980	POLAR WIND	56.6096	-155.604	Y	12.32	3	37	36	39	63	66	Both	Neither	30	30	55	56	Both	Both	31	31	56	57	Both	Both
2012 10 12	367131980	POLAR WIND	56.6096	-155.604	Y	12.32	3	37	36	39	63	66	Both	Neither	30	30	55	56	Both	Both	31	31	56	57	Both	Both
2012 11 07	367131980	POLAR WIND	61.129	-150.719	Y	12.32	1	37	7	10	20	26	Both	Neither	13	16	25	30	Both	Both	15	18	27	32	Both	Both
2012 12 19	367131980	POLAR WIND	59.5747	-150.531	Y	12.32	4	37	21	24	33	36	Both	Neither	15	15	25	25	Both	Both	16	17	26	27	Both	Both
2012 12 26	367131980	POLAR WIND	60.5481	-145.768	Y	12.32	6	37	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 14	338726000	ISLAND CHAMPION	59.6062	-151.415	Y	12.262	2	36	12	13	14	15	Both	Neither	5	5	5	6	Both	Both	7	8	8	9	Both	Both
2012 08 22	338726000	ISLAND CHAMPION	61.2247	-149.91	Y	12.262	1	36	7	9	14	18	Both	Neither	15	15	23	25	Both	Both	16	17	26	28	Both	Both
2012 01 18	303284000	Discovery	59.35	-151.817	N	12	2	32	9	12	12	14	Both	Neither	3	3	3	3	Both	Both	3	4	4	4	Both	Both
2012 02 08	303284000	Discovery	59.3546	-151.817	N	12	2	32	9	12	11	14	Both	Neither	3	3	3	3	Both	Both	4	4	4	4	Both	Both
2012 02 22	303284000	Discovery	59.3533	-151.811	N	12	2	32	9	12	11	14	Both	Neither	3	3	3	3	Both	Both	4	4	4	5	Both	Both
2012 04 18	303284000	Discovery	59.3504	-151.824	N	12	2	32	9	12	12	14	Both	Neither	3	3	3	3	Both	Both	3	4	4	4	Both	Both
2012 11 07	303284000	Discovery	60.9172	-151.132	N	12	1	32	2	2	3	3	Both	Neither	10	10	12	12	Both	Both	11	12	14	15	Both	Both
2012 11 14	303284000	Discovery	59.3595	-151.82	N	12	2	32	9	12	11	14	Both	Neither	3	3	3	3	Both	Both	4	4	4	5	Both	Both
2012 11 28	303284000	Discovery	59.3512	-151.822	N	12	2	32	9	12	12	14	Both	Neither	3	3	3	3	Both	Both	3	4	4	4	Both	Both
2012 12 05	303284000	Discovery	59.3522	-151.815	N	12	2	32	9	12	12	14	Both	Neither	3	3	3	3	Both	Both	4	4	4	4	Both	Both
2012 12 12	303284000	Discovery	59.3518	-151.821	N	12	2	32	9	12	12	14	Both	Neither	3	3	3	3	Both	Both	3	4	4	4	Both	Both
2012 12 26	303284000	Discovery	59.3557	-151.818	N	12	2	32	9	12	11	14	Both	Neither	3	3	3	3	Both	Both	4	4	4	5	Both	Both
2012 01 04	367008020	ARTHUR BRUSCO	58.4749	-151.089	Y	8	4	32	28	29	41	48	Both	Neither	17	18	28	30	Both	Both	18	20	29	33	Both	Both
2012 01 04	367008020	ARTHUR BRUSCO	58.4749	-151.089	Y	8	4	32	28	29	41	48	Both	Neither	17	18	28	30	Both	Both	18	20	29	33	Both	Both
2012 01 18	367008020	ARTHUR BRUSCO	60.1183	-149.427	Y	8	4	32	42	42	68	76	Both	Neither	31	32	56	57	Both	Both	32	34	57	60	Both	Both
2012 02 01	367008020	ARTHUR BRUSCO	60.5383	-146.651	Y	8	6	32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 22	367008020	ARTHUR BRUSCO	60.1189	-149.426	Y	8	4	32	42	42	68	76	Both	Neither	31	32	56	57	Both	Both	32	34	57	60	Both	Both
2012 03 07	367008020	ARTHUR BRUSCO	61.1216	-146.309	Y	8	6	32	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 14	367008020	ARTHUR BRUSCO	57.7313	-152.524	Y	8	3	32	36	37	57	64	Both	Neither	25	26	44	46	Both	Both	26	28	46	49	Both	Both
2012 03 28	367008020	ARTHUR BRUSCO	58.2263	-151.044	Y	8	4	32	31	31	46	53	Both	Neither	20	21	33	35	Both	Both	21	23	35	38	Both	Both
2012 04 25	367133090	The Green Provider	59.0732	-150.031	Y	11.6	4	32	22	25	34	36	Both	Neither	15	16	25	26	Both	Both	16	17	26	27	Both	Both
2012 07 25	367133090	The Green Provider	60.8518	-151.233	Y	11.6	1	32	5	7	8	16	Both	Neither	11	13	14	19	Both	Both	13	15	16	22	Both	Both
2012 06 27	369960000	FAIRWEATHER	58.0256	-152.061	Y	12.026	3	31	22	25	34	36	Both	Neither	15	16	25	26	Both	Both	16	17	26	28	Both	Both
2012 09 12	369960000	FAIRWEATHER	58.0516	-152.493	Y	12.026	3	31	23	26	37	39	Both	Neither	17	17	28	29	Both	Both	18	18	29	31	Both	Both
2012 09 19	369960000	FAIRWEATHER	58.0976	-152.408	Y	12.026	3	31	23	26	36	39	Both	Neither	16	17	27	28	Both	Both	17	18	28	30	Both	Both
2012 10 05	369960000	FAIRWEATHER	57.7294	-152.516	Y	12.026	3	31	24	27	40	42	Both	Neither	18	19	31	32	Both	Both	19	20	32	33	Both	Both
2012 10 12	369960000	FAIRWEATHER	58.0549	-152.484	Y	12.026	3	31	23	26	37	39	Both	Neither	17	17	28	29	Both	Both	18	18	29	30	Both	Both
2012 10 19	369960000	FAIRWEATHER	58.1003	-152.404	Y	12.026	3	31	23	26	36	39	Both	Neither	16	17	27	28	Both	Both	17	18	28	30	Both	Both
2012 08 15	303935000	RAINIER-NOAA	57.6273	-154.515	Y	12.026	3	31	28	31	47	50	Both	Neither	22	22	39	39	Both	Both	23	23	39	41	Both	Both
2012 09 19	303935000	RAINIER-NOAA	57.969	-152.922	Y	12.026	3	31	25	28	40	43	Both	Neither	19	19	32	32	Both	Both	19	20	33	34	Both	Both
2012 10 25	303935000	RAINIER-NOAA	57.8933	-152.652	Y	12.026	3	31	24	27	39	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	33	Both	Both
2012 05 23	367498540	WENDY O	60.0747	-151.912	Y	10	2	30	9	15	11	22	Both	Neither	9	10	10	11	Both	Both	11	13	12	14	Both	Tanker Only
2012 05 30	367498540	WENDY O	57.6827	-153.801	Y	10	3	30	31	33	51	52	Both	Neither	23	23	40	41	Both	Both	24	25	41	44	Both	Tanker Only
2012 02 29	366887110	SENECA	60.1189	-149.431	Y	12.32	4	30	28	31	46	49	Both	Neither	21	22	38	38	Both	Both	22	23	39	40	Both	Tanker Only
2012 11 14	367399110	SESOK	59.6163	-151.451	Y	11.351	2	30	12	13	15	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Tanker Only

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 05 23	367309280	NOKEA	61.1221	-150.786	Y	6	1	30	9	24	34	81	Both	Neither	21	28	46	58	Both	Both	24	33	49	65	Both	Tanker Only
2012 09 26	367309280	NOKEA	61.2463	-149.9	Y	6	1	30	9	20	24	77	Both	Neither	26	28	44	69	Both	Both	30	33	48	76	Both	Tanker Only
2012 11 07	367546770	Soveriegn	60.64	-151.365	Y	11.934	2	30	5	6	7	12	Both	Neither	11	12	11	14	Both	Both	13	15	13	17	Both	Tanker Only
2012 02 29	367428840	ETHAN B	60.1178	-149.437	Y	11.902	4	29	28	31	48	50	Both	Neither	22	22	39	40	Both	Both	23	24	40	41	Both	Tanker Only
2012 03 07	367428840	ETHAN B	57.7762	-152.414	Y	11.902	3	29	24	27	39	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	33	Both	Tanker Only
2012 03 14	367428840	ETHAN B	57.7764	-152.414	Y	11.902	3	29	24	27	39	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	33	Both	Tanker Only
2012 03 21	367428840	ETHAN B	57.7764	-152.414	Y	11.902	3	29	24	27	39	41	Both	Neither	18	18	30	31	Both	Both	19	19	31	33	Both	Tanker Only
2012 01 18	367322830	CHUKCHI SEA	59.8848	-148.641	Y	7	5	27	45	49	75	85	Both	Neither	34	35	61	63	Both	Both	35	37	63	67	Both	Neither
2012 01 25	367322830	CHUKCHI SEA	60.1196	-149.433	Y	7	4	27	46	50	77	87	Both	Neither	35	36	63	65	Both	Both	36	38	65	69	Both	Neither
2012 05 02	367322830	CHUKCHI SEA	59.5289	-150.581	Y	7	4	27	35	38	53	63	Both	Neither	23	24	39	41	Both	Both	24	26	40	45	Both	Neither
2012 08 08	367322830	CHUKCHI SEA	59.5289	-150.581	Y	7	4	27	35	38	53	63	Both	Neither	23	24	39	41	Both	Both	24	26	40	45	Both	Neither
2012 04 04	367098050	GRETCHEN H	60.1309	-152.207	Y	10	2	27	9	15	10	22	Both	Neither	10	11	10	11	Both	Both	12	14	13	15	Both	Neither
2012 04 25	367098050	GRETCHEN H	59.5069	-149.775	Y	10	4	27	27	29	43	44	Both	Neither	19	19	32	33	Both	Both	20	21	33	35	Both	Neither
2012 07 18	367098050	GRETCHEN H	60.5823	-151.846	Y	10	2	27	6	9	8	17	Both	Neither	11	13	11	14	Both	Both	14	16	14	17	Both	Neither
2012 07 25	367098050	GRETCHEN H	61.2249	-149.91	Y	10	1	27	7	11	17	19	Both	Neither	17	18	28	30	Both	Both	19	21	31	34	Both	Neither
2012 09 26	367098050	GRETCHEN H	59.5888	-151.505	Y	10	2	27	14	15	17	17	Both	Neither	6	6	6	6	Both	Both	8	9	8	10	Both	Neither
2012 11 14	367098050	GRETCHEN H	60.6762	-151.395	Y	10	2	27	5	7	7	14	Both	Neither	12	14	13	16	Both	Both	15	16	15	19	Both	Neither
2012 01 04	367103740	KRYSTAL SEA	60.7783	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 04	367103740	KRYSTAL SEA	60.7783	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 18	367103740	KRYSTAL SEA	60.773	-148.144	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 25	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 01	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 08	367103740	KRYSTAL SEA	60.7782	-148.698	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 22	367103740	KRYSTAL SEA	60.7784	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 02 29	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 07	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 14	367103740	KRYSTAL SEA	60.7784	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 21	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 28	367103740	KRYSTAL SEA	60.7782	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 04	367103740	KRYSTAL SEA	60.7782	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 18	367103740	KRYSTAL SEA	60.7783	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 04 25	367103740	KRYSTAL SEA	60.7782	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 02	367103740	KRYSTAL SEA	60.0632	-148.009	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 16	367103740	KRYSTAL SEA	60.7782	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 30	367103740	KRYSTAL SEA	60.6256	-146.388	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 06	367103740	KRYSTAL SEA	60.7784	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 13	367103740	KRYSTAL SEA	60.7783	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 20	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	367103740	KRYSTAL SEA	60.7783	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 11	367103740	KRYSTAL SEA	60.7866	-148.277	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 18	367103740	KRYSTAL SEA	60.6144	-146.303	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 25	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 01	367103740	KRYSTAL SEA	60.6282	-146.415	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 08	367103740	KRYSTAL SEA	60.0631	-148.009	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 15	367103740	KRYSTAL SEA	60.6444	-146.554	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	Upper Cook Inlet Incident: Total Time To Incident 50th With (hr)	50th Ag. (hr)	90th With (hr)	90th Ag. (hr)	Capability 50th vessel	Capability 90th vessel	Kachemak Bay Incident: Total Time To Incident 50th With (hr)	50th Ag. (hr)	90th With (hr)	90th Ag. (hr)	Capability 50th vessel	Capability 90th vessel	Kennedy Entrance Incident: Total Time To Incident 50th With (hr)	50th Ag. (hr)	90th With (hr)	90th Ag. (hr)	Capability 50th vessel	Capability 90th vessel
2012 08 22	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 29	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 05	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 12	367103740	KRYSTAL SEA	60.7782	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 19	367103740	KRYSTAL SEA	60.7978	-146.846	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	367103740	KRYSTAL SEA	60.7784	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 05	367103740	KRYSTAL SEA	60.5529	-145.762	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 12	367103740	KRYSTAL SEA	60.7783	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 19	367103740	KRYSTAL SEA	60.8	-146.848	Y	11.776	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 25	367103740	KRYSTAL SEA	60.7783	-148.669	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 07	367103740	KRYSTAL SEA	60.7784	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 14	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 21	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 28	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 05	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 12	367103740	KRYSTAL SEA	60.0851	-149.356	Y	11.776	4	27	28	31	48	50	Both	Neither	22	22	39	39	Both	Both	23	24	40	41	Both	Neither
2012 12 19	367103740	KRYSTAL SEA	60.0875	-149.356	Y	11.776	4	27	28	31	48	50	Both	Neither	22	22	39	40	Both	Both	23	24	40	41	Both	Neither
2012 12 26	367103740	KRYSTAL SEA	60.7783	-148.699	Y	11.776	7	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 30	367103880	TRIUMPH	57.6155	-153.897	Y	12	3	27	27	30	44	47	Both	Neither	20	21	36	36	Both	Both	21	22	37	38	Both	Neither
2012 06 06	367103880	TRIUMPH	60.1182	-149.426	Y	12	4	27	28	31	47	50	Both	Neither	22	22	39	39	Both	Both	23	24	40	41	Both	Neither
2012 09 12	367103880	TRIUMPH	57.9853	-152.054	Y	12	3	27	22	25	34	37	Both	Neither	16	16	26	26	Both	Both	16	17	27	28	Both	Neither
2012 09 26	367103880	TRIUMPH	60.3979	-147.904	Y	12	6	27	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 12	367103880	TRIUMPH	57.9957	-152.104	Y	12	3	27	22	25	34	37	Both	Neither	16	16	26	26	Both	Both	16	17	27	28	Both	Neither
2012 11 07	367103880	TRIUMPH	60.1198	-149.435	Y	12	4	27	28	31	47	50	Both	Neither	22	22	39	39	Both	Both	23	24	40	41	Both	Neither
2012 11 14	367103880	TRIUMPH	59.6062	-151.415	Y	12	2	27	12	13	14	15	Both	Neither	5	5	5	6	Both	Both	7	9	8	9	Both	Neither
2012 06 27	367162920	SAM B	61.2293	-149.9	Y	11.763	1	26	7	10	15	18	Both	Neither	15	16	24	27	Both	Both	17	18	27	29	Both	Neither
2012 07 11	367162920	SAM B	61.1736	-150.159	Y	11.763	1	26	7	10	16	21	Both	Neither	14	16	26	29	Both	Both	16	18	28	32	Both	Neither
2012 09 05	367162920	SAM B	60.7545	-151.307	Y	11.763	1	26	5	6	6	10	Both	Neither	11	11	12	14	Both	Both	13	14	14	16	Both	Neither
2012 09 12	367162920	SAM B	59.6148	-151.448	Y	11.763	2	26	12	13	14	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	9	Both	Neither
2012 09 19	367162920	SAM B	60.7766	-151.72	Y	11.763	1	26	6	7	10	18	Both	Neither	12	13	15	19	Both	Both	13	15	17	22	Both	Neither
2012 09 26	367162920	SAM B	61.2297	-149.899	Y	11.763	1	26	7	10	15	18	Both	Neither	15	16	25	27	Both	Both	17	18	27	29	Both	Neither
2012 10 05	367162920	SAM B	60.7545	-151.307	Y	11.763	1	26	5	6	6	10	Both	Neither	11	11	12	14	Both	Both	13	14	14	16	Both	Neither
2012 10 12	367162920	SAM B	59.6148	-151.448	Y	11.763	2	26	12	13	14	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	9	Both	Neither
2012 10 19	367162920	SAM B	60.7767	-151.72	Y	11.763	1	26	6	7	10	18	Both	Neither	12	13	15	19	Both	Both	13	15	17	22	Both	Neither
2012 11 07	367162920	SAM B	61.2292	-149.901	Y	11.763	1	26	7	10	15	18	Both	Neither	15	16	24	27	Both	Both	17	18	27	29	Both	Neither
2012 11 14	367162920	SAM B	61.2107	-150.035	Y	11.763	1	26	7	9	14	17	Both	Neither	15	15	24	25	Both	Both	17	18	26	28	Both	Neither
2012 02 22	367058210	ISLAND SCOUT	60.1697	-147.666	Y	12.376	6	25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	367058210	ISLAND SCOUT	61.2386	-149.89	Y	12.376	1	25	7	9	14	18	Both	Neither	15	15	24	26	Both	Both	16	17	26	29	Both	Neither
2012 05 30	367058210	ISLAND SCOUT	60.2957	-147.974	Y	12.376	6	25	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	367058210	ISLAND SCOUT	60.9903	-151.064	Y	12.376	1	25	6	8	14	19	Both	Neither	12	14	19	23	Both	Both	13	16	21	25	Both	Neither
2012 07 25	367058210	ISLAND SCOUT	61.2248	-149.91	Y	12.376	1	25	7	9	14	17	Both	Neither	15	15	23	25	Both	Both	16	17	25	28	Both	Neither
2012 09 26	367058210	ISLAND SCOUT	61.2393	-149.889	Y	12.376	1	25	7	9	14	18	Both	Neither	15	15	24	26	Both	Both	16	17	26	29	Both	Neither
2012 11 14	366379000	Cavek	60.1159	-149.428	Y	10	4	24	33	36	57	57	Both	Neither	25	26	46	46	Both	Both	26	28	47	49	Both	Neither
2012 03 07	367484440	MILLIE CRUZ	60.0661	-149.402	Y	10	4	24	33	35	56	56	Both	Neither	25	25	45	46	Both	Both	26	27	46	48	Both	Neither
2012 03 14	367484440	MILLIE CRUZ	59.605	-151.422	Y	10	2	24	14	14	16	16	Both	Neither	6	6	6	6	Both	Both	8	10	8	10	Both	Neither
2012 04 18	367484440	MILLIE CRUZ	59.615	-151.448	Y	10	2	24	14	14	16	16	Both	Neither	6	6	6	6	Both	Both	8	10	8	10	Both	Neither

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 05 16	367484440	MILLIE CRUZ	61.2524	-149.881	Y	10	1	24	7	12	18	21	Both	Neither	17	18	29	32	Both	Both	19	21	31	36	Both	Neither
2012 05 23	367484440	MILLIE CRUZ	61.1736	-150.159	Y	10	1	24	8	12	18	23	Both	Neither	16	18	30	35	Both	Both	19	22	32	38	Both	Neither
2012 05 30	367484440	MILLIE CRUZ	61.2355	-149.893	Y	10	1	24	7	11	17	20	Both	Neither	17	18	28	31	Both	Both	19	21	31	35	Both	Neither
2012 06 06	367484440	MILLIE CRUZ	61.1653	-150.08	Y	10	1	24	7	12	18	21	Both	Neither	16	18	29	33	Both	Both	19	21	31	36	Both	Neither
2012 06 13	367484440	MILLIE CRUZ	61.1662	-150.102	Y	10	1	24	7	12	18	22	Both	Neither	16	18	29	33	Both	Both	19	21	31	36	Both	Neither
2012 06 20	367484440	MILLIE CRUZ	61.1685	-150.123	Y	10	1	24	7	12	18	22	Both	Neither	16	18	29	34	Both	Both	19	21	32	37	Both	Neither
2012 06 27	367484440	MILLIE CRUZ	61.1688	-150.154	Y	10	1	24	8	12	18	23	Both	Neither	16	18	30	35	Both	Both	19	22	32	38	Both	Neither
2012 07 11	367484440	MILLIE CRUZ	61.2684	-149.914	Y	10	1	24	7	12	18	21	Both	Neither	17	18	29	33	Both	Both	19	21	31	36	Both	Neither
2012 07 18	367484440	MILLIE CRUZ	61.2684	-149.914	Y	10	1	24	7	12	18	21	Both	Neither	17	18	29	33	Both	Both	19	21	31	36	Both	Neither
2012 07 25	367484440	MILLIE CRUZ	61.2684	-149.914	Y	10	1	24	7	12	18	21	Both	Neither	17	18	29	33	Both	Both	19	21	31	36	Both	Neither
2012 08 01	367484440	MILLIE CRUZ	61.2684	-149.914	Y	10	1	24	7	12	18	21	Both	Neither	17	18	29	33	Both	Both	19	21	31	36	Both	Neither
2012 09 19	367484440	MILLIE CRUZ	61.2921	-149.916	Y	10	1	24	8	12	18	23	Both	Neither	18	18	29	34	Both	Both	20	21	32	38	Both	Neither
2012 09 26	367484440	MILLIE CRUZ	61.2683	-149.914	Y	10	1	24	7	12	18	21	Both	Neither	17	18	29	33	Both	Both	19	21	31	36	Both	Neither
2012 10 19	367484440	MILLIE CRUZ	61.2921	-149.916	Y	10	1	24	8	12	18	23	Both	Neither	18	18	29	34	Both	Both	20	21	32	38	Both	Neither
2012 10 25	367484440	MILLIE CRUZ	61.0096	-151.166	Y	10	1	24	6	9	16	22	Both	Neither	13	16	23	25	Both	Both	16	18	26	28	Both	Neither
2012 11 07	367484440	MILLIE CRUZ	59.6151	-151.448	Y	10	2	24	14	14	16	16	Both	Neither	6	6	6	6	Both	Both	8	10	8	10	Both	Neither
2012 11 14	367484440	MILLIE CRUZ	59.6172	-151.451	Y	10	2	24	14	14	16	16	Both	Neither	6	6	6	6	Both	Both	8	10	8	10	Both	Neither
2012 04 18	367105510	HENRY BRUSCO	57.7316	-152.523	Y	11.646	3	24	25	28	41	43	Both	Neither	19	19	32	33	Both	Both	19	20	33	34	Both	Neither
2012 04 25	367105510	HENRY BRUSCO	58.0899	-151.614	Y	11.646	4	24	22	25	34	36	Both	Neither	15	15	25	25	Both	Both	16	17	26	27	Both	Neither
2012 09 19	367105510	HENRY BRUSCO	61.1216	-146.307	Y	11.646	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 09 26	367105510	HENRY BRUSCO	61.1216	-146.307	Y	11.646	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 10 19	367105510	HENRY BRUSCO	61.1216	-146.307	Y	11.646	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 12 12	367105510	HENRY BRUSCO	60.119	-149.426	Y	11.646	4	24	29	32	49	51	Both	Neither	22	23	40	40	Both	Both	23	24	41	42	Both	Neither
2012 12 19	367105510	HENRY BRUSCO	57.7768	-152.414	Y	11.646	3	24	25	28	40	42	Both	Neither	18	18	31	31	Both	Both	19	20	32	33	Both	Neither
2012 12 26	367105510	HENRY BRUSCO	57.7315	-152.524	Y	11.646	3	24	25	28	41	43	Both	Neither	19	19	32	33	Both	Both	19	20	33	34	Both	Neither
2012 06 27	366983840	LOIS H	61.1216	-146.31	Y	11.646	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 07 25	366983840	LOIS H	57.7752	-154.122	Y	11.646	3	24	27	30	45	47	Both	Neither	21	21	36	36	Both	Both	21	22	37	38	Both	Neither
2012 09 26	366983840	LOIS H	59.6049	-151.422	Y	11.646	2	24	12	13	14	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	9	Both	Neither
2012 12 12	366983840	LOIS H	57.5574	-153.939	Y	11.646	3	24	28	31	47	49	Both	Neither	21	22	38	38	Both	Both	22	23	38	40	Both	Neither
2012 12 26	366983840	LOIS H	60.5481	-145.768	Y	11.646	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 03 28	303496000	SAMSON MARINER	57.7688	-152.444	Y	11.58	3	24	25	28	40	43	Both	Neither	18	19	31	32	Both	Both	19	20	32	34	Both	Neither
2012 05 16	303496000	SAMSON MARINER	60.1189	-149.426	Y	11.58	4	24	29	32	49	51	Both	Neither	23	23	40	41	Both	Both	23	24	41	42	Both	Neither
2012 05 23	303496000	SAMSON MARINER	57.7318	-152.523	Y	11.58	3	24	25	28	41	43	Both	Neither	19	19	32	33	Both	Both	19	20	33	35	Both	Neither
2012 06 13	303496000	SAMSON MARINER	57.7309	-152.524	Y	11.58	3	24	25	28	41	43	Both	Neither	19	19	32	33	Both	Both	20	20	33	35	Both	Neither
2012 06 27	303496000	SAMSON MARINER	57.9126	-153.836	Y	11.58	3	24	26	29	42	44	Both	Neither	19	19	33	33	Both	Both	20	21	34	35	Both	Neither
2012 07 11	303496000	SAMSON MARINER	57.673	-153.96	Y	11.58	3	24	27	30	45	48	Both	Neither	21	21	36	37	Both	Both	22	22	37	39	Both	Neither
2012 08 01	303496000	SAMSON MARINER	59.8486	-149.429	Y	11.58	4	24	27	30	45	47	Both	Neither	21	21	36	36	Both	Both	21	22	37	38	Both	Neither
2012 09 12	303496000	SAMSON MARINER	58.2821	-151.391	Y	11.58	4	24	21	24	31	34	Both	Neither	14	14	22	23	Both	Both	15	16	23	25	Both	Neither
2012 09 19	303496000	SAMSON MARINER	60.1189	-149.426	Y	11.58	4	24	29	32	49	51	Both	Neither	23	23	40	41	Both	Both	23	24	41	42	Both	Neither
2012 10 12	303496000	SAMSON MARINER	58.2621	-151.423	Y	11.58	4	24	21	24	32	34	Both	Neither	14	14	23	23	Both	Both	15	16	23	25	Both	Neither
2012 10 19	303496000	SAMSON MARINER	60.1189	-149.426	Y	11.58	4	24	29	32	49	51	Both	Neither	23	23	40	41	Both	Both	23	24	41	42	Both	Neither
2012 11 07	303496000	SAMSON MARINER	57.7323	-152.522	Y	11.58	3	24	25	28	41	43	Both	Neither	19	19	32	33	Both	Both	19	20	33	34	Both	Neither
2012 11 28	303496000	SAMSON MARINER	56.9228	-155.988	Y	11.58	3	24	37	40	66	68	Both	Neither	31	31	57	57	Both	Both	31	32	57	59	Both	Neither
2012 02 22	366889340	POINT OLIKTOK	60.0151	-149.359	Y	6.3	4	24	49	56	82	94	Both	Neither	36	38	67	68	Both	Both	38	41	68	73	Both	Neither
2012 02 29	366889340	POINT OLIKTOK	60.1191	-149.427	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 03 14	366889340	POINT OLIKTOK	60.1188	-149.431	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 03 21	366889340	POINT OLIKTOK	60.1187	-149.432	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 03 28	366889340	POINT OLIKTOK	60.1189	-149.429	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 04 04	366889340	POINT OLIKTOK	60.1172	-149.431	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 04 18	366889340	POINT OLIKTOK	60.1172	-149.431	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 04 25	366889340	POINT OLIKTOK	60.1172	-149.431	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 05 02	366889340	POINT OLIKTOK	61.1215	-146.307	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 16	366889340	POINT OLIKTOK	61.1132	-146.431	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 23	366889340	POINT OLIKTOK	61.1242	-146.36	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 30	366889340	POINT OLIKTOK	61.1242	-146.359	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 06	366889340	POINT OLIKTOK	61.1154	-146.373	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 13	366889340	POINT OLIKTOK	61.1218	-146.307	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 20	366889340	POINT OLIKTOK	61.1239	-146.36	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 06 27	366889340	POINT OLIKTOK	61.124	-146.36	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 08 08	366889340	POINT OLIKTOK	61.1216	-146.307	Y	6.3	6	24	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 28	366889340	POINT OLIKTOK	60.119	-149.429	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 12 05	366889340	POINT OLIKTOK	60.119	-149.429	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 12 12	366889340	POINT OLIKTOK	60.1192	-149.429	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 12 19	366889340	POINT OLIKTOK	60.1178	-149.431	Y	6.3	4	24	50	58	85	97	Both	Neither	38	39	70	72	Both	Both	39	42	71	76	Both	Neither
2012 09 05	367035230	NORMAN O	61.2684	-149.914	Y	11.446	1	21	7	10	15	20	Both	Neither	16	16	26	29	Both	Both	18	19	28	31	Both	Neither
2012 09 12	367035230	NORMAN O	59.326	-152.04	Y	11.446	2	21	12	15	15	17	Both	Neither	6	6	6	6	Both	Both	6	7	6	8	Both	Neither
2012 09 19	367035230	NORMAN O	60.6553	-151.382	Y	11.446	2	21	5	6	7	12	Both	Neither	11	13	12	14	Both	Both	13	15	14	17	Both	Neither
2012 09 26	367035230	NORMAN O	59.6042	-151.422	Y	11.446	2	21	12	13	14	15	Both	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Neither
2012 10 05	367035230	NORMAN O	61.2684	-149.914	Y	11.446	1	21	7	10	15	20	Both	Neither	16	16	26	29	Both	Both	18	19	28	31	Both	Neither
2012 10 12	367035230	NORMAN O	59.3061	-152.033	Y	11.446	2	21	12	15	15	17	Both	Neither	6	6	6	6	Both	Both	6	7	7	8	Both	Neither
2012 10 19	367035230	NORMAN O	60.652	-151.379	Y	11.446	2	21	5	6	7	12	Both	Neither	11	13	12	14	Both	Both	13	15	14	17	Both	Neither
2012 10 25	367035230	NORMAN O	60.0874	-149.355	Y	11.446	4	21	29	32	49	51	Both	Neither	23	23	40	41	Both	Both	23	24	41	42	Both	Neither
2012 11 07	367035230	NORMAN O	60.1193	-149.433	Y	11.446	4	21	29	32	50	52	Both	Neither	23	23	40	41	Both	Both	24	24	41	43	Both	Neither
2012 11 14	367035230	NORMAN O	60.1196	-149.434	Y	11.446	4	21	29	32	50	52	Both	Neither	23	23	40	41	Both	Both	24	25	41	43	Both	Neither
2012 11 21	367035230	NORMAN O	60.1164	-149.432	Y	11.446	4	21	29	32	49	52	Both	Neither	23	23	40	41	Both	Both	24	24	41	43	Both	Neither
2012 11 28	367035230	NORMAN O	60.1181	-149.434	Y	11.446	4	21	29	32	50	52	Both	Neither	23	23	40	41	Both	Both	24	24	41	43	Both	Neither
2012 12 05	367035230	NORMAN O	60.1199	-149.434	Y	11.446	4	21	29	32	50	52	Both	Neither	23	23	40	41	Both	Both	24	25	41	43	Both	Neither
2012 12 12	367035230	NORMAN O	60.7781	-148.691	Y	11.446	7	21	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 01 04	367304650	GLACIER WIND	61.2251	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 01 04	367304650	GLACIER WIND	61.2251	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 01 18	367304650	GLACIER WIND	61.2252	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 01 25	367304650	GLACIER WIND	61.2275	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 02 01	367304650	GLACIER WIND	61.2251	-149.91	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 02 08	367304650	GLACIER WIND	61.2251	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 02 15	367304650	GLACIER WIND	61.2254	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 02 22	367304650	GLACIER WIND	61.2251	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 02 29	367304650	GLACIER WIND	61.2251	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 03 07	367304650	GLACIER WIND	61.2252	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 03 14	367304650	GLACIER WIND	61.2252	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 03 21	367304650	GLACIER WIND	61.2368	-149.892	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 03 28	367304650	GLACIER WIND	61.2252	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 04 04	367304650	GLACIER WIND	61.2252	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 04 18	367304650	GLACIER WIND	61.2251	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 04 25	367304650	GLACIER WIND	61.2252	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 05 02	367304650	GLACIER WIND	61.2251	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 05 16	367304650	GLACIER WIND	61.2251	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 05 23	367304650	GLACIER WIND	61.2252	-149.91	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 05 30	367304650	GLACIER WIND	61.2252	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 06 06	367304650	GLACIER WIND	61.2329	-149.904	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 06 13	367304650	GLACIER WIND	61.1738	-150.159	N	11.902	1	20	4	6	10	13	Both	Neither	12	13	19	20	Both	Both	14	15	21	23	Both	Neither
2012 06 20	367304650	GLACIER WIND	61.2446	-149.888	N	11.902	1	20	5	8	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 06 27	367304650	GLACIER WIND	61.2251	-149.91	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 07 11	367304650	GLACIER WIND	61.2251	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 07 18	367304650	GLACIER WIND	61.2415	-149.888	N	11.902	1	20	5	8	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 07 25	367304650	GLACIER WIND	61.225	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 08 01	367304650	GLACIER WIND	61.2427	-149.89	N	11.902	1	20	5	8	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 08 08	367304650	GLACIER WIND	61.2251	-149.908	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 08 15	367304650	GLACIER WIND	61.2246	-149.91	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 08 29	367304650	GLACIER WIND	61.2252	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 09 05	367304650	GLACIER WIND	61.2249	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 09 12	367304650	GLACIER WIND	61.232	-149.899	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 09 19	367304650	GLACIER WIND	61.2303	-149.907	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 09 26	367304650	GLACIER WIND	61.2375	-149.902	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 10 05	367304650	GLACIER WIND	61.2249	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 10 12	367304650	GLACIER WIND	61.232	-149.899	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 10 19	367304650	GLACIER WIND	61.2278	-149.91	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 10 25	367304650	GLACIER WIND	57.7751	-152.416	N	11.902	3	20	17	20	22	23	Both	Neither	12	12	14	14	Both	Both	9	9	11	11	Both	Neither
2012 11 07	367304650	GLACIER WIND	61.242	-149.887	N	11.902	1	20	5	8	12	14	Both	Neither	13	13	22	22	Both	Both	15	15	24	25	Both	Neither
2012 11 14	367304650	GLACIER WIND	61.2248	-149.911	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	24	Both	Neither
2012 11 21	367304650	GLACIER WIND	61.225	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 11 28	367304650	GLACIER WIND	61.225	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 12 05	367304650	GLACIER WIND	61.2249	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 12 12	367304650	GLACIER WIND	61.225	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 12 19	367304650	GLACIER WIND	61.225	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 12 26	367304650	GLACIER WIND	61.2249	-149.909	N	11.902	1	20	5	7	12	14	Both	Neither	13	13	21	22	Both	Both	15	15	24	25	Both	Neither
2012 06 13	367338330	JUNIOR	60.1184	-149.438	Y	11.343	4	19	30	33	50	52	Both	Neither	23	23	41	41	Both	Both	24	25	42	43	Both	Neither
2012 12 12	367338330	JUNIOR	60.1184	-149.438	Y	11.343	4	19	30	33	50	52	Both	Neither	23	23	41	41	Both	Both	24	25	42	43	Both	Neither
2012 01 25	367115480	REDOUBT	59.627	-151.424	Y	10	2	18	13	14	16	16	Neither	Neither	5	6	5	6	Both	Both	8	10	8	11	Both	Neither
2012 02 08	367115480	REDOUBT	59.6017	-151.418	Y	10	2	18	14	14	16	16	Neither	Neither	6	6	6	6	Both	Both	8	10	8	10	Both	Neither
2012 12 12	367115480	REDOUBT	59.6042	-151.422	Y	10	2	18	14	14	16	16	Neither	Neither	6	6	6	6	Both	Both	8	10	8	10	Both	Neither
2012 12 19	367115480	REDOUBT	59.6152	-151.394	Y	10	2	18	13	14	16	16	Neither	Neither	5	6	6	6	Both	Both	8	10	8	11	Both	Neither
2012 08 22	303295000	MALOLO	58.1647	-152.579	Y	8	3	17	34	35	54	61	Neither	Neither	24	24	41	43	Both	Both	25	27	42	46	Both	Neither
2012 04 25	366798280	CROSS POINT	57.3166	-155.828	Y	11.009	3	14	36	39	63	65	Neither	Neither	29	30	54	54	Both	Both	30	31	55	56	Both	Neither
2012 06 06	367112310	AUGUSTINE	59.664	-151.44	Y	10.95	2	13	13	14	15	16	Neither	Neither	6	6	6	6	Both	Both	8	9	8	10	Both	Neither
2012 06 27	367112310	AUGUSTINE	59.6241	-151.374	Y	10.95	2	13	12	14	15	15	Neither	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Neither
2012 12 19	367112310	AUGUSTINE	59.6143	-151.395	Y	10.95	2	13	13	14	15	15	Neither	Neither	5	6	5	6	Both	Both	8	9	8	10	Both	Neither
2012 05 30	366950140	AVIK	60.3899	-145.723	Y	11.351	6	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 05 02	366888910	SIKU	60.4712	-147.288	Y	12	6	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 08 08	366888910	SIKU	60.4562	-147.307	Y	12	6	12	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
2012 11 28	366888910	SIKU	57.9618	-153.123	Y	12	3	12	23	26	36	39	Neither	Neither	17	17	28	29	Both	Both	17	18	29	30	Both	Neither
2012 12 05	366888910	SIKU	60.0851	-149.355	Y	12	4	12	28	31	47	49	Neither	Neither	22	22	38	39	Both	Both	22	23	39	41	Both	Neither
2012 04 18	367526000	SINUK	59.9268	-152.045	Y	12	2	11	9	14	11	19	Neither	Neither	8	8	8	8	Both	Both	9	10	10	11	Both	Neither
2012 05 02	367305430	COSMIC WIND	61.1737	-150.159	Y	11.168	1	9	7	11	16	22	Neither	Neither	15	17	27	31	Both	Both	17	19	29	33	Both	Neither
2012 05 16	367305430	COSMIC WIND	61.2292	-149.901	Y	11.168	1	9	7	10	15	19	Neither	Neither	16	16	26	28	Both	Both	18	19	28	30	Both	Neither
2012 05 23	367305430	COSMIC WIND	61.2248	-149.909	Y	11.168	1	9	7	10	15	18	Neither	Neither	16	16	26	28	Both	Both	18	19	28	30	Both	Neither
2012 05 30	367305430	COSMIC WIND	61.1738	-150.16	Y	11.168	1	9	7	11	16	22	Neither	Neither	15	17	27	31	Both	Both	17	19	29	33	Both	Neither
2012 06 06	367305430	COSMIC WIND	61.1668	-150.082	Y	11.168	1	9	7	10	16	20	Neither	Neither	15	17	26	29	Both	Both	17	19	29	32	Both	Neither
2012 06 06	367305430	COSMIC WIND	57.4805	-154.824	Y	11.168	3	9	32	35	54	56	Neither	Neither	25	25	45	46	Both	Both	26	27	46	47	Both	Neither
2012 06 13	367305430	COSMIC WIND	61.1676	-150.099	Y	11.168	1	9	7	10	16	20	Neither	Neither	15	17	26	30	Both	Both	17	19	29	32	Both	Neither
2012 06 20	367305430	COSMIC WIND	61.1678	-150.112	Y	11.168	1	9	7	11	16	21	Neither	Neither	15	17	26	30	Both	Both	17	19	29	32	Both	Neither
2012 06 27	367305430	COSMIC WIND	61.1691	-150.128	Y	11.168	1	9	7	11	16	21	Neither	Neither	15	17	27	30	Both	Both	17	19	29	33	Both	Neither
2012 07 25	367305430	COSMIC WIND	61.1734	-150.159	Y	11.168	1	9	7	11	16	22	Neither	Neither	15	17	27	31	Both	Both	17	19	29	33	Both	Neither
2012 08 08	367305430	COSMIC WIND	61.1737	-150.16	Y	11.168	1	9	7	11	16	22	Neither	Neither	15	17	27	31	Both	Both	17	19	29	33	Both	Neither
2012 08 15	367305430	COSMIC WIND	61.2245	-149.91	Y	11.168	1	9	7	10	15	18	Neither	Neither	16	16	25	28	Both	Both	18	19	28	30	Both	Neither
2012 09 05	367305430	COSMIC WIND	57.7749	-152.413	Y	11.168	3	9	26	28	41	43	Neither	Neither	19	19	32	33	Both	Both	19	20	33	35	Both	Neither
2012 09 12	367305430	COSMIC WIND	61.042	-151.164	Y	11.168	1	9	6	9	16	20	Neither	Neither	13	15	22	24	Both	Both	15	17	24	27	Both	Neither
2012 09 19	367305430	COSMIC WIND	61.2246	-149.91	Y	11.168	1	9	7	10	15	18	Neither	Neither	16	16	25	28	Both	Both	18	19	28	30	Both	Neither
2012 10 12	367305430	COSMIC WIND	61.042	-151.164	Y	11.168	1	9	6	9	16	20	Neither	Neither	13	15	22	24	Both	Both	15	17	24	27	Both	Neither
2012 10 19	367305430	COSMIC WIND	61.2246	-149.91	Y	11.168	1	9	7	10	15	18	Neither	Neither	16	16	25	28	Both	Both	18	19	28	30	Both	Neither
2012 10 25	367305430	COSMIC WIND	61.2246	-149.91	Y	11.168	1	9	7	10	15	18	Neither	Neither	16	16	25	28	Both	Both	18	19	28	30	Both	Neither
2012 11 07	367305430	COSMIC WIND	61.2251	-149.907	Y	11.168	1	9	7	10	15	18	Neither	Neither	16	16	26	28	Both	Both	18	19	28	30	Both	Neither
2012 11 14	367305430	COSMIC WIND	61.2249	-149.909	Y	11.168	1	9	7	10	15	18	Neither	Neither	16	16	26	28	Both	Both	18	19	28	30	Both	Neither
2012 06 06	366673090	Diane H	57.2494	-155.329	Y	8.5	3	7	45	46	77	83	Neither	Neither	35	36	65	66	Both	Both	36	38	66	69	Both	Neither
2012 05 16	367487620	CAPT. FRANK MOODY	60.1179	-149.431	Y	11	4	0	31	33	51	53	N/A	N/A	24	24	42	43	N/A	N/A	24	25	43	45	N/A	N/A
2012 05 02	366951660	GLADYS M	61.2427	-149.887	Y	9	1	0	8	13	18	25	N/A	N/A	19	20	31	36	N/A	N/A	21	23	33	40	N/A	N/A
2012 05 16	366951660	GLADYS M	61.2517	-149.882	Y	9	1	0	8	13	19	25	N/A	N/A	19	20	31	36	N/A	N/A	21	24	34	41	N/A	N/A
2012 05 23	366951660	GLADYS M	61.2434	-149.888	Y	9	1	0	8	13	18	25	N/A	N/A	19	20	31	36	N/A	N/A	21	23	33	40	N/A	N/A
2012 05 30	366951660	GLADYS M	61.2198	-149.941	Y	9	1	0	7	12	17	21	N/A	N/A	19	19	30	32	N/A	N/A	21	23	32	37	N/A	N/A
2012 06 06	366951660	GLADYS M	61.2372	-149.891	Y	9	1	0	8	13	18	24	N/A	N/A	19	20	31	35	N/A	N/A	21	23	33	40	N/A	N/A
2012 06 13	366951660	GLADYS M	61.2193	-149.941	Y	9	1	0	7	12	17	21	N/A	N/A	19	19	30	32	N/A	N/A	21	23	32	37	N/A	N/A
2012 06 20	366951660	GLADYS M	61.2202	-149.937	Y	9	1	0	7	12	17	21	N/A	N/A	19	19	30	33	N/A	N/A	21	23	32	37	N/A	N/A
2012 06 27	366951660	GLADYS M	61.2192	-149.941	Y	9	1	0	7	12	17	21	N/A	N/A	19	19	30	32	N/A	N/A	21	23	32	37	N/A	N/A
2012 07 11	366951660	GLADYS M	61.2377	-149.892	Y	9	1	0	8	13	18	24	N/A	N/A	19	20	31	35	N/A	N/A	21	23	33	40	N/A	N/A
2012 07 18	366951660	GLADYS M	61.2362	-149.893	Y	9	1	0	8	13	18	24	N/A	N/A	19	20	31	35	N/A	N/A	21	23	33	40	N/A	N/A
2012 07 25	366951660	GLADYS M	61.2189	-149.941	Y	9	1	0	7	12	17	21	N/A	N/A	19	19	30	32	N/A	N/A	21	23	32	37	N/A	N/A
2012 08 01	366951660	GLADYS M	61.2366	-149.892	Y	9	1	0	8	13	18	24	N/A	N/A	19	20	31	35	N/A	N/A	21	23	33	40	N/A	N/A
2012 08 08	366951660	GLADYS M	61.2433	-149.886	Y	9	1	0	8	13	18	25	N/A	N/A	19	20	31	36	N/A	N/A	21	24	33	40	N/A	N/A
2012 08 15	366951660	GLADYS M	61.235	-149.895	Y	9	1	0	8	13	18	24	N/A	N/A	19	20	31	35	N/A	N/A	21	23	33	40	N/A	N/A
2012 08 22	366951660	GLADYS M	61.2357	-149.893	Y	9	1	0	8	13	18	24	N/A	N/A	19	20	31	35	N/A	N/A	21	23	33	40	N/A	N/A
2012 08 29	366951660	GLADYS M	61.2355	-149.893	Y	9	1	0	8	13	18	24	N/A	N/A	19	20	31	35	N/A	N/A	21	23	33	40	N/A	N/A
2012 09 05	366951660	GLADYS M	61.2528	-149.89	Y	9	1	0	8	13	18	25	N/A	N/A	19	20	31	36	N/A	N/A	21	24	33	41	N/A	N/A
2012 09 12	366951660	GLADYS M	61.2516	-149.903	Y	9	1	0	8	13	18	25	N/A	N/A	19	20	31	36	N/A	N/A	21	23	33	40	N/A	N/A
2012 09 19	366951660	GLADYS M	61.2258	-149.923	Y	9	1	0	7	13	18	22	N/A	N/A	19	19	31	33	N/A	N/A	21	23	33	38	N/A	N/A
2012 09 26	366951660	GLADYS M	61.2425	-149.889	Y	9	1	0	8	13	18	25	N/A	N/A	19	20	31	36	N/A	N/A	21	23	33	40	N/A	N/A

									Upper Cook Inlet Incident						Kachemak Bay Incident						Kennedy Entrance Incident					
									Total Time To Incident				Capability		Total Time To Incident				Capability		Total Time To Incident				Capability	
						Environmental Condition:			50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th	50th	50th	90th	90th	50th	90th
						Current: With or Against (Ag.)			With	Ag.	With	Ag.			With	Ag.	With	Ag.			With	Ag.	With	Ag.		
Date	MMSI/ID #	Name	Latitude	Longitude	Towing?	Max Speed	Zone #	Bollard Pull (MT)	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel	(hr)	(hr)	(hr)	(hr)	vessel	vessel
2012 10 05	366951660	GLADYS M	61.2526	-149.884	Y	9	1	0	8	13	19	25	N/A	N/A	19	20	31	36	N/A	N/A	21	24	34	41	N/A	N/A
2012 10 12	366951660	GLADYS M	61.2504	-149.884	Y	9	1	0	8	13	18	25	N/A	N/A	19	20	31	36	N/A	N/A	21	24	33	41	N/A	N/A
2012 10 19	366951660	GLADYS M	61.2278	-149.917	Y	9	1	0	7	13	18	23	N/A	N/A	19	19	31	34	N/A	N/A	21	23	33	38	N/A	N/A
2012 10 25	366951660	GLADYS M	61.2256	-149.922	Y	9	1	0	7	13	18	22	N/A	N/A	19	19	31	33	N/A	N/A	21	23	33	38	N/A	N/A

	Upper Cook Inlet 50th	Upper Cook Inlet 90th	Kachemak Bay 50th	Kachemak Bay 90th	Kennedy Entrance 50th	Kennedy Entrance 90th
# Both:	1011	0	1044	1044	1044	851
# Neither:	33	1044	0	0	0	182
# Tanker Only:	0	0	0	0	0	11
# Containership Only:	0	0	0	0	0	0
Total #:	1044	1044	1044	1044	1044	1044
# Neither:	33	1044				
# < 6 hours:	57	0	77	87	19	19
# 6-12 hours:	188	0	148	82	180	153
# 12-18 hours:	103	0	298	82	445	67
# > 18 hours:	663	0	521	793	400	612
Total #:	1011	0	1044	1044	1044	851

Cook Inlet Risk Assessment: Benefit-Cost Analysis of the Trans-Foreland Pipeline as an Oil Spill Risk Reduction Option

Prepared for

Nuka Research

January 2015

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Contents

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Abbreviations

BCA	Benefit-cost analysis
BCR	Benefit-cost ratio
CIRA	Cook Inlet Risk Assessment
DRT	Drift River Terminal
EIA	U.S. Energy Information Administration
EPA BOSCEM	Environmental Protection Agency Basic Oil Spill Cost Estimation Model
KPL	Kenai Pipeline Company
LSFO	Low Sulfur Fuel Oil
MGO	Marine gas oil
NPV	Net Present Value
O&M	Operating and maintenance
RRO	Risk Reduction Option

1 Introduction and Key Findings

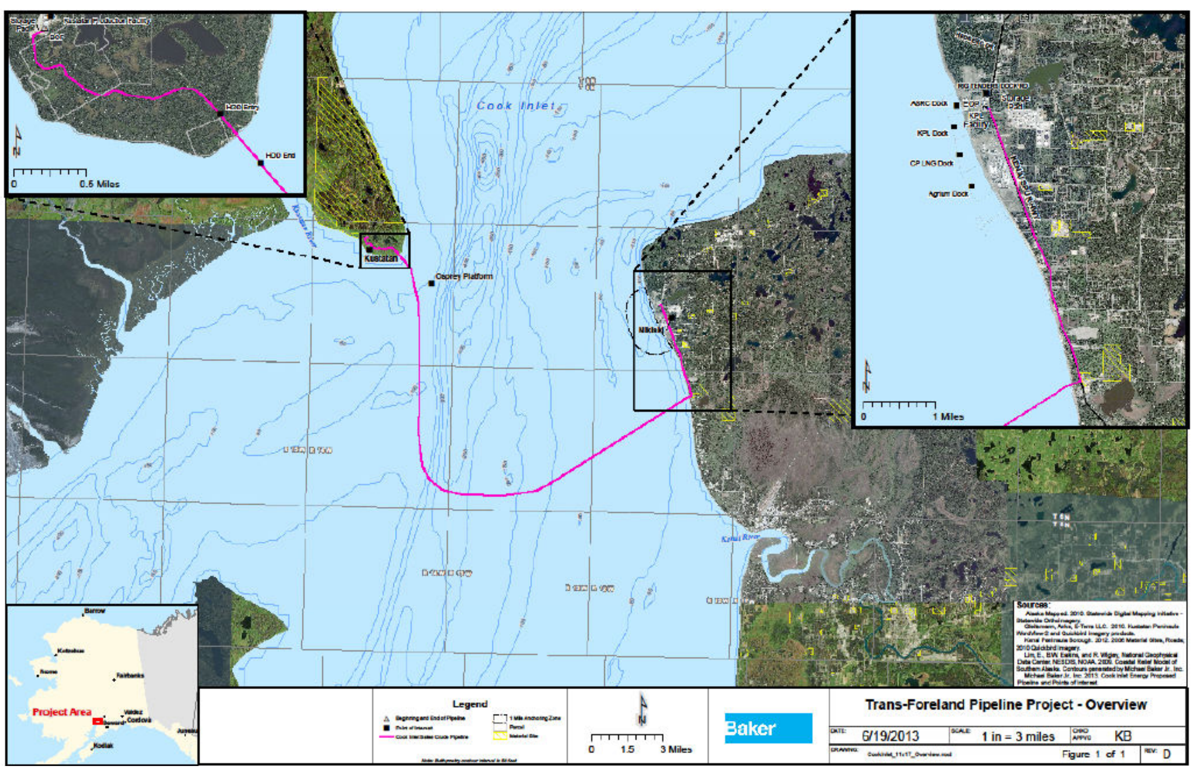
Northern Economics, Inc. conducted a benefit-cost analysis (BCA) in support of the evaluation of the proposed Trans-Foreland Pipeline, an 8-inch diameter pipeline that would transport crude oil from the existing Kustatan Production Facility on the west side of Cook Inlet to the Kenai Pipeline Company (KPL) Tank Farm on the east side of the inlet (Michael Baker, Jr., Inc. 2013). This report documents the data and methodologies that informed this analysis, as well as its major findings.

1.1 Project Background

The proposed pipeline is one of several risk reduction options (RROs) being considered as part of the Cook Inlet Risk Assessment (CIRA). Launched in 2011 by the Cook Inlet Regional Citizens Advisory Council, Alaska Department of Environment Conservation, and U.S. Coast Guard, the goal of the risk assessment is to examine the extent to which marine vessels transiting through or near the Cook Inlet region present risks for oil spills and to identify whether and by what means those risks can be mitigated (Cook Inlet Risk Assessment 2014).

The proposed pipeline would have a project life of 30 years and a capacity of 62,600 barrels per day (Loy 2013). The total cost of construction for the pipeline is $55 million, and annual operating and maintenance (O&M) costs would be $5.2 million (Tesoro 2014). Figure 1 is a map displaying the proposed pipeline route.

Figure 1. Map of Proposed Trans-Foreland Pipeline



Source: Michael Baker, Jr., Inc. 2013.

Cook Inlet Energy filed the initial application to the Alaska Department of Natural Resources in November 2012 for a right-of-way for the Trans-Foreland Pipeline. Tesoro, which operates a refinery at Nikiski, assumed control of the project in fall 2013. The new pipeline would allow Cook Inlet producers to bypass the current Drift River infrastructure on the west side of the inlet.

Project proponents cite three primary benefits (Loy 2013):

1. Elimination of tanker transport of crude across the sometimes icy and turbulent Cook Inlet;
2. Provision of an alternative to the Drift River Terminal (DRT), which was knocked out of service in 2009 as a result of flooding following eruptions of the nearby Redoubt volcano; and
3. Potentially lower oil transportation costs.

This analysis considers the following impact categories in estimating the benefits and costs associated with the proposed pipeline relative to the existing (without pipeline) scenario, given projected oil spill volumes for each: value of spilled oil; oil spill cleanup costs; environmental damages; socioeconomic damages; human injuries and fatalities; and vessel damages. This analysis also considers O&M costs under the without and with project scenarios to the extent that data were available.

1.2 Findings

This analysis concludes that the Trans-Foreland Pipeline presents two major benefits to the Cook Inlet region:

1. The nearly complete mitigation of the risks of oil spills resulting from the transport of crude from the west side to the east side of the inlet; and
2. The avoidance of costs from a large tanker vessel oil spill that would greatly outweigh the costs of construction and operation of the pipeline.

Table 1 underscores the first benefit, comparing small, moderate, large, and worst case spill volumes for crude tanker impact spills and subsea pipeline spills, as modeled by The Glosten Associates (Glosten). For each of the four spill size categories, the estimated pipeline spill volumes represent at least a 99 percent reduction from the associated crude tanker spill volumes.

Table 1. Spill Volumes from a Double Hulled Crude Tanker Impact Incident and Subsea Pipeline Spill

	Small[1] (25th percentile (gallons)	Moderate (50th percentile) (gallons)	Large (95th percentile) (gallons)	Worst Case Discharge (gallons)
Crude tanker impact	500	20,000	15,000,000	28,500,000
Subsea pipeline	<1	5	571	232,227
Reduction (%)	>99	>99	>99	99

Source: Glosten 2013.

If only moderate size tanker vessel spills were to occur over the 30-year design life of the project, and either at or below the rate estimated by Glosten, the alternative yields a very low benefit-cost ratio (BCR). However, the occurrence of even a single large spill clearly justifies the cost of the pipeline from

[1] The spill volume percentile for each spill size category indicates the percentage of spills estimated to be smaller than that percentile. For example, for the 25th percentile, 75 percent of spills for a particular incident type are estimated to be larger than the spill volume in that percentile column.

a benefit-cost standpoint. Thus, the second major benefit of the pipeline is more nuanced than the first, but no less important to the evaluation of the pipeline's merits in addressing the goals of CIRA. Comparison of the four spill scenarios identified in Table 2 is repeated throughout this report and constitutes the entirety of the sensitivity analysis whose results are included herein. As exhibited in Table 2 and developed later in this report, the alternate inclusion of a large or worst case spill is the pivotal factor in determining whether the estimated BCR is far greater than or less than 1. Regardless, the BCRs for spill scenarios 2, 3, and 4 clearly indicate that the pipeline would prove a far more cost-effective alternative to the accrual of the catastrophic costs of a large vessel tanker oil spill.

Table 2. Benefit-Cost Ratio of the Alternative under Four Spill Scenarios

	Scenario 1 Median Spills Only	Scenario 2 Single Large Spill Only	Scenario 3 Single Large Spill and Median Spills	Scenario 4 Worst Case Spill Only
BCR	0.05	5.8	5.9	18.1

Source: Glosten 2013; Jensen 2014; Etkin 2004; Northern Economics estimates.

1.3 Key Assumptions and Limitations

Except where otherwise noted, "baseline" refers to the "without pipeline" scenario and "alternative" refers to the "with pipeline" scenario.

This analysis assumes completion of pipeline construction in 2014 and the total cessation of tanker traffic between DRT and Nikiski beginning in 2015 and continuing through the life of the project. The assumed life of the pipeline is 30 years, although similar pipelines have been in operation for much longer periods of time.

This analysis excludes the annual O&M cost for DRT. This avoided cost represents a benefit of the pipeline and would elevate the BCR. This analysis also ignores the risk of a potential catastrophic failure of DRT tanks, considered a possibility given the facility's proximity to the recently active Mount Redoubt volcano (Petri 2009). This analysis further assumes that DRT would have to be decommissioned at some point, regardless of whether construction of the pipeline occurs, and that this cost does not vary between the base (without pipeline) and alternative (with pipeline) scenarios. This analysis does not consider the cost of decommissioning or removal of the pipeline at the end of its life.

In addition to low sulfur fuel oil (LSFO), the tankers that transport crude from DRT to Nikiski burn require some volume of marine gas oil (MGO) for the operation of the vessel generators (Jensen 2014). While an estimate for the amount of MGO burned annually was not available, the avoidance of its use represents a benefit of the alternative and would increase the BCR.

Other benefit-cost impact categories excluded from this analysis include vessel damage and human injuries and fatalities. Vessel damage is likely to take place with collisions, allisions, and groundings. Neither actual vessel damage costs from previous tanker incidents nor academic literature informing the development of a damage cost estimate could be found. A review of National Oceanic and Atmospheric Administration summaries of Cook Inlet oil spills from tanker vessels over the time period 1987–present revealed no record of injuries or fatalities involved in the transport of crude from DRT to Nikiski. However, the grounding of the M/V Alaska Constructor in the Upper Cook Inlet in November 1988 resulted in the deaths of three crewmen. At the time of grounding, the vessel was en route from Anchorage to Trading Bay to deliver fuel to an earth-moving operation. This analysis does not attempt to quantify the risk of human injuries or fatalities based on this incident, but acknowledges that the removal of vessel traffic involved in the transport of crude and requiring the use of other fuels also eliminates some of this risk.

All costs are in 2013 dollars. Where cost estimates are from years prior to 2013, the Bureau of Labor Statistics' Consumer Price Index was used to convert to 2013 dollars.

One factor that impacts the severity of oil spills is oil type. This analysis assumes that all oil spilled would be medium crude, which is the substance that would be transported across Cook Inlet via tankers and the pipeline under the baseline and alternative, respectively.

This analysis considers only impacts of potential spills for the sub-sea portion of the pipeline and does not separately assess the risk of spills occurring along the above-grade section of the pipeline.

This analysis should be considered in the context of these assumptions and limitations.

1.4 Report Layout

The remainder of the report is divided into three sections:

Section 2 details estimation of costs under the baseline for four different oil spill scenarios. This section also details the methodologies used in the calculation of estimated costs under both the baseline and alternative.

Section 3 summarizes costs under the alternative.

Section 4 defines the benefits accrued under the alternative and compares net present value of benefits and costs, as well as BCRs for the four spill scenarios.

2 Baseline (Without Pipeline)

This section presents estimated costs under the baseline (without pipeline). Table 3 summarizes the net present value (NPV) of costs across operating and spill impact cost categories for four oil spill scenarios:

1. Moderate (median) sized spills, as estimated using spill frequency and volume projections by Glosten;
2. Single large spill in Y2030, plus moderate spills (as estimated in Scenario 1);
3. Single large spill in Y2030 only; and
4. Single worst case scenario spill in Y2030.

Table 3 includes only those cost categories for which this analysis was able to calculate estimates. Notably excluded are DRT O&M costs, as well as vessel damages and human injuries and fatalities resulting from tanker spill incidents. Exactly what constitutes each of these spill scenarios is explained later in this section.

The difference in NPV of costs across the four spill scenarios indicates that the occurrence of a single large or worst case spill increases total costs by more than two orders of magnitude, while the variable inclusion of moderate, or median, volume spills adjusts total costs only incrementally. The NPV of total costs under the median spills scenario (Scenario 1) are 0.8 percent of costs under the single large spill scenario and just 0.2 percent of costs under the single worst case spill scenario.

Cleanup costs, socioeconomic damages, and environmental damages constitute the largest value impact categories for three scenarios that include a large or worst case spill, while expenditure on LSFO is the largest cost item under spill scenario 1. The value of spilled oil represents a relatively small portion of total costs under scenarios 2-4 but, for each of these scenarios, is greater than the NPV of total costs for scenario 1.

Table 3. Summary of Net Present Value of Costs for Various Spill Scenarios under Baseline

	Scenario 1 Median Spills Only	Scenario 2 Single Large Spill Only	Scenario 3 Single Large Spill and Median Spills	Scenario 4 Worst Case Spill Only
	Cost/Value			
Cost Category	**($1,000)**	**($1,000)**	**($1,000)**	**($1,000)**
LSFO – tankers	2,929.0	2,929.0	2,929.0	2,929.0
Spilled oil value	10.3	8,342.1	8,352.1	25,946.4
Cleanup costs	832.4	280,931.7	281,741.3	873,442.1
Environmental damage	474.2	144,939.3	145,400.5	450,629.3
Socioeconomic damage	673.6	214,724.8	215.380.1	667,599.0
Net Costs	**4,919.4**	**651,866.8**	**653,802.9**	**2,022,471.9**

Note: Columns may not sum to total due to rounding. A discount rate of seven percent is applied to all costs.
Source: Glosten 2013; Jensen 2014; Northern Economics estimates.

2.1 Overview

The baseline assumes that tanker vessel trips will continue at a rate of 38 per year and that no alternative for the transport of crude between DRT and Nikiski will emerge over the assumed life of the pipeline (under the with pipeline scenario), from 2015–2044. Analysis of the baseline attempts to estimate all costs associated with the transport of crude from DRT to Nikiski without construction of the sub-sea pipeline.

2.2 Costs

Central to analysis of the baseline is consideration of the costs of vessel tanker oil spills across various impact categories. The methodologies applied to the estimation of these costs are described in detail below.

Under the baseline, DRT would remain in operation, incurring O&M costs. However, this analysis was unable to obtain an estimate for annual O&M costs for DRT. Operations costs under the baseline also include the cost of LSFO and MGO, required for the operation of the tanker vessels that transport crude between DRT and Nikiski. This analysis considers these fuel costs to the extent that data were available. Depreciation to tanker vessels resulting from the 38 one-way trips between the west and east sides of Cook Inlet each year are not included in this analysis.

2.2.1 LSFO for Tanker Vessels

Vessel tankers transporting crude between DRT and Nikiski burn an average of four tons of LSFO per one-way trip during summer, when they pass directly north of Kalgin Island, and nine tons of LSFO per one-way trip during winter, when they travel south of Kalgin Island and icy conditions are prevalent. This analysis assumes an equal distribution of trips alternately burning four and nine tons of LSFO, or 19 trips each, as well as an average LSFO weight of 7.25 pounds per gallon (Flint Hills Resources 2003). The calculation of the cost of LSFO also assumes a fuel cost for 2014 equivalent to the average cost of marine diesel at the port of Homer, averaged across the months July 2013 to June 2014 (Fisheries Economics Data Program 2014). The rate of change in LSFO price from 2015–2044 is assumed equivalent to that of medium crude, as projected by the U.S. Energy Information Administration (EIA 2013).

2.3 Frequency and Severity of Potential Spills

The two components of risk related to oil spills are frequency and severity. Glosten provided an estimate of 0.0030 vessel tanker spills per traffic-day. Assuming 38 one-way crude carrier transits across Cook Inlet each year, or 35.1 vessel traffic-days, this translates to an annual average of 0.1053 tanker spills (Glosten 2013). Thus, this analysis estimates that roughly three median sized spills will occur over a 30-year period. As exhibited in Table 3, however, these three spills combined incur costs amounting to less than one percent of the NPV of costs from a single large or worst case spill in year 16 under the alternative.

Glosten separately estimated spill volumes from a double-hulled crude tanker for impact, non-impact, and transfer error incidents, as exhibited in Table 4. Impact incidents include collisions, allisions, and groundings; non-impact incidents include fires, equipment failures, and operations errors; and transfer error incidents include both cargo transfers and bunker errors. The spill volume percentile for each incident type indicates the percentage of spills estimated to be smaller than that percentile. For example, 50 percent of impact, non-impact, and transfer error spills are estimated to be smaller than 20,000, 2,000, and 10 gallons, respectively.

Table 4. Spill Volumes from a Double Hulled Crude Tanker

Incident Type	Small (25th percentile (gallons)	Moderate (50th percentile) (gallons)	Large (95th percentile) (gallons)	Worst Case Discharge (gallons)
Impact	500	20,000	15,000,000	28,500,000
Non-Impact	100	2,000	8,000,000	28,000,000
Transfer Error	1	10	2,000	75,000,000

Source: Glosten 2013.

Importantly, the volumes in the moderate spill size column are median predicted spill sizes; mean estimated spill volumes may be substantially greater. An overall median estimated spill size was calculated by multiplying the moderate spill volume for each incident type by its respective share of Cook Inlet spill incidents from 1995–2010 and summing these three values.[2] Over the time period 1995–2010, impact, non-impact, and transfer error incidents represented 11 percent, 49 percent, and 40 percent of total product and crude tanker spill incidents, respectively. The multiplication of these weights by their respective estimated moderate spill volumes (from Table 4) yielded an overall median spill volume of 3,204 gallons.

A BCA that assumes only the occurrence of median-size spills at the estimated spill frequency fails to capture the potentially far more severe consequences of larger spill scenarios. Thus, while this analysis uses the median estimated spill volumes to calculate estimated spill costs for each year during the assumed life of the proposed pipeline, it alternately assumes the occurrence of a large or worst case spill in 2030 (year 16 of the project under the alternative) to capture the avoided costs of the type of spill (i.e. a large one) whose preclusion would be the greatest intended benefit of the pipeline. Estimated volumes of large and worst case scenario spills were calculated similarly to the estimated moderate spill volume, but include only impact and non-impact incidents. This analysis considers highly improbable the prospect of transfer errors resulting in the spillage of many thousands of gallons of oil. As shown in Table 5, the weighted estimated volume of large spills, estimated to be larger than 95 percent of all spills, is less than one-third of the size of a worst case spill.

Table 5. Calculation of Estimated Spill Volumes under Large and Worst Case Scenarios

Spill Size	Impact		Non-Impact		Weighted Estimated Spill Volume (gallons)
	Volume (1,000 gal)	Share of Spills (%)	Volume (1,000 gal)	Share of Spills (%)	
Large (95th percentile)	15,000	19	8,000	81	9,166,667
Worst Case	28,500	19	28,500	81	28,500,000

Source: Glosten 2013; DEC 2013; Northern Economics estimates.

2.4 Spill Costs

While Glosten's projections suggest that no oil from tanker incidents will be spilled in nearly 9 out of 10 years, it is beneficial in a BCA that assigns a discount rate to benefits and costs to spread out those

[2] Oil spill data came from the Alaska Department of Environmental Conservation Oil Spill Database. Each spill type's share of total spills was determined using all 45 spills that occurred in Cook Inlet over the years 1995–2010 that resulted in at least one gallon of spillage. The share of spill types for product and crude tanker spills only were nearly identical to those of the larger sample of 45 spills.

estimated costs across the full BCA timeline. This particularly applies to the current analysis, since the timing of tanker spills that would occur from 2015 to 2044 constitutes an unknown. Thus, the estimated median spill size of 3,204 gallons was used to calculate costs across the various impact categories, but these costs were then spread evenly across the 30-year timeframe of the current analysis. Contrasting this approach is the assignment of all large or worst case spill costs to a single year (i.e. Y2030) under the three spill scenarios that assume the occurrence of such an incident.

This analysis relied on the Environmental Protection Agency Basic Oil Spill Cost Estimation Model (EPA BOSCEM) to estimate cleanup costs, as well as environmental and socioeconomic damages. Based on a data set of 42,860 oil spills of at least 50 gallons that occurred between 1980 and 2002, D.S. Etkin developed the model to estimate the costs of oil spills occurring in navigable inland waterways in the EPA Jurisdiction Oil Spill Database. EPA BOSCEM allows for the incorporation of spill-specific factors that variably influence costs, including spill amount, oil type, response methodology and effectiveness, type of impacted medium, location-specific socioeconomic value, freshwater vulnerability, habitat/wildlife sensitivity, and location type (Etkin 2004). The sections below explain the application of specific factors to the estimation of cleanup, environmental, and socioeconomic costs.

2.4.1 Value of Spilled Oil

This analysis used projected prices of medium crude oil (Brent spot price) from the EIA (2013) to calculate the value of spilled oil for each spill scenario. For each scenario, the estimated volume of spilled oil was multiplied by the price per gallon for each year of the current analysis. A value of spilled oil for each scenario is shown in Table 3.

2.4.2 Cleanup Costs

EPA BOSCEM provides for the estimation of oil spill cleanup costs based on four criteria: type of oil, spill volume, type of cleanup method used, and effectiveness of cleanup method. Heavy, persistent oils, such as heavy crude and lube oil, have the highest starting cost per gallon, followed by (medium) crude oil, volatile distillates, and light fuels. While the model allows for modification of the per gallon cleanup cost depending on the primary cleanup method, this analysis assumes that only mechanical methods would be applied to Cook Inlet tanker spills, thus excluding dispersants and in-situ burning.

Table 6 displays per gallon oil spill cleanup costs for crude oil and mechanical removal only, as applied by EPA BOSCEM. The model assigns higher per gallon cleanup costs to smaller spills, with the per gallon cost of the largest category of spills less than half that of the smallest spills. Also, not surprisingly, the model assigns higher per gallon costs to spills for which mechanical cleanup is less effective. Table 3 displays estimated cleanup costs for each of the four spill scenarios.

Table 6. Per Gallon Oil Spill Response Costs Applied in EPA BOSCEM, Crude Oil and Mechanical Removal Only

	0 Percent Reduction	10 Percent Reduction	20 Percent Reduction	50 Percent Reduction
Spill Volume (gallons)	**Per Gallon Cost of Oil Spill Response ($)**			
<500	220	199	189	153
500-1,000	218	197	187	151
1,000-10,000	215	195	185	149
10,000-100,000	195	185	174	138
100,000-1,000,000	123	118	113	92
>1,000,000	92	82	76	64

Note: Per gallon costs in this table are in 2004 dollars but have been converted to 2013 dollars for this analysis.
Source: Etkin 2004.

2.4.3 Environmental Damages

EPA BOSCEM provides for the modification of environmental damages based on four criteria: spill volume, location medium type, vulnerability of nearby freshwater sources, and habitat sensitivity. The beginning per gallon environmental cost is higher for smaller crude oil spills, ranging from $30 per gallon for spills over one million gallons to $90 per gallon for spills under 500 gallons.

Location medium type modifiers range from 0.5 for pavement/rock to 1.6 for wetlands areas. The model's default modifier of 1.0 for open water/shore was applied to this analysis, as the location medium of potential spills is unknown.

Freshwater modifiers range from 0.4 for fresh water sources used for industrial purposes to 1.7 for areas characterized by wildlife use. Since it is unknown whether potential tanker spills would impact freshwater sources, the model's default non-specific modifier of 0.9 was applied to this analysis.

The final modifier applied to estimation of environmental damages in the EPA BOSCEM model is the sensitivity of wildlife and habitat in the affected area. This modifier ranges from 0.4 for urban/industrial areas to 4.0 for wetlands. The default value of 1.5 was applied for this analysis.

2.4.4 Socioeconomic Damages

EPA BOSCEM allows for the adjustment of socioeconomic costs according to three criteria: spill volume, oil type, and socioeconomic and cultural value of the affected area. Unlike cleanup and environmental costs, beginning per gallon socioeconomic costs are lowest for the smallest crude oil spills (under 500 gallons) and highest for median-sized spills (those between 1,000 and 10,000 gallons). Per gallon costs for crude oil spills decline as spill volumes continue to increase.

Notably, EPA BOSCEM assigns lower beginning per gallon socioeconomic costs to crude oils than to any other type, including volatile distillates and light fuels.

The modifier for the socioeconomic and cultural value of the affected area ranges from 0.1 (characterized by heavy industry or dump sites) to 2.0 (characterized by subsistence and commercial fishing and/or aquaculture). As the CIRA Consequence Analysis Report assigned generally high socioeconomic receptor scores to a crude oil spill at Drift River and low scores to a diesel spill at Nikiski, this analysis assigned an EPA BOSCEM socioeconomic modifier of 1.0 to the current analysis (Nuka Research & Planning Group, LLC 2013). This modifier denotes areas with high socioeconomic and cultural sensitivity, often characterized by recreational areas with sport fishing opportunities.

3 Alternative (With Pipeline)

This section presents estimated costs under the alternative (with pipeline). Table 7 summarizes the NPV of estimated costs across operating and spill impact cost categories for the alternative. Less than $150 of the nearly $112 million NPV of costs under the alternative are attributable to pipeline spills. Clearly, nearly all of the cost under the alternative falls under pipeline construction and O&M costs. This represents a significant departure from the composition of costs under the baseline and is discussed further in Section 4.

Table 7. Summary of Net Present Value of Estimated Costs under Alternative

Pipeline Costs ($1,000)		Pipeline Oil Spill Costs ($)				Net Cost ($1,000)
Capital costs	O&M	Spilled oil	Cleanup	Envir.	Socioecon.	
51,505	60,306	1	53	29	42	111,708

Note: A discount rate of seven percent is applied to all costs.
Source: Glosten 2013; Jensen 2014; Northern Economics estimates.

3.1 Overview

The baseline assumes that all crude produced on the west side of Cook Inlet will be transported to the east side by way of the pipeline and that existing tanker vessel transport for the purpose of crude transport will be eliminated. This analysis assumes construction of the pipeline in 2014 and full pipeline operation beginning in 2015. While similar pipelines have been proven safe for operation for longer periods of time, this analysis assumes a 30-year design life. A 30-year design life does not indicate that the pipeline and associated structure will require major maintenance or replacement after 30 years, but rather that the pipeline's systems, components, and structures will perform their primary functions at acceptable safety, regulatory, and environmental performance levels for 30 years and will not experience major failures or require significant repairs (Michael Baker Jr., Inc. 2013).

3.2 Costs

This analysis applied the same methodologies to the estimation of costs of spilled oil, spill cleanup, environmental damages, and socioeconomic damages as those used under the baseline. The major costs associated with the alternative, however, are those of pipeline construction and annual O&M. The total cost of construction is $55 million, with annual O&M costs of $5.2 million (Tesoro 2014). The cost of fuel consumed in the operation of vessel tankers disappears under the alternative.

3.3 Frequency and Severity of Potential Spills

Table 7 displays the NPV of costs resulting from pipeline spills. The NPV of these costs range from $1 for the value of spilled oil to $53 for spill cleanup. That these cost estimates are so low is rooted primarily in the exceedingly low probability of a spill occurring, as well as the relatively small spill volumes at the various ends of the spill size distribution. As shown in Table 8, a median, or moderate, spill is expected to be five gallons, while 95 percent of spills from the Trans-Foreland pipeline are expected to result in the spillage of 571 gallons of crude or less. A worst-case spill from the pipeline, meanwhile, would consist of the discharge of 100 percent of the maximum pipeline volume of 232,227 gallons (Glosten 2013).

Table 8. Estimated Spill Volumes from Trans-Forelands Pipeline

Small (25th percentile (gallons)	Moderate (50th percentile) (gallons)	Large (95th percentile) (gallons)	Worst Case Discharge (gallons)
<1	5	571	232,227

Source: Glosten 2013.

As noted above, the low risk of spills from the pipeline also is attributable to the low probability of a spill occurring. Glosten estimates that the pipeline will result in 0.0018 spills per year, or approximately two spills per thousand years. Thus, the costs associated with crude spills appear to be mitigated almost entirely under the alternative.

4 Benefit-Cost Analysis

Benefit-cost analyses typically attempt to capture all benefits and costs accruing to members of society for the various project alternatives. This analysis considers only one alternative, which consists of the construction of a pipeline that would carry crude oil from the west side of Cook Inlet to the east side and that would eliminate the need for tanker vessel trips.

Benefits under the alternative consist of avoided costs that would be incurred without implementation of the alternative. In this case, avoided costs of tanker vessel oil spills primarily comprise the benefits under the alternative. As the expected costs from pipeline oil spills are almost negligible, costs under the alternative are constituted almost entirely of pipeline construction and O&M.

Table 9 displays the composition of the NPV of estimated benefits and costs, as well as the BCR for the alternative under each of the four spill scenarios. The inclusion of only median spills in the calculation of the BCR yields a BCR of 0.05. However, the avoided costs of a single large spill alone cause the BCR to spike to 5.8, and a worst case scenario spill yields another jump in the BCR to 18.1.

Table 9. Net Present Value (NPV) and Benefit-Cost Ratio of the Alternative under Four Spill Scenarios

	Life-cycle Costs	Benefits (Avoided Costs) ($1,000)			
Benefit/Cost	($1,000)	Scenario 1 Median Spills Only	Scenario 2 Single Large Spill Only	Scenario 3 Single Large Spill and Median Spills	Scenario 4 Worst Case Spill Only
NPV (7%) – Total Costs	**111,708**				
Capital Costs	51,402				
O&M	60,306				
NPV (7%) – Total Benefits		**5,124**	**652,072**	**654,008**	**2,020,711**
Tanker Vessel Fuel		3,134	3,134	3,134	3,134
Spilled Oil		10	8,342	8,352	25,936
Cleanup Costs		832	280,932	281,741	873,429
Environmental Damage		474	144,940	145,401	450,623
Socioeconomic Impact		674	214,725	215,380	667,589
BCR		**0.05**	**5.8**	**5.9**	**18.1**

Note: The NPV of life-cycle costs is equivalent for each of the four spill scenarios.
Source: Glosten 2013; Jensen 2014; Etkin 2004; Northern Economics estimates.

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Appendix D - Comments Received During Public Comment Period and Management Team Response to Comments

Thirteen comments on the Draft Final Report for the Cook Inlet Risk Assessment were received from the following individuals and organizations. Comments are included in this Appendix in the order in which they were received, followed by a response to comments developed by the Management Team.

1. Alaska Oil and Gas Association (AOGA)
2. Cook Inletkeeper
3. United Cook Inlet Drift Association
4. Leah Cloud
5. Kachemak Bay Conservation Society
6. Jamie Sutton
7. Kat Haber
8. Dru Sorensen
9. Jeremiah Emmerson
10. Karen Dearlove
11. Hilcorp Alaska (including report from ERM)
12. AOGA (2nd comment)
13. Cook Inletkeeper (Supplement)

Based on comments received, the original public comment period was extended for an additional 30-day period.

Alaska Oil and Gas Association

AOGA

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Kara Moriarty, President/CEO

September 23, 2014

Mr. John Williams, President
Cook Inlet Regional Citizens Advisory Council
8195 Kenai Spur Highway
Kenai, AK 99611

Dear Mr. Williams,

Thank you for providing the opportunity to comment on the final report of the Cook Inlet Risk Assessment dated September 17, 2014.

The Alaska Oil & Gas Association (AOGA) is a professional trade association for the oil and gas industry in Alaska. Our member companies account for the majority of oil and gas activities in the state; including producers, explorers and the refinery in the Kenai Peninsula Borough.

AOGA respectfully requests a 30-day extension of the public comment period. AOGA received a link to the report yesterday (Monday, Sept. 22) and would like additional time beyond the deadline of Friday, Sept. 26 to fully evaluate the report and its recommendations. The additional time will allow us to facilitate meaningful dialogue with all of our members so we can provide the Cook Inlet Regional Citizens Advisory Council (CIRCAC) meaningful comments on the thirteen risk reduction options outlined in the report.

We look forward to your response of this request. I can be reached at 907-272-1481.

Sincerely,

Kara Moriarty

KARA MORIARTY
President/CEO

Cook Inletkeeper
3734 Ben Walters Lane
Homer, Alaska 99603

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f. 907.235.4069
www.inletkeeper.org

SUBMITTED VIA EMAIL ONLY
cira.comments@nukaresearch.com

September 25, 2014

TO WHOM IT MAY CONCERN:

A. Introduction

Cook Inletkeeper is a community-based nonprofit formed in 1995 to work with Alaskans to protect Cook Inlet's fish and water resources and the countless families who rely on them. Please accept these comments on behalf of Inletkeeper and its more than 2000 members and supporters on the draft Final Cook Inlet Risk Assessment (CIRA), dated September 17, 2014. We appreciate the work of the Advisory Panel and we have the following comments on the draft report:

B. Comments

1. Opportunity for Public Review & Comment

As a threshold matter, the public has been given only 8 business days to comment on a document containing complex and important issues. This is an inadequate timeframe, especially considering the CIRA process has been ongoing for several years. Due to these time constraints, Inletkeeper lacks the time and resources to delve into the full range of issues presented by the draft report, and Native tribes, fishing groups and other stakeholders are at a similar disadvantage. A time extension on the comment period – coupled with community presentations to explain the document and the process, and to engage individuals and groups in communities around Cook Inlet – would result in more meaningful input.

2. Trans-Inlet Pipeline

Inletkeeper strongly supports the report's recommendations on an oil pipeline from the west side of Cook Inlet to the east side. The draft report notes an oil pipeline will eliminate numerous tanker transits and result in a 98% net reduction in spill risk. It's unclear, however, why the report fails to incorporate risks and costs posed by the Drift River Oil Terminal when footnote 13 recognizes the inclusion of such data would increase the benefit/cost ratio. As we've learned through the past several eruptions at Mount Redoubt, the Drift River Oil Terminal poses significant risks to worker safety and the fisheries and habitats that lie below the facility.

3. Safe Harbors/Ports of Refuge

Inletkeeper supports the draft report's recommendation to create a Harbor Safety Committee (HSC), with the caveat such a body must include local stakeholders – including fisherman, Tribes, small businesses, local governments and other interest and user groups. If an HSC ignores local community engagement, it will quickly become yet another top-down bureaucracy that fails to earn much-needed community trust. To engender such trust, an HSC should be housed in an entity without direct financial ties or conflicts of interest with shippers or the oil and gas industry.

On a related topic, the draft report fails to discuss Ports of Refuge, which play an important role in risk reduction in Cook Inlet. Specifically, the report should recognize Kachemak Bay as a predetermined and preferred Port of Refuge, and identify specific risk reduction measures that can be brought to play when stricken vessels enter the Kachemak Bay Critical Habitat Area. Enhanced tug capacity, additional spill response assets, and permanent mooring buoys are but a few of the tools which could reduce navigational risks in Kachemak Bay.

4. Self Arrest & Tug Escorts

The self-arrest section of the draft report, and accompanying appendix B, reflect the most problematic aspects of the draft report. As Appendix B shows, the CIRA Management Team contracted with Glosten & Associates (Glosten) – a well-respected maritime safety and engineering firm – to provide its professional opinion whether self-arrest was a viable option for risk reduction when large cargo or tanker vessels are adrift and powerless in Cook Inlet. Glosten concluded "[s]elf arrest is not a reliable risk reduction option. While it is regularly attempted, it does not usually succeed." (Glosten Self Arrest Report, p. 9).

The CIRA Management Team and Advisory Panel, however, "expressed several concerns" with the Glosten Report, and contracted with another consultant – Safeguard Marine LLC (Safeguard) – which provided contrary findings. Yet there are glaring problems with the Safeguard Report, despite the fact the report played a central role in the Management Team's and Advisory Panel's dismissal of the Glosten findings. Some include:

- Safeguard notes it is "common practice ….to utilize anchor when maneuvering a vessel in Cook Inlet. <u>This is done with the engines running and the ship making way</u>." (Safeguard, p. 2 (emphasis added). This statement ignores the fact that self-arrest occurs in an emergency situation, when a vessel has lost power.

- Safeguard emphasizes a quote in the Glosten report (Safeguard, p. 2): "anchors can be very effective in stopping a ship." Yet that same quote notes "[c]are should be taken when trying to stop any ship in this way, especially a large ship, as the anchor and its equipment may "carry away" causing damage or injury, if the anchor should snag." So, it's undisputed anchors "can be" effective in stopping a powerless vessel under favorable conditions, but the Safeguard report emphasizes the upside benefits, and wholly dismisses the considerable downside risks.

- Safeguard quotes Glosten's conclusion that "[a]ttempting to self-arrest has risks, potentially great ones, and an overall low probability of success." It then states this conclusion is "in direct contrast to what professional mariners perform when dredging anchors in Cook Inlet." But Safeguard's statement compares apples to oranges; Glosten is referencing emergency situations where a large vessel is powerless; Safeguard is talking about docking and other maneuvers when such vessels are under power.

- Safeguard cites one incident to illustrate a successful emergency self-arrest by highlighting the grounding of the *T/V Seabulk* Pride in February 2006 in Upper Cook Inlet. Safeguard writes "[t]he vessel was capable of self-arresting as a result of deploying anchor. <u>She came to rest safely at anchor without grounding or striking the shoreline due to the anchor self-arresting the vessel without damaging the vessel of injuring personnel. This action is in direct conflict with the Glosten Associates statement</u>." (Safeguard, p. 3). Yet the USCG Report on the *Seabulk Pride* incident concluded the vessel ran hard aground and suffered hull and prop damage. (USCG, *Report of the Investigation into the Circumstances Surrounding the Incident Involving the M/T Seabulk Pride Grounding, Nikiski, on 2/2/2006* (Attachment 1); see also, Aerial Images, *Seabulk Pride* Grounding, Feb. 2, 2006 (Attachment 2). Furthermore, I obtained a briefing at the Incident Command Center at CISPRI in Nikiski on the morning of the incident, and everyone there – state and federal agencies, oil industry personnel, and CIRCAC representatives – recognized the *Seabulk Pride* had grounded shorty after it broke-free. Thus, Safeguard's attempts to demonstrate a successful emergency self-arrest in Cook Inlet by highlighting the 2006 *Seabulk Pride* incident are contrary to the USCG Report, conflict with numerous eye-witness accounts, and are without merit.

Unfortunately, the Advisory Panel relies on the shaky assertions in the Safeguard Report to reject the Glosten Report. For example, it states self arrest is a "relatively common practice" in Cook Inlet, but it cites not one example, apparently aligning with the Safeguard Report's confusion between emergency self-arrest and anchor dredging by a vessel under power. It admits conditions for self arrest in the deeper waters of lower Cook Inlet are "less suitable" for self arrest, but it provides no data to support the notion there is "extensive sea room" around Kennedy Entrance; instead it simply concludes "tidal currents due not trend toward hazards," without any mention of wind or wave forces. It argues Glosten's claims that self-arrest puts ground tackle at risk are "over-stated," yet it provides zero support for this conclusion. Finally, while it recognizes "[a]ctive subsea pipelines and cables may be damaged by a self arrest," a vessel "could drift with the current until free of underwater obstructions" – if the vessel captain, in the heat of an emergency, chose to check the charted subsea obstructions and decide it was safer to drift toward Kalgin Island and its accompanying shoals before attempting self-arrest on an ebbing tide.

In 1992, CIRCAC contracted Captain J.T. Dickson for a report entitled "*Report on the Safety of Navigation and Oil Spill Contingency*." Dickson – an experienced seaman hailing from the oil terminal at Sullom Voe, Shetland Islands – wrote:

> Vessels transiting Cook Inlet which suffer a loss of propulsion, may be able to anchor safely if the water depth is not excessive at the position where power is lost and the ship is in either slack water or stemming the tidal stream at the time of loss of power and an anchor is let go before the vessel runs with the stream. If the vessel is running with the tidal stream when power loss occurs, or is in deep water, it is unlikely that the vessel will be able to anchor without risking loss of gear. This will obviously be at worst case at times of spring tides. It is therefore recommended that tugs conduct escort duties for all tankers to/ from the entrance to Cook Inlet.
>
> Dickson Report, p. 90 (Attachment 3).

Dickson's recommendations for tug escorts for laden tankers have been ignored for the past 23 years. His recommendation for docking tugs at Nikiski was also ignored, and it wasn't the 2006 *Seabulk Pride* incident which prompted industry to secure an assist tug; instead, it took a second incident – again involving the *Seabulk Pride* at the Tesoro dock in 2007, where it parted lines and nearly broke away again – to highlight the extreme risk to industry and drive home Dickson's longstanding conclusion that the Nikiski docks were some of the most dangerous and challenging Dickson had encountered in the world. The point here is this: Dickson was right about the docking tug, and he was right about tug escorts.

Accomplished and respected marine pilots and mariners in Cook Inlet insist emergency self-arrest is a viable risk reduction option in Cook Inlet. But they also concede self-arrest is often risky and may be limited by wind, ice, tides, location and other factors.

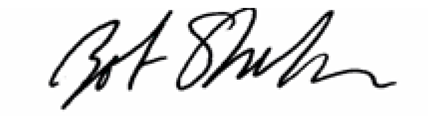
The CIRA draft report's section on self-arrest and Appendix B lack substance and credibility, and they draw into question the entire risk assessment process for Cook Inlet. Inletkeeper recommends the Management Team and Advisory Committee work with Glosten Associates to interview local mariners to gain their important insights on local conditions, document instances of successful emergency self-arrest involving large tank and cargo vessels in Cook Inlet and elsewhere, and simulate self-arrest under worst case conditions in Upper and Lower Cook Inlet.

C. Conclusion

Captain Dickson's recommendations from 1992 still hold true, and as oil and gas activities in Cook Inlet pick up pace, it's important to bring our navigational safety standards into the 21st century. Our pilots and mariners have a wealth of experience in Cook Inlet's notoriously rough waters, and they should have the best tools available to avoid marine causalities that would put Cook Inlet's fish and water resources at risk.

Thank you for the opportunity to comment.

Very truly yours,



Bob Shavelson
Cook Inletkeeper

Encs.

USCG Report on 2006 Seabulk Pride Incident (Attachment 1)
Aerial Images, Seabulk Pride Incident 2006 (Attachment 2)
Dickson report 1992 (Attachment 3)

United States Coast Guard

Report of Investigation into the Circumstances Surrounding the Incident Involving
M/T SEABULK PRIDE/ Grounding/ Nikiski

On 02/02/2006

MISLE Activity Number: 2578263
Originating Unit: MSO ANCHORAGE
MISLE Activity Owner: COMMANDANT (G-MRI)
MISLE Activity Controller: COMMANDANT (G-MRI)
MISLE Case Number: 274660

IV. FINDINGS OF FACT

Subjects of the Investigation

Vessels. The following vessels were subjects of this investigation. Particulars for each vessel follow.

Vessel Name:	SEABULK PRIDE
Flag:	UNITED STATES
Vessel Identification Number:	1072068
Call Sign:	WCY7052
Status:	Damaged
Role:	Involved in a Marine Casualty
Vessel Class, Type, Sub-Type:	Tank Ship, Petroleum Oil Tank Ship, Crude Oil Tank Ship
Gross Tonnage(GRT):	
Net Tonnage(NRT):	
Deadweight Tons:	53006
Length:	575.7
Home/Hailing Port:	
Keel Laid Date:	10/28/1996
Delivery Date:	10/15/1998
Place of Construction:	NEWPORT NEWS VA, , UNITED STATES
Builder Name:	NEWPORT NEWS SHIPBLDING
Propulsion:	Diesel Direct
Horsepower:	10800
Master:	
Classification Society:	American Bureau of Shipping
Owner:	LIGHTSHIP TANKERS III LLC 2200 ELLER DR, LEGAL DEPT P O BOX 13038 FT LAUDERDALE, FL, 33316 LIGHTSHIP TANKERS III LLC 2200 ELLER DR, LEGAL DEPT P O BOX 13038 FT LAUDERDALE, FL, 33316
Operator:	SEABULK TANKERS INC 2200 ELLER DRIVE P O Box 13138 FT LAUDERDALE, FL, 33316 US
Inspection Subchapter:	
Most Recent Vessel Inspection Activity:	1935204, 10/24/2003 8:35:00 AM
Current Certificate of Inspection:	Issued on 10/27/2003 9:23:26 AM, by Sector

Facilities. The following facilities were subjects of this investigation. Particulars for each facility follow.

Facility Name:	Kenai Pipeline Co. / Tesoro
Type:	Waterfront Facility
Status:	Damaged and Repaired - Operational
Role:	Cargo Transfer Recipient
Contact Phone:	
Location:	Latitude: 60 41.0 N Longitude: 151 23.8 W

Waterway Segment(s). The following waterway segment(s) were subjects of this investigation.

COOK INLET
Role: Location
Local Name:
Description: KENAI, AK

Incident Information

Location(s).

Description	Latitude	Longitude
COOK INLET	60 41.0 N	151 23.49 W
Aboard Vessel: SEABULK PRIDE: COOK INLET	60 41.0 N	151 23.8 W

Sequence of Events.

02/01/2006 8:00:00 to 02/01/2006 8:00:00 (Known): No meetings or conferences were held by the USCG to discuss waterway issues.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Procedure
Location: Unknown

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: None

Kenai Pipeline Co. /	Facility	Damaged and	Cargo Transfer

Tesoro		Repaired - Operational	Recipient

Details Filed: None

United States Coast Guard	Other		Regulatory Agency

Details Filed: Policy/Regs/Procedures Condition

ISM Code Data

Does the ISM Code apply to the Subject: No
Safety Management System (SMS) implemented: No

ISO 9000 Data

Does ISO 9000 apply to the Subject: No
Quality Management System (QMS) implemented: No

ISO 14000 Data

Does ISO 14000 apply to the Subject: No
Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist

Explanation of Nonexistence: The USCG has not held pre-winter or post-winter meetings to discuss waterways issues with the users of Cook Inlet. This meeting could include Ice rules, operations, and lessons learned that season.
Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard:
Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: No

02/01/2006 12:00:00 to 02/01/2006 12:00:01 (Known): Not all personnel on either the vessel or facility were familiar with the operating policies that were in place at the time of the incident.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Policy
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Policy/Regs/Procedures Condition

ISM Code Data

Does the ISM Code apply to the Vessel: No
Safety Management System (SMS) implemented: No

ISO 9000 Data

Does ISO 9000 apply to the Vessel: No
Quality Management System (QMS) implemented: No

ISO 14000 Data

Does ISO 14000 apply to the Vessel: No
Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist

Explanation of Nonexistence:
Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard:
Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Law/Regulation: No
Name: ICE POLICIES
Effective Date:
ISM Policy: No
ISO 9001 Policy: No
Issued By: USCG, Facility and Vessel
Policy Nature: Safety
Reason Inadequate: Not all personnel on either the vessel or facility were familiar with the operating policies that were in place at the time of the incident. The vessel, facility, and USCG had policies and guidelines in place for these special occasions.

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: No

Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Policy/Regs/Procedures Condition

ISO 9000 Data

Does ISO 9000 apply to the Facility: No
Quality Management System (QMS) implemented: No

ISO 14000 Data

Does ISO 14000 apply to the Facility: No
Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist

Explanation of Nonexistence:
Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard:
Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Law/Regulation: No
Name: ICE POLICY
Effective Date:

ISM Policy: No
ISO 9001 Policy: No
Issued By: FACILITY
Policy Nature: Safety
Reason Inadequate: Not all personnel on either the vessel or facility were familiar with the operating policies that were in place at the time of the incident. The vessel, facility, and USCG had policies and guidelines in place for these special occasions.

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: No

02/01/2006 12:00:00 to 02/01/2006 12:01:01 (Known): The vessel was left open to the ice flows allowing it to take massive blows while moored to the KPL dock.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Non-Vessel Material/Equipment Condition
Subject Type: Operations/Management
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Detail Description

The vessel was left open to the ice flows allowing it to take massive blows while moored to the KPL dock. Defenses could be put in place to prevent such blows, such as ice break bulkheads.

02/01/2006 12:00:02 to 02/01/2006 12:02:03 (Known): The USCG's Ice and Extreme Ice Rules are rules being guidelines rather then Regulation limiting the enforcement options.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Regulations
Location: Unknown

Subject(s) and Details:

Name	Type	Status	Role
Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Policy/Regs/Procedures Condition

ISO 9000 Data

Does ISO 9000 apply to the Facility: No
Quality Management System (QMS) implemented: No

ISO 14000 Data

Does ISO 14000 apply to the Facility: No
Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist
Explanation of Nonexistence:
Major Nonconformity: No

Policies/Procedures that Are Not Aboard
Explanation why Not Aboard:
Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate
Law/Regulation: No
Name: Ice Rules, Extreme Ice Rules
Effective Date: 10/15/2005
ISM Policy: No
ISO 9001 Policy: No
Issued By: COTP Western Alaska, USCG
Policy Nature: Safety
Reason Inadequate: Enforcement options are limited unless these guidelines are adopted into U.S. Regulation.

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: Yes

02/01/2006 12:01:00 to 02/01/2006 12:02:01 (Known): The USCG did not conduct a spot check on the facility to verify that the Ice and Extreme Ice Rules were being implemented.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Policy
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Policy/Regs/Procedures Condition

ISO 9000 Data
Does ISO 9000 apply to the Facility: No
Quality Management System (QMS) implemented: No

ISO 14000 Data
Does ISO 14000 apply to the Facility: No
Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist
Explanation of Nonexistence: No policy by the Coast Guard to spot check on the facility to verify that the Ice and Extreme Ice Rules were being implemented.

Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard:
Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Law/Regulation:	No
Name:	USCG Ice Policy
Effective Date:	
ISM Policy:	No
ISO 9001 Policy:	No
Issued By:	USCG
Policy Nature:	Safety
Reason Inadequate:	

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: No

02/01/2006 17:59:00 to 02/01/2006 18:00:00 (Known): The facility and vessel did not have a reasonable understanding of when to abort transfer operations.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Procedure
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

Crewmembers and Pilot aboard the vessel were unaware that the facility ice operations manual called for the transfer to be shutdown 2 hours into the flood or ebb tide.

Details Filed: Policy/Regs/Procedures Condition

ISM Code Data

Does the ISM Code apply to the Vessel:	No
Safety Management System (SMS) implemented:	No

ISO 9000 Data

Does ISO 9000 apply to the Vessel:	No
Quality Management System (QMS) implemented:	No

ISO 14000 Data

Does ISO 14000 apply to the Vessel:	No
Environmental Management System (EMS) implemented:	No

Policies/Procedures that Do Not Exist

Explanation of Nonexistence:
Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard: The vessel intended to follow the facilities Ice Operations Manual while at the KPL dock. The contents of the Manual were not communicated to the vessel due to the unreasonable nature of the Manual.

Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: No

Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Detail Description

Crewmembers and Pilot aboard the vessel were unaware that the facility ice operations manual called for the transfer to be shutdown 2 hours into the flood or ebb tide. The Ice Operations manual was not written as the facility intended to conduct operations. They only intended to suspend fuel transfer ops when ice was present, not every 2 hours into each flood or ebb tide.

Details Filed: Policy/Regs/Procedures Condition

ISO 9000 Data

Does ISO 9000 apply to the Facility: No

Quality Management System (QMS) implemented: No

ISO 14000 Data

Does ISO 14000 apply to the Facility: No

Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist

Explanation of Nonexistence:

Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard:

Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Law/Regulation: No

Name: KPL Dock Ice Operations Manual

Effective Date:

ISM Policy: No

ISO 9001 Policy: No

Issued By: KPL Dock

Policy Nature: Safety

Reason Inadequate: The Ice Operations manual was not written as the facility intended to conduct operations. They only intended to suspend fuel transfer ops when ice was present, not every 2 hours into each flood or ebb tide.

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: No

Report of Investigation

02/01/2006 18:00:00 to 02/02/2006 23:59:00 (Estimated): There was a discreprency between the expectations of the facility and vessel with mooring arrangements.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Procedure
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

The M/V used the same mooring configuration in all conditions at the KPL dock. According to the facility ice procedures a vessel shall double to triple mooring lines in the ice conditions, which was not done nor communicated to the vessel.

Details Filed: Policy/Regs/Procedures Condition

ISM Code Data

Does the ISM Code apply to the Vessel: Yes
Safety Management System (SMS) implemented: Yes
SMS Subjects: Development of Plans for Shipboard Operations
Safety Management Certificate
Issued By:
Issue Date:
Expiration Date:
Document of Compliance
Issued By:
Issue Date:
Expiration Date:
Audit Information
Type: External Audit
Date:
Results:
Evaluation of SMS during Investigation: No

ISO 9000 Data

Does ISO 9000 apply to the Vessel: No
Quality Management System (QMS) implemented: No

ISO 14000 Data

Does ISO 14000 apply to the Vessel: No
Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist

Explanation of Nonexistence:
Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard:
Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Law/Regulation: No
Name: KPL Ice operations manual
Effective Date:
ISM Policy: No
ISO 9001 Policy: No
Issued By: KPL Dock
Policy Nature: Safety
Reason Inadequate: With a vessel of this size and the number of lines already in use it would be impractical and unnecessary to double or triple the lines as in the KPL Ice Operations manual.

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: Yes

Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Detail Description

The M/V used the same mooring configuration in all conditions at the KPL dock. According to the facility ice procedures a vessel shall double to triple mooring lines in the ice conditions, which was not done nor communicated to the vessel.

Details Filed: Policy/Regs/Procedures Condition

ISO 9000 Data

Does ISO 9000 apply to the Facility: No
Quality Management System (QMS) implemented: No

ISO 14000 Data

Does ISO 14000 apply to the Facility: No
Environmental Management System (EMS) implemented: No

Policies/Procedures that Do Not Exist

Explanation of Nonexistence:
Major Nonconformity: No

Policies/Procedures that Are Not Aboard

Explanation why Not Aboard:
Major Nonconformity: No

Policies/Procedures/Law/Regulation that is Present but Inadequate

Law/Regulation: No
Name: KPL Ice operations manual
Effective Date:
ISM Policy: No
ISO 9001 Policy: No
Issued By: KPL dock
Policy Nature: Safety
Reason Inadequate: With a vessel of this size and the number of lines already in use it would be impractical and unnecessary to double or triple the lines as in the KPL Ice Operations manual.

Policies/Procedures/Law/Regulation that is Present and Adequate

Latent Unsafe Condition: Yes

02/01/2006 18:00:01 to 02/01/2006 18:00:02 (Known): The mooring diagrams were set up by both the vessel and facility to be a catch all rather then a practical working diagram based off real life conditions that a vessel would experience.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Procedure
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

The mooring diagrams were set up by both the vessel and facility to be a catch all rather then a practical working diagram based off real life conditions that a vessel would experience.

Name	Type	Status	Role
Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Detail Description

The mooring diagrams were set up by both the vessel and facility to be a catch all rather then a practical working diagram based off real life conditions that a vessel would experience.

02/01/2006 18:01:00 to 02/01/2006 18:01:01 (Known): The hooks on the KPL dock allowed multiple lines to come off.

Condition Class: Vessel, Facility, Equipment, Gear, or Cargo
Condition Type: Non-Vessel Material/Equipment Condition
Subject Type: Deck/Cargo
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Detail Description

The hooks on the KPL facility have in the past and in this incident allowed multiple lines to come free. With the normal movements of the vessel at the dock the lines would pop up and come off the hooks. A mousing hook or similar device on each of the facilities hooks would prevent the lines from coming free at times other then when desired.

Details Filed: Material/Equipment Condition

System:	Deck/Cargo
Sub-System:	Cargo Transfer/Lightering (liquid)
Component:	Loading Arms

Details: The hooks on the KPL facility have in the past and in this incident allowed multiple lines to come free. With the normal movements of the vessel at the dock the lines would pop up and come off the hooks. This would also prevent the loading arms from bearing the weight of the vessel.
Cite:

02/01/2006 18:02:02 to 02/01/2006 18:02:03 (Known): Neither the vessel or facility were in full compliance with the USCG ice rules and extreme ice rules.

Condition Class: Policy, Procedures, or Regulations
Condition Type: Policy, Regs, and Procedures Condition
Subject Type: Policy
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description
Neither the facility or the vessel were in full compliance with the ice rules and extreme ice rules put out by the USCG. A preseason meeting to discuss these and other expectations may have gained full compliance. Also a regulatory change incorporating the ice rules and extreme ice rules into Regulation would allow the USCG further control over vessels operating in the ice conditions. The preseason meeting would also be a time for industry to discuss any other options for safe operations in Cook Inlet such as an ice break bulkhead or tugs in the immediate vicinity.

Name	Type	Status	Role
Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Detail Description
The hooks on the KPL facility have in the past and in this incident allowed multiple lines to come free. With the normal movements of the vessel at the dock the lines would pop up and come off the hooks. A mousing hook or similar device on each of the facilities hooks would prevent the lines from coming free at times other then when desired.

02/01/2006 18:03:00 to 02/01/2006 18:03:01 (Known): The KPL dock has line tensionometers which are not made available to the vessel.

Condition Class: Operations Status
Condition Type: Workplace Environment
Subject Type:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

The KPL dock has tensionometer readings in the main house on the dock which is available to the terminal operator but not to the vessel. This information could be used by the vessel for tending the lines which would spread the load more evenly between the lines rather then by seaman's eye which in this case adjusted the lines inappropriately leaving the load on an individual line.

Kenai Pipeline Co. / Tesoro	Facility	Damaged and Repaired - Operational	Cargo Transfer Recipient

Details Filed: Detail Description

The hooks on the KPL facility have in the past and in this incident allowed multiple lines to come free. With the normal movements of the vessel at the dock the lines would pop up and come off the hooks. A mousing hook or similar device on each of the facilities hooks would prevent the lines from coming free at times other then when desired.

02/02/2006 0:01:00 to 02/02/2006 12:00:00 (Estimated): Maintaining ice watch and monitoring bridge.

Action Type: Bridge Operations - Visual Monitoring and Lookout
Action Class: Maintain lookout to detect objects, traffic, or navigational aids and assess visibility
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
[redacted]	Party	Not at Risk	Subject of Investigation

Details Filed: Detail Description

Maintaining watch for ice on bridge in accordance with Coast Guard Ice Rules.

02/02/2006 0:01:00 to 02/02/2006 5:35:00 (Estimated): Engines in 5 minute standby

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Vessel Activity Details

Vessel Activity Type: Moored
Activity Description: Engines in 5 minute standby (Unmanned with Start air secured, indicator cocks open, blowers secured, turbocharger drains open, and lube oil secured). The ice guidelines and extreme ice guidelines that were in effect did not specify the amount of time that is considered "immediate standbye" as described in the guidelines.

Permit Required: No
Latent Unsafe Condition: No

02/02/2006 3:00:00 to 02/02/2006 5:25:00 (Estimated): Vessel conducted trasfer operations, (VTBB and Unleaded Gasoline)

Condition Class: Operations Status
Condition Type: Vessel Operation Status
Subject Type:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Vessel Activity Details

Vessel Activity Type: Moored
Activity Description: Transferring product through loading arms.
Permit Required: No
Latent Unsafe Condition: No

02/02/2006 5:15:00 to 02/02/2006 6:00:00 (Estimated): Ice flow in Cook Inlet

Condition Class: Marine Environment
Condition Type: Marine Environment
Subject Type:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
COOK INLET	Waterway		Location

Details Filed: Marine Environment Details

Weather Conditions:

Conditions	Weather Forecast	Actual Weather
Wind Speed:	10 Knots	7 Knots
Wind Direction:	270	270
Wind Gusts:	20 Knots	10 Knots
Ceiling:	Feet	Feet
Sky Conditions:	Overcast	Overcast
Air Temperature:	10° F	6° F
Weather/Precipitation:	Snow shower	Snow shower
Visibility/Precipitation:	Blowing snow	Blowing snow
Visibility:	2 nm	0.5 nm
Precipitation (24 hr period):		
Sea Level Pressure:	Millibars	Millibars

Weather a Forecast Obtained: Yes

Date/Time Obtained:	02/07/2006 7:27:35 AM
Source of Forecast:	National Weather Service
How were Conditions Predicted:	
Weather Forecast Error:	Yes

Water Conditions:

	Water Forecast	Actual Water Conditions
Water Temperature:	° F	° F
Water Depth/River Stage:	Feet above MLLW	(Feet above MLLW)
Tide:	Flooding	Flooding
Tidal Current Speed:	5 Knots	4 Knots
Tidal Current Direction:	350	350
River Current Speed:	Knots	Knots
River Current Direction:		
Ice Coverage:	30 %	60 %
Character of Ice:	Close drift ice	Pressure ice or big, fast, heavy ice flows
Wave Height:	feet	2 feet
Wave Direction:		350
Wave Period:	seconds	seconds
Swell Height:	feet	2 feet
Swell Direction:		350
Swell Period:	seconds	seconds
Warnings in Effect:		

Was a Water Forecast Obtained:	Yes
Date/Time Obtained:	11/24/2006 10:19:04 AM
Source of Forecast:	South West Pilots Association tables
Water Forecast Error:	Yes
Latent Unsafe Condition:	Yes

02/02/2006 5:22:50 to 02/02/2006 5:23:00 (Known): A massive ice flow struck the vessel at the KPL Dock.

Event Type: Allision
Event Class: Head-on
Event Subclass: No Control
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty
Details Filed: None			
Ice Flow	Other		Hazardous Environmental Conditions
Details Filed: None			

02/02/2006 5:22:55 to 02/02/2006 5:23:00 (Known): The crewmember had just begun tending line BP2B.

Action Type: Deck Operations - Deck Equipment Operations
Action Class: Conduct docking, anchoring, and mooring operations
Location: Known; US Waters
Description: Aboard Vessel: SEABULK PRIDE: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.8 W

Subject(s) and Details:

Name	Type	Status	Role
[redacted]	Party	Not at Risk	Subject of Investigation

Details Filed: Detail Description
The crewmember had just begun tending line BP2B when the line parted. The crewmember was relatively new to the job and also extremely inexperienced in ice operations. The crewmember had not gone through any extra training for the cold weather operations.

02/02/2006 5:23:00 to 02/02/2006 5:23:01 (Known): Line BP2B parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure
System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line BP2B parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:23:15 to 02/02/2006 5:23:16 (Known): Line MD3B parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters

Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD3B parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:23:30 to 02/02/2006 5:23:31 (Known): Line MD3A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD3A parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:23:35 to 02/02/2006 5:23:36 (Known): Line MD2A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD2A parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:24:05 to 02/02/2006 5:24:06 (Known): Line MD4A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD4A parted.
Cite:

Equipment Approval Information
Q-Number:

Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:24:10 to 02/02/2006 5:24:10 (Known): Line MD4B and BP2A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Lines MD4B and BP2A parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:24:15 to 02/02/2006 5:24:15 (Known): Line MD2B parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes

Category: Catastrophic Failure
Details: Line MD2B parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:24:20 to 02/02/2006 5:24:21 (Known): Line BP1B parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure
System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line BP1B parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:24:25 to 02/02/2006 5:24:26 (Known): Line MD1A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine

Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD1A parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:24:30 to 02/02/2006 5:24:31 (Known): Line MD1B parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD1B parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:24:45 to 02/02/2006 5:24:46 (Known): Line MD5A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET

Latitude: 60 41.0 N   Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD5A parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:25:29 to 02/02/2006 5:25:31 (Known): Line BP1A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N   Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line BP1A parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:26:14 to 02/02/2006 5:26:16 (Known): Line MD6B parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD6B parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:26:20 to 02/02/2006 5:26:21 (Known): Line MD6A parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD6A parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:

Serial No:
Year Built:
Description:

02/02/2006 5:26:35 to 02/02/2006 5:26:36 (Known): Line MD5B parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Mooring/Anchoring
Component: Mooring Line/Hawser
Failure: Yes
Category: Catastrophic Failure
Details: Line MD5B parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:26:36 to 02/02/2006 5:26:59 (Known): The fuel transfer hoses parted.

Event Type: Material Failure (Vessels)
Event Class: Deck/Cargo
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Material/Equipment Failure

System: Deck/Cargo
Sub-System: Cargo Transfer/Lightering (liquid)
Component: Transfer Hose
Failure: Yes
Category: Catastrophic Failure

Details: The fuel transfer hoses parted.
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 5:26:45 to 02/02/2006 5:26:59 (Known): Approximately 5 bbls of oil were discharged onto the KPL dock and presumably into Cook Inlet.

Event Type: Damage to the Environment
Event Class: Oil Discharge
Event Subclass: Cargo
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Discharge Details
Substance Name: Oil, misc: Motor
Potential Volume/Amount: 5 Barrels (estimated)
Potential Only: No

Discharge/Released Amount: 5 Barrels (estimated)
Situation: Point-source one-time discharge
Impacted Medium and Amount:
Land 5 (estimated)
Circumstances/Means Halted:

Not Discharged/Released Amount: 0 Barrels (estimated)
Method Contained/Accounted For: Oil froze on the KPL dock and presumably went into Cook Inlet.

02/02/2006 5:26:59 to 02/02/2006 5:33:00 (Known): All of the lines and hoses had become disconnected from the dock.

Event Type: Set Adrift
Event Class: Unintentional
Event Subclass: From Dock
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

All of the lines and fuel transfer hoses had parted allowing the vessel to drift free of the dock.

02/02/2006 5:27:00 to 02/02/2006 5:33:00 (Known): Engine start attempts

Action Type: Engineering Operations - Engineering Systems Operations
Action Class: Operate main propulsion system (engines, boilers, fuel, and steering)
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
[redacted]	Party	Not at Risk	Subject of Investigation

Details Filed: Detail Description

Status of engine:
Air secured, oil secured, jacking gear engaged, cylinder air cocks open

Attempted start of engine through the following sequence:

Disengaged jacking gear
Shut turbocharger drain
Started Lube oil pumps
Opened start air valve
Closed indicator cocks on cylinder

Placed engines in bridge control and stood by for attempted starts. Engine failed to start and depleted start air down to 10 bars from initial capacity of 31. Engine plaed back in engine room control so local restart could be attempted. Local restart aborted after grounding

02/02/2006 5:27:01 to 02/02/2006 5:27:30 (Estimated): prop fouled with mooring lines

Event Type: Fouling
Event Class:
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

Stern line fould in prop, line ran from winch down to propeller, line broke free from winch during subsequent refloat attempts. Determined during dive surveys that 44' of wire rope wrapped around propeller hub.

02/02/2006 5:27:02 to 02/02/2006 5:35:00 (Known): The vessel lost all maneuverability when not able to start the vessel.

Event Type: Vessel Maneuverability
Event Class: Total Loss
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: None

02/02/2006 5:27:10 to 02/02/2006 5:27:15 (Known): Communicated to crew during break away and ordered anchors dropped.

Action Type: Bridge Operations - Bridge Communications
Action Class: Communicate and coordinate effectively among the vessel's crew (Bridge, Engine, and Deck)
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
[redacted]	Party	Not at Risk	Subject of Investigation

Details Filed: Communications Details

Communications Description:
Communications Type: Internal
Sent or Received: Received
Means of Communication: Verbal
Communication Acknowledged: Yes
Communication Protocols:
Communications Effectiveness: Communication Effective
Effectiveness Description:
Interference Difficulties:
Interference Description:

02/02/2006 5:27:15 to 02/02/2006 5:27:30 (Known): Rudder put hard right to prevent bow of ship from turning hard into shore.

Event Type: Evasive Maneuvers

Event Class: Other vessel Manuever
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

Pilot ordered hard right rudder to try to swing the bow to starboard in the event the engines started and they could be given a kick ahead.

02/02/2006 5:35:00 to 02/02/2006 5:35:00 (Estimated): The vessel grounded.

Event Type: Grounding
Event Class: Outside marked channel
Event Subclass: No Control
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Grounding Details

Type of GroundiUSCGng: Hard
Type of Bottom: Rocky
Depth of Water:
Charted: Feet
Actual: Feet
Recorded: Feet
Part of Vessel Aground:
Vessel Course: True
Vessel Speed: 4 Knots
Steering Functional: Fully
Propulsion Functional: Fully
Hazard to Navigation: No
ATON Survey Required: No
Fuel On Board:
Cargo On Board:

Cargo Name	**Quantity**

Additional Information:

02/02/2006 5:35:01 to 02/02/2006 5:35:01 (Known): The vessel suffered minor damage to the hull.

Event Type: Material Failure (Vessels)

Event Class: Construction/Loadline
Event Subclass:
Location: Known; US Waters
Description: COOK INLET
Latitude: 60 41.0 N Longitude: 151 23.49 W

Subject(s) and Details:

Name	Type	Status	Role
SEABULK PRIDE	Vessel	Damaged	Involved in a Marine Casualty

Details Filed: Detail Description

Grounding damage notes, SEABULK PRIDE

Vessel reportedly broke free from moorings at TESORO NIKISKI dock on 02 February 2006 at 0525 AST and came to rest aground approximately 3 miles north of the dock. Ground conditions reportedly soft mud.

Vessel pulled off ground at approximately 0830 AST utilizing three tugs and ship's power.

Port anchor payed out and left on sea-bed during retrieval operations.

Vessel attended at approximately 1200 AST for inspection of damages.

Following damaged areas found:

PUMP ROOM:

1. Fr. 46 found buckled and tripped over an area of approximately 5 M extending inboard from the corner attachment between the frame and the STBD Slop Tank.
2. Starboard seachest discharge pipe found mildly distorted and first two flanged connection of pipe to seachest and pipe to pipe found leaking.
3. Bottom longitudinals 1 - 6 counting inboard from slop tank found distorted and fractured along their connection to the pump room forward bulkhead.
4. Cargo Pump #1 found set up approximately 2"
5. Ballast Pump #1 found set up approximately 2"
6. Emergency Bilge Suction valve controller for the pump room found distorted.
7. Bottom of pump room set up approximately 2" between the aft bulkhead and Fr. 46 between bottom longitudinals 3 and 6 counting inboard from stbd pump room swash bulkhead.
8. Bottom longitudinals 4, 5 counting inboard from stbd pump room swash bulkhead found distorted at connection to aft bulkhead.

#5 PORT BALLAST WING/DOUBLE BOTTOM TANK:

1. Tank visually inspected, however 0.8M silted saltwater lay in bottom of tank masking internals. Tank to be drained and visually examined.
2. Tank indicated one leak approximately 0.3 M aft of Fr. 52 approximately 1 M inboard of sideshell. Water seen bubbling up in this area, however due to heavy silt, it was not possible to ascertain the extent of damage.

No other tanks were reported by the crew as having changes in water levels.

Divers survey undertaken commencing at 0900 04 FEB 2006

DIVE SURVEY:

Diver inspected the shaft, wire rope and multiple types of synthetic lines wrapped around the shaft. Rope guard found with uneven gap to propeller of 2" at maximum to 1" at minimum.

Propeller blades slightly damaged at leading edge, showing small indentations and material loss.

Rudder found with two fractures in way of pintle slot. Upper starboard pintle slot corner found fractured approximately 1-1/2", lower starboard pintle slot corner found fractured approximately 2-1/2".

Propeller hub had slight scoring from wire.

Rudder exhibited slight deflection 2' above the bottom of the propeller on the trailing edge.

Scraping and gouging of the bottom plating between Fr. 15 and 48 from the centerline extending towards the port out to the port bilge strake.

Bottom Shell aft of Fr. 17 an area set in up to 1-1/2" over an area of 6 foot by 6 foot near the centerline slanting towards the port.

Bottom Shell 8 feet forward of frame 17 set in 2" over an area of 2' x 8'.

Bottom shell 3 feet inboard port bilge strake at Fr. 30 set in up to 3".

Bottom shell set in at Fr. 35 up to 5" over an area 2' x 3' in way of the forward portion of the Bilge Water Storage Tank, port side first strake inboard from bilge strake.

Bottom shell set in 2 feet forward of Fr. 35 set in up to 1 foot over an area of 2' x 2' including areas of the plating with gouging approximately ¼" deep, port side first strake inboard from bilge strake.

Bottom shell set in at bilge strake at Fr. 35 1" over an area approximately 4" x 6"

Bottom shell set in 10' forward of Fr. 35 at keel strake approximately 3" deep over an area 1' x 2'.

Bottom shell set in 10' inboard from port bilge strake 4-5" over an area 2' x 3' in way of Fr. 40.

Seachest "BSC" missing after grating.

Bottom shell inset 5' inboard from port bilge strake approximately ¼" in way of Fr. 46.

Bottom shell set in first strake inboard of port bilge strake set in up to 10" over an area 5' x 4' in way of Fr. 50. Rock found imbedded into the hull in way of this area.

Bottom shell found fractured 7" x 1/8" between Fr. 52 and 53, port side, one strake inboard from bilge strake.

Bottom shell found fractured 4" x ½" between Fr. 52 and 53, port side, one strake inboard from bilge strake.

Bottom shell found inset 4' inboard from port bilge strake between Fr. 52 - 53 up to 12" over an area of approximately 4' x 7'.

Bottom shell found inset 2-3" approximately 10' inboard from the port bilge keel over an area of 18" x 36" in way of Fr. 79.

Bottom shell found inset 3" approximately 8' inboard from the port bilge keel over an area 42" x 18" between Fr. 80 - 81.

Bottom shell found inset up to 4" approximately 10' inboard from the port bilge keel over an area 6' x 2-1/2' between Fr. 81 - 82.

Bottom shell found inset up to 1" approximately 10' inboard from the port bilge keel over an area 3' x 8' between Fr. 82 - 83.

Bottom shell found inset up to 6" approximately 10' inboard from the port bilge keel over an area 12' x 2-1/2' in way of Fr. 90.

As a result of the survey, the following tanks to be inspected on Sunday, Feb 5:
1. Port Bilge Water Storage Tank together with areas forward and outboard to port.
2. Forepeak tank
3. #1 Port Water Ballast Tank, forward end.
4. #5 Port Water Ballast Tank

Details Filed: Material/Equipment Failure

System: Construction/Loadline
Sub-System: Hull
Component: Double Hull
Failure: Yes
Category: Non-Catastrophic Failure Requiring Repair/Replacement
Details: See Detail Description
Cite:

Equipment Approval Information
Q-Number:
Manufacturer:
Serial No:
Year Built:
Description:

02/02/2006 12:00:00 to 02/02/2006 12:01:00 (Estimated): Five of the chemical drug tests were cancelled by the MRO due to a failure to provide the Federal Custody and Control form. One other chemical drug test was not conducted because the specimen was not received by the lab. Five of the six alcohol tests were negative. The sixth alcohol test was not conducted due to the time frame after the incident.

Action Type: Other Actions - Drug and Alcohol Use and Testing
Action Class: Take Drug Test - Post-casualty
Location: Unknown

Subject(s) and Details:

Name	Type	Status	Role
[redacted]	Party	Not at Risk	Subject of Investigation

Details Filed: Drug and Alcohol Test Details

Sample Collection

Reason for Sample: Post Accident
Directed to get DOT Test: Yes
Chemical Test Sample Provided: Yes
Chemical Test Type: Dangerous Drugs

Sample Type: Urine
Date/Time Sample Taken: 02/02/2006 6:00:00 PM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: No
Collection Agent Name: Stewart Potter
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No

Field Sobriety Test

Field Sobriety Test Performed: No

Drug Analysis

Analyzing Laboratory: QUEST DIAGNOSTICS INCORPORATED, Irving, TX 75063
DOT Protocols Used: No
Test Results: Sample Not Tested
Reason: Uncorrected Flaw
Details: Sample was lost between the collection and shipment to the labratory.
Medical Review Officer: MERSON, BENJAMIN
MRO Conclusions: Test Not Performed: Uncorrected flaw
Sample Transferred and Chain of Custody Complete: No
Irregularities: Chain of Custody was lost after the collection.

Drug Re-Analysis

[redacted] Party Not at Risk Subject of Investigation

Details Filed: Drug and Alcohol Test Details

Sample Collection

Reason for Sample: Post Accident
Directed to get DOT Test: Yes
Chemical Test Sample Provided: Yes
Chemical Test Type: Alcohol
Sample Type: Breath
Date/Time Sample Taken: 02/02/2006 7:12:00 AM
Sampling Location: Onboard M/V SEABULK PRIDE
DOT Protocols Used: Yes
Collection Agent Name: Peter Davis
Collection Agent's Organization: M/V SEABULK PRIDE
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No
Chemical Test Type: Dangerous Drugs
Sample Type: Urine
Date/Time Sample Taken: 02/02/2006 1:00:00 PM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: No
Collection Agent Name: Paul Patterson
Collection Agent's Organization: M/V SEABULK PRIDE
Donor Certified: Yes
Irregularities Noted: Yes
Description: Federal Control and Custody Form was not filed with the MRO.
Transferred/Chain of Custody Complete: No

Field Sobriety Test

Field Sobriety Test Performed: No

Alcohol Analysis

Method of Analysis: Breath Test
Instrument Used:
Date/Time Results Obtained: 02/02/2006 7:12:00 AM
Results: Alcohol Not Detected
Agency Conducting Analysis: Seabulk Tankers
Description of Analysis:
Irregularities in Analysis: No

Drug Analysis

Analyzing Laboratory: QUEST DIAGNOSTICS, Schaumburg, IL 60173
DOT Protocols Used: No
Test Results: Sample Not Tested
Reason: Uncorrected Flaw
Details: There was not a chain of custody present with the specimen.
Medical Review Officer: MERSON, BENJAMIN
MRO Conclusions: Test Not Performed: Uncorrected flaw
Sample Transferred and Chain of Custody Complete: No
Irregularities: The Chain of Custody was not maintained

Drug Re-Analysis

[redacted] Party Not at Risk Subject of Investigation

Details Filed: Drug and Alcohol Test Details

Sample Collection

Reason for Sample: Post Accident
Directed to get DOT Test: Yes
Chemical Test Sample Provided: Yes
Chemical Test Type: Alcohol
Sample Type: Breath
Date/Time Sample Taken: 02/02/2006 7:12:00 AM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: Yes
Collection Agent Name: Peter Davis
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No
Chemical Test Type: Dangerous Drugs
Sample Type: Urine
Date/Time Sample Taken: 02/02/2006 12:00:00 PM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: No
Collection Agent Name: Paul Patterson
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: Yes
Description: Chain of Custody was not available after the collection
Transferred/Chain of Custody Complete: No

Field Sobriety Test

Field Sobriety Test Performed: No

Alcohol Analysis

Method of Analysis: Breath Test
Instrument Used:
Date/Time Results Obtained: 02/02/2006 7:12:00 AM
Results: Alcohol Not Detected
Agency Conducting Analysis: Seabulk Tankers
Description of Analysis:
Irregularities in Analysis: No

Drug Analysis

Analyzing Laboratory:
DOT Protocols Used: No
Test Results: Sample Not Tested
Reason:
Details: Sample was lost between the collection and shipment to the labratory.
Medical Review Officer/Coroner:
MRO/Coroner Conclusions:
Sample Transferred and Chain of Custody Complete: No
Irregularities: Sample was lost between the collection and shipment to the labratory.

Drug Re-Analysis

[redacted] Party Not at Risk Subject of Investigation

Details Filed: Drug and Alcohol Test Details

Sample Collection

Reason for Sample: Post Accident
Directed to get DOT Test: Yes
Chemical Test Sample Provided: Yes
Chemical Test Type: Alcohol
Sample Type: Breath
Date/Time Sample Taken: 02/02/2006 7:12:00 AM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: Yes
Collection Agent Name: Peter Davis
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No
Chemical Test Type: Dangerous Drugs
Sample Type: Urine
Date/Time Sample Taken: 02/02/2006 1:00:00 PM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: No
Collection Agent Name: Paul Patterson
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: Yes
Description: Chain of Custody was lost after the initial sample's collection.
Transferred/Chain of Custody Complete: No

Field Sobriety Test

Field Sobriety Test Performed: No

Alcohol Analysis

Method of Analysis: Breath Test
Instrument Used:

Date/Time Results Obtained: 02/02/2006 7:12:00 AM
Results: Alcohol Not Detected
Agency Conducting Analysis: Seabulk Tankers
Description of Analysis:
Irregularities in Analysis: No

Drug Analysis

Analyzing Laboratory: QUEST DIAGNOSTICS INCORPORATED, Irving, TX 75063
DOT Protocols Used: Yes
Test Results: Sample Not Tested
Reason: Uncorrected Flaw
Details: Chain of Custody was lost after the sample was collected.
Medical Review Officer: MERSON, BENJAMIN
MRO Conclusions: Test Not Performed: Uncorrected flaw
Sample Transferred and Chain of Custody Complete: No
Irregularities: Chain of Custody was lost after the sample was collected.

Drug Re-Analysis

[redacted] Party Not at Risk Subject of Investigation

Details Filed: Drug and Alcohol Test Details

Sample Collection

Reason for Sample: Post Accident
Directed to get DOT Test: Yes
Chemical Test Sample Provided: Yes
Chemical Test Type: Alcohol
Sample Type: Breath
Date/Time Sample Taken: 02/02/2006 7:12:00 AM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: Yes
Collection Agent Name: Peter Davis
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No
Chemical Test Type: Dangerous Drugs
Sample Type: Urine
Date/Time Sample Taken: 02/02/2006 1:00:00 PM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: No
Collection Agent Name: Paul Patterson
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No

Field Sobriety Test

Field Sobriety Test Performed: No

Alcohol Analysis

Method of Analysis: Breath Test
Instrument Used:
Date/Time Results Obtained: 02/02/2006 7:12:00 AM
Results: Alcohol Not Detected
Agency Conducting Analysis: Seabulk Tankers

Description of Analysis:
Irregularities in Analysis: No

Drug Analysis
Analyzing Laboratory: QUEST DIAGNOSTICS INCORPORATED, Irving, TX 75063
DOT Protocols Used: No
Test Results: Sample Not Tested
Reason: Uncorrected Flaw
Details: Chain of Custody was lost after the collection
Medical Review Officer: MERSON, BENJAMIN
MRO Conclusions: Test Not Performed: Uncorrected flaw
Sample Transferred and Chain of Custody Complete: No
Irregularities: Chain of Custody was lost after the collection

Drug Re-Analysis

[redacted]	Party	Not at Risk	Subject of Investigation

Details Filed: Drug and Alcohol Test Details

Sample Collection
Reason for Sample: Post Accident
Directed to get DOT Test: Yes
Chemical Test Sample Provided: Yes
Chemical Test Type: Alcohol
Sample Type: Breath
Date/Time Sample Taken: 02/02/2006 7:12:00 AM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: Yes
Collection Agent Name: Peter Davis
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No
Chemical Test Type: Dangerous Drugs
Sample Type: Urine
Date/Time Sample Taken: 02/02/2006 1:00:00 PM
Sampling Location: M/V SEABULK PRIDE
DOT Protocols Used: No
Collection Agent Name: Paul Patterson
Collection Agent's Organization: Seabulk Tankers
Donor Certified: Yes
Irregularities Noted: No
Transferred/Chain of Custody Complete: No

Field Sobriety Test
Field Sobriety Test Performed: No

Alcohol Analysis
Method of Analysis: Breath Test
Instrument Used:
Date/Time Results Obtained: 02/02/2006 7:12:00 AM
Results: Alcohol Not Detected
Agency Conducting Analysis: Seabulk Tankers
Description of Analysis:
Irregularities in Analysis: No

Drug Analysis
Analyzing Laboratory: QUEST DIAGNOSTICS INCORPORATED, Irving, TX 75063

DOT Protocols Used:	No
Test Results:	Sample Not Tested
Reason:	Uncorrected Flaw
Details:	Chain of Custody was lost after the collection.
Medical Review Officer:	MERSON, BENJAMIN
MRO Conclusions:	Test Not Performed: Uncorrected flaw
Sample Transferred and Chain of Custody Complete:	No
Irregularities:	Chain of Custody was lost after the collection

Drug Re-Analysis

02/02/2006 18:00:00 to 02/15/2006 12:00:00 (Known): The Serious Marine Incident Chemical drug tests were not conducted in accordance with D.O.T. regulations.

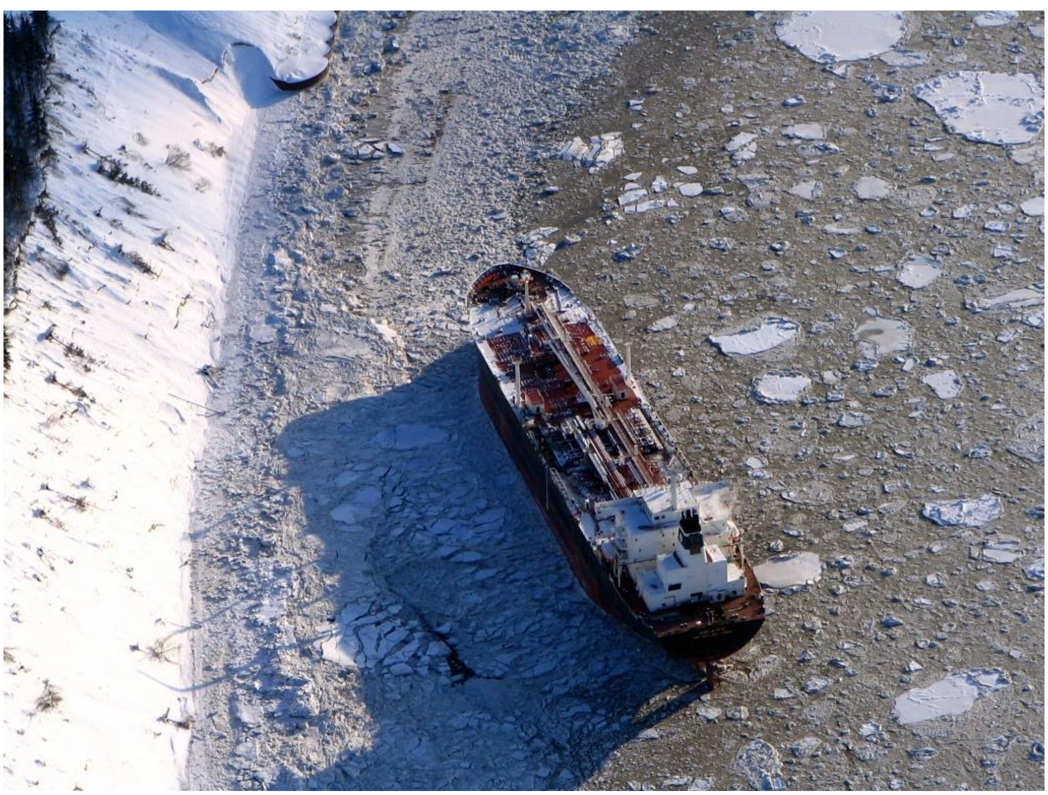
Action Type: Other Actions - Alleged Criminal/Civil Offenses
Action Class: Other Criminal or Civil Offense (text)
Location: Unknown

Subject(s) and Details:

Name	Type	Status	Role
SEABULK TANKERS LIMITED	Party	Not at Risk	Subject of Investigation

Details Filed: None

Attachment 2
***Seabulk Pride* Grounding, Feb. 2, 2006**
Photos: Cook Inletkeeper



Cook Inlet Regional Citizens Advisory Council

Report on Safety of Navigation and Oil Spill Contingency Plans

Final Report

(NOTE: Due to modern changes in typesetting, page numbers in the Table of Contents match the new electronic edition, not the 1992 print edition. All other style characteristics have been observed as much as practicable.)

Date: 15th February, 1992

Cpt. J. T. Dickson
Brae
Shetland Isles
United Kingdom

Tel 01144-8062

Ms. Lisa Parker,
CIRCAC
11355 Frontage Road,
Suite 228,
Kenai,
Alaska 99611

Cpt. James T. Dickson,
"Hvidahus,"
Hillswik Road,
Brae,
Shetland Isles.
ZE2 9QG

17.02.92

Dear Lisa,

Final Report

Safety of Navigation and Oil Spill Contingency Plans

Please find enclosed the final draft of my repot. There are also three extra appendices to add to those in the draft report, please add them to the ones you already have.

I hope you and your committees have found the study of some benefit. Captain Anderson and I are quite convinced that what we have proposed is practical, seaman like, and that the objectives result from fear of the "bottom line" implications from the tanker owners and oil companies. They bear the burden in all other parts of the word and we see no reason why not in Alaska.

We would be most happy to quote you for other marine, oil spill control/ planning, environmental impact studies and hope you will include us on your tender list. In the meantime if there is any further information you require, please do not hesitate to call me.

Yours faithfully,

CONTENTS

Summary of Major Comments and Recommendations

Part: A: Evaluation of Risk Assessment, Contingency Plans and Operations Manuals

1. PLG Risk Assessment for CISPRI

General: Cook Inlet is fortunate to have the oil industry funded CISPRI operating within this area. In general, the updated equipment list is considered sufficient to cope with most spills and the response team would appear to be planning for the inevitable spills with some vigor. The following comments are meant to assist them in this task.

a. The figures expressed in the report would appear to be too optimistic and actual spill incidence rates are more common than those published in the report.

b. The report does not give a cumulative, overall spill figure for all the installations of the CISPRI members.

c. Due to the very rapid spread of spilled oil, more attention should be given to aerial spraying of oil dispersant. It is recommended that the following equipment/ materials be considered for inclusion in the equipment stock. One ADDS pack for a Hercules C-130, 4 helicopter under slung spray units and a stockpile of 25,000 gallons of dispersant at the Kenai airport.

d. The recommendation to acquire a 60,000 barrel barge should be changed to two 30,000 barrel barges. Each unit should be equipped with the following:

1. Storage capacity for 30,000 barrels recovered fluids.

2. On board system to inject demulifier chemicals into the storage tanks in order to break water in oil emulsions and so allow water to be decanted back to sea. The use of seam heating coils in the tanks should also be considered.

3. A minimum of 3 reels, each 1000 ft. of Bay size boom, together with power packs to drive reels and air blowers.

4. A minimum of three weir skimmer sections which can be inserted in the booms required in 3. See section on oil skimmers.

5. A minimum of two Transrec 250 skimmers.

6. Accommodations and basic sleeping accommodations for approx 20 men, two 12 hour shifts.

7. VHF and satellite radio room with FAX/ Telex facility.

8. Each barge to be attended by its own tug in order that it can be moved to encounter and recover the thickest oil.

e. The equipment pile should try to standardize one type of boom for open sea use. It is suggested that the Roulands Bay boom be considered. There is little to be achieved by purchasing the larger sizes. Expanding boom is not recommended for open sea use.

f. Weir booms can recover large amounts of fresh and semi-viscous oil. It is recommended that weir sections be acquired that insert into the Bay boom suggested before.

g. There are new modern alternatives to bladders and dracones. The use of oil bags should be considered to hold recovered oil/ water or to allow tanks to pump oil from the ship to stop the outflow from a damaged tank. See appendix A.

h. It is understood that there are special arrangements made at the KPL dock to allow the discharge of recovered oil/ water to the Tesoro tank farm. These are not mentioned in the risk assessment and should be tested to confirm that the discharge pumps/ line trace heating are suitable for viscous mousse to be efficiently pumped ashore in winter weather conditions.

i. Holding contracts with fixed wing and helicopter operators should be in place to allow the rapid deployment of aircraft to follow the movement of spilled oil. One such helicopter should be fitted with a VHF DF set to track the movement of the Orion tracker buoys.

j. A study should be made to investigate the practicality of r entering into agreements with SERVS and PIRO schemes such that additional equipment/ skilled manpower can be brought in to assist with a major spillage.

2. Tesoro Alaska Oil Discharge Prevention and Contingency Plan

a. There is no sub-section dealing with procedures to be followed when oil is found in the sea, at the dock when a tanker is working alongside. A procedure is suggested in this report.

b. In section 2, the spread of spilled oil on the sea has not been fully appreciated. In 12 hours such a spillage will cover approximately 40,000 acres. This will exceed the proposed booming capability.

c. The recovery rates of spilled oil are overly optimistic. The recovery rate given is 74% whereas, in reality, worldwide experience has shown that 7.4% would be a more accurate figure.

d. Declaration of Inspection. It is recommended that a jetty information book be drawn up which contains all DOI items and other safety requirements. See appendix B.

e. There are no details of tanker ballasting after discharge and crude oil washing. This should be included.

f. The addition of an extra crew member on the *Overseas Washington* is fully supported. All cargo tanks should be hydrostatically loaded, if this is not already the case.

g. Spill Detection. It is recommended that aircraft operators who regularly over fly Cook Inlet be requested to keep a lookout for spilled oil. Any such reports should be made to the USCG via air traffic control.

h. The section on radio communications should be re-examined in the light of the *Exxon Valdez*. The size of the scope of communications is a different area of magnitude in a large spill and should be pre-planned as far as is practicable.

i. Vessel Mooring Winches. The reference to the tension winches should be removed from the section on vessel moorings. Such a practice is not recommended and is forbidden at this and most other tanker terminals.

3. Kenai Pipeline Company, Nikiski Terminal Manual

General: This is a competent document as you might expect from an oil major. The following comments are given as constructive suggestions.

a. The list of pre-arrival information should be expanded to cover the following:

1. Inert gas system operational and all tanks checked to be inert for the last 24 hours.

2. All navigational systems and safety equipment operational, if not details required of deficiencies.

3. Hull and valves oil tight, no leaks.

4. Both anchors available and cleared away.

5. Number and types of moorings, all winches operational. Any deficiencies to be detailed.

6. Approved oil spill contingency plan and certificate of financial responsibility on board.

7. Name of P and I club.

8. Name of Master, ship operator and charterer.

9. Engines will be checked to come astern before boarding the pilot or passing abeam Homer.

b. There are no details of minimum under keel clearance nor maximum loads on the mooring hooks. This should be given.

c. It is recommended that there be minimum ballast requirements for tankers arriving at the dock.

d. The lack of fire-fighting cover at the dock is a major concern to the authors of this report. A study should be made of what is necessary to provide sufficient emergency fire cover and there should be a fire-fighting tug in the near vicinity when there are tankers/ barges alongside.

e. The mooring diagrams given are sufficient to hold the ship alongside with strong winds and current. However, if the ship were to move from the dock at an angle to the tidal stream then the moorings would quickly fail. Ice coming between the ship and the shore would force the tanker off line. It is recommended that tractor type tug(s) be used to assist tankers to remain on the jetty during icing conditions.

4. Cook Inlet Pipe Line Company, Offshore Operating Manual and Contingency Plan, Drift River

a. No details of minimum under keel clearance required and maximum safe loads on the mooring hooks.

b. The tidal current forces on a loaded ship, due to a 15 degree offset of the jetty to the tidal stream direction, indicate mooring forces which could exceed the suggested mooring pattern. Tractor type tug(s) should be used to assist tankers to remain alongside in adverse wind/ icing conditions.

c. A thorough study should be made into mooring arrangements at the loading platform and, if necessary, remedial strengthening of the mooring hooks or additional hooks should be provided. The charter ships should similarly be studied.

d. The use of mixed moorings (rope and wire) to the same dolphin should be strictly forbidden.

e. The ballast reception facilities are non-functional and too small for normal tankers trading to the loading platform. It may be the case that only segregated ballast ships be chartered or older tankers which will retain all ballast on board after loading. This should be made clear in the manual and a suitable ship chosen for the trade, i.e. all segregated ballast and the ship in a good condition of draught/ trim to be effectively handled by the pilot under winter conditions or, a tanker with permanent dirty ballast to achieve the same condition.

f. No fire-fighting capability to assist a ship fire. Additional foam monitor(s) should be fitted which cover the ship's manifold area. A fire-fighting tug should be available in the near vicinity to provide fire cover when a ship is alongside.

g. A system of pre-arrival information should be introduced similar to that suggested for Nikiski dock.

h. A senior member of staff should remain on the loading platform at all times when a tanker is loading crude oil. At present such supervisor returns to Drift River when the pre-loading checks have been completed.

i. There is no mention of checking the oxygen content of the cargo tanks prior to loading. This should be introduced.

j. An emergency shut down button should be available to the tanker crew. The use of VHF radio to achieve such a stop of the cargo is insufficient.

5. General Comment

It is recommended that two tractor type tugs should be available in Cook Inlet to provide the following services:

a. Berthing/ unberthing of large ships.

b. Provide additional push up to moored tankers in adverse wind/ tide/ ice conditions.

c. Provide fire-fighting cover for tankers working cargo alongside Nikiski docks and *Christy Lee* loading platform.

d. Assist spilled oil recovery operations, tow recovery barges, etc.

e. Provide emergency escort services to loaded tankers and barges while traversing restricted waters within Cook Inlet.

f. The Type of such tractor tugs and their design should be the subject of a separate study and will require the input of pilots, dock and oil jetty operators, CISPRI, USCG, Fire Authorities and tug operators.

Part B: - Study and Recommendations on the Safety of Navigation

1. All vessels carrying dangerous or hazardous cargoes to/ from Cook Inlet in winter should be ice strengthened to an appropriate standard.

2. Most of the "Winter Rules" should be incorporated in standard regulations.

3. The originators of the "Winter Rules" should include the existing requirement to place a pilot from the Southwest Association on board tankers at the oil docks during ice conditions.

4. Strain gauges should be installed to all mooring points (hooks) at all tanker berths. Readouts to be centralized in a jetty control room.

5. Protected current meters to be fitted at Drift River and Nikiski docks.

6. Seasonal buoys to be deployed only for the use of seasonal traffic. If such buoys are required all the year round then they should be replaced with fixed navigation aids.

7. Studies be put in hand to examine:

a. Upgrading of visual navaids. This to include the need for RACON and high power landfall lights at entrances to Cook Inlet. Sectored or leading lights to aid approaches to jetties and main channels.

b. Traffic Routing and Designated Anchorages. This to include the requirement to separate ships carrying dangerous cargoes from other shipping to reduce the risk of high impact collisions.

c. Vessel Traffic Services. This to include the requirement for a Traffic Control Center, a VHF relay system throughout Cook Inlet and a traffic way point reporting system.

d. Hydrographic Surveys. This to include an examination of the age and standard of previous surveys of the navigable routes in Cook Inlet and the requirement to update.

8. Suitable tugs should assist in berthing/ unberthing/ escorting of tankers at Nikiski and Christy Lee Loading platform. These tugs will be the tractor type, but the detailed design is to be the subject of an independent study.

9. Clearly defined operating parameters relating to wind, tide, deadweight, etc. to be established.

10. Pilotage licensing to be re-organized under one certifying authority.

11. Only licensed pilots to handle tankers.

12. An independent Harbor Authority/ Administration should be established to manage and regulate all marine aspects and to ensure the safety of navigation in Cook Inlet. This body must be empowered to raise funds to finance its own operations and support the provision and maintenance of naiads/ vessel traffic service/ harbor surveys.

13. All tanker jetties/ structures including fendering should be subject to periodic independent engineering surveys. The results of such surveys should be made available for public scrutiny.

14. The Cook Inlet Pollution Prevention and Safety Program issued by the USCG should be elevated from guideline to regulation.

Section 1

Cook Inlet

Introduction

Draft Report on Vessel Navigation, Pilotage, Terminal Operations, Oil Spill Contingency Plans, Cook Inlet Risk Assessment Report and Related Subjects.

The Cook Inlet Regional Citizens Advisory Council (CIRCAC) engaged Captain J. T. Dickson to examine, comment and compare certain aspects of the operations currently functioning within their area of responsibility. The scope of work of the project includes but is not limited to examination of the following:

1. Contingency Plans
2. Vessel Traffic Management
3. Pilotage and Ship Handling
4. Risk Assessment Report, November 1990
5. Vessel/ Terminal Operating Parameters
6. Moorings and Fendering
7. Vessel Pre-arrival Information and Checks
8. Pollution Prevention Measures
9. Pollution Response Measures
10. Dirty Ballast Facilities
11. Communications
12. Weather Forecasting
13. Navigation Aids
14. Emergency Anchoring Procedures
15. Terminal Operations at the Ship/ Shore Interface
16. Environmental Monitoring

The emphasis of the study is to be directed at the Drift River offshore loading terminal and KPL dock at Nikiski, together with their associated tanker and barge traffic. Where possible, comparisons will be made with the Sullom Voe Oil Terminal and the harbor operations under the jurisdiction of the Shetland Islands Council, the Harbor Authority at Sullom Voe. Where valid comparisons cannot be made, comment will be subjective and based on the authors' experience and research.

Captain Dickson was assisted in this project by Captain James Anderson.

Captain J. T. Dickson

James T. Dickson, M.Sc, B.Sc. (Tech) has worked at Sullom Voe since 1980 as head of the oil pollution control and safety section. His duties are mainly concerned with the prevention and control of oil pollution safety of navigation, ship inspection and air surveillance operations. He is the Council's link with the oil industry and government and other related and interested groups 0on these matters. He sits on the environmental monitoring committee and the oil spill advisory committee connecting with the oversight group, the Sullom Voe Association. Prior to Sullom Voe, he worked for Chevron Petroleum both on and offshore as their Marine Supervisor and prior to that as a tanker officer at sea. He has published papers on his work and has delivered such at conferences and seminars.

Captain J. Anderson

James Anderson, Master Mariner, MNI, M. Inst. Pet., is a Marine Officer and Pilot with the Sullom Voe Harbor Authority since 1984 and was the Senior Deputy Director with that department for two years. He also operates a company which provides marine consultant and contract services which among other ventures, operates a refined product/ crude oil jetty. He is also retained as an advisor to a leading United Kingdom towage company.

Prior to 1984 his career was mainly seagoing and included extensive experience on crude oil and product tankers including seven years in command. He has also provided expertise in marine related litigation and has contributed to papers published on pollution and pilotage. The tanker cargo handling computer driven training simulator in Glasgow College of Nautical Studies was developed by James and a colleague.

In the course of the Cook Inlet study Captain Anderson visited the Cook Inlet area of Alaska from Sunday, 21st of July to Sunday 28th of July. During this period he visited the Port of Anchorage, Nikiski Oil Terminal, Chevron Oil Terminal and dock, Rig Tenders dock, Drift River Terminal, Christy Lee loading platform, the oil tank vessel *Sansinena II* and took passage on the tanker *Overseas Washington* from Nikiski to Homer. He also met with the following persons to obtain background information:

Captain R. Asaro	US Coast Guard, COTP Western Alaska
Captain G. Glenzer	Port Director, Anchorage
Captain J. Cunningham	Pilot, SW Alaska Pilots Association
Captain A. Joslin	Pilot, SW Alaska Pilots Association
Barry Eldridge	CISPRI
Bill Stillings	CISPRI
Master, *Banda Seahorse*	CISPRI
D. Gregor	Manager, Cook Inlet Pipe Line
Larry Duncanson	Supervisor, Cook Inlet Pipe Line
Bill Blessington	City of Anchorage
Jack Brown	City of Anchorage
Damon King	Environment Supervisor, Tesoro
Paul Samora	Tank Farm Coordinator, Tesoro
Gene Jackson	Operations Supervisor, Chevron, KPL
Peter Hellstrom	Mapco Alaska Petroleum
Steve Peterson	Crowley Maritime Corporation
Alex Sweeney	Crowley Maritime Corporation
Blain Elliot	Foss Maritime

William Madigan	Foss Maritime
R. B. Stiles	Diamond Christina Project
Captain O'Brian	Master, *Overseas Washington*
Captain Christiansen	Master, *Sansinena II*
Walt Parker	PWS RCAC, Consultant
Captain Stan Stanley	PWS RCAC, Maritime Specialist
Larry Smith	CIRCAC
Dr. D. Jones	CIRCAC
Cathy Godfrey	CIRCAC
Ken Castner	CIRCAC
Dan Winn	CIRCAC

Section 2

Cook Inlet Risk Assessment

Prepared for the Cook Inlet Resource Organization

Contractor: PLG Inc., November 1990

This study was commissioned by the Cook Inlet Resource Organization (CIRO), now Cook Inlet Spill Prevention and Response, Inc., (CISPRI).

The scope of the work was as follows:

a. Assess the risk of oil spills into Cook Inlet from CIRO members' facilities.

b. Evaluate the existing capability of the CIRO resources to cope with such spills.

c. Identify action to minimize the risk of spills into the sea.

d. Recommend improvements to oil spill equipment list that would enhance the CISPRI response to oil spill incidents

It is a fairly typical document commissioned by the oil industry to answer the usual questions:

1. What is the maximum spill and the range of spill sizes we are able liable to face?

2. How often will they occur?

3. What equipment do we need to cover our exposure?

4. What are the minimum costs that need to be incurred?

5. How can such costs be allocated to members?

6.

How these figures are calculated and how they can be interpreted is a matter for a statistician. However, anyone can apply a "sanity check" to see how, in reality, the findings and recommendations stand up in the cool light of experience.

A. Spill Size/ Years between Spills:

This report gives the maximum, minimum and typical spill sizes together with frequency between spills as follows:

1. Collision between tanker and another vessel. 51,000 bls. max/ <25 min/ 17,000 typical, with a frequency of 170 years between spills.

2. Collision between tanker and jetty. 6,400 bls. max/ <25 min/ 200 typical, with a frequency of 128 years between spills. It is interesting to note that the report gives as a "mitigating" factor that the berthing is performed without the use of tugs.

3. Grounding of tanker. 46,000 bls. max/ 0 min/ 7,000 typical, with a frequency of 50 years between spills.

4. Fire, explosion or structural failure to/ of tanker. 46,000 bls. max/ 0 min/ 23,000 typical, with frequency of 170 years.

Another report which covers Cook Inlet was that commissioned by the Alaska Oil Spill Commission from Engineering Computer Optecnomics, Inc. (ECO) and was published in December, 1989. Table 11-4 on page 11-52 gives a spill of between 7 and 24,000 barrels every 2.2 years, a spill of between 24,000 and 215,000 barrels every 24 years and between 7 and 215,000 barrels every 2.0 years.

Who is giving the more accurate figure? Perhaps one test might be to compare with what has actually happened in Cook Inlet. The ECO report states that over a ten year period there were 19 known tanker induced oil spills in Cook Inlet. The spill sizes were between 1 and 220,000 gallons (5238 barrels) with the majority being less than 300 gallons. The two largest spills were 207,000 gallons and 220,000 gallons (4928 and 5238 barrels). Both were from tankers which grounded and had a local pilot on board. However, it is believed the presence of the pilots did not contribute to the incidents.

The report of the Alaska Oil Spill Commission goes on to make the very telling point that someone born and living in Cook Inlet in 1977 who survives into 2060 could be expected to endure 4 large oil spills. The beaches would be contaminated with oil for much of their lifetime. This clearly brings into prospective what these statistics are trying to tell the reader. On the other hand, this resident could be “lucky” and experience none.

The figures for the Port of Sullom Voe show that one spill of 7,700 barrels in 1978 which was caused by a tanker collision with the jetty. The next largest spill was 600 barrels in 1985 which was caused by a cargo overflow while loading crude oil. Overall, since 1981 Sullom Voe has experienced 286 incidents in 6430 tanker arrivals at the terminal. It must be stressed that, at Sullom Voe, the reporting of any spill is 100% and the vast majority are mainly sheens of oil where the quantity is very small indeed. The number of spills in excess of one long ton is 27, which gives a mean incidence rate (spill per port call) of 0.0042.

The detailed figures for spillages of crude oil at Sullom Voe are:

27 spills greater than 1 ton, of which	
14 were in the range	1 to 5 tons
4	5 to 10 tons
2	10 to 20 tons
5	20 to 50 tons
2	more than 50 tons, greatest being 90 tons.

The biggest and only significant spillage of fuel oil was 1100 tons. This resulted from a tanker collision with the jetty.

The spill rate per port call for the ECO and PLG reports compared with Sullom Voe are as follows:

PLG, spills between 1/ 7140 tons,	0.0003
ECO, spills between 1/3333 tons,	0.0026
Sullom Voe, spills > 1 ton,	0.0042

Therefore, it is the writers' opinion that the figures expressed in the PLG report are too optimistic and actual spill incidence rates are more common than that published. It could be the case that this has been caused by the report not giving cumulative figures, rather a figure is given for each of the "lead' installations as they are described. If this is the case then it is a major failure of the report not to give the overall spill figures for all the installations of the CISPRI members

The range of spill sizes given in the PLG report is reasonable considering the size of tankers used to carry oil to and from Cook Inlet. When asked how big a spill could be, it is rather like the question, "How long is a bit of string?" If an accident occurs it is only a matter of luck as to how much oil is spilled. The discharge of Oil will depend on where the hull is punctured, over how long a length, and whether the tear is in a cargo tank(s) or ballast tank(s), etc., etc.

B. Containment and Clean-Up Equipment:

It is important to recognize that the very real difficulties facing the oil spill team in Cook Inlet.

a. Tidal Range. Varying from 14.3 feet at Port Chatham to 29 feet at Anchorage.

b. Tidal Current. 2/3 knots at the entrance to Cook Inlet, which increases with distance up the inlet to 5 knots or more near the East and West Foreland. It is thought that 8 knots or more can be experienced during spring tides in this area.

c. Wind. Mainly south westerly during the summer and north easterly in the winter.

d. Ice. Ice is most severe north of the Forelands. Tidal action and current keep the ice in a shattered condition. Nikiski lies in an area that, in the main, is kept free of ice by the prevailing north easterly wind. However, if this wind direction is not present then it too can have ice causing problems to ship movements and to ships working alongside. Close pack ice can be found as far south as Kalgin Island with open to pack ice as far as Kamishak Bay.

e. Floating Debris. Logs and debris are common throughout Cook Inlet and present a problem to booms, skimmers and small craft assisting with oil spill operations.

In the Nikiski area, the average tidal current is approximately 3.8 knots on the flood and 2.6 knots on the ebb, with extreme currents of 6/7 knots. The tidal range is about 20.7 feet at springs. Waves of between 4/ 12 feet can be experienced with between 10/12 fee occurring about 3 times per year. Ice is a problem especially during January and February and more son on the flood than the ebb.

The Spread of Spilled Oil:

With the above natural forces it is quite clear to anyone that the extent of any spilled oil will very quickly overcome the capability of the existing CISPRI equipment to contain and recover the oil. Worldwide experience of large oil spills in open sea conditions has shown that no one has ever recovered more than 10% of the oil spilled and 5% is a typical figure of what is achievable. This fact is caused by the laws of physics which dictate that booms can not hold oil in more than 20 knots of wind or a perpendicular current of 0.7 knot. Wave heights more than 6 feet will drive oil over the larges of ocean booms and render skimmers ineffective. Even in 2 ft. waves skimmers can be less than 50% effective, assuming they are placed in an area of thick non-viscous oil. The recovery figures quoted by manufacturers relate to test tank conditions when a continuing supply of fresh oil is fed into the tank under ideal conditions. In real life, these conditions never exist in open sea recovery conditions.

The basic technology of oil spill containment and recovery has not changed in the last 10 years and whereas the *Exxon Valdez* incident has spurred research, no great improvements are expected. Increases in the effectiveness on large offshore spills are only expected with the use of larger equipment sizes and faster deployment in an emergency. It is therefore important not to restrict reaction to containment alone because for large periods of time they may be impossible to deploy. The person in charge needs to have many strings to his/her bow. No two oil spills are alike; each has to be tacked in a different way. The tools required are as follows:

1. Aerial application of dispersants, where and when allowed.
2. Use of aircraft to observe movement of oil and direct surface craft.
3. Corporate membership of equipment pools of international significance, e.g. SERVS base, PIRO scheme.

4. Standing contracts to all up large numbers of manpower, barges, living accommodations, surface craft and communications equipment.

5. Containment and recovery by means of ocean boom, weir skimmers and large capacity barges.

6. Use of local craft and manpower who have had previous training in oil spill clean-up operations, e.g. fishing fleet.

1. Dispersants:

These chemicals are sprayed on to the oil to break up the oil into small droplets which can sink and disperse into the water column. The use of dispersants is controversial in certain countries, as in the past, these chemicals were more toxic than the oil itself. This is no longer the case and each dispersant which is approved for use at sea has to pass tests that show it meets the requirements of the regulatory authority.

Dispersants are most effective for oil viscosities of less than 2000 cst and ineffective above 10,000 cst. In general terms that gives the on-scene commander about three days to use dispersants as after that period the viscosity will be too great. In severe wind/ sea conditions the formation of water-in-oil emulsions can be very rapid, in as little as 4 hours under certain conditions. Viscosity will then be too high for effective application of dispersants.

Why use dispersants at all? The major reason is to prevent oil from reaching shallow water and stranding on the shoreline. It is thus a delicate balancing act to determine which has the greater overall environmental impact, oil on the land or dispersed oil in the water column. When dispersed, oil in the first few meters under the surface will affect organisms living in that area, but the dilution thereafter is fairly rapid. Thus dispersants are not generally used in shallow waters less than 20 meters deep.

When applying these chemicals, speed is of the essence as they work most effectively on fresh oil. Due to the rapid spread of spilled oil by means of gravity, current and wind, the most effective method of application is the use of aircraft. An aircraft such as a Hercules C-130, fitted with an ADDS pack (airborne dispersant delivery system) can deliver, at full load, approximately 5,000 gallons of dispersant concentrate. Other types of aircraft can be used if they are fitted with spraying equipment. Underslung spray pods for helicopters are also available. These can be used in pairs such that one is being refilled while the other is in use over the scene of the spill. The helicopters can thus be used to full advantage. Application from a boat is also commonly used but it is slow and not time efficient when you consider the three day time bar after which the chemicals are likely to be ineffective.

The effectiveness of dispersants when used with fresh oil is often the question of hot debate among the experts. In 1979 the American Petroleum Institute carried out field trials and the results indicated an effectiveness of between 60 to 78% of the slick being dispersed in the sea. There are opposing views on how this success was calculated, but in the writer's opinion, when compared with Sullom Voe experience, thee figures are reasonable. When the correct dispersant is correctly used on fresh crude oil, the dispersal is almost total. This is true because North Sea crude is very amenable to dispersion and tests have been done to choose the most effective chemical (Enersperse 1583). Research is no continuing into dispersants for use with high viscosities and their use in fresh water. Up to now there is no dispersant that is effective in waters other than salt.

The National Research Council has approved the use of dispersants and recommends they be considered a potential first response option. They are one of the few counter measure that can be applied quickly over a large area.

Work has been done to pre-plan the use of dispersants in Cook Inlet, but whether pre-approval has been obtained is unknown at the time of writing the draft report.

In January 1991 the Alaska Regional Response Dispersant Working Group published a useful document entitled "Oil Dispersant Guidelines for Alaska." This contains useful information and advice and gives details on the effectiveness and toxicity of dispersants.

The dispersant use criteria classify the coastal waters into three use zones. In all cases, the use of these chemicals will be based on the determination that the impact of dispersant or dispersed oil will be less harmful than the non-dispersed oil. The three zones are defined by physical parameters such as bathymetry and surface currents, biological parameters such as fish and wildlife, human use activities and lastly, the time required to respond.

Zone 1 is an area where dispersants can be used where a standing agreement is in force and further consent is not required before use. However, the required authorities should be notified as soon as practicable after spraying has commenced.

These areas are characterized by water conditions that will allow dispersed oil to be rapidly diluted to low concentrations and are far enough away from sensitive resources that dispersant operations are not likely to cause problems. In a Zone 1 area there is likelihood that spilled oil will impact sensitive resources and so an immediate response is required.

Zone 2 is an area where the use of dispersants is conditional and prior consultation is required before spraying is commenced. Such zones are again in deep water but far enough away from sensitive areas that immediate response is not necessary.

Zone 3 is an area where the use of dispersants is not recommended, but there is still the possibility to use them if, on balance, the impact will be less than that of the spilled oil. Again, consultation with EPA and the State of Alaska will be vital before any operations are commenced.

Specific Guidelines for the Use of Dispersants

Cook Inlet

Because of the presence of large numbers of commercially valuable adult salmon, that section of Cook Inlet north of a line drawn along the latitude at Anchor Point north of Kachemak Bay is considered to be Zone 3 during the period from July 1 to August 15. The general rationale is presented below and i8llustrated in Figures 4 and 5.

A. Upper Cook Inlet (North of Point Possession and North Foreland) (See Figure 4.)

Upper Cook Inlet is unique because the extreme upper portion contains two Zone 3 designations (dispersant use not recommended) which are based upon tidal stages. During the first three hours of an ebb tide, the Zone 3 boundary is roughly defined by the five-fathom isobath. For period outside this time window, Zone 3 is defined as the area north of a line between Point Possession and North Foreland.

* The high spill potential;
* The difficulty in mechanically containing spill;
* The extreme tidal fluctuations which rapidly transport spilled oil; and
* Sensitive coastal habitats requiring protection from potential oil contamination.

1. Zone 3 – Ebb Tide

The Ebb Tide Zone 3, <u>which exists only during the first 3 hours of an ebb tide</u>, occurs shoreward of the five-fathom isobath. This shallower isobath is used because: 1) the ebb tide will rapidly transport the dispersed oil to deeper waters; 2) benthic communities in Upper Cook Inlet exhibit relatively low productivity; and 3) increased water depths from the high tide stage will enhance dilution capabilities.

2. Zone 1 – Ebb Tide

The Ebb Tide Zone 1, which exists only during the first 3 hours of an ebb tide, extends outward from the five-fathom isobath. Dispersant use is restricted to an ebb tide period to prevent high concentrations of dispersed oil from being transported to shallow near shore waters.

3. Zone 3 – Flood Tide

The Flood Tide Zone 3 is defined as the area north of a line extending from Point Possession to the North Forelands, for all period outside of the first three hours of an ebb tide. This designation is necessary due to the potential for strong tidal currents to rapidly transport high concentrations of dispersed oil in to important shoreline habitats.

B. Middle Cook Inlet – South of a Line Between Point Possession and North Foreland to East Foreland and West Foreland. (See Figures 4 and 5.)

1. Zone 3

Zone 3 occurs inshore of the five-fathom isobath near the northeast shoreline of this section. The five-fathom isobath is used in this area due to a lack of fish and wildlife resources and the presence of strong currents that run parallel to the shoreline. The Zone 3 designation extends out to the 10-fathom isobath along the southeast shoreline to provide protection to the Swanson River estuary area. Along the west shoreline, the Zone 3 boundary follows the 10-fathom isobath.

2. Zone 1

The remaining waters within this Inlet section are designated as Zone 1. This designation will allow for an immediate dispersant use decision to protect important fish and wildlife resources in Cook Inlet.

C. Lower Cook Inlet – South of East and West Forelands. (See Figure 5.)

1. Zone 3

Zone 3 occurs inshore of the 10-fathom isobath. The 10-fathom isobath provides ample protection to the razor clam beaches and several river estuaries along the east and west shorelines, including Redoubt Bay where large numbers of birds seasonally reside. Around Kalgin Island, a Zone 3 designation is established along the five-fathom isobath. Kachemak and Kamishak Bays are given special protection through an expanded Zone area due to the important fishery resources associated with these bays. The shoreline in the extreme southern portions of Cook Inlet drops off rapidly resulting in the 10-fathom isobath being located very near the shoreline. Consequently, Zone 3 is defined as an area extending one mile out from the shoreline for areas exhibiting such shoreline characteristics. The one-mile buffer distance will allow for dilution of dispersed oil prior to impacting the shoreline or shallow-water areas.

2. Zone 1

Zone 1 is identified as an approximately five-mile wide buffer area extending outside Zone 3. It is believed that the five-mile wide Zone 1 area will provide adequate time to conduct a dispersant response prior to oil entering the sensitive Zone 3 area.

3. Zone 2

The remaining waters within this section of Cook Inlet are designated as Zone 2.

The PLG Report makes very little mention of spraying and this is an omission. It is recommended that access to at least one ADDS pack is guaranteed. In addition, 4 helicopter underslung units should be purchased and stored at the airport for use by helicopters fitted with underslung equipment. The writer is advised that a Hercules C-130 can land at Kenai Airport. Such aircraft normally requires 1722 yards of runway and can carry 4,600 gallons of dispersant.

A stock pile of approximately 25,000 (approximately 5 ADDS loads) gallons of dispersant should be based at the airport to refill such ADDS pack and the helicopter underslung spray units.

2. Booms for use in Open Sea Conditions:

There are many types of oil barrier available on the market today, such as floating booms, netting systems, absorbent booms, bubble barriers and even oil herder chemicals. However, the vast majority of oil containment booms in use throughout the world today consist of the following features:

a. Freeboard (height above water surface) to prevent or reduce oil splashing over due to wave and/ or wind action.

b. Skirt to prevent or reduce escape of oil under the boom.

c. Buoyancy provided by air or some other material.

d. Longitudinal tension member, chain or wire, to withstand the effects of wind, wave and current.

Booms can then be subdivided in to two types, curtain and fence. Curtain booms, as their name implies, have a continuous skirt under the water surface which is supported by a buoyant upper flotation chamber. This chamber is normally filled with air but can be a solid material, e.g. plastic foam. Fence booms are a vertical barrier held I place by solid flotation members and ballasted at the bottom by weights spaced at regular intervals.

Curtain booms have better wave following characteristics and better oil escape velocities than fence booms, which are normally used in calm waters and where tidal current is low.

Forces Exerted on Booms

Environmental forces on booms can be very large indeed and it is important to estimate these before deciding on oil containment operation and choice of assisting craft.

1. Current

Force (kgs) = 26 x subsurface area (sq. mi.) x velocity of current (knots) squared.

Ex: A 300 m. section of boom with a skirt 1 m. deep placed at right angles to a current of .75 knot.

F = 26 x 300 x 0.75 x 0.75 = 4388 kgs.

Note: If the speed of current or tow rate doubles then the force increases four fold due to square of the velocity.

2. Wind Force

F=26 x area above water linex (wind speed/40) squared.

Ex: As above, in 30 knots average wind speed, 1 m. high freeboard.

F = 26 x 300 x (30/40) x (30/40) = 4388 kgs.

These are the maximum forces that could be expected, as in reality, booms curve under external force an thus the exposed area at right angles to the wind/ current is reduced.

As stated earlier in this report booms will not hold oil when:

a. The wind speed is gusting in excess of 20 knots.
b. The wave heights are in excess of 6 feet.
c. The current, at right angles to the boom, exceeds 0.7 knot.

Deployment of these booms can be done in two basic ways. The first, which is designed for rapid deployment, is a continuous upper chamber into which air is pumped while being the boom is pulled off its storage reel. The danger with this type is the probable loss of the boom if the air chamber is punctured by debris or a surface support craft. The design of he second type has the air chamber in sections, usually about 10 feet long, and these are inflated by the insertion of an air lance as the boom is deployed. The loss of one or more of these sections is not critical to the survival of the boom but it is slower to deploy. Another important consideration is the strength of the fabric to withstand rough handling, puncture by floating debris and minimize deterioration while in storage. Booms of all sizes wee used in the *Exxon Valdez* incident, but it is interesting to note that the men on scene considered that booms in the 32 to 42 inch range were just as good at retaining oil as their larger brothers.

In general, booms for use in the open sea will have a draught (depth under the water) of approximately 40 inches and a freeboard of 24 inches. Special powered reels can hold the deflated boom in lengths of between 650 feet and 1000 feet. The quoted inflation time for a sectioned air chamber boom is given at 25 feet per minute using two men. Booms for use in more sheltered waters have a draught of about 28 inches and a freeboard of 20 inches. Those for harbor use are 22 inches draught by 14 inches freeboard.

The Port of Sullom Voe has the following booms in its list of oil spill containment and recovery equipment:

a. Ocean Boom, 8 units, total length 7,550 feet.
b. Bay Boom, 10 units total length 11,420 feet.
c. Self-contained fast boom layer, boom length 1,150 feet.
d. Vikoma seapack, boom length 1,500 feet.

Total length of boom 21,620 feet.

In terms of future development, there is little that can be done to enhance the oil retaining capability of booms. The laws o f physics are a barrier to design, but some advances can be made with speed of inflation/ deployment and in the development of new boom materials that are stronger but yet lightweight.

In Cook Inlet the spread of oil will be very rapid and thus it is reasonable to suggest that the boom will have to be transported to the area of spilled oil. It would be impracticable to tow an inflated boom over a large distance due to the forces described previously and the danger of damage due to floating debris or ice. The use of an offshore rig supply ship is certainly a good transportation system but this should be backed up with booms, housed no powered reels, mounted on an oil recovery barge. Such barge can act as a command center and act as the major collection point or skimmed oil. The PLG report advocates the use of a 60,000 barrel barge and this is to be supported. However, it would be better to have two 30,000 barrel barges as this gives more flexibility and redundancy in the event of non-availability of one unit. Each barge would require conversion to act as described above. In this way will the barges be put to full use. It is recommended that each barge be equipped as follows:

1. Storage capacity for 30,000 barrels recovered fluids.
2. On board system to inject demulsifier chemicals into the storage tanks ni order to break water in oil emulsions and so allow water to be decanted back to sea. The use of steam heating coils in the tanks should also be considered.
3. A minimum of 3 reels, each 1000 feet, of Bay size boom, together with power packs to drive reels and air blowers.
4. A minimum of three weir skimmer sections which can be inserted in the booms required in 3. See section on oil skimmers.
5. A minimum of two Transrec 250 skimmers.
6. Accommodations and basic sleeping accommodations for approximately 20 men, two 12 hour shifts.
7. VHF and satellite radio room with FAX/ Telex facility.
8. Each barge to be attended by its own tug so it can be moved to encounter and recover the thickest oil.

In the PLG report the boom recommendations are as follows:

1. CIRO Resource Group 1. Response vessel to be equipped with 3,000 feet of boom, 1,500 feet of Roulands Bay boom and 1,500 feet of Expandi 4300 boom.

The booms should all be Roulands Bay boom, or similar sized boom of robust construction. Expandi boom, in the writers' opinion, is not suitable for Cook Inlet sea conditions/ ice/ debris/ potential rough handling. Also it is not good practice to mix booms on a vessel if it is unnecessary.

2. CIRO Resource Group 1A. Work boat fitted with 1,000 feet of Expandi 4300.

Again, this should be a powered reel containing 1,000 feet of Roulands Bay Boom. Ocean boom would be too large to handle.

3. CIRO Resource Group 2. Two work boats, 40 feet each, to carry 500 feet of containment boom of approximately 18 inches overall depth.

Roulands Harbor boom is robust, designed for calm water use and 525 feet can be housed on a reel 6 feet by 5 feet, weight 1.5 tons.

4. CIRO Resource Group 3. 1,500 feet of Expandi 4300 boom/ Kepner Reel boom to be deployed from/ near dock to contain or deflect.

Recommend use of Roulands Bay boom.

5. CIRO Resource Group 4. A barge with 1,500 feet of Roulands Bay boom plus 1,500 feet of Expandi 4300 boom.

This recommendation requires substantial reconsideration. The writer would suggest a minimum of 5 reels, each 1,000 feet of Roulands Bay boom would be more appropriate.

6. CIRO Resource Group 6. 10,000 feet of Tide boom, 10 inches minimum freeboard. 2,500 feet of 3M fireboom.

Fireboom should be held as one response capability, if circumstances so allow. Tide boom, it is assumed, is a three compartment, clover leaf design, of which the bottom leaves are water filled and the top chamber air filled. This arrangement acts as a seal against the beach which dries out at low tide. It works quite well as long as there are no under-cut channels in the mud/ sand areas such that the oil will flow under the boom where it spans such a gap. This boom, used correctly, would be a welcome addition to the stockpile of equipment.

3. Oil Skimmers:

The basic design types are as follows:

a. Disk skimmers consist of a number of rotating discs normally made of plastic or aluminum, on to which oil adheres. This oil is then scraped off as the disc enters the body of the skimmer and the oil falls into a pump suction. The pump then transfers the oil to a holding tank. They can operate in moderate sea conditions, but work best on fresh oil. Once the oil forms a mousse or is in excess of 2000 cst viscosity, then disc skimmers should not be used.

Pluses: Good on fresh oil.

Minuses: Oil must flow between the discs in order to be recovered. As viscosity increases with time the disc speed has to be reduced in order to pull the oil inwards. Easily clogged with debris. Use limited to a matter of days after the initial spill, 7 at most.

b. There are four different types of weir skimmer. The simplest consists of the lip of the weir just below the surface of the water allowing the top inch or so to fall into the transfer pump section. The next type allows the recovered fluid to fall into a hopper where it is moved using an Archimedes screw or auger type of pump. The vortex weir type uses paddles to concentrate the oil and then it falls over the weir. The last type is the combination weir/ boom skimmer here one or more weir units are built into a length of oil recovery boom. Weir skimmers tend to have high capacity storage available to match their recovery rates. Otherwise skimming operations will quickly come to a halt due to lack of tankage.

Pluses: Can take very large quantities of fresh oil as long as sufficient oil can be fed to the skimmer by the boom and there is sufficient storage to take the recovered fluid.

Minuses: With viscous oil, units without auger type pumps and debris cutters on the intake quickly become clogged with rubbish. High pressure water jets may have to be employed to push large debris items to one side and force very heavy oil/

c. Suction Skimmers consist of a head which is suspended just beneath the water level and a recovery hose is led to a vacuum pump.

Pluses: Truck mounted units very useful hen road access to a recovery site is available. These have also been mounted on barges with some success.

Minuses: Debris will quickly clog up the intake unless very large hoses (and thus pipes) are used. Six or 8 inch hoses preferred.

d. Belt skimmers consist of a moving conveyor type belt which lifts the oil from the surface up and over a scraper which takes of the oil. The recovered oil is led into holding tanks. The moving belt can be made of materials on to which oil will adhere in preference to water or simply rubber with horizontal metal bands which scoop up the oil. This latter type is used with fuel oils, mousse or other high viscosity fluids.

Pluses: One of the most effective skimmers with heavy oil and mousse. The units with integral holding tanks should be able to allow the recovered water to be run back to sea. The addition of emulsion break chemicals will hasten this process.

Minuses: None worth mentioning. Not designed to work in waves/ swell more than 2/ 3 feet.

e. Rope Mop skimmers consist of polypropylene fiber ropes on to which oil will adhere in preference to water. The ropes pass through metal rollers which squeeze out the oil which is then led to tanks. A special design of these rope skimmers is called the zero velocity skimmer. in which the ropes are passed along between the hulls of a catamaran hull at the same speed as the craft is moving forward. The ropes thus lie effectively motionless in the water and so maximize the adhesion of the oil to the rope. These craft require small booms on either side of the bow to concentrate the spilled oil and direct it to the rope system.

Pluses: Designed to recover heavy oil/ mousse, can pull out oil between floating debris.

Minuses: Slow, if the wringer unit is mounted too high above the water line then oil will run down the ropes. Steam injection on the wringers is required to soften the most viscous oil and keep it liquid to assist pumping to the storage tanks. Some users prefer 6 inch rather than 9 inch ropes as they are stated to hold the thicker oil/ mousse better.

f. Brush skimmers area fairly new development but are basically belt skimmers in concept. The brush is a rotating drum on to which is attached a layer of bristles. The drum rotates down into the water and the bristles hold the oil and the water pressure pushes the oil up into and between the fibers. The drum then passes a scraper removing the oil, which then falls into tankage.

Pluses: Work well in thin oil, less affected by waves.

Minuses: Debris will stop the flow of oil to the brushes. Little practical experience as yet.

Each of the above will have their uses and, as oil will increase in viscosity with time, different skimmers will be called into play. The transrec skimmer system (350, 250 and 100) made in Norway by Frank Mohn, has a skimmer head which can be exchanged for weir, disc skimmer or rope mop depending on oil lay thickness and viscosity. This is a very adaptable piece of equipment but requires mounting on a substantial barge or having a tank vessel available to hold its recovered oil.

Temporary storage of the skimmed oil/ mousse is an important consideration for the logistics staff. Most of the bladders or dracones tend to be of the disposable type. Once filled it is all but impossible to pump them out. The detachable pumps on the Desmi skimmers offer the best chance to pump out such units, but it is a very slow operation. The danger of hydrocarbon gas build up should not be ignored. These rubber tanks will tend to concentrate the gas and this should be expelled by ventilation before pumping is commenced.

The PLG report quite correctly describes the quick drop in efficiency with time due to the increase in viscosity of the oil on the surface of the sea. After 3 days the skimmer is probably only capable of recovering 20% of its rated capacity. Bad weather and lack of daylight also hinder oil containment which is required to keep a supply of oil coming towards the skimmer. This is why the Alaska Department of Environmental Conservation uses the rule of thumb of 30% capacity for three 12 hour periods during the first 72 hours. Oil in water emulsions have 4 parts water to one part oil and so a spill of 5,000 barrels of oil can become 25,000 barrels of mousse (excluding evaporation) should the conditions be such that water and oil are mixed, i.e. bad weather at sea. All these points should be considered when making the choice of skimmers to be included int the equipment list.

The equipment recommended in the PLG report is as follows:

1. CIRO Resource Group 1. Two, Destroil Desmi-250.

These are weir type skimmers with a screw pump to transfer the oil into storage. The Desmi pump is very good indeed and enjoys a good reputation. The skimmer head can have problems in following wave motion but is as good as any in this respect. All things considered, this recommendation is to be supported. The pump used in the 250 is the same as the off loading pump, but the larger power pack must be acquired if it is desired to use the pump as a salvage pump at its maximum capacity of 440 USGPM. This power pack is 47 KW rather than the small KW unit normally supplied with the Desmi 250 skimmer.

However, the writer further recommends that a weir section be obtained to fit into the Roulands Bay boom which is recommended for the response craft. This weir section is inserted into the boom and forms an integral part of the boom. The skimmed oil is then led back to the deploying vessel. This makes the recovery task that much easier in that the skimmer and boom are all in one unit, making it easier to maneuver when catching an recovering oil.

The PLG report also recommends a 4,000 gallons floating container for recovered oil. Recently, Unitor of Norway has introduced an oil recover bag which can hold large quantities of oil yet can be stored in a relatively small container. This bag system is new and untried but it is worth investigating. See Appendix A.

The writer cannot find in the PLG report what is to happen to the recovered oil. Clearly, skimmed oil and mousse needs to be discharged so that vessels can continue skimming operations. It is recommended that this oil should be pumped ashore at the crude oil discharge dock of KPL for storage into tankage at the Tesoro refinery. Special arrangements will have to be made to allow the recovery craft to couple up to the pipeline and also to boost the discharge pressure such that the oil moves the approximately ¾ mile to the shore tanks.

2. CIRO Group 1A. One Destroil 250 skimmer. 4,000 gallon container or bladder.

This skimmer design is acceptable. Suggest use of oil bag rather than bladder.

3. CIRO Resource Group 2. One Desmi 250 skimmer, one Walosep W4 weir skimmer.

The Desmi is acceptable. The writer is unable to find in the PLG the reason why certain specific types of equipment have been recommended to the client. The Walosep is a variation on the weir design called a vortex skimmer and little is known about their track record in large spills. A better alternative would be the inclusion of a Roulands weir skimmer section for the Bay boom already on the craft and the provision for a Unitor oil bag to hold the recovered oil once the on board tanks have been filled.

4. CIRO Resource Group 4. One Transrec 250.

This skimmer has a capacity of 250 cubic meters per hour whereas the larger 350 is quoted at 350 cm/ hr and uses 6 inch hoses rather than 5 inch/. There is little to be gained going for the larger unit and so the choice of the 250 unit is to be recommended. However, two such units should be fitted rather than one. Both of the units should be fixed to the barge in such a manner that they can be lifted off and used on a vessel of opportunity in addition to working from the barge.

5. CIRO Resource Group 5. One lightening system for pumping out recovered oil from skimming craft and tanks.

The writer is unable to find out the pump design used by the system. The recovered oil will be very viscous, mixed with debris and experience has shown the best pump type is the screw design. Also note that the pump on the Desmi 250 skimmer is detachable such that it can be used as a lightening pump. Its capacity (440 USGPM with the large power pack) is less than the APTS but is purpose designed to shift thick viscous mousse. It has been used in real spills with good results. It is thus recommended that this be acquired as it can fulfill a dual role, discharge pump and spare unit for the Desmi skimmers.

Other Recommended Equipment

a. Orion 2100 tracking equipment. This is a VHF transmitting buoy which is tracked with a portable direction finding VHF radio receiver. I can also be fitted into a helicopter. This is no substitute for the mark one eye ball. These buoys, with time, move out of phase with the oil and become inaccurate. They can however, in ice free conditions, give a general indication of direction. Their detection range from a surface craft can e quite limited, often less than 12 miles. This is better with height, i.e. an aircraft and if used then it is recommended that a contract helicopter have the antennae fitted such that the VHF radio can be quickly fitted up. There are now on the marked VHF DF (Direction Finding) sets for use in aircraft and all that is required would be to have their radio frequency installed or made available to this new receiver. The tracking of spilled oil is a vital part of oil spill containment and clean-up. CISPRI should have standing agreements wit fixed wing and helicopter operators such that aircraft can be obtained with the minimum of delay. There need not be any special equipment fitted to the aircraft other than a VHF DF receiver for the buoy tracking aircraft and under slung gear for the helicopters. A trained observer should fly with the pilot to gather information and pass on, via a marine band VHF radio, to the on-scene commander. The observer should carry an S-VHS camcorder to record important events such that he tapes can be shown at the planning meetings. One picture is often worth more than 1000pwords. The aircraft should be flown last thing at night and also at first light such that surface craft are kept informed of the movement of the spilled oil.

Contacts with Other Response Organizations

In the event of a major incident, equipment and perhaps more importantly, trained man power will be required to mount a large oil spill clean-up operation. Probably most attention will be turned towards Alyeska, whose resources are renowned world wide It is recommended that CISPRI investigate the possibility of entering into a contractual agreement with Alyeska where, in return for an annual fee, CISPRI can call upon equipment and supervisory staff. Clearly such a call on resources will be set at a maximum level such that the TAPS operations are not compromised.

Such arrangements already exist within the oil industry, the most well known is the Southampton Oil Spill Service Center where 12 oil majors have formed a service company that has sufficient oil spill equipment to cover two simultaneous spills each of 30,000 tons. This equipment is sent world wide and where necessary, the center sends its skilled staff to supervise operation of the equipment. Another example is the United Kingdom Offshore Operators Association who acts on behalf of all the oil companies with interests in the North Sea. They have stock piles of oil spill equipment along the coast line of Great Britain which can be called on by any member dealing with an oil spill.

Marine Spill Response Corporation is establishing oil spill response depots around the US coast and the American oil industry is setting up the Petroleum Industry Response Organization which will also have stock piles of oil spill clean-up equipment at strategic locations along the US coastline. It is understood that Alaska will not be one of the stock pile locations, presumably because the bulk of the oil moved is of TAPS origin and Alyeska has sufficient equipment already in place in Valdez. However, CISPRI must establish contact with the managements of these stock piles planned for Settle and other locations, and pre-plan the logistics of moving the equipment to Cook Inlet. Equipment should be pre-slung on pallets/ containers for direct loading on heavy transport aircraft such as the Hercules C-130, with heavier items containerized for quick loading on to platform supply craft or similar vessels of opportunity.

Manpower and Accommodations

Having sufficient equipment is only half the battle; manpower is equally important. It is no use having the equipment sitting on the beach if there is no staff to deploy and operate it. Trained supervisors are vital; they can lead teams of relatively unskilled labor picked up from the local population. If labor has to be imported into the area to cope with large spillage, lack of accommodations can be a major restraint on the ability to respond with sufficient manpower.

For the supply of additional skilled supervisors standing agreements should be in place with local and US wide clean-up contractors: Alaska Clean Seas, Alyeska, PIRO (when established), Southampton Oil Spill Service Center, US Coast Guard and other sources of expertise.

For the supply of unskilled labor, the local supply will quickly be exhausted, especially during the summer months. It is thus important to be able to draw from the lower 48 using the States' employment organizations. Clean-up contractors should be able to assist in this work as they have to hire labor in these circumstances when a large operation is under way.

Contactors who can supply accommodations in the form of barges with living modules on deck and "flo-tels" (semi-submersible rigs fitted out to act as living accommodations for hook-up staff working offshore) should be pre-agreed with the regulatory authorities remembering that sewage discharge could be a problem if only partial treatment facilities are available on the unit. Arrangements for collection and disposal of garbage also need to be addressed.

No mention is made of tanker casualty management plans. This we consider to be an omission as they are required as part of the ship's oil spill response plans. These plans should address, among other things, the most suitable location to place a damaged tanker or barge in terms of minimum current, minimum environmental impact, suitability of seabed for possible beaching and convenience of logistical support. There is a clear need for close cooperation with the USCG and CIRCAC on agreeing such management plans with reference to operations in Cook Inlet.

Section 3: Tesoro Alaska Oil Discharge Prevention and Contingency Plan

Volume One, March 1991

This contingency plan covers all aspects of the Tesoro operation in Alaska including shipping of crude, discharge, refining, storage, vessel/ barge loading of product and he management of a pipeline to Anchorage. The parts of the plan which the writer is competent to comment on are matters concerning shipping and dock side operations.

Section 1, Emergency Spill Response Plan:

Paragraph 1.1 would appear to cover a major incident such as a collision or explosion where a large quantity of oil has been released and crew members may have even injured or even killed. In such cases the safety of life is paramount and the Master's initial efforts will be directed towards that end. In these circumstances, the US Coast Guard will be his first contact point in order to request assistance and ensure the safety of his crew and tend to the injured. At this point the Master will advise the USCG that oil has been released and it is recommended that in the USCG emergency check list that there is an action to inform the Tesoro incident commander. It is assumed that the USCG will be aware that the vessel is on charter to Tesoro. The next probable action by the Master will be to contact his owners or managers and advise what has happened. They in turn will notify the P and I club, hull underwriters, cargo owners, classification society and probably the Salvage Association. After these contacts, the ship will inform the charterer (Tesoro incident commander) of the situation so it is unrealistic to expect that Tesoro will be the initial contact in these extreme circumstances and thus Tesoro management must ensure that they will be informed by the others detailed above. This is known as "closing the loop."

The check list correctly highlights the requirement to locate the source of the spill and take immediate steps to stop the flow of oil. This will probably require the transfer of oil into empty or slack tanks such that the hydrostatic differential between oil/ seawater is reduced to zero. Clearly, for this to succeed the ship must have sufficient empty space to take the transferred oil, if many tanks have been damaged then this will not bee completely effective. To overcome this lack of available space, Unitor of Norway has developed an oil bag which can be used to hold oil pumped from the manifolds. This bag is released into the sea with one end retained at the pump manifold. The bag can be purchased in sizes between 50 and 20,000 cubic meters and has been approved by DNV, the Norwegian classification society. The first units have been delivered to several European tankers. See Appendix A.

If there is oil on deck, a very rare occurrence while at sea, then it can be pumped to the slop tank and/ or absorbents can be used to soak up the oil.

What is not often realized by the general public is the ship's complete inability to contain and recover oil which has been lost into the sea. It is impossible for the crew of a large tank vessel to shoot booms or skimmers, the freeboard is too high, there are no assist craft to take the end of the boom, spilled oil is taken away from the ship by wind and tide, etc. Any action taken to contain the spilled oil must come from an agency other than the ship.

There would appear to be an omission in this section in that there is no subsection dealing with the discovery of oil at a jetty when a ship/ barge is alongside transferring oil. In such circumstances very clear guidelines need to be laid down or the ship's crew will assume the dock supervisor will report the spill or vice-versa. When sheens and/ or oil are found at the jetty head the source is not immediately obvious, although the odds are it is the ship that is at fault. However, the source could be leaks from the loading arms/ hoses, jetty sump overflow, vent valves partially open, etc., so it is better to have the following reporting system:

1. If first seen by the ship's staff then they should reporter it to the jetty operator who will then advise the senior duty officer at the Tesoro refinery.

2. If it is the jetty operator who first sees the oil, he/she should inform the ship and then the senior duty manager at the refinery.

3. The ship and jetty operator must then immediately investigate the spill and if it is not immediately obvious that the spill is of a very minor nature and has stopped, then cargo pumping must cease until the situation has been resolved to the satisfaction of he Tesoro incident commander. Where it is suspected that the ship has passing sea valves then it may be the case that only a diving inspection will resolve the source. This can only be done at slack water.

Section 2, Spill Response Scenarios:

Section 2.1 outlines a spillage of 50,000 barrels from a tanker off the KPL dock at Nikiski. To say the least, the spill has occurred in ideal weather conditions. The text states that the spilled oil has formed a slick “2-3 inches” thick and is under the influence of the tide. Oil, like everything else, is affected by gravity and will quickly spread to a thin, uniform layer approximately 0.04 inches deep. In 12 hours, given calm wind conditions, the spill will spread to approximately 40,000 acres (6 square miles) and in 24 hours it will cover approximately 60,000 acres (9 square miles). This is hastened by hot oil, on a warm sea, in summer air temperatures. Moderate to high winds will drive the oil to cover more sea area. The sea area polluted by oil will quickly spread to an area far in excess of what the proposed booming capacity can handle. The response craft skippers will be overwhelmed and they will only be able to deploy their equipment in what they perceive to be the thickest oil. This is very difficult unless they are receiving guidance from the air where a trained observer ill be able to guide them to the thickest areas, ignoring the sheens. It will be vital to embark on a major aviation response in addition to the surface craft. Helicopters and even Hercules C-130 aircraft will be needed to spray dispersants in areas outside the scope of the booms. Other aircraft will need to supply a near constant supply of information to the surface craft and the incident commander.

The estimation of the quantity o recovered oil is unrealistically high, 37,000 barrels out of 50,000 barrels, 74%. Experience has shown that actual recovery rates are nearer 7.4%, 3,700 barrels, even under ideal conditions such as those in the scenario. The reason is the spread of oil to cover such a large area. The Independent Tanker Owners Pollution Federation advised that in such a catastrophic spillage as that described, 90% of the oil will be released in the first few hours of the disaster. Clearly, the response to this size of spillage will require more thought.

Section 3, Operation and Spill Prevention:

There can be no doubt that one ounce of prevention is better than on ton of cure, especially n hostile waters such as the Cook Inlet. Subsection 3.1A, correctly states that the ship master is ultimately responsible for the vessel being securely moored. This does not prevent the berth operator from insisting on minimum requirements for the number and type of ropes to be used forward and aft. The reason is that some masters have differing standards as to what can be considered safe. It is almost certain that the KPL dock operator will lay down minimum standards and these and any other requirements should form part of the charter party between the ship and Tesoro. Once a ship has been to the dock for the first time, the ship master and the dock operator should inspect the moorings such that a drawing can be made which shows the optimum mooring arrangement. The Oil Companies International Marine Forum issues guidelines on mooring principles and these should be consulted. The principle is concentrate on breasts and springs wherever possible.

Declaration of Inspection (DOI):

There is no information on what items are inspected and found to be in order before the certificate is signed. Also, there is no mention of paper work where all the agreed items are recorded for both parties to work to as the transfer takes place. It is recommended that a jetty regulations and information book be drawn up such that the variable items are printed on carbonless paper so that one copy can be torn off and given to the ship as record of the pre-transfer conference. It will also contain the items to be checked before the DOI certificate is signed. A copy of such a book is given in Appendix A of this report. This is the booklet used by BP at the Sullom Voe Oil Terminal and it is a good example of an "all in one" check list/ DOI and jetty information pack See Appendix B.

Watch and Shift Arrangement:

No particular merit is seen in having a new transfer conference every time there is a shift change ashore or a watch change on board. It is important that ship and shore have copies of the jetty information book in which is recorded all the required information. Clearly the ship and ashore staff must have an efficient scheme to correctly give all information to on-coming staff. One other recommendation is that tat hourly intervals, the jetty supervisor should board the vessel/ check the waters around ship for oil or sheens/ walk around the vessel checking moorings, hoses or arms, scupper plugs, etc., and if any faults are found the ship's duty officer should be informed immediately.

As discharge commences and at approximately 4 hourly intervals thereafter, the jetty supervisor should satisfy himself that the quality of the inert gas is within the required specification, i.e. 4% from the engine room. He should check the oxygen content and pressure gauges in the control room and witness a random test of a tank being discharged. This should be less than 8% oxygen content. These checks will only apply to ships which are required by USCG regulations to be equipped with and use inert gas.

Cargo Transfer Procedures:

There is no mention of ballasting the ship. The following guidelines are recommended:

1. Ballasting the segregated ballast tanks should commence soon after cargo discharge has commenced. The principle being to keep the vessel as low as possible in the water to reduce wind loads on the moorings. Reasonable stern trim for draining is acceptable.

2. If dirty ballast has to be taken, i.e. sea water pumped to a dirty cargo tank, then this should not be commenced until the jetty supervisor boards and ensures that the ballast pump is run up before the sea suction valve is opened. He/ she should check that no oil escapes.

Personnel Training:

It has been mentioned elsewhere that the *Overseas Washington* carries an extra crew member in order, presumably, to reduce fatigue on the deck officers. It is not mentioned exactly who this extra crew member is, but it is assumed to be an extra navigating officer. This requirement of the charterer is fully supported as the prime reason for accidents is crew error brought on, more often than not, by fatigue. This is made worse by short voyages which can result in excessive hours. Officers in charge of cargo operations (12 hours per day) then take up 4 hourly navigation watches until the next port is reached when they again revert to 12 hours per day. When mooring and unmooring standby by all hands is added to these already excessive hours, it is little wonder that ship's crew become tired and attention to detail can lapse. The inclusion of an extra officer goes a long way to lessening such excessive hours and is relatively cheap compared with the ship hire charges plus cost of the cargo. It is to be recommended that other large tank vessels on time charter to Cook Inlet making short voyages should also consider the inclusion of an additional deck officer.

Section 4, Spill Detection:

A. Deck Watch on Tank Vessels While Alongside. Mention has already been made on spill detection while alongside. The best method is for the ship to advise the jetty supervisor if the crew sees the oil first. If the jetty sees the oil first then the ship should be advised. The jetty supervisor should then contact the Tesoro duty manager. Cargo should immediately be shut down unless it is obvious that the spill is very minor and is not from the ship. At night oil on the surface is very difficult to see, and both the jetty and on the ship lighting should be directed towards the surface of the sea so that ship and shore staff can check for oil. In high tidal areas if there are known points on the shore where spilled oil will collect, i.e. tidal eddies, these should be checked at regular intervals.

B. In Transit Spill Detection. It is most unusual for the ship's crew to discover an oil sheen trailing astern. The ship's wake will mask all but the largest discharge of oil. Even this will be impossible during the hours of darkness. The first reports of oil will come from passing aircraft or fishing vessels working astern of the tank vessel as she passes. The writer has personal experience with oil pollution surveillance flights and every time a sheen of oil has been seen astern and the ship advised, not once were they aware of the problem. It is recommended that scheduled and charter aircraft operators who regularly over fly Cook Inlet be requested to keep a look out for signs of oil on the surface of the sea. If anything is seen, then the pilot should request air traffic control to pass on the sighting to the USCG.

In the event that oil is being released into the sea, the source is almost certain to be passing valves in the pump room/ engine room, or, rarely, damage to the hull in the way of a full cargo or dirty ballast tank. In the event that, despite every effort by the crew, oil continues to escape from the ship, there is little alternative other than to find a sheltered anchorage for the ship. There she can be met by the Banda *Seahorse*, boomed off and temporary repairs commenced. Suitable locations for such work to be done must be identified in advance and approval obtained from the appropriate authorities. These locations are called "safe havens" and in the event of an emergency the USCG should direct the vessel to such a location.

Section 6, Radio Communications:

At every debriefing after a spill or a spill exercise, one problem which is always close to the top of the list is communications. It is the one factor that is always underestimated and log jams develop in logistics and the effectiveness of clean-up operations. To give the reader an idea of the radio communications used in the *Exxon Valdez* incident, the following is part of the equipment list published by Exxon:

1. VHF Systems

    a. 15 base stations
    b. 200 mobile stations
    c. 1150 hand held radios

2. UHF Systems

    a. 50 repeaters
    b. 600 mobile radios
    c. 2040 hand held radios

3. Satellite Systems

    a. 5 earth stations
    b. 15 Inmarsat terminals

Contact should be made with the Federal Communications Division to investigate what assistance can be had in an emergency to allocate frequencies for use during the response operations. The use of VHF channel 10 will be swamped within a matter of minutes of the oil spill incident.

Volume 4 of the CISRPI Technical Manual's "Logistics" has made a start on such considerations, but it is recommended that it be reviewed to consider the communication implications of a major incident.

Section 10, Vessel Information:

It is stated that the *Overseas Washington* is hydrostatically loaded in that the oil level in the cargo is level with or below the sea level. In the event of a grounding oil should not escape to sea unless the vessel's draught is reduced due to riding up on the sea bed obstruction. This action on the part of the charterer is to be supported, but Section 10 does not give details of this method of loading. A description would be of benefit to all concerned. Are all tanks so loaded, or are just the wings or the centers? For hydrostatic loading to be effective, all tanks must be so loaded.

In the section on "Tending Mooring Lines" it is stated that the vessel is equipped with six constant tension mooring winches and only periodic checking of the lines is required. This is contrary to the advice of the oil Companies International Marine Forum who advise in their book on *Effective Mooring*,

"Experience has shown that the use of such (tension) winches whilst the ship is alongside is not a safe practice because the winch restraint is limited to its render load, which is small compared to what it can hold on the brake. It is possible for winches at opposite ends of the ship to work against each other when an external force caused by either wind or current or both is applied to one end so that the ship could "walk" along the jetty. Should the bow winch render a little for whatever reason (i.e. a change in direction or force of wind or current) some wire will pay out, which cannot be heaved onto the drum again because the heaving force of the winch is always less than its render force. It is not possible to heave in until the eternal force which caused it to render is reduced."

Mooring winches should not therefore be left in automatic self tensioning mode once a ship is secured alongside. On completion of mooring the winch should be left with the brake on and out of gear. It is understood that the use of such winches in the tension mode is indeed banned at KPL dock, so it is surprising that they use is mentioned in the text. It is our recommendation that the reference to the use of tension winches be removed from the text of the contingency plan.

Section 4: Kenai Pipeliine Company, Nikiski Terminal Manual

Revision dated, May 1991

This publication issued by Chevron USA, Inc. is intended to inform jetty users of the operating regulations when using the dock, the facilities available and details of the jetty itself. It is written by an oil major with one of the best operated fleet of tankers in the world, and the manual is well written and contains all necessary information. The operating regulations are clear and in keeping with the ISGOT guidelines (International safety Guide for Oil Tankers) published by the Oil Companies International Marine Form (of which Chevron was a founding member) and the International Chamber of Shipping.

The following comments are intended as constructive advice rather than criticism:

a. ETA Requirements:

After the vessel has been approved by the ship vetting department of Chevron Shipping, San Francisco, the list of required information sent by the ship master should be expanded to cover details of:

1. Inert gas system operational and all tanks checked to be inert within the last 24 hours.
2. All navigational systems and safety equipment operational, and if not, details of deficiencies required.
3. Hull and valves oil tight, no leaks.
4. Both anchors available and cleared away.
5. Number and types of moorings, all winches operational. Any deficiencies to be detailed.
6. Approved oil spill contingency plan and certificate of financial responsibility on board.
7. Name of P and I club.

8. Name of Master, ship operator and charterer.
9. Engines will be checked to come astern before boarding the pilot or before passing abeam Homer.

b. Docking:

There are no details of the minimum required under keel clearance. An average figure is about 6 feet, but local conditions may require more if large boulders are known to be taken into the dock area by strong tides.

There are no details of maximum loads on the mooring hooks. This is normally about 100 to 150 tons and ships should be instructed not to allow too many moorings to one hook such that SWL could be exceeded. The winter rules warn the mariner that "in heavy ice conditions it may be necessary to double or triple the normal mooring line requirements." Care should be taken to ensure that the maximum hook loads are not exceeded.

c. Ballast Requirements:

This area should be strengthened to require vessels to berth with a minimum of 35% of the summer deadweight, including ballast/ bunkers/ fresh water and stores. The propeller tips must be covered and the ship in a suitable trim for maneuvering.

d. Fire Fighting:

This is one area of the manual which causes concern. It is our opinion that there is insufficient effective fire cover at the jetty or from seaward. The manual states there is no fire water at the jetty head and fire fighting equipment is limited. The local fire department will assist with their pumps and there are rig tenders/ CISPRI vessel and monitors. This is not sufficient cover when you consider the products and the quantities there of passing over the dock. Following is a list of how a large crude jetty is normally fitted in the United Kingdom:

1. Two 8" lines, one water and one foam.
2. Fixed monitors on the jetty head to spray water on the whole area plus a water curtain on the gangway to allow persons to escape the area. Four head hydrants every 25 yards down the jetty access road.
3. Two foam monitors, steerable, trained on the manifold area delivering 20,000 GPM produced foam for a minimum of 25 minutes. This can be extended with extra foam making compound. Once again, four head hydrants down the jetty access way. The foam line can be used for water if foam stocks run out.

And all this is backed up by the fire fighting tugs. Each tug is equipped with a top monitor (70 feet above sea) giving 13,500 GPM produced foam for 10 minutes or 1,400 GPM water. Two wheel house top monitors giving a total of 10,000 GPM foam or 1,400 GPM water. All three can be used at the same time. The tugs are versatile in that they can fight fires on tank vessels when away from the berth and so mitigate potential disastrous consequences of a major ship fire.

It is recommended that a tug with the above fire fighting capability should be within reasonable distance to provide emergency fire cover.

e. Oil Spill Incidents:

Oil spills on deck leaks from hoses on the ship or jetty are normally discovered quickly. Passing sea valves or leaks from the hull are more difficult to see and require more diligence to observe. The ship and shore staff should be instructed to look over the side and down tide to check if oil sheens are present. At night, a light should be directed towards the sea on both sides of the ship to enable the staff to check the area within the illumination of the lamp. Where possible, a craft should carry out an oil pollution patrol to see if there are discharges of oil around or down tide. If there is an airport nearby, local pilots should be asked to quickly check the harbor area and report any findings to air traffic control for onward telephone contact to the dock operator.

Many oil spill incidents are of a minor nature and should not require immediate notification to all the parties listed. If the source is known and has been stopped, there is no real need to suspend cargo as long as there are sufficient crew members to deal with the clean-up and carry on cargo operations. If there is any doubt as to the source, then cargo/ ballast operations must be stopped until the source is found. On occasion divers will be required to identify the source and cargo may have to be halted until tidal conditions are suitable.

f. Tanker Moorings:

To check on the adequacy of the moorings the following quick method will indicate the maximum forces and restraining force of the moorings. The computer printouts which follow show the wind/ current forces on the tank vessel *Overseas Washington*, loaded and in ballast.

1.	27 Degrees	7.	8 Degrees
2.	27	8.	8
3.	40	9.	55
4.	90	10.	60
5.	8	11.	35
6.	8	12.	35

Assuming the case of a steady offshore wind of 30 knots blowing at right angles to the ship's side combined with a 5 knot current running parallel to the jetty, the total forces will be as follows:

		Ballasted	Loaded Ship
1.	Forward, across ship	17.2 t	7.8 t
2.	Aft, across ship	25.6 t	14.5 t
3.	Longitudinal,	41.7 t	64.8 t

If the wind were to increase to a three second gust of max 60 knots then the forces would increase as follows:

		Ballasted	Loaded Ship
1.	Forward, across ship	68.6 t	31.3 t
2.	Aft, across ship	102.3 t	57.9 t
3.	Longitudinal	41.7 t	64.8 t

The maximum load on the winch brakes will be not more than 70% of the breaking strain of the wires, 55.6 long tons. The ropes will be on bits thus the maximum strain will be the breaking strain, 73.6 tons. When resolved at right angles considering the angles estimated above, the maximum strain of each line can be resolved as follows, fore and aft/ across ship.

1.	65.5/ 33.1 tons	7.	55.4/ 4.9 tons
2.	65.5/ 33.1	8.	55.4/ 4.9
3.	41.7/ 36.7	9.	31.7/ 45.6
4.	0.0/ 55.6	10.	27.8/ 48.4
5.	55.4/ 4.9	11.	60.3/ 42.0
6.	55.4/ 4.9	12.	60.3/ 42.0

Total Restraint Forward:

Fore and Aft, 283.5 tons — Across Ship, 158.5 tons

Total Restraint Aft:

Fore and Aft, 290.9 tons — Across Ship, 187.8 tons

Thus the proposed mooring pattern is adequate for the anticipated forces as long as the ship maintains parallel to the jetty. From the attached computer printouts you can see the very large forces the current will apply to the ship if, for whatever reason, the ship comes off the jetty at an angle to the current. If ice were to come between the ship and shore and force the ship off, then the moorings could not restrain the ship if the tide was running in excess of about 2.5 knots. It is recommended that assistance to the vessel is given to remain parallel in times of heavy icing that could force the ship off line. This can be achieved by a tractor type tug(s) moored alongside the tanker, parallel to the ships side, and using direction thrust form her propulsion units to push the ship towards the jetty.

Section 5: Cook Inlet Pipe Line Company,
Offshore Operating Manual, Drift River Contingency Plan, October 1990

These documents issued by the Cook Inlet Pipe Line Company contain the jetty information and emergency procedures to be followed by company staff and ships' crews while alongside the Christy Lee offshore loading platform. The documents are competent and informative, well up to acceptable standards. The following observations are put forward to the operators for their consideration.

a. Section 1, General Information:

There is no data on water depths alongside, tidal range, nor the minimum under keel clearance. It is understood that the water depth is quite sufficient for the maximum class of ship expected, however this information should be included in case an unusual happening occurs, i.e. damage to engine room and ship settles by the stern due to ingress of water. The safe working load of the slip hooks (112.5 short tons) should be clearly shown to avoid the danger of overloading during ice conditions when extra moorings are required.

The paragraph on maximum number of lines states that no more than seven lines may be run to any one breasting dolphin. This means that one hook will have two, possibly 1.5" wires. With such wires on a standard winch with brakes rendering at 70% of the wire's breaking load, the load on the hook will be approximately 111 long tons. The hooks are advised to have safe working load of 112.5 short tons which is probably sufficient as long as not more than 2 wires are used and such wires are not greater than 1.5", but there is no room for error. The hooks are on their maximum safe working load.

It has been advised that tidal stream can run in excess of 5 knots on the ebb and 3 knots on the flood in the area of the loading platform and the jetty is aligned some 15 degrees off the direction of the stream. In the attached computer printouts of the tanker *Sansinena II* the forces applied by wind and current are as follows:

		Ballasted	Loaded Ship
1.	Forward, across ship	78.6 t	242.3 t
2.	Aft, across ship	46.7 t	118.8 t
3.	Longitudinal	1.1 t	16.3 t

A quick calculation of the mooring restraint using 4 head/ stern lines and 3 springs each end (a total of 14 mooring lines with an assumed brake render load of 55 tons) gives the following:

Forward, across ship	208 tons
Aft, across ship	208 tons
Longitudinal in one direction	162 tons

The above forces clearly show there is no room for error in the moorings of the ship at the Christy Lee loading platform while in the final stages of loading on a flood tide. Indeed it is surprising that, despite the undoubted vigilance of the ship and platform staff, there have not been more incidents when a ship has come off the berth. It is again recommended that a tractor type tug(s) be used to assist such tankers to remain alongside in times of icing or abnormally high winds and/ or large tidal streams. It is further recommended that a detailed study be made of the berth and ships/ barges that use the facility to ensure that the mooring restrain is sufficient and the mooring equipment is strong enough to take the anticipated loads.

The section outlining the use of mixed moorings is possibly dangerous and could jeopardize safe loading of oil during winter conditions. Mixed moorings should be strictly forbidden and ships that can not comply should not be chartered to come to the facility. The reason is the near impossibility to adjust wires/ ropes such that each bears an equal load at maximum load. The OCIMF guide to moorings stresses this point and advises mixed moorings be forbidden.

The ballast reception facility as described in the operating manual is much too small at 90,000 barrels and it is understood it is not operational at this time. An 80,000 ton tanker will carry approximately 25,000 tons of ballast which is about twice the capacity of the holding tank. It is important that a tanker coming to load be ballasted such that the propeller tips are well immersed and the trim such that the ship can be efficiently maneuvered alongside the platform. This will normally mean about 35% of the summer deadweight including bunkers, fresh water and stores. Ballast is normally a combination of segregated and dirty, depending on the age of the ship. Older ships may not have segregated ballast tanks as defined in the MARPOL convention of the IMO. Segregated ballast is carried in tanks that are only used for such water and there is no piping connection to the cargo system. Dirty ballast is carried in dual purpose tanks which are used for oil on the loaded passage and then for ballast en route back to load. Such water must be sent ashore for processing whether or not the tanks have been washed after discharge. Oil is still present in the ballast and the cargo lines and pumps may well be contaminated with oil. This is the normal practice worldwide and probably at the Drift River offshore loading platform and is a requirement of the MARPOL convention. If the ballast facility is not operational then the ships must sail with the dirty ballast still on board. The discharge of segregated ballast into the sea is permissible, but it is recommended that such ballast be sampled and then tested to confirm the hydrocarbon content is below background level, approximately 3 ppm. This is particularly important for older vessels as the segregated ballast pipe lines run through oil cargo tanks and may be perforated, and so allow the ingress of oil cargo. When discharging at night, a light should be trained on to the sea surface near the ballast outlet to check that no oil is being discharged from a perforated line or joint.

Later in this section a procedure is laid down for the ship to deballast. It should be made quite clear in this section that deballasting will not be permitted before loading. Whereas this may be allowable in certain circumstances, it should e normal practice to require the ship to be in an acceptable condition of draught and trim to allow safe navigation should the vessel have to leave the jetty in an emergency. This will mean that the ship must load/ deballast concurrently or load/ deballast/ load. Deballasting before loading may lead to propeller tips emerging from the water and excess aft trim which hinders maneuvering the ship.

The fire fighting equipment would appear to give adequate protection for the platform itself, but is not sufficient to assist in extinguishing a ship fire or keeping the deck area cool while the ship's crew fights the source of the flames. Details of an acceptable jetty fire fighting installation is given in the section describing the KPL dock and as a minimum requirement it is recommended that a large foam/ water remotely controlled monitor overlooking the ship's manifold area be installed. It is further recommended that an efficient and capable fire fighting tug be in the near vicinity while loading/ deballasting operations are taking place.

There would appear to be no requirement for pre-arrival information from the tanker. This should be put in place with the requirements as given in the comments on the KPL facility. The requirement to accept ship's garbage may be impractical, unless there is an efficient means to transport such waste back to the Drift River terminal. The items which require checking prior to commencement of cargo operations are the minimum laid down in the "Declaration of Inspection" and should be compared with that used at the KPL dock.

The statement that the Terminal Supervisor will leave the platform and return to the terminal after the inspection has been completed is possibly a cause for concern It is recommended that while a crude oil tanker is alongside a senior member of staff should remain on the platform. If the pipe line operator insists that a person of similar status is required ashore, then additional supervisory staff should be sent to the site while a tanker is loading. It is difficult and unfair to expect an operator to force his will on a senior member of ship's staff if the operator is unhappy with a certain operation or situation. It is fully understood that the supervisor can be contacted by radio, but that is not the same as being on site and weighing a potentially dangerous position or situation.

There is no mention of checks on the oxygen content of the cargo tanks. Inert gas is an important safety item and is required by international convention by all crude oil ships. The shore supervisor should take his own oxygen analyzer and check any three tanks at random. If any tank atmosphere contains more than 8% oxygen then the ship should be refused permission to load and asked to vacate the berth until all cargo tanks have been inerted to less than 8% oxygen. The ship's IG plant should also be checked to be operational as inert gas will be required to fill the void space left by out going cargo tank ballast. This is an important requirement. If there is source of ignition present in a tank with hydrocarbon vapors and oxygen within the explosive envelop, then a disaster of major significance will result. It is too important to ignore.

The duties of the platform staff should include:

a. Ensure no craft comes within 50 yards of a tanker alongside. (This may require a safety zone to be declared by the COTP).

b. Ensure no stores are loaded/ discharged during cargo during cargo or ballast operations.

c. Give the tanker hourly figures on cargo loaded to assist ship's staff to prevent cargo overflows.

d. Check that the crewman is on deck at all times and is in radio communication with the platform in the event that an emergency shut down is required if such crewman spots an oil leak or cargo overflow.

The duties of the ship's crew should include:

a. Maintain water pressure on the ship's fire main, bleed off water through hawse pipe washers, if necessary.

b. Rig hoses and foam concentrate near the manifold area.

c. Check scupper plugs are properly in place. Release deck rain water to sea if clean; if dirty, pump to slop tank. If water is allowed to fill the after deck area up to scupper plate level then any spilled oil will go straight over the side.

d. Check ullages at 30 minute intervals, more often if

e. Slow down in good time to top off tanks.

f. Inert gas line to mast riser should be drained prior to commencement to cargo operations.

g. Verify cargo figures as advised by the platform.

Section 3, Emergency Procedures

There is no method for the ship to initiate an emergency shutdown other than by contacting the platform operator on VHF radio. This is a weak point as the platform operator may not hear the radio, the radio may be malfunctioning or the ship's radio may not be available or it may be broken down. Consideration should be given to giving the ship an emergency shut down (ESD) button on a cable near the manifold area. In this position it will be available to the ship's crew member on cargo watch on deck, the person who is most likely to spot an oil spill on the ship or near the area. Such an ESD arrangement is fitted at Sullom Voe.

Comments have already been made on the lack of efficient fire fighting equipment to protect the ship and cargo while working cargo or ballast. There should be a different scale of magnitude of fire protection in the form of equipment capable of laying down large quantities of foam and also the provision of a fire fighting vessel to assist from seaward. One procedure given is to release the moorings if the fire is on the ship is endangering the platform. Whereas it is agreed that this is a possibility, the operator must not do this if the ship is not under command, i.e. engines unavailable or ship control systems non-operational. To do this will result in the ship grounding with all the consequences of hull damage. It also makes the work of the rescue services more difficult and it is thus recommended that moorings only be released if the ship agrees and is able to steam away from the area while the remainder of the crew fight the source of the fire.

The section on spills or leaks which result in oil discharged to sea should include the following:

a. The contract helicopter (which is available at all times at Drift River) should be mobilized to over fly the area and guide the *Banda Seahorse* to the leading edge of the spill.

Section 6: Cook Inlet and Sullom Voe, General Description

Cook Inlet

The Cook Inlet tidal estuary runs north east from the Gulf of Alaska and is about 200 nautical miles long. It varies in width from about 50 nautical miles at the entrance to an average of about 15 nautical miles north of the Forelands. The depth of the navigable waters of the estuary varies from more than 50 fathoms near the entrance at the south west extremity rising to an average of around 20 fathoms in the Nikiski/ Forelands area. North of the Forelands water of 10 fathoms deep or more is available up to Fire Islands Shoals. The approach channels and berths at Anchorage are periodically dredged to maintain 35 depth at MLLW. The depths at the other two principle installations at Drift River and Nikiski are maintained by the natural souring effects of the tidal stream. The Kennedy and Stevenson entrance to Cook Inlet lie respectively north and south of the Barren Islands. Both are relatively unobstructed over a width of about 8 nautical miles. The tidal range in Upper Cook Inlet is one of the largest in the world at more than 30 feet. The tidal streams are commensurate with such tidal ranges and currents can exceed 7 knots at times. The tides are semi-diurnal and can vary from prediction by more than an hour in time and several feet in height due to meteorological effects. Ice hampers shipping operations over the winter months. The degree of disruption to shipping due to ice can vary significantly from year to year.

Sullom Voe:

It must be noted that Sullom Voe and Yell Sound are not comparable to Cook Inlet in many respects. At Sullom Voe the tanker jetties are located 12 nautical miles from the open sea at the north entrance and east entrance to the harbor area. There are relatively few shoals and the water depth varies from 70 meters at the north entrance to over 25 meters off the jetties. The east entrance is limited to vessels of maximum draught 11.6 meters and is not used by crude tankers. The currents in the deep draught route to the north and in the jetty area are unlikely ever to exceed 2 knots even in spring tides. Current rates of up to 7 knots may be experienced in the south eastern area of Yell sound. Siltation is not a problem in Yell Sound/ Sullom Voe. Sullom Voe/ Yell Sound is not affected by ice at any time. The tidal range in Sullom Voe is 2.3 meters at spring tides.

Section 7: Tanker Jetties, General Information

A. Nikiski Dock, Kenai Pipeline Company:

The Tesoro jetty is located at 60º 41’ North, 151º 224’ West on the east side of Cook Inlet. It is a conventional steel piled open “T” tanker jetty with a concrete deck.

Water depth is 40 feet at MLWS and the tidal range at springs can exceed 30 feet. The maximum current at the dock is said to exceed 5 knots on flood spring tides.

Maximum berthing wind is not stated in the operating manual, although it is understood that an upper wind speed of 35 knots is in force for berthing and working cargo.

Berthing Draught/ Trim/ Ballast requirements are not clearly defined.

Number of ships/ barges per annum (1990) 136/ 38.

Maximum size of ships allowed – 70,000 LT displacement for berthing.

The orientation of this berth is similar to the tidal flow.

B. Christy Lee Loading Platform, Cook Inlet Pipe Line Company

The Christy Lee Loading Platform is located on the west side of Cook Inlet adjacent to Drift River at Latitude 60º 33’ North Longitude 152º 08’ West. The Platform is a sea island berth of steel construction on steel piles. The berth is equipped an unusual fendering system which can be moved vertically on wire pulleys to achieve the optimum location with respect to ship’s hull as vessel loads/ deballasts/ and the tide rises/ falls.

The water depth at the berth at MLWS is reported to be 60 feet, the tidal range can be 30 feet at spring tides. The maximum current at the dock is said to exceed 6 knots at spring tides.

Maximum berthing wind – not defined, but helicopter said to be unable to place mooring personnel on platform in winds in excess of 25 knots.

Berthing Draught/ Trim/ Ballast requirements – not defined.

Number of ships per annum – approximately 24.

Maximum size of ship allowed – 50,000 LT displacement for berthing.

The orientation of this berth is not aligned with the tidal flow. It is reported to be some 15º off the berthing line, i.e. berth is 035º/ 215º and current is 050º/ 230º. Berthing tankers particularly on a flood tide (as is the preference of ship masters) without tug assistance will be fraught with difficulty even in moderate wind conditions. In winds directly on or off this berth, a safe, continuously controlled berthing operation without using tugs is questionable.

C. Sullom Voe Jetties

The Sullom Voe tanker jetties are located at the north east end of the sea inlet known as Sullom Voe at Latitude 60º 27’ N Longitude 01º 17’ W. All four jetties are conventional steel piled open “T” tanker jetties with concrete decks.

The water depth at three of the jetties is 24 meters at MLWS and 17 meters at the other jetty at MLWS. The maximum tidal range is 2.3 meters. The current in the jetty area never exceeds 2 knots.

Maximum berthing wind – 30 knots for vessels up to 350.000 tons DWT/ 365 meters Overall Length (vessels longer than this will not routinely berth in winds of over 20 or 25 knots depending on jetty).

Berthing Draught/ Trim/ Ballast requirements – minimum of 35% of summer DWT. Propeller must be immersed. Trim to be "reasonable" but not defined. These conditions apply at all times vessel is at Sullom Voe, including during loading and deballasting operations.

Number of ships per annum – 540 (1989)

Maximum size of ships allowed – No limit except draught of 22.6 meters.

The orientation of the jetties at Sullom Voe is not significant in terms of the small tidal flow. They are aligned such that the prevailing winds, which are the significant factor at this terminal, will tend to force vessels "on" to the jetties.

Section 8: Weather

Records indicate that the wind speeds at Nikiski/ Kenai rarely exceed 28 knots, (less than 1% of the time). At Sullom Voe during 1990 wind speeds exceeded30 knots for 20% of the year. Wind records for the west side of Cook Inlet are not available. The climate in the inlet is significantly moderated by the horse shoe of mountain ranges protecting the inlet. The mountains also create variations in the weather within the inlet at one time and reports from fishermen indicate that large differences in wind speeds can be experienced between the east and west side of Cook Inlet in certain conditions.

The predominant wind direction is north easterly in winter and southerly in summer. Winter storms with winds gusting in excess of 50 knots over open waters have been reported. Reduced visibility due to fog, haze snow, etc., does occur, but records indicate that visibility of less than 2.5 miles occurs less than 1% of the time at Nikiski/ Kenai. There are no other statistics available for delays to shipping caused by weather at either Nikiski or Drift River.

During 1990 Sullom Voe operations suffered a total of 2,106 hours for all disruptions including high wind speeds, high swell and low visibility. For end of year statistics, see Appendix G.

Weather Forecasting

Weather forecasting in Cook Inlet is provided from Anchorage by the US National Weather Service. There are no forecasts or forecasters specifically dedicated to weather conditions at the oil terminal docks at Nikiski or Drift River.

Sullom Voe has a dedicated forecast service funded by the harbor authority and provided under contract by the National Meteorological Office.

It is our view that such a dedicated service for Nikiski and Drift River is not required if all operations are firmly governed by established weather parameters. It is apparent that the weather conditions at Sullom Voe are, in general, much more sever for a prolonged period and much more volatile than Cook Inlet.

We do recommend that clearly defined operating parameters be established and promulgated to all concerned and interested parties. These shall include:

a. Maximum wind for berthing, unberthing and transferring cargo, (this may vary with wind direction).
b. Minimum berthing deadweight.
c. Define suitable trim condition.
d. Require propeller immersion.
e. Set maximum mooring line/ hook loads. See sections 12, 5 an 4.
f. Set tidal windows for berthing and unberthing.
g. Set tug numbers/ utilization requirements.
h. Set minimum and maximum current rates for berthing and unberthing. See section 12.
i. Set minimum under keel clearance at jetty and in approaches.
j. Set minimum operating visibility requirements.

Section 9: Cook Inlet – Navaids

Most of the shipping bound for Cook Inlet enters through the Kennedy Entrance to the north of the Barren Islands. The only significant navigational aids to this entrance for a vessel approaching from seaward are the lights located on East Amatuly Islands and Perry Rock marking the limits of the entrance to the south and north respectively. Both of these lights have a range of seven nautical miles. In terms of landfall lights, these are of very limited range. There are no racons (radar responder beacon) located in the area of the entrance for radar identification purposes.

The range of the principle landfall lights at the north entrance to Yell Sound (Sullom Voe) is 24 nautical miles and a racon is located on an island close by for purposes of positive radar identification. The landfall light at the east entrance to Yell Sound is 19 nautical miles in range. There is similarly a racon located on a rock inside the sound. Those lights located within Cook Inlet, while considered to be well spaced and placed, are also of inadequate power and range.

It is recommended that high definition sectored lights of appropriate range be established to delineate the safe channels in certain areas, e.g., to guide tankers to the deepest water across the shoals off Nikiski Terminal and to provide distance off berth information to pilots on approach to jetties. Leading lights should also be established where it is practical to locate two or more lighting towers.

We are aware that seasonal buoys are deployed in Cook Inlet. It is presumed that such buoys are intended to aid only those craft which operate during the season of deployment, i.e., inshore fishermen, ferries, pleasure craft, etc.

Any seasonal buoys which are found to be useful to shipping which operate year round should be replaced by visual aids which operate at all times, e.g., sectored lights or robust light towers.

A comprehensive independent study of all visual navigational aids, in consultation with all users, is recommended for Cook Inlet. It is considered that much of the Cook Inlet coastline provides for reliable radar information to shipping. The exception is the mud flats in Upper Cook Inlet. There are, however, numerous hazardous rocks and shoals within the Cook Inlet estuary. Customarily, many of these shoals would be marked with buoys to define the danger areas and deep water channels. Winter ice conditions make the deployment of such aids impractical. In view of the absence of such navigation marks it is recommended that in addition to radar, Loran C, and other statutory navigation equipment, vessels loading to or loading in Cook Inlet and carrying hazardous, noxious or polluting cargoes should be fitted with a GPS satellite navigation system.

Section 10: Traffic Routing, Designated Anchorages and VTS

Currently there is no routing of traffic within Cook Inlet. Currently at Sullom Voe, tanker traffic in restricted channels are not permitted to pass any other vessels. There is also a ten mile tanker exclusion zone around the Shetland Islands. Tankers only enter this zone when proceeding to or from the pilot stations. Within the confines of the harbor area ships are under radar surveillance and port control direction, and thee is also a Pilot on board all tanker traffic. Tanker traffic is given priority over other traffic I this area. Neither double hulls nor any form of hydrostatic loading can protect the environment from high impact collision. The risk of high impact collisions can be reduced by routing tankers and other ships carrying hazardous cargoes so that they do not pass close to one another or other shipping. When considering the matter of routing vessels carrying hazardous cargoes, the practicalities of such an instrument during a winter of heavy ice concentration must be examined closely particularly I Upper Cook Inlet. All vessels/ bares carrying hazardous cargoes would have an inbound or outbound designated route and all other traffic would be aware of that route and the movement of shipping within the route and so avoid impeding shipping which is compelled to use these routes.

It is recommended that a study be implemented to examine the routing of all vessels in Cook Inlet.

It is also considered that anchorages should be designated within Cook Inlet for ships which have on board hazardous, noxious or polluting cargoes and again all other shipping would be aware of these areas and would be directed to avoid passing close to them. When considering the matter of designated anchorages, suitable areas which have the least current affect and the best holding bottom should obviously be chosen. Other factors which influence the selection of designated anchorages are the practical aspects such as vessels waiting for pilots, vessels which may have to wait for suitable tidal conditions or a vacant berth, vessels under repair or waiting for the charter loading period to commence. Anchorages for vessels not transporting cargoes of a hazardous, noxious or polluting nature should be located at a safe distance from dangerous anchorages. As an example, a suitable area off the Port of Homer should be examined and designated an anchorage for vessels and barges carrying hazardous cargoes waiting to proceed north into the inner part of Cook Inlet.

It is recommended that the study on traffic routing incorporate designated anchorages.

Vessel Traffic Services

Currently Cook Inlet has no vessel traffic service. Currently Sullom Voe has a vessel traffic service which includes reporting and radar surveillance.

IMO resolution A.578(14) sets out “Guidelines for Vessel Traffic Services”, (VTS).

The guidelines define VTS as, “any service implemented by a competent authority designed to improve safety and efficiency of traffic and the protection of eh environment. It may range from the provision of simple information messages to extensive management of traffic within a port or waterway.”

It is also stated that, “A VTS is particularly appropriate in the approaches to a port, its access channels and in areas having one or more of the following characteristics:

High traffic density
Traffic carrying noxious or dangerous cargoes
Navigational difficulties
Narrow channels
Environmental sensitivity.”

Cook Inlet qualifies for a VTS on several counts. There are noxious and dangerous cargoes moved by barge and ship. There are many navigational difficulties, particularly in the winter months due to ice. The approach channel to Anchorage is restricted and regularly dredged. There is a sensitive environment to be protected from damage by oil pollution.

It is considered that the sea room available in most areas of Cook Inlet and the relatively low ship traffic density does not demand radar surveillance traffic management.

It is, however, recommended that a traffic management control center be established and all vessels over 25 meters in length shall report the vessel's name and position, speed and destination at specified locations within the Inlet. In view of the geographical spread of Cook Inlet and the limited range of the VHF radio, such an arrangement would require the establishment of a series of VHF transmit/ relay stations suitable located around Cook Inlet. Re-broadcasting by the control center of the movements of vessels carrying hazardous, noxious or polluting cargoes would ensure that all shipping, reporting and non-reporting, could be made aware and directed to keep well clear of all shipping of that nature. The geographical location of the traffic control center should ideally be in the area of East Foreland, which gives a degree of visual monitoring of traffic bound to/ from Nikiski and Anchorage, the busiest ports in the inlet.

Reporting should commence at the natural seaward limit of the "Cook Inlet Harbor Area", the Kennedy and Stevenson entrances. Further reporting is recommended one hour from the Homer Pilot Station (if relevant) and in any case at no more than 1 hour intervals when transiting any part of Cook Inlet. Reporting of arrivals and departures will be necessary at all ports and terminals.

There are additional advantages of a vessel movement reporting system in that the awareness of everyone regarding craft within Cook Inlet will be significantly raised and concentrated. Such a system also allows for immediate reporting of breach of any Cook Inlet Regulation or International Collision Regulation to the appropriate authorities so that action may be taken, thus raising concentration levels even more.

Section 11: Moorings

The mooring diagrams contained in the Regulations issued by the Kenai Dock Operator are considered to provide adequate restraint under normal operating conditions. The mooring arrangements at the Christy Lee loading platform leave little margin for error when considering the fifteen degree offset of the tidal current. In severe offshore weather conditions or when severe weather and significant tidal currents are acting in concert – these moorings may not safely secure a vessel to either berth. (See sections 4 and 5 of this report). In winter conditions when ice is also exerting a force on a vessel's hull, mooring lines not infrequently part. Such situations have resulted in pollution incidents in the past. The platform operator does have winter rules in effect which stop loading in ice during the flood tide and also require extra moorings, but even so the danger of break out is present.

Similarly, the mooring arrangements at Sullom Voe only provide restraint under normal conditions and "off berth" winds regularly interrupt loading operations during the winter months. Regulations are in place which require loading arms to be disconnected and tugs to push up on tankers under certain conditions:

The following regulations are in place in Sullom Voe:

"All loading and deballasting operations must cease when the following wind conditions and direction limits are reached.

a. When the wind speed exceeds 44 knots for a 3 second gust in an onshore direction towards the jetty from seaward.

b. When the wind speed exceeds 35 knots for a 3 second gust in an arc covering the inside of the jetty from 10º to seaward on either side of the berthing orientation line of the jetty axis.

Tugs and Pilots

1. At least one tug shall be called out to assist in keeping any vessel alongside when all the following conditions exist:

a. Where the mean freeboard height of the vessel exceeds the mean draught

b. When the wind is of sufficient speed for loading to be suspended, and

c. When the wind is from a direction within the arc extending from 10º seaward of the berthing line through north to 10º seaward of the berthing line.

2. At the time of suspending loading/ deballasting operations because of deteriorating weather conditions, the Terminal Loading Supervisor will advise Port Control immediately of any vessels in the condition stated in (1.a) above.

3. When a tug is called out under the conditions stipulated in (1) above:

a. The Terminal Loading Supervisor will notify the Master of the situation and request that the vessel be brought to a state of immediate readiness.

b. With the exception of the Port Controller, such Pilots as are available will station themselves on board those vessels which are considered to be most vulnerable, and any vessel with a tug alongside must be attended by a Pilot throughout the period a tug is required.

c. The Duty Harbor Master will be notified.

4. Tugs may be necessary to assist in keeping vessels alongside when some of the conditions in (1) above are absent, and may or may not be called for by the vessel. In such circumstances any vessel requiring tug assistance will also be attended by a Pilot who will board the vessel as soon as possible and remain on board throughout the whole period a tug is in attendance. In these circumstances the duty Harbor Master will be informed.

5. Notwithstanding anything contained in 1-4, the duty Port Controller may, before consultation with the Harbor Master, call out such tugs as are required, at any time, if he feels the situation warrants this action. In the case of large vessels in light condition, for example, it may be prudent in certain circumstances to call out the tugs when the wind off the berth is less than that stated in (1.b) above. In such cases the duty Port Controller should exercise his discretion.

6. In all situations where tugs are required to assist a vessel moored alongside, a Pilot will also be stationed on board that vessel as soon as possible after tugs are called out, and will remain on board throughout the whole period the tugs are in use.

There are currently no tugs located in Cook Inlet capable of assisting a tanker during adverse conditions. The general need for tugs in Cook Inlet is addressed elsewhere in this report.

Section 12: Ice

1. Ice conditions in Cook Inlet vary from year to year. In worst case scenario in extremely cold winters, ice in Cook Inlet can disrupt the ability of shipping to navigate, anchor, berth and remain at berths. Hull damage from ice must be a consideration throughout the winter and in the spring when river ice several feet thick can be found in the Inlet. The hulls of ships carrying cargoes capable of causing oil pollution should be ice-strengthened if they are to trade to Cook Inlet throughout the winter ice period. We understand that container vessels currently trading to Anchorage are ice-strengthened, but the crude tankers trading to Nikiski and Drift River are not. This is inconsistent and those tankers which are of single skin construction should be strengthened to trade in Cook Inlet ice conditions. The necessity is self evident. Sullom Voe and Yell Sound are not affected by ice at any time.

2. Winter Rules:

"Winter Rules" apply at both Drift River and Nikiski during the winter months when free ice is present in Cook Inlet. There is very little regulation contained in these "Rules" which should not be in force throughout the year at both Terminals and be maintained as normal practice.

The "Winter Rules" make no mention of placing a licensed Pilot on board ships if conditions demand unberthing or re-mooring, although it is understood that such is the case in reality. This requirement should be formalized and put into these winter rules. The pilot must, it is recommended, be a member of the local association and not the master or chief officer of the ship concerned.

It is recommended that provision for the placement of a Pilot on board tankers at berths during the period when "Winter Rules" apply should be written into these Rules and Jetty Regulations. Since this has an obvious cost implication, the judgment of when this is necessary should be made by an experienced and independent harbor official (Coast Guard)?

It is also recommended that strain gauges be placed on all mooring hooks at both Nikiski and Drift River. The gauges should be capable of being monitored simultaneously from a central control room at each installation. Such a facility removes the guesswork from making a decision to unberth. It is immediately apparent when a jetty mooring point or mooring line has exceeded its acceptable safe working load and is approaching the breaking strain.

The fitting of such instruments would significantly reduce the risk of unexpected ship breakout caused by wind, current and/ or ice. Strain gauges are commonly fitted at docks and buoy installations when conditions demand, to prevent both damage to the installation and pollution of the seas.

Protected current meters, fitted at each berth, would also give positive information on current rates and accurate timing on hen the peak rate is passed. Definitive information on current rates and direction would also be valuable to pilots during berthing/ unberthing operations.

Section 13: Hydrographic Surveys

The age, quality and regularity of the hydrographic surveys covering the Cook Inlet estuary have not been examined in detail in this report. This is an area of obvious relevance to the safety of navigation and should be addressed under the study recommended on routing, designated anchorages, VTS and visual navaids. We understand that much of the Cook Inlet area has not been surveyed to modern standards. It has been suggested that this may be due to a lack of resources allocated to this area by NOAA and thus supports our argument to raise finance through harbor charges whch could supplement the survey work conducted by NOAA. If the above study confirms a lack of up to date surveys, representations from local and state bodies must be made to NOAA to give Cook Inlet greater priority in their budget for future hydrographic surveys.

Section 14: Pilotage

Services provided by Pilots in most ports, including Cook Inlet and Sullom Voe, mainly comprise conducting ships to or from an open harbor approach to or from facilities where cargo is loaded or discharged. The Pilots must have proven familiarity with their district of operation, including channel depts., tidal streams, navigational marks and local regulations. They must also have proven expertise and skills in ship handling in restricted and sometimes busy waters and berthing/ unberthing ships to/ from jetties, utilizing all the available aids at their disposal, including ship's engines, rudders, anchors, thrusters and tugs.

Pilotage in Cook Inlet is provided by Pilots who are members of the South West Alaska Pilots' Association, pilots who may not be members of the South West Pilots' Association, Ship's Masters and Ship's Officers who have pilotage endorsements on their licenses.

Pilotage in Sullom Voe is provided only by licensed Pilots of the Harbor Authority of Sullom Voe. This is a single tier pilotage and Ship's Masters and Ship's Officers are not permitted to pilot tankers into, out of, or within Sullom Voe.

There would appear to be at least three different bodies who demand their own level or style of qualification to pilot ships within Cook Inlet:

1. The U.S. Federal Authorities issue licenses.
2. The State of Alaska issue licenses.
3. The South West Alaska Pilots' Association requires that their members be qualified beyond the requirements of the Federal and State licenses.

Terminal Operators may also demand a level of familiarity with their dock in addition to that required by the State and Federal Authorities.

In view of the different nature of the shipping in Sullom Voe and in Cook Inlet and the variety of shipping and berths in the pilotage district of SW Alaska, we have not sought to make direct comparisons between the licensing requirements either for the State, Federal or Association licenses. We attach for information the licensing requirement of the State Authority, Federal Authority and Sullom Voe. The South West Alaska Pilots' Association requirements are presently under review and we are therefore unable to comment on their current requirements.

It is our view that the existing multi-license arrangement is not a rational system for regulating ship pilotage. Ships from or to a foreign port require state licensed pilots. Ships to or from another US State require Federal licensed Pilots. The port of origin or destination of a ship is not relevant to the pilotage of that ship. It is strongly recommended that pilotage license qualifications, examinations and other standards be brought under the control of a single authority, and standardized at the highest level currently required for the different classes of pilotage licenses. While it is recognized that the vast majority of Association Cook Inlet Pilots hold both licenses plus meet the Association and Terminal standards, it is a glaring anomaly that persons who do not meet these same standards of qualification and experience, may also freely and legally pilot ships within Cook Inlet. It should also be noted that in UK ports the issue of endorsements to a Ship's Master or Officer is usually restricted to vessels not carrying dangerous cargoes. In Sullom Voe, endorsements are not issued to masters or mates of any vessels. When masters and mates are permitted to pilot their own ships, it is unfortunately often the case that in adverse weather conditions they call in the services of the professional pilot. Pilots, in common with other professionals must practice their skills to maintain their familiarity with every facility within their pilotage district. When they are only infrequently invited to handle a ship at a particular berth and in the most difficult conditions, it is not only unfair; it is also unsafe. This practice is common in Cook Inlet. We recommend that only professional pilots holding the appropriate high qualification be permitted to conduct the berthing, unberthing and pilotage of oil tankers in Cook Inlet.

Section 15: Tugs/ Tug Escorting

Currently in Cook Inlet there is no requirement for ships to use tugs at any time. At Sullom Voe all tankers are required to use tugs to berth and unberth. The number of tugs used is dependent on the size of the tanker, but usually 4 for berthing and 2 for sailing. Find attached the tug requirements for the major European ports, Appendix E.

There is one small harbor tug currently available in Cook Inlet providing assistance to ships docking and undocking at Anchorage. It is of conventional design, 1200 horsepower. The tug is lifted from the water when heavy ice conditions prevail in Upper Cook Inlet. No other tugs are routinely available to assist in berthing, unberthing or escorting or in the event of any emergency at the Nikiski docks or the Christy Lee Platform. The *Banda Seahorse* must not be considered a substitute for a harbor tug.

We have made inquiries of other Pilots and Ship Masters and we cannot find another facility within the western world which routinely berths and unberths large crude tankers without tug assistance.

In most ports the berthing of ships is the most critical stage of pilotage and ship handling and demands the utmost care and control by Pilots as there are enormous forces involved when a ship initially comes into contact with a jetty. The magnitude of these forces obviously varies with the size of ship, the speed, the landing face and the fendering on the jetty. If a vessel is landed with greater impact than ship or jetty are designed to accept, damage to one or both will result. If the ship is damaged, pollution of the sea may also occur. It is therefore the case that tankers are generally placed alongside jetties with the greatest of care, invariably assisted by tugs. It should be noted that hydrostatic loading of tankers is mainly affected to minimize pollution in the event of a grounding. Even minor hull damage at or near the water line in a hydrostatically balanced tank will result in a large spillage of oil due to the fact that approximately 20% of the volume of that tank is above the water line. There is clear evidence of severe fender damage at the Nikiski dock and to a lesser extent at Drift River. Repairs to the dock facing at Anchorage are an expensive, ongoing maintenance routine due to damage caused by ship berthings. We are unable to inspect the other docks at Nikiski. Tankers and other large ships are also undocked using tugs for the same reasons of enhancing the safety of operation.

It is understood that westerly and southwesterly winds can generate significant swell heights of up to 12 feet at Nikiski. Vessels at any of the Nikiski docks would have great difficulty, or indeed find it impossible, to unberth in such conditions without the aid of tugs and could easily suffer hull damage when surging against the dock. The wood cladding on one breasting dolphin fender at Nikiski had been almost totally removed as a result of some incident(s) prior to the visit of our consultant. In effect, loaded tankers were berthing steel hull to steel berth; this would not be permitted at any other installation and should not be permitted at Nikiski.

The tidal stream current a Drift River lies at an angle of 15º to the berthing face. Utilization of tugs would make for a much more controlled berthing at this dock. It is our view that berthing a ship with a moderate or strong onshore or offshore wind would be fraught with difficulty and highly risky without the use of tugs. The presence of suitable tugs in Cook Inlet would also provide for emergency assistance to other ships or barges at or near the tanker jetties which may be a danger to shipping carrying hazardous, noxious or polluting cargoes. It should also be noted that the larger gas tankers berthing at the adjacent dock will have a heavy fuel oil bunker capacity exceeding 1000 tons. They must also maneuver in close proximity to the KPL dock and are equally capable of having a main engine failure.

We recommend that suitable tugs assist all tankers berthing/ unberthing at both Drift River and Nikiski.

There are a few ultra modern tankers which routinely berth and unberth with little or no tug assistance. For example, see Appendix J. These vessels are the third generation dynamic positioning vessels designed for offshore loading of crude oil from platforms and buoys. Nevertheless, they are not allowed to berth at Sullom Voe without tugs.

Some European harbor authorities do permit such vessels to berth and unberth without tug assistance, but they do not experience the same severe weather conditions as Sullom Voe. We recommend that such vessels be examined on a case-by-case basis to establish their capabilities and back-up equipment in the event of failure of a major control unit, prop or thruster. Escorting such vessels remains a requirement.

Escorting by Tugs

Tug escorting of tankers can be conducted either with a tug continuously attached to the vessel or with a tug running free close by the vessel. "Line up" escorting is essential in situations where an immediate application of steering or retardation forces may be required in event of a ship's machinery malfunction or failure in confined waters. The routes from/ to the entrance of Cook Inlet do not, for the most part, fall into this definition. In those stages of the pilotage near the docks at Drift River or Nikiski, when maneuvering is more restricted, the vessel would in any case have tugs attached to assist in berthing and unberthing.

Vessels transiting Cook Inlet which suffer a loss of propulsion, may be able to anchor safely if the water depth is not excessive at the position where power is lost and the ship is in either slack water or stemming the tidal stream at the time of loss of power and an anchor is let go before the vessel runs with the stream. If the vessel is running with the tidal stream when power loss occurs, or is in deep water, it is unlikely that the vessel will be able to anchor without risking loss of gear. This will obviously be at worst case at times of spring tides.

It is therefore recommended that tugs conduct escort duties for all tankers to/ from the entrance to Cook Inlet.

The design of tugs required to operate a service to the tankers trading to Cook Inlet and to other vessels are required and in emergencies throughout the year would have to take into account the many particular features that are specific to Cook Inlet, including the winter ice in terms of damage to the tug's hull, having a tug of sufficient power to be effective in winter ice conditions, protection for the tug propulsion units, the ability of the tug to provide forces to the ship while not presenting its full length to ice or current forces, suitable engine cooling systems, suitable accommodations, etc. The conceptual design and utilization of tugs would be an entirely separate study. Any tug study must also address training of personnel in best use of these purpose built tractor tugs in the Cook Inlet conditions. Pilots should be included in the training program. The tugs would be funded by all users of Cook Inlet, to differing degrees of course, with the tankers and terminals contributing the most.

For information, one oil major UK terminal operator has already put in place a requirement that all crude tankers over 70,000 tons deadweight shall be escorted to and from their installation. The charge to each ship, regardless of size, for this escort service is currently set at $9,300 per port call. It should be noted that the tankers are also escorted in the ballasted condition.

Section 16: Cook Inlet Regulation and Management

Cook Inlet and all other coastal areas of the United States of America come under the control of the United States Coast Guard. The Coast Guard has many duties and responsibilities. We are of the view that Cook Inlet must be looked upon as a whole operation and a general harbor area on its own account, and as such, shall have its own regulating and governing body which should have authority to raise funds and use them to enhance the safety of the Cook Inlet shipping operations.

We firmly believe that the creation of a dedicated "Authority" headed by professional marine staff with a singular undiluted remit directed only at the Cook Inlet operations would be a significant improvement on the status quo. We are convinced that the full time staff of the "Harbor Authority" would have a long term interest and commitment to enhance safety and services as their appointments would not be of a temporary nature. The "Authority" would also be directly accountable to local interests, both commercial and non-commercial.

General Management

As we have noted above, there is currently no regulating or monitoring of traffic within Cook Inlet. The Coast Guard "Cook Inlet Pollution Prevention and Vessel Safety Program" dated 21st March, 1991, is a sound attempt to deal with this matter on a voluntary basis. The point is made very clearly in the covering letter from the Captain of the Coast Guard Western Alaska that the contents of the document are for guidance only. The Coast Guard is confident that compliance will be forthcoming from those involved without recourse to regulation by Government. While we understand that the creation or amendment of such regulation would be a ponderous and lengthy process, we do not share the Coast Guard's confidence and believe that absolute compliance will only be achieved by regulation and would recommend that after a brief period as a guideline and further consultation with parties involved, much of the document should be part of a Cook Inlet Regulation.

It is also appropriate to highlight here other advantages that would follow from the creation of a Cook Inlet Harbor Authority or similar statutory body. Currently the funding of Navaids for Cook Inlet is met from Federal resources. Such a system of funding inevitably means that Cook Inlet must compete with other coastal areas for a share of the allocated monies. Priorities are set by bodies whose perceptions of whose needs are greatest may be different from the citizens and operating companies in the Cook Inlet area. While central government funding may need to remain a factor under the light dues levy system, as it currently exists, a harbor authority would nevertheless concentrate influence and could directly fund navaids when considered essential to safe navigation (as in Sullom Voe).

Currently the funding of the operation of any ship assist tugs which may be required at any facility in Cook Inlet would need to be met by the operators of that installation alone or the ships using that facility. This takes no account o the emergency response role such tug(s) would continuously provide to all shipping transiting Cook Inlet. It is relevant here to mention that the large container ships trading to Anchorage have a bunker capacity of 3,000 tons of heavy fuel oil. The escape of one third of that amount caused massive pollution in Sullom Voe in 1978.

A harbor authority could, for example, set charges on all shipping to support the existence of suitable tugs in Cook Inlet.

For information, the port charges levied on a tanker of 44,907 GRT (*Overseas Washington*) berthing at Nikiski Terminal with the master conducting the pilotage is currently NIL.

The same tanker berthing at Sullom Voe would be charged as follows:

Boarding and Landing pilot	$2,846
Pilotage (2)	2,657
Mooring	1,000
Tugs (4 berthing, 2 leaving)	23,940
Port Charges	27,113
Total Costs for the turnaround	$57,556

Central authority light charges are not included in the above. The *Sansinena II* would pay $51,500 whereas she pays nothing at Drift River.

Sullom Voe charges are by no means excessive in comparison with UK tanker terminals

Section 17: Environmental Monitoring at the Sullom Voe Oil Terminal

The monitoring of the Sullom Voe Oil Terminal is carried on at various levels as follows:

1. Government level. Annual sea bed survey at the end of the waste water pipe which discharges to the sea. Monthly reports required on the quality of the water discharged, automatic sampling used. Camera records of smoke emissions from the main flares.

2. Local Government level. Grab samples of the water prior to discharge down the pipe to sea. This is done about once a month, with no warning given. Noise/ smell, etc., checked as and when required.

3. Independent Monitoring. This is by far the most rigorous monitoring of the environment surrounding the oil terminal. The local government (Shetland Islands Council) has powers to control developments and when agreeing to the building of Sullom Voe terminal they "extracted" agreement that a joint oversight body should watch over the operation of the terminal. This body is called the SVA (Sullom Voe Association) and consists of members of the oil industry and the Shetland Islands Council. The SVA has two committees which report to it. The first is SVOSAC (Sullom Voe Oil Spill Advisory Committee) which reports on oil pollution control, and the second is SOTEAG (Shetland Oil Terminal Environmental Group) which advises on the environment. SOTEAG has a budget of approximately $500,000 per annum which is used to observe what effects the terminal is having on the environment.

4. The scope of work is adequately described in the booklet contained in Appendix C. Should more information be required, this can be done separately or in the final draft of this report.

5. The observed effects, to date, are small and limited to:

a. Elevated hydrocarbon levels within 100 meters of the jetties. This quickly drops to background levels with distance from the docks.

b. Tributyltin (TBT) contamination of certain shell fish within about a mile of the inner harbor. This is caused by the anti-fouling paint on the tankers' hulls. This problem is now being addressed at an international level.

c. Smell of hydrogen sulfide from the ballast water treatment system. This is now being corrected by increasing the time the treated water remains in the biological treatment pond prior to discharge and also by adding oxygen using a cascade.

d. Studies are now being carried out on the effects of chemicals added at the oil fields offshore to promote production levels and inhibit corrosion in the production tubing and line pipe to the shore. Water extracted from the oil contains these chemicals.

Section 18: Emergency Use of Anchors in Tidal Waterways

In the event of power loss on a tanker, one action which can be used to stabilize the situation is to bring the ship to anchor and so allow repairs to be carried out or wait until a tug can tow the tanker to a repair yard (there are no such facilities in CI). This is not a straight forward task in situations where there are strong tidal currents or when attempting to anchor in a river with a strong flow of water.

The following test is taken from *Peril at Sea and Salvage*, published by the International Chamber of Shipping:

Use of Anchors

In water too deep for the anchor to reach bottom, lowering the anchor or anchors to about 60 fathoms will reduce down weather progress. The anchor and cable may have the effect of a drogue and should help to keep the ship's head to the weather. It should be noted that recovering 60 fathoms of cable and anchors should be possible as this amount is within the design capabilities for windlasses.

Once the ship is in a water depth where the anchor can find the bottom, use of anchors to arrest the ship should be attempted. If the bottom is sand or mud, it may be possible for the ship's movement to be slowed down or even arrested by slowly lowering the anchor until it begins dragging along the bottom. For larger vessels, the scope should be short at first and later it should e gradually increased as the ship's speed decreases. This action should bring the ship's head into the weather and slow her speed over the ground. The chance of success of using anchors on a rocky bottom is much lower, but nevertheless it should be attempted if this is the only alternative available.

If disablement is limited to loss of steering, careful use of the engines should enable the ship to carry out this operation with a much better chance of success. Also, the engines can enable the ship to maintain a safe position if the weather causes the anchor(s) to drag.

For large tankers over 150,000 dwt, the anchoring system has the capability of stopping a ship with a maximum speed over the bottom of about 0.5 knots and a length of cable of between 6 and 10 times the water depth with good holding ground. For these vessels, when anchored, the anchor systems can withstand a 60 knot wind, without current or waves using an ordinary stockless anchor, or a 60 knot wind, with a 2-3 knot current and waves of less than 20 feet, with a high holding power anchor.

Anchors should be made ready for use at the earliest opportunity. Deteriorating conditions may preclude or delay action later. It should be noted however that severe sea conditions near the Kennedy entrance may preclude such clearing away of the anchors until the ship reaches more sheltered waters within CI.

Any decision to lower anchors should not be clouded by fear that they may be lost if they cannot be weighed later.

It is difficult for a large ship to come to anchor in moving water due to the momentum of the vessel compared with the sea bed. For an 80,000 ton tanker, if the drift rate exceeds 2 knots over the sea bed, anchoring is all but impossible. There is every danger that the brakes on the windlass will fail to grip resulting in polishing of the brake linings and so reducing friction with the brake drum. The "bitter end" which connects the end of the chain to the chain locker will be torn from the bulkhead and all chain will pass over the windlass. This will almost certainly result in damage to the windlass system. If the sea bed is very soft and the anchor is dragged, acting as a chock absorber, then there is a chance. It will not work, however, if the anchor gets a good grip, i.e. rock/ shingle, etc., as the full load will be applied to the chain and so to the windlass system.

Today the anchor, cable and windlass of a VLCC or large bulk carrier must be regarded as an extremely fragile arrangement. As ships have increased in size, anchors have become proportionately lighter, cables proportionally shorter, and windlasses more vulnerable to shock loads. In consequence, the anchoring process must be conducted with extreme caution; otherwise the gear will be carried away.

The anchors of a 542,000 dwt tanker are proportionately only one-fifth as heavy as those of an 18,000 dwt vessel, and the cables proportionately only half as long.

There is no margin for error and in consequence the notion that the anchors (for such ships) can be deployed in emergency situations, is no longer tenable.

In many ports in the world pilots daily use anchors with great skill, still for too many the anchor does not exist. Lack of familiarity of use by ship handlers often breeds similar qualities among those on the ships responsible for working the anchors, with the result that an unexpected order to "let go" will mean the anchor being allowed to run out to the bitter end in a cloud of dirt and rust. Once the order is given, the noise on the forecastle head is such that belated orders to "hold on and screw up at one shackle" are rarely heard.

The ship master must ensure that the deck officer in charge of anchoring understands what is required and especially how much chain to slack out, before he goes forward to stand by. The importance of having a man forward who can handle the anchor and be relied upon to put out the correct amount of chain- no more, no less- cannot be over stressed.

The effective way to use anchors to stop in an emergency is to let go just sufficient chain to allow the anchor to first grab and then break loose and drag. The anchor must no dig in and hold. Should the anchor hang up or too much chain be allowed to run, the momentum of the moving mass of the ship on the relatively small brake on the windlass will either burn out the brake or part the cable in all but a small or moderate size ship. It is vital that the anchor breaks out of the ground and relieves the strain on the brake or chain.

To use the anchors, the vessel's under-keel clearance should be at least 20% of the vessel's maximum loaded draught, in order to prevent underwater damage to the ship. The amount of chain used is the distance from the hawsepipe to the bottom. Provided the anchor is correctly worked, and the depth of water does not exceed 120 feet or 1 ½ shackles of cable, the ship will continue along her track slowly losing headway, and can be brought to a controlled stop. This is particularly useful after a loss of main engine or steering gear.

Naturally, many mariners will be concerned that it might be difficult to stop the chain running after letting go because of the ship's speed over the bottom or the depth of water. This concern is especially prevalent when handling larger ships. It is partly due to lack of confidence, for, as stated earlier, emergency situations are fortunately rare, and until experienced, the ability of the brake to cope with the demands put upon it are naturally suspect. There has, in fact, been some improvement in the braking mechanisms on

VLCC windlasses, including the use of retrofit disc brakes and the installation of combination disc and band brakes. It should, however, be remembered that static friction is three times greater than dynamic drum. The brake has three times as much holding power when the gypsy is stopped, as when it is turning. The secret is to screw up the brake as soon as the anchor touches bottom and the weight has momentarily come off the cable. The anchor digs in as the chain comes tight and is then pulled free from the bottom before the static friction is overcome, dragging along the bottom as the flukes ball up with mud.

The arbitrary maximum depth of 1 ½ shackles is based upon the deepest water one could expect to drop an anchor in an emergency in a large ship and still be able to retain control of the weight of anchor and cable. It should, therefore, be treated with caution and, where possible, the anchors should be walked back to about 15 feet (4.6 meters) from the seabed under power and then dropped. This can only be done when time allows. Finally, if dragging the anchors cannot stop the ship before grounding and if the bottom is soft and not likely to damage the hull when the ship goes aground, slack more chain when on or two ship's lengths from the shoal, so that the anchors are laid out ready to help pull the ship back off. The timing of this action will depend on the ratio of the ship's length / length of anchor cable.

The following flow diagram has been taken from a publication on pilotage and outlines emergency anchoring procedures.

Part D

Section 1: Use of Tractor Tugs in Ice Conditions

Cook Inlet Pipe Line and West Coast Shipping managers have made several statements to the effect that tractor tugs would be useless in ice conditions. This is an important point and I have contacted European ports where ice is common and they also use tractor tugs. The following points are the results of the investigations:

1. Voith water tractor tugs use cycloidal propulsion which, for the non-mariner, uses two vertical propulsion units not unlike two egg whisks, rotating in different directions. The blades change pitch while rotating and so impart movement to the ship. The units are mounted under the hull some 1/3rd of the way from forward and have protective mounting bars around the units as well as a plate underneath which clearly is meant to safeguard the units should the tug touch bottom. The net result is that these tugs can operate in worse ice conditions than can standard tugs or any other ship with normal propulsion system.

2. There are three German ports where heavy icing is common in winter: Bremen, Bremerhaven and Hamurg. The tug operators in these ports are Hapag Lloyd and URG, and they have vast experience with Voith tractor tugs in these ports. They state that the tractors are the only tugs that can operate in severe ice conditions which prevent the use of conventional twin screw tugs

URG states,

"Our Voith equipped tugs provide reliable and problem-free service in heavy ice. In contrast to our tugs with Kort-Nozzle props, neither the propulsion units nor the prop blades experienced the slightest damage. This was proved subsequently during the routine dry docking of our vessels."

Hapag Lloyd states,

"It can be established, in so far as passage making in ice with Voith tugs is concerned, that there are no difficulties. In contrast to screw prop tugs, no propulsion element was damaged."

3. Furthermore, ships fitted with Voith propulsion units are used as ice breakers. The German equivalent of the USG uses such vessels to maintain navigation for merchant shipping.

Mr. Mueller of the engineering department states,

"Icebreaker *Buffel*, fitted with Voith units. With respect to the direction of rotation of the opposite turning coaxial propellers, our experience supports the view that these units are decidedly more effective in shedding ice than propellers turning conventionally. The propulsive values achieved of the Voith units are also better. As far as judgment regarding the maneuverability of these units it can be said that they are incomparable.

Voith icebreaker *Bison* and Voith tug *Nordmark* operate in the upper Elbe regularly in ice breaking.

4. There is no doubt in the minds of these tug operators and the manufacturers of the Voith propulsion units that a tractor tug designed to cope with the specific needs and environmental conditions of Cook Inlet can play an effective role in the area during heavy ice conditions.

5. We would repeat our recommendation that a study be commissioned to further study the type, design and effectiveness of tractor/ conventional tug utilization in Cook Inlet waters.

Section 2: Author's Response to Received Comments:

Note:

a. Where the author accepts the points made by the contributors, these have been included in the text of the final report.

b. Where a general comment has been made, there is no need for a reply.

c. Where the author disagrees with a received comment, the reasons are given below.

A. Marathon Oil Company, Mr. W. Watson

1. Failure to meet with Phillips/ Marathon with regard to LNG shipments from Cook Inlet.

Our brief from CIRCAC was to confine our study to the crude oil handling facilities within Cook Inlet, as these were seen as the principle threat to the environment. In our experience, and that accepted worldwide, is that LNG and LPG carriers are the safest bulk ships afloat due to the fact that naval architects and cargo systems designers appreciated that they are working with a potentially dangerous cargo and have accordingly built ships to the highest safety standards. The facilities to load the cargo are similarly designed and so we saw no need to press the RCAC to include the LNG shipping operation. The safe navigation of such vessels is no different from any other large vessel navigating in CI.

2. Risk Assessment, Cumulative figures inappropriate

I would have thought that the authors would want to make the overall picture clear to the general public. The average Alaskan wants to know what the total risk is, not just individual parts of the situation. It is my opinion that the lack of cumulative figures is a weakness of the report and, since the reported spill record is quite good up to this point in time, I see no reason why it should be withheld.

3. Cook Inlet/ Sullom Voe Comparisons

It was never the intent of the report to recommend a mirror image of Sullom Voe be inserted into CI. However, many of the safety procedures used are, in the main, used at all other European ports handling crude oil tankers. The authors have used their discretion not to recommend what is done at Sullom Voe where it is considered inappropriate, e.g. radar coverage, weather forecasting, numbers of tugs.

The average cargo shipped from Sullom Voe is only 600,000 barrels although there is the occasional large shipment. Accordingly, most of our tankers are in the 80/ 100,000 ton deadweight range, which is similar to the crude ships trading in CI. There is no doubt, however, that the SV traffic figures are much larger and our harbor area is only approximately 12 miles in length. The problem of scheduling tug operations is an important one in an area such as CI with its numerous facilities over a wide area. However, it is not impossible, and in the major port complexes such as Rotterdam, ship movements are tailored to tug availability. One role of the proposed area traffic center, possibly I the Kenai area, would be to coordinate such ship movements.

4. Environmental Monitoring

The author was asked what monitoring was done at Sullom Voe and this information was given n good faith. It was not the intention it be recommended for CI, but again, the areas of concern will be similar: discharged water quality/ air emissions/ hydrocarbon sedimentation/ anti-fouling paints, etc. To what degree/ how often/ by whom/ what pollutants will of course differ in CI and will need to be addressed. I cannot emphasize too strongly the need for independent monitoring, the results of which are assessed by a competent panel of experts independent of Federal/ State and oil company control. Only in this way will the public be assured of the extent operations are effecting the environment. Be in no doubt that they are, the degree of which is the important matter. At SV the effects are considered acceptable, providing there is no chronic build up of pollutants. For guidance I have included as Appendix L a copy of the 1991 monitoring program and the budgets for future years. This will give readers a feeling for what work and expenditure we consider necessary in Sullom Voe to check on the effects of the terminal on the environment.

B. Offshore Systems – Kenai, Mr. F. Newton

1. Additional layers of bureaucracy are not required

I presume Mr. Newton is referring to recommendation 12 where it is suggested that an independent harbor authority/ administration be set up to ensure the overall safety of navigation n CI. If this turned out to be a manufacturer of red tape with little practical control of shipping, I would agree with Mr. Newton; but it is certainly not the case in the rest of the world where such authorities exist. What we envisage is a transfer of some of the responsibility from the USCG to a harbor administration rather than pile on extra bureaucracy. What we wish to see installed is a skilled group of people commercially managing the whole harbor area to the betterment of safety. The USCG, we are quite sure, as a federal body, would remain the overall authority, but with some transfer of some of their responsibilities. There are two main benefits as I see them. The first is to raise funds through user charges and invest that money in navigational aids, etc. for CI. In this way the tax payer is not subsidizing the oil industry and the addition of/ replacement of equipment is not dependent on outside funds which may have perceived higher priorities elsewhere. Secondly, there is someone at the top holding all the strings with regard to shipping in the inlet. There is coordination among pilotage, towage, navigational aids, traffic routing, local interest groups, etc. I fully appreciate that this will affect the present responsibilities of the USCG, but given the will, there is a way on this matter. It could be the case that the USCG plays a role within the suggested harbor administration.

C. Ocean Marine Services, Captain F. Staplemann

1. Ice damage/ shoal constraints restrict use of tractors

The matter regarding ice damage is addressed at the beginning of this section. I am a bit puzzled at the comment on the draught of the tug as its own draught will be much less than any of the large ships with which it is intended to work. The draught of a Voith tractor tug of length 121 feet, beam 37 feet and bollard pull of 45 tons is 17.75 feet and this is a little more than would be expected of a conventional tug due to the protective plate under the Voith propulsion units. However, unless working with a large barge in shallow water, I can see no restraints on normal ship operations.

2. Spread of oil on moving water

Captain Staplemann is quite correct when he advises that the oil will of course moved down current. However, it also spreads out in exactly the same way as oil on still water. In other words, the angle X quickly becomes large with some distance from the spill source. The weir skimmers will have to be placed quite close to the spill in order that oil does not pass the outer end of the collection booms. If this can be done safely, all is well, but if there is some danger to life by approaching the spill at close quarters, then oil could bypass the extremities of the booms.

D. Cook Inlet Pipe Line Company, Mr. D. Gregor

1. Mixed Moorings

The section on mixed moorings on page I-3 states that mixed moorings should be avoided but if used, the crew must try and achieve equal tensions, etc. It is my opinion that this is quite impractical and dangerous to all concerned. You cannot tell the tension on a wire due to its very low elasticity (approximately 4% at break). OCIMF guidelines give no latitude on these matters and it again stressed that such practices should be strictly forbidden.

2. Ballast Reception Facility

Captain Anderson, during his visit to CI, was advised that the ballast facility was non-operational. If it is now the case that the system is up and running then, of course, we will accept Mr. Gregor's statement. The point on ballast discharge before loading remains valid; as well as imprudent deballasting while in the early stages of loading. The ship must, at all times, have propeller tips immersed and the ship in a suitable trim for safe departure from the berth in an emergency.

With reference to the capacity of the ballast reception system, the CFR 33, part 158 states that the terminal must be able to accept:

a. 11 tons of sludge from fuel/ lube oil purifiers.

b. 11 tons of oil bilge water

c. 30% of the deadweight tonnage of the largest ocean going crude oil tankers loading at the terminal. If an 80,000 ton ship is used, 30% is equivalent to 130,000 barrels and so it is still thought that the 90,000 tank is too small.

3. Platform Fire Fighting Equipment, Ship Fires

There is simply not enough capacity and number of monitors to effectively cope with a ship fire affecting the deck area. It is more than probable that the ship, as a result of explosion, will be unable to fight the fire herself due to no motive power for the pumps or the crew are helping injured colleagues. The present platform equipment is not in the right area of magnitude to cope with a major fire until other help arrives on scene.

6. Terminal Supervisor to remain on platform

The suggestion is that the platform operators be directly supervised by a senior member of staff. This may well be someone other than the Terminal Supervisor, but whoever it may be he must be fully acquainted with tanker operations to such a level that he/ she can converse with the tanker master at peer level. Only in this way can tanker mal-practice be recognized and corrected. The OCIMF guidelines did not envisage such a situation where the operators were cut off from their supervisor by a hostile stretch of open sea.

7. Removal of ship from berth

The OCIMF guidelines do indeed provide for such an eventuality, but the point still is, don't cut the ship loose unless she can safely navigate away from the berth and tackle the situation herself. Imagine the situation on board where the crew is fire fighting or searching for injured staff when they look up to see themselves drifting down current towards the shore. The ship has to be contacted to ensure she is ready to vacate the berth.

8. Minimum berthing deadweight

I don not understand the figure of 50 tons given by Mr. Gregor. What w mean is that there should be a minimum percentage of summer deadweight made up of ballast/ fuel/ fresh water and stores which will ensure propeller tips will be immersed and the ship in a suitable trim for safe navigation. A figure of 35% is recommended which means for a ship of summer deadweight of say, 100,000 tons, should carry not less than 35,000 tons of ballast/ fuel/ fresh water and stores. Displacement tonnage could also be used and indeed it is becoming more common to do so.

9. Pilots

We do not suggest that because an individual becomes a member of a professional body which provides pilotage service he is automatically somehow more gifted at ship handling than someone who is not. What we do firmly believe is that it is important that whoever is licensed to pilot must meet the highest standards of training that is mentioned in this report and gain a wide experience and then be thoroughly examined by a body which must include his peers, senior pilots for the area in question. He/ she must then regularly and frequently exercise these skills he/ she gained and indeed, hopefully improve on them. It is most unlikely that a ship master could satisfy these requirements and continue to ply his trade as a ship's master. It is also a fact, that by the very nature of their operation and individual relationships, pilot members of an association continuously monitor their colleagues. This is another good reason why ships carrying high risk cargoes would be piloted by dedicated pilots. Ship masters with pilotage endorsements conducting their own pilotage do not serve under the same peer scrutiny from job to job and any particular failing they might hae would not be brought to their attention by a peer.

E. West Coast Shipping Company, Mr. E. S. Mealins

1. Ballast discharge

The comment on the ballast capacity ashore has already been covered before. Mr. Mealins suggests that in the summer time his ship may discharge ballast ashore before loading, and again it is my opinion that this should be forbidden for exactly the reasons Mr. Mealins gives for winter time loading.

2. Fire fighting

All ships are approved by their flag states to comply with SOLAS (Safety of Life at Sea) convention which covers, among other things, fire fighting. While in deep sea, the crew has only themselves and their equipment to cope with a fire and so the list of equipment is indeed extensive. In the case of tankers, a serious fire can have severe consequences to ship and crew and this risk is much increased while loading or discharging. There is thus a requirement for the shore facility to assist/ stabilize the fire until all the emergency services can assist. It is the case that the ship may be helpless to fight the fire if there has been a serious incident and the terminal should be equipped accordingly. Fire fighting tugs are common in Europe and they have massive capacity as I have detailed before. They are without doubt effective tools and can lay down large amounts of foam on the deck or anywhere on the outside of the ship.

It is not the intention to have the tug remain alongside the ship while loading. This is against OCIMF guidelines and the tug, if required at Drift River, would have to remain well clear of the ship. Only when cargo/ ballast operations were suspended would the ship assist to push up/ fire fight/ unberth, etc.

3. Garbage disposal

These must be available to the ship master by international convention. Arrangements should be in place in case they are required.

4. Docking without tugs

It is a pity Mr. Mealins has to resort to sarcasm to make his point. I am glad to report that at Sullom Voe we have never dented anyone's hull as the pilot always checks with the master the ship's pushing area on the hull. These are usually marked, by the prudent ship owner, with a vertical white line. The concept that tugs provide no assistance or measure of safe navigation while berthing is, quite honestly, ridiculous and I am sure Mr. Mealin's comments are driven more by awareness of tug costs rather than the overall safety of the operation. The question must be asked, what would happen if the ship lost power at a critical moment? This is not an uncommon occurrence. They use tugs on the Mississippi River where the currents are predictable, so why not in Cook Inlet?

5. Operating parameters

If they are already in place then why are they not mentioned in the operations manual? It is recommended they be so included. The point on minimum berthing deadweight is understood. Displacement is the better parameter, but is often not available in shipping detail lists such as Clarkson's or Lloyds. Ships do change their deadweight tonnage, but tankers rarely do and, anyway, the figure of 35% is arbitrary and can be changed if the ship fails to meet the trim/ minimum draft requirements.

6. Navaids/ Traffic schemes

The USA is one of the very few countries where the local tax payer funds the safety of navigation of merchant shipping. In most other countries user fees on the ships pay for such equipment and services; this is reflected in the charter rates the ship owner is able to extract from the cargo owners. Where Federal or State funding is the sole source of funding, money is uncertain and can be delayed or transferred to other spending. It is the ships that use the service, why should everyone else have to pay? This method is an indirect subsidy to the shipping and oil industries and would not be tolerated in other countries.

The routing of ships comes under the International Maritime Organization and they publish a manual on the different schemes and how they are implemented. Publication NO. 977 84.03E, I attach a general description of such schemes that are available as copied from the publication. The only scheme where fishing is not permitted is the full blown traffic separation scheme which normally only exists in heavy traffic density areas such as the English Channel or similar sea ways. Other traffic routes allow the normal collision avoidance rules to be observed and this is what is recommended for CI, although more in depth study is required. The benefit is that the small boat owners know if they are in or near a route for large shipping, then they will have to be very careful what they are doing and keep a good lookout for such ships. Unless I am otherwise persuaded, a two traffic separation scheme with a prohibition on fishing, etc., in the area is not warranted for CI.

7. Pilots

The point should be made who is/ are the pilots Mr. Mealins is talking about. It is the master/ chief officer of the ship concerned and not normally a member of the Southwest Association. The policy of only calling in an association pilot if and when conditions are poor is a bad one. Pilots need constant practice at berthing at a jetty to keep up the level of their skills. The ship owner will only take such an outside pilot when there is no alternative as he sees it as a cost affecting his bottom line profitability. The rules should be simple, when there is ice an association pilot should remain on board at all times. The point about decisions being taken by port officials not “having a stake in what is being done” could be taken as a point of benefit. In other words, they are free from commercial influences which could cloud decision making on matters of safety.

These comments appear to have been written on the premise that only one dedicated ship, the *Sansinena II*, operated by one company, West Coast Shipping, with a master and mates that will never change will ever be permitted to uplift cargo from the Christy Lee platform. If that were indeed the case and the master and mates are trained, examined and experienced to the highest standard we recommend on page 86 of our report, we would agree that the Christy Lee platform is unique in terms of pilotage and could be treated as such, but only if all of these considerations are applied without deviation. We think it most unlikely that any operator would accept the kind of restrictions that these requirements would demand.

Mr. Mealins also covers in the first paragraph of his section 12 comments that there are platform and shipping company policies requiring 2 pilots to be on board during ice conditions. We were not aware there were written procedures for both the ship and the platform specifying the requirement of Christy Lee. However, the policy may be somewhat confused as the second paragraph would indicate the provision of a second pilot should be determined by a person making a subjective judgment and "doing the right thing when it has to be done." We remain of the view that procedures should be established to trigger off an experienced, licensed pilot. For the sake of clarity I will have to provide that age old legal definition of a pilot. "Pilot means a person, not belonging to the ship, who has the conduct thereof."

Mr. Mealins' comments on numbers of ships which load at Christy Lee and which may be conducted by Cook Inlet pilots, are somewhat confusing. There are about 24 ship visits, i.e. 48 acts of pilotage per annum. Anyone licensed to pilot ships to or from this berth must be suitably trained and experienced, then examined by a body which must include, but not exclusively, senior licensed pilots for the area. The ship handling skill gained must be frequently and regularly exercised. Additionally, familiarity with a particular berth must be maintained. It is our view that such a regime can only be unswervingly adhered to by an organized and regulated body of dedicated pilots. The existing regime is only acceptable if all the considerations mentioned earlier in these comments are satisfied, and this is most unlikely. We consider this unlikely because we are confident that changes of characters and ship's personnel must take place from time to time.

We can make no comment on Mr. Mealins' penultimate paragraph on our section 14, but obviously, when warranted, appropriate disciplinary action must be taken by the authority responsible for the safe movement of shipping through Cook Inlet. The statement made in the final paragraph of section 14 comments indicates a complete reversal of roles to the usual ship master/ pilot relationship. What is concerning here is if that experienced Captain is on leave or resigns, who is then the "expert"? This reinforces our view that these ships must be piloted by a local group with a large enough member group having experience and the required training.

In conclusion, Mr. Mealins' comments, not surprisingly, either support or do not address the parts of this report which will not incur costs to his company. We have not cited the detailed training requirements and experience requirements and level of ability demanded by the marine committee prior to licensing someone to pilot to/ from the Christy Lee.

8. Tugs

In addition to what is given in part D, section 1, of this report the use of current is not the same as using a tug. A tug can give thrust in what direction the pilot so requires, especially if it is one of the tractor types. In the event of a ship malfunction the tugs can assist the pilot in recovering the situation or hold the ship until return of control is achieved. Tugs can also rectify a situation where there has been a misjudgment on the part of the pilot or a squall catches the ship while in the final stages of approach. Why take my word for it? We can think of no other crude oil loading berths worldwide where large crude carriers berth without tugs, current or no current.

9. Fendering

We fully agree with Mr. Mealins' comments on fendering; they come from bitter experience, I have no doubt.

10. Escorting

The point of commencement of escort would not necessarily be in the area of Cape Elizabeth. The pick up/ escort from point would be decided after detailed studies take place. This would normally be just before the ship enters an area where any loss of power or steerage could result in a grounding or collision with other harbor users/ jetties. If you take PWS as an example, it is my opinion that tug escorting after passing Bligh Reef outward is unnecessary as the ship is in open water.

With regards to anchoring, yes of course it can be done, providing the ship's speed over the bottom is within limits as described in this report.

11. Regulation and Management

The USCG has no powers, as far as I know, to raise revenue to finance the safety of navigation in CI. Accordingly, it is recommended that the USCG delegate some of their powers to such a harbor administration. It is not, nor has it ever been, the recommendation of this report that another layer of regulation be placed on shipping companies within Cook Inlet. The rules would be much the same as present plus some extra ones to assist the overall level of safety. For example, the Sullom Voe harbor authority does not have its own rules, it merely enforces those of central government, international conventions and the industry guidelines lain down by OCIMF and other similar authorities. The point is that the harbor master is the central controlling figure and is not influenced by outside pressure groups.

Guidelines are not mandatory, and if an incident occurs after they have been ignored it will only result in the remark, "I am not obliged to follow guidelines" and any disciplinary action will most likely fail. Perhaps this is another reason the USCG only made them "guidelines". I have a higher regard for fishermen than does Mr. Mealins, but I agree that it is important to report breaches of any regulations to the fishermen's association who must be represented on the harbor advisory committee which is set up to advise on regulation and feedback information to/ from the harbor users. Despite whatever such a committee may advise, the decision of the harbor master is final.

12. Funding

If funding is available why has it not been spent on extra navigational aids and other studies on the safety of navigation? Everyone seems to agree that more work is necessary and extra equipment is required. The Federal budgets are very tight at the moment and there is great demand for what money is available. It is recommended that the CIRCAC fund a study to ascertain what legislation would be required to establish such a port administration.

F. Tesoro Alaska, Mr. J. Meitner, Spill Prevention Coordinator

1. Spill at the dock

I have no doubt that the jetty staff are very aware, but this should be included in order to "cover all the bases" in the C-Plan. It is not a case of adding a redundant section; it is an important area and its inclusion will only enhance the cover/ reputation and effectiveness of the plan.

2. Summer weather/ sea conditions

I am sure the weather and sea conditions are very close to that of Shetland. The water temperature in Sullom Voe, in summer, is between 50º -54º with similar air temperatures. What we never have is ice, thanks to the Gulf Stream. Long may it last.

3. Jetty Supervisor

I cannot imagine why the supervisor should be forbidden from carrying out spot checks on the ship. If that is the case the checks could be carried out by the jetty operators, given suitable training. The jetty operators at Sullom Voe do such checks and sample inert gas and ballast quality.

4. Ballasting

This section, on page 50, deals with ballasting of the ship, not with deballasting ashore. I think there is a misunderstanding on Mr. Meitner's part.

5. Tension Winches

This prohibition on the use of such winches is not mentioned in the section on tending mooring lines, so it is not the text of this report that requires correction. I will add that, "it is understood that such winches are not allowed, etc…."

G. Kenai Pipe Line Company, Mr. O.E. Jackson

1. Docking details

These should not be advised to ships only after chartering has been agreed with Chevron, San Francisco. These parameters should be published to all mariners as there is no reason why they should not be widely known. Under-keel clearance, etc. are important data items for potential users.

2. Wind parameters

The figure of 35 knots should be included in the text of the operations manual; I cannot understand why it is not given. What I would add is that considering the size of ships that can be handled at this jetty without tugs, 35 knots is, in our opinion, too high a wind speed for a safe approach to the jetty.

3. Pilots

Mr. Jackson does not say to what extent the pilots did or did not contribute to the incidents he relates. That is rather like saying 99% of people who die do so in bed, therefore you are advised to sleep on the floor. There is no doubt that a large proportion of incidents in near shore waters occur with a pilot on board, but it must be said that the pilot is the servant of the ship master and many incidents are outside the control of the pilot. The fact that there was a pilot on board made no contribution to many shipping accidents.

4. Tugs

Credit was given for the skill of pilots in the report. But to say that the currents are predictable and therefore a vessel can safely berth is stretching credibility a little far. I have already mentioned the role of tugs to assist during a ship control failure while docking. My point is that berthing without the use of tugs is taking, in my opinion, an unacceptable risk and would not be permitted at any other crude oil installation, current or no current.

H. Ms. Mary Jacobs, PROPS Chair, Dispersants/ Burning

A FAX from the above has just been received with the request that its questions be included in the report.

1. In-Situ Burning

This method of removing oil from the surface of the sea has never been popular in Europe and indeed I am unaware that it has ever been used during an actual spill. It has been tested, however, in test tanks. The main arguments given against such a course given are:

a. “All you are doing is transferring pollution of the sea to pollution of the air.” This is not quite the case, as the heat does destroy a large portion (75%) of the oil but none-the-less the smoke is quite horrific and the pres will have a field day.

b. “In order to burn the oil, you have to boom it anyway, so why not try to recover the oil instead of burning it?” This is indeed the case and is a powerful argument. If the weather is good enough to keep the oil inside the boom, then it should be good enough to skim the oil into tankage.

c. It is often very difficult indeed to set the oil alight as, in a short space of time it loses most of its light ends due to evaporation. The use of heli-torches, etc., normally used in fighting forest fires, is often insufficient to set the fire going. If it does light, then often it will extinguish itself due to the cooling effect of the sea and wind.

d. The operation requires the use of special booms to corral the oil and yet be fire proof when burning commences.

e. Not all the oil burns, and you are left with a thick sticky mess which can only be recovered by belt skimmers/ weir skimmers or grabs. Approximately 25% of the oil will remain n this condition.

f. Great care is required to ensure that the burning oil is not a hazard to shipping or that it drifts ashore and starts a fire in the woodlands, etc. It is quite out of the question to allow such burning in a harbor area where there is even the remotest risk that the fire could spread to tanker jetties or any other harbor installations, for that matter. To this extent Cook Inlet is similar to Sullom Voe where burning does not, nor ever will, appear on the option list. I cannot advise too strongly that this oil removal option be discounted.

2. Dispersants

The writer has now had some 20 years' experience with dispersants used both offshore and in harbor areas. Over the last 10 years great advances in chemistry and application methods have been made and the latest systems available are now in use in Sullom Voe. Used correctly, they are a valuable tool in the armory of the oil spill control team.

United Cook Inlet Drift Association

43961 K-Beach Road, Suite E • Soldotna, Alaska 99669 • (907) 260-9436 • fax (907) 260-9438 • info@ucida.org •

Date: September 25, 2014

Addressee: Cook Inlet Regional Citizens Advisory Council
8195 Kenai Spur Hwy.,
Kenai, AK 99611

RE: Public Comment, Cook Inlet Risk Assessment

United Cook Inlet Drift Association (UCIDA) supports the utilization of an underwater pipeline to transport gas/oil liquids from the Kustatan Area to Nikiski. This preferred method of transportation is conditional on all appropriate construction and operational issues needed to protect the water quality, wildlife and fishery resources of the Cook Inlet Basin.

UCIDA strongly supports the development of a tug escort program for Cook Inlet. A tanker laden with crude oil or an LNG vessel moving in the Inlet in January delivering crude oil at the Nikiski dock; the engine conks out; the tide is flooding and the wind is SW 30. Can they rely on "self-arrest" (throwing out the anchor) as a means of preventing a spill? According to the study and the experts, that answer is NO. There is no vessel in Cook Inlet capable of assisting a fully laden tanker. PWS tractor tugs are 24 hours away.

In the example above, an oil tanker with no power that is being driven by strong winds and tide could fetch up hard aground on the east side of the Inlet (imagine the sisters with a 1200 foot tanker pounding on it in the middle of the night in January) and becomes a wreck and spill.

The only real answer to this dilemma is to have a tug with adequate horsepower stationed in the Inlet. This is an old issue and has been discussed before, but it needs to be emphasized again.

CIRCAC, the USCG, the State of Alaska, and ADEC are aware of this huge hole in oil spill contingency plans, but the general public is not. As fishermen, we know what the wind and tide can do in the Inlet, and it is our job to help others understand this. The only real way to mitigate oil spills is to prevent them in the first place. The oil companies must pay to play, and with increased exploratory activity in Cook Inlet, a tractor tug permanently stationed in the Inlet just makes good sense.

Sincerely,

Original Signed Document

Roland Maw, PhD
UCIDA Executive Director

'Leah Cloud' via CIRA Comment Email <cira.comments@nukaresearch.com>
To: "cira.comments@nukaresearch.com" <cira.comments@nukaresearch.com>
Reply-To: Leah Cloud <leahcloud@yahoo.com>
Cook Inlet Risk Assessment - Final Report Comments

September 26, 2014 8:29 PM

My comment on the risk assessment is that improved self arrest methods of a tanker in storm conditions is not a sure solution. Requiring tanker escorts by a tractor tug would be more likely to prevent an oil spill under adverse conditions. I want to see tanker escorts as a required mitigation to oil spill risks.
Thank you,
Leah Cloud
Homer, AK

Sent from my iPhone

Kachemak Bay Conservation Society
3734 Ben Walters Ln, Homer, AK 99603
907 235.8214
kbayconservation@gmail.com

SUBMITTED VIA EMAIL ONLY
cira.comments@nukaresearch.com

October 15, 2014

Comments to The Cook Inlet Risk Assessment, September 17, 2014 Final Report

To Whom It May Concern,

Kachemak Bay Conservation Society (KBCS) is a nonprofit formed over 35 years ago with over 80 members and supporters.
The Kachemak Bay Conservation Society's Mission is to protect the environment of the Kachemak Bay region and encourage sustainable use and stewardship of local natural resources through advocacy, education, information, and collaboration.
Please accept these comments on behalf of the KBCS Members.

KBCS appreciates the Advisory Panel and commends them on volunteering their time and input to further bring to the forefront the needs for safe navigation in Cook Inlet.

Comments

1. KBCS supports the Construction of a Sub-Sea Pipeline for the transportation of produced petroleum that has previously been shipped out from the Drift River Terminal. This will end the use of the Drift River facility, eliminate the need to store product in the active flood plain under Redoubt Volcano and end cross inlet tanker traffic. The Drift River Facility has been exposed to several major eruptions and lahars from Mt. Redoubt that has resulted in major damage and inundation to the facility without a catastrophic spill. The environment has been very lucky in this regard. We still have concerns on pipeline damage due to seismic events creating a large spill. If built, we expect the latest monitoring system to incorporate fail-safe isolation valves.

2. KBCS strongly supports the recommendation to create a Harbor Safety Committee with the following recommendation.

A. This Committee should have representation from all stakeholders, i.e. local government, fishing interests, environmental organizations and user groups. This will ensure the group balance does not become one sided by a single interest and decisions will be in a transparent and fundamentally safe manner.

B. The mitigation measures which are listed in 4.2.3 all have a significant effect on safe navigation and should be pursued.

C. The issue of training cannot be over stressed. 4.3 Points out the intent of this Study with recommendation in 4.3.1. A major element left out is the Offshore Support Vessel (OSV) and Towing industry. Many losses in the past have involved poor decision on the part of captains on these vessels which have resulted in sinking's. There are many factors involved in these incidents however one common factor is the lack of local knowledge of Cook Inlet. I specifically refer to the sinking of the Tug Lorna B, The OSV Monarch and The OSV Pete Tide. Very lucky there was no loss of life.

D. As stated in Recommendation 4.3.1, Bridge Resource Management Training specific to Cook Inlet should be a requirement. Simulators and On the Job Training should be incorporated as is required for Marine Pilots.

E. When developed, The Harbor Safety Committee could further study the designated Ports of Refuge and resources available. KBCS realizes that Kachemak Bay, (A State Critical Habitat Area) is an ideal location due to it's protected waters and proximity to roads and airports. The question arises over the resources on hand locally to deal with a major marine incident. If Homer is to be designated as a preferred location the resources on hand should be increased so in the event of poor weather, transportation of needed resources will not be a major issue.

Kachemak Bay Conservation Society
3734 Ben Walters Ln, Homer, AK 99603
907 235.8214
kbayconservation@gmail.com

3. KBCS is pleased the issue of unsafe vessel detection and facility capability is discussed and appreciates the recommendations in 4.4.3.

KBCS agrees with Recommendations 6.3. We also see several glaring problems that exist today.

A. The issue of Self Arrest by dropping anchors is described by some as an acceptable method to stop a disabled ship. It is also described as a highly dangerous operation and not appropriate, (The Glosten Associates)
B. KBCS would like to point out that Cook Inlet presents varied situations depending on the time of year, weather, and location. A single statement that self-arrest will work Inlet wide is not true and presents a bad assumption. Situations will vary as to ship size and draft. Dropping both anchors may not prevent grounding and hinder efforts to refloat the vessel. Further problems will arise if power cannot be restored to anchor winches. Ships are not all the same nor are their anchor winches. A new, underway ship may be able to drop both anchors safely with little danger to the crew. That is not true for all age of vessels. Fatalities and injuries have occurred with anchor gear.
C. Deep draft ships have grounded in the past, some leaking product and others luckier.
D. Today, with well-trained pilots and ship crews, navigation is much safer. Mechanical failures are a on-going issue as the marine industry well knows.
E. The subject of a rescue capable vessel has been discussed for years. Study will show that many towing vessels of opportunity are not suitable for operation in ice conditions due to light hulls or being salt water-cooled. This drops the available tug inventory significantly in the winter. The fire fighting capability in the Inlet depends on several OSVs with single fire monitors that severally limit the ability to assist an emergency situation on a ship. A capable fire fighting response tug would carry foam and have multiple fire monitors and spray rails for close in support.

It is past time that several escort-emergency response vessels are required for Cook Inlet.

There have been past studies, Dickson's Report 1992, Glosten Associates Reports, Safety of Navigation in Cook Inlet 1999, and more, which point out the shortcomings of effective response capabilities in Cook Inlet. With the advent of a new LNG Terminal at Nikiski and the increase of ship traffic to the Port of Anchorage we feel it is a perfect time to address the Escort, Rescue Tug issue and develop a means to fund an effective system.

As a footnote to this issue, it is time that an Inlet Authority is created, to be funded by commercial shippers plying the waters of Cook Inlet, The State of Alaska and Industry. This organization could fund the resources, which will be necessary as shipping traffic increases.

As a final comment, KBCS would like to again, go on record and remind everyone about the true issues of today. Ocean acidification, global warming, and climate change are a fact and the continued burning of fossil fuels is one of the major systemic causations. The state must stop the archaic practices of fossil fuel expansion and increase its efforts to develop renewable energy.

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907 235.8214
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Thank you for the chance to comment on the findings of this Risk Assessment.

Yours truly,
Roberta Highland
President, KBCS

Tug Lorna B Sinking

Cook Inlet Risk Assessment Final Report - Comments

Inbox x

Jamie Sutton <jamie@v-dac.com>

Oct 16
(5 days
ago)

to cira.comments

Let's get serious about protecting the Cook Inlet. Assign 2 tugs to each laden vessel.

Jamie

Jamie Sutton
Homer Theatre [106 W. Pioneer at Main, Homer, AK, 99603]
c/o P.O. Box 146
Stinson Beach CA, 94970
http://www.homerdocfest.com/

415-868-1960 (Home office)
415-298-1960 (cell)
415-868-9901 (home)

'Kat Haber' via CIRA Comment Email <cira.comments@nukaresearch.com>

Oct 17 (4 days ago)

to cira.comments

Please be precautionary and do not allow the waters of Alaska be spoiled from extraction, drilling, transporting hydrocarbons that need to remain in the ground to avoid climate change. Many areas of our state are already experiencing devastating impacts from current levels of high CO_2 concentrations in our atmosphere. Clearing the way for greater levels is suicidal for our species. I've marched 3,000 miles this year coast to coast to emphasize the need for America to join the rest of the world in ramping up a 21st Century Energy plan. It is not made any easier when business as usual is the relationship between agencies, the state, and public. It is in all of our best long term interest to diversify our economy immediately and energize our state economy as quickly and completely with renewables as possible.

Naturally,
Kat Haber

Oil in Cook Inlet

Inbox x

Sourdough Dru <goldy@sourdoughdru.com>

8:54 PM (13 hours ago)

to cira.comments

To whom it may concern:

I am writing to concur with the comments made by Cook Inlet Keeper via email 9/25/2014

I concur with gratitude for your services as well; however even the comment extension to 10/27/2014 is not a long enough period for such an important issue as protecting Cook Inlet.

Shocked is an inadequate description of my feeling when I learned that the Drift River Oil Terminal is still operating (@ the bottom) so close to an active volcano(Mt.Redoubt).
After The last near disaster when Mt. Redoubt erupted and flooded the site.

I do not understand how such a non-renewable resource can be given priority and even such exclusive right to destroy our renewable resources.

Aghast - I write so this may be remedied before time proves our action/inaction on the dire matter of the Drift River Oil Terminal location catastrophic for our home Cook Inlet.

Sincerely
Dru Sorenson
(907)782-3120
Sourdough Dru's Gifts & Gold
Bx 109 Main St. Hope, Ak. 99605

Jeremiah Emmerson <ezjtharocka@gmail.com>
October 26, 2014 4:59 PM
To: cira.comments@nukaresearch.com
Cook Inlet Risk Assessment Final Report - Comments

Something to consider is that in situations where boats lose their power you need to do everything in your grasp to avoid running aground or worse. Commercial fisherman understand this and when a fellow fisherman is having problems other fisherman come to help. They will tow and do whatever is necessary to keep that boat and crew safe. Anchoring works sometimes..but you have to be in the right depth and if the weather is bad you run the chance of breaking free of your anchor..then what?

I believe mandatory tug escorts should be required for all tankers permanently, everywhere. This will greatly reduce accidents.

"Dearlove, Karen - NRCS, Kenai, AK" <karen.dearlove@ak.usda.gov> October 26, 2014 12:31 PM
To: "cira.comments@nukaresearch.com" <cira.comments@nukaresearch.com>
Cc: Karen Dearlove gmail <karen.s.dearlove@gmail.com>
Cook Inlet Risk Assessment Final Report - Comments

For the safety of crew, responders, landowners, and the environment, I find it essential to require tug escorts for oil tankers within Cook Inlet.

Karen Dearlove
PO Box 881
Kenai, AK 99611
Home phone: 907-262-2323
Email: Karen.S.Dearlove@gmail.com

Sent from my iPhone

Hilcorp Alaska, LLC

Post Office Box 244027
Anchorage, AK 99524-4027

3800 Centerpoint Drive
Suite 100
Anchorage, AK 99503

Phone: 907/777-8300
Fax: 907/777.-8301

October 27, 2014

Cook Inlet Risk Assessment (CIRA)
Attn: Advisory Panel
c/o Nuka Research and Planning Group

Re: Public Comment on CIRA Final Report Draft

CIRA Advisory Panel:

Please accept this letter in response to the request for comment on Cook Inlet Risk Assessment Final Report Draft. Hilcorp is an oil & gas producer in Cook Inlet focused on responsible development of Alaska's resources and we appreciate the opportunity to provide what we hope will be useful feedback.

The stated purpose of the Final Report Draft is: "…to provide a semi-quantitative assessment of potential vessel oil spill impacts to Cook Inlet's marine and coastal environments." Consistent with prior written comment, Hilcorp asserts that a complete risk assessment should identify all possible risks, consequences as well as their probability of occurrence. We acknowledge that many subject matter experts were given the opportunity to take part in the study; however, there is still concern that a "semi-quantitative" approach did not yield complete and accurate information. Reliable data is critical to building useful conclusions and determining the right path forward for Cook Inlet.

Hilcorp is in alignment with the advisory panel and wants the report to reflect precise conclusions based on accurate data. Professionals within our organization certainly aimed to provide in-depth feedback, but the window of opportunity came at a very busy time. In order to provide meaningful comment, Hilcorp engaged the services of Environmental Resources Management (ERM) to do a qualified peer review of the Final Draft Report. A copy of that review is enclosed. The review raises concerns in several areas. We recommend that those concerns are discussed and addressed prior to issuing the final report.

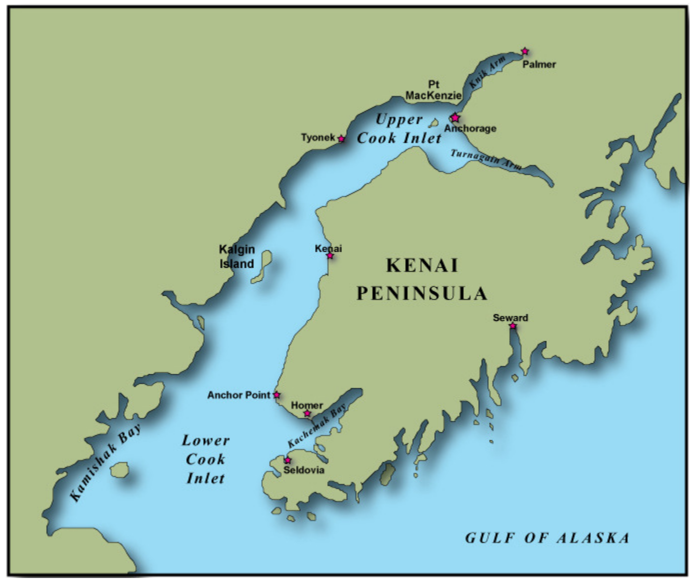
Hilcorp works to continue the legacy of responsible development in Alaska. We can do that best by maintaining good working relationships with our stakeholders and regulators. Our goal in providing comment and soliciting a peer review is to generate information and recommendations that prove to be useful, accurate and appropriate. Please feel free to contact our offices with any questions or concerns regarding our comments.

Sincerely,

Kurtis K. Gibson
Vice President, Hilcorp Alaska – Midstream Division

ERM Peer Review (separate attachment)

COOK INLET RISK ASSESSMENT



PEER REVIEW

Project 0268205;RS-PR-14-117-001 Rev2

22 October 2014

Americas Risk Practice

Delivering sustainable solutions globally
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Texas Registered Engineering Firm F-2393

Title: Cook Inlet Risk Assessment: Peer Review	**Report Number:** Project 0268205;RS-PR-14-117-001 Rev2
Client: Hilcorp Alaska, LLC	**ERM Office:** Houston
Keywords: CIRA, Peer Review, Cook Inlet	
Country: USA	

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A	Internal Review	Didier Batherosse	Stephen Shaw			13 October 2014
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2	Issued to Client	Stephen Shaw	Norma Garcia	P. Davis		22 October 2014

Cook Inlet Risk Assessment Peer Review

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ABBREVIATIONS

ADEC	Alaska Department of Environmental Conservation
AIS	Automated Identification System
AOOS	Alaska Ocean Observing System
ATON	Aid to navigation
AVTEC	Alaska Vocational Technical Center
AWOIS	Automated Wrecks and Obstructions Information System
bbl	Oil barrels
BTD	Bowtie diagram
CBA	Cost-Benefit Analysis
CIRA	Cook Inlet Risk Assessment
CISPRI	Cook Inlet Spill Prevention and Response, Inc.
CIVT	Cook Inlet Vessel Traffic
COMAH	Control of Major Accident Hazards
Cook Inlet RCAC	Cook Inlet Regional Citizens Advisory Council
CVI	Close Visual Inspection
DRT	Drift River Terminal
ERM	Environmental Resources Management Southwest, Inc.
ETC	Eligible telecommunications carrier
ETS	Emergency towing system
FMEA	Failure Mode Effect Analysis
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HFO	Heavy Fuel Oil
HSC	Harbor Safety Committee
ITOPF	International Tanker Owner Pollution Federation Limited
LOPA	Layer of Protection Analysis
MXAK	Marine Exchange of Alaska
NOAA	National Oceanic and Atmospheric Administration
OCS	Outer Continental Shelf
OGP	International Association of Oil & Gas Producers

PWSRCAC	Prince William Sound Regional Citizens' Advisory Council
RAM	Reliability, Availability, and Maintainability
ROV	Remote Operated Vehicle
SIL	Safety Integrity Level
SIMOPS	Simultaneous Operations System
SMS	Safety Management System
TOO	Tug of Opportunity
TRB	Transportation Research Board
VHF	Very high frequency
WCD	Worst case discharge

EXECUTIVE SUMMARY

Background

The Cook Inlet Risk Assessment (CIRA) is a multi-year, multi-stakeholder project whose purpose was to assess the risks of oil spills from marine vessels in the Cook Inlet and to recommend appropriate risk reduction measures. The CIRA study report has recently been issued for public comment.

The conclusion and recommendations associated with the study could have a significant impact on the future protection of the Cook Inlet and on the industry within it. Hilcorp Alaska, LLC (Hilcorp) are in their second year of operations in the Cook Inlet and remain focused on the responsible development of Alaska's resources. Hilcorp therefore wishes to assure themselves that the basis for the conclusions and recommendations resulting from the CIRA are robust and support the importance of the potential resulting recommended actions.

Hilcorp has therefore invited ERM to undertake a peer review of the CIRA study report.

Scope

The scope of the peer review is to examine the study report, appendices and supporting documents (where available) to determine the adequacy of the study basis, analysis methodology, conclusions and recommendations.

This peer review is reported in a form that will allow convenient transmittal to the CIRA study management team.

Method

The methodology adopted to perform the peer review has several steps:

- General comments on the approach adopted for undertaking the CIRA.
- Detailed comments resulting from the review of the study report and the documents posted on the CIRA website (http://www.cookinletriskassessment.com).

The framework used in this peer review was to compare the CIRA's approach of the approach that would have been adopted by ERM.

Conclusions and Recommendations

The CIRA has not established the baseline risk of oil spills in the Cook Inlet. It has examined and assessed certain aspects of that risk in a qualitative and semi-quantitative manner. However, that information is poorly presented within the CIRA main report and this peer review has suggested that some aspects that analysis may be flawed.

The poor reporting of the components of the baseline assessment of Cook Inlet oil spill risk may well be due to the circumstance that the analyses are largely irrelevant. With the exception of the subsea pipeline option, the identification of risk reduction options (together with their review, assessment and eventual recommendation/rejection) does not appear to have been informed by the baseline risk assessment work. It might therefore be suggested that the investment made in the work associated with first phase of CIRA returned little value.

In the case of the subsea pipeline option, data from the baseline risk assessment was utilized. However the flawed and incomplete nature of that analysis does not make a case for investment in that risk reduction option.

Some of the other risk reduction options recommended in the CIRA are either poorly defined (with no specific action actually suggested) or are already underway. These recommendations therefore deliver little value.

The study report did however recommend some other risk reduction options that have merit and their implementation will serve to reduce the oil spill risk in the Cook Inlet.

However, this is largely an opportunity lost. A project of this access, schedule and level of resource could have had a major impact in achieving a justified reduction of oil spill risk in the Cook Inlet. Instead a significant amount of effort was invested in analyses that have not been subsequently utilized. Most of the useful conclusions and recommendations from the CIRA could have been obtained without the bulk of the baseline risk analysis having been undertaken.

1 INTRODUCTION

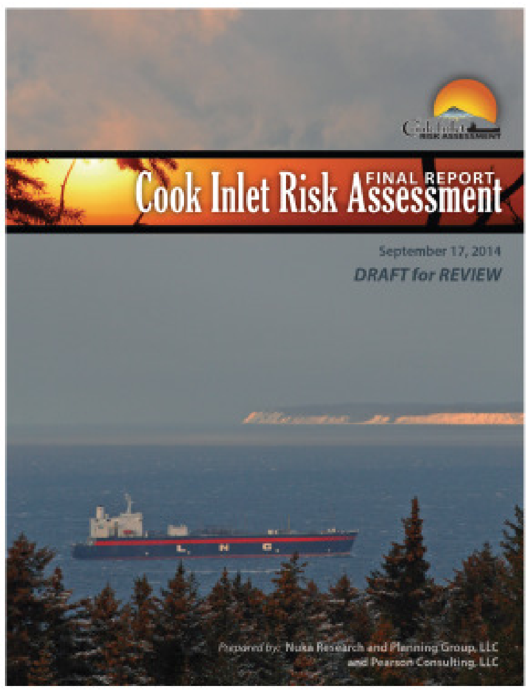
1.1 Background

The Cook Inlet Risk Assessment (CIRA) is a multi-year, multi-stakeholder project designed to assess the risks of oil spills from marine vessels in the Cook Inlet and to recommend appropriate risk reduction options. The CIRA study report has recently been issued for public comment.

The conclusion and recommendations associated with the study could have a significant impact on the future protection of the Cook Inlet and on the industry within it. Hilcorp Alaska, LLC (Hilcorp) are in their second year of operations in the Cook Inlet and remain focused on the responsible development of Alaska's resources. Hilcorp therefore wishes to assure themselves that the basis for the conclusions and recommendations resulting from the CIRA are robust and support the importance of the potential resulting recommended actions.

Hilcorp has therefore invited ERM to undertake a peer review of the CIRA study report.

Figure 1.1: Cook Inlet Study Report Front Page



1.2 Scope

The scope of the peer review is to examine the study report, appendices and supporting documents (where available) to determine the adequacy of the study basis, analysis methodology, conclusions and recommendations.

This peer review is reported in a form that will allow convenient transmittal to the study management team.

1.3 ERM Credentials

ERM is a leading global provider of environmental, health, safety, risk, social consulting services and sustainability related services. With over 5,000 employees in over 40 countries, ERM has served all of the major oil and gas companies for 40 plus years.

ERM's Risk Management services range from the traditional assessment of risk and input into the design and operation of upstream and downstream O&G facilities, to the areas of human factors and safety culture. The Risk Management team works closely with operators and their engineering consultants and/or EPC contractors to identify, assess and reduce risk.

ERM has the ability to evaluate the combined impacts of risk on business from a safety, environmental, health, social, reputational and security perspective. We deliver the full suite of engineering safety studies on new development projects, including Formal Safety Assessments, all the way to detailed Process Safety reviews of high risk sites and liability costings for clients considering major transactions.

Risk Management Services include: Project risk and safety support, including decision support, Quantitative Risk Assessments (QRA), HAZID, HAZOP, FMEA Reviews, Drilling/SIMOPs Risk Assessment, Process Safety Management, Offshore Safety Cases, HSE Cases, COMAH, HSE Impact Assessments (HSEIAs), Bridging Documents, Consequence Modeling and Analyses, SIL, LOPA, FMEA Studies, Bow-tie Analyses, Safety Critical Elements Identification and Performance Standards, Reliability, Availability, and Maintainability (RAM) Studies, amongst others.

1.4 Overview of the Project

The CIRA was executed under the leadership of a Management Team and with the guidance of an Advisory Panel. Input was obtained from contracted consultants/analysts, the public and a Subject Matter Expert in risk assessment.

The risk assessment was conducted in two phases. The first phase was to collect baseline information about the risks of marine accidents in Cook Inlet. The original intention was that this information should be used to guide the selection of potential risk reduction options. The second phase of the risk assessment was to conduct technical analyses for selected risk reduction options and then provide final recommendations on appropriate risk mitigation measures.

Figure 1.2 includes a map showing the Cook Inlet Areas.

Figure 1.2: Map of Cook Inlet Areas

1.5 Support for the Study Objectives

Hilcorp and ERM would commend the effort to execute the CIRA. A better understanding of the threats, potential outcomes and associated risk facilitates the enhanced management of those risks and the better protection of the Cook Inlet resource. This peer review has been conducted to support that objective.

2 METHOD OF PEER REVIEW

2.1 Approach

The methodology adopted to perform the peer review is built in several steps:

- General comments on the approach adopted for undertaking the CIRA.
- Detailed comments resulting from the review of the study report and the documents posted on the CIRA website (http://www.cookinletriskassessment.com).

The framework used in this peer review was to compare the CIRA's approach with the approach that ERM would have adopted.

2.2 Documents Reviewed

The primary documents reviewed as part of this peer review exercise were (but not limited to):

- Cook Inlet Risk Assessment, Final report (including Appendices A-E), Draft for review, Nuka Research and Planning Group, LLC and Pearson Consulting, LLC, September 2014
  - Appendix A: Reduced Risk of Oil Spill with a Cross Inlet Pipeline (2013), by The Glosten Associates.
  - Appendix B – Evaluate Drifting Vessel's Ability to Self-arrest (2013), by The Glosten Associates and Evaluation of 2012 Tugboat Response Times (2013), by The Glosten Associates with Comments.
  - Appendix C – Benefit-Cost Analysis of the Trans-Foreland Pipeline as an Oil Spill Risk Reduction Option (2014), by Northern Economics, Inc.
  - Appendix D – CIRA Management Team and Advisory Panel Members.
  - Appendix E – Methodology for Zone of No Save Analysis
- Cook Inlet Vessel Traffic Study, report to the CIRA Advisory Panel, Cape International, Inc., January 2012.
- Consequence analysis, report to the CIRA Advisory Panel, Nuka Research and Planning Group, LLC., February 2013.
- Risk Reduction Options for Immediate or Sustained Implementation, Preliminary Recommendations of the CIRA Advisory Panel, July 2013.
- Cook Inlet Maritime Risk Assessment Spill Baseline and Accident Causality Study, The Glosten Associates, June 2012.

3 PEER REVIEW GENERAL COMMENTS

3.1 Introduction

The peer review general comments are primarily focused on the overall CIRA approach. The review uses as its framework, the approach that ERM would have adopted for such a study. This approach is then compared with what was actually undertaken by CIRA, and the resulting comments/observations have been recorded.

The general comments also address the management of the study and the resources available to the study.

3.2 Overall CIRA Approach

The risk assessment was conducted in two phases:

1. Establish the baseline risk of marine accidents in the Cook Inlet.
2. Identify and assess potential risk mitigation options.

The overall structure of the CIRA approach was intended to be as recommended by the Transportation Research Board (TRB) in their 2008 Special Report 293, and as was utilized in the Aleutian Islands Risk Assessment.

If appropriately executed, such an approach should allow the insights gained from the baseline risk analysis to firstly determine the need for risk reduction and then to use the characteristics of the baseline risk (including the key risk drivers) to guide where the best risk reduction might be found.

However, the CIRA work did not present the baseline oil spill risk for the Cook Inlet and thus was unable to achieve these objectives.

Given the scope of the CIRA, the following overall approach to the risk assessment work should have been adopted:

- Agree the risk tolerability criteria by which the estimated baseline and future risk levels would be judged
- Select the scenarios of concern (oil spill in the Cook Inlet)
- Undertake a hazard identification (HAZID) workshop (to identify detailed causes, potential outcomes and existing preventative/mitigative controls).
- Illustrate this information in bowtie diagrams (BTD)
- Establish the current and future marine traffic in the Cook Inlet
- Use the traffic data and historical incident data to predict the frequency of marine incidents and the proportion that could result in an oil spill, for selected zones within the Cook Inlet
- Define a range of potential spill amounts based on the vessel types present, and assign a probability distribution to that range of spill sizes
- Assess the impact of representative spill sizes at various locations to estimate a cost associated with the impact of each scenario.
- Combine the frequency and cost of impact information to get a measure of oil spill risk ($ per year) at the selected locations in the Cook Inlet

- Compare the estimated risk levels with the agreed risk tolerability criteria in order to determine the need for risk reduction
- Undertake a structured approach to identifying options for risk reduction.
- Conduct an initial screening of the options to determine which options be rejected immediately, accepted immediately or which are worthy of further consideration. Record the basis for any such decisions.
- For the remaining risk reduction options, undertake suitable cost-benefit analysis to determine which of those options should be recommended or rejected.
- Consolidate the study basis, findings, conclusions and recommendations into a suitable study report.

This ideal program of work will now be compared with work actually undertaken for the CIRA.

3.2.1 Tolerability Criteria

The conventional approach to a risk assessment is to analyze the risks and then compare the estimated risk levels with appropriate risk tolerability criteria that define the resulting action required. In the case of the CIRA approach, the baseline analysis simply estimates and characterizes the current risk and the need for risk reduction is presumed. Whilst the need for oil spill risk reduction in the Cook Inlet may well be an appropriate conclusion, the CIRA approach does not seek to substantiate that conclusion. Furthermore, it does not by provide guidance on the vigor with which risk reduction should be pursued. Should risk reduction be pursued irrespective of cost, where the benefits can be demonstrated to outweigh the costs, or according to some other criteria?

The CIRA did not specify any tolerability criteria against which to judge the estimated oil spill risk levels; and therefore it is not adequate.

3.2.2 Selection of Scenarios

The overall scenario of concern is that of an oil spill in the Cook Inlet. The analysis considered an appropriate selection of vessel types (4) and zones with the Cook Inlet (3).

The CIRA did not consider oil spills from other operations within the Cook Inlet (example; oil and gas exploration, production and pipeline activities) nor did they consider oil spills outside of the Cook Inlet that could migrate into the Cook Inlet. These could be important omissions in the understanding of the complete oil spill risk picture for the Cook Inlet.

3.2.3 HAZID

It is understood that the CIRA did not include a HAZID workshop. Instead the detailed causes of marine incidents and associated oil spills were taken from the categories used to report the historical data utilized in the incident frequency analysis.

Whilst such an approach does address the main generic causal categories, it does not facilitate the identification of special features and circumstances within the Cook Inlet that might affect the potential causes and other characteristics of marine incidents.

Various existing controls are mentioned in passing throughout the CIRA report. However, there is no consolidated listing of existing controls. The report would benefit from such a listing, which should form the starting point for the search for additional risk reduction options. In fact, it is noted that a number of the CIRA recommended risk reduction options are either already existing or already underway.

3.2.4 Bowtie Diagrams

A stylized BTD is illustrated in Figure 3.1

Figure 3.1: Example Bowtie Diagram

BTD are now widely accepted as being a highly effective means of illustrating the causes, outcomes and preventative/mitigative controls associated with major accident events. The CIRA report would have benefited from presenting the characteristics of the oil spill events in this manner.

3.2.5 Marine Traffic Study

The form and apparent approach to the marine traffic study is sufficient. However, it is understood that are concerns regarding the validity of the data used for certain key segments. These concerns are further described elsewhere in this report.

3.2.6 Incident Frequency Estimates

The use of historical data to determine the appropriate generic marine incident frequencies and the combination of this information with actual traffic data to determine the overall marine incident rates for the Cook Inlet is sufficient. However, the generic incident frequency information should have also been adjusted to take account of specific local conditions.

There are also some concerns about the specific data utilized in the CIRA. These concerns are further described elsewhere in this report. Wherever possible, global generic data should have been validated and/or calibrated with the actual local experience.

3.2.7 Spill Size Analysis

The CIRA used historical data to determine the probability distribution between spill sizes (as a function of cargo size) as well as the actual spill volumes for different spill categories. Whilst the use of historical data for determining the appropriate probability distribution is widely respected, there are some concerns about the specific data utilized in the CIRA because actual spill volumes associated with each spill category could be better determined by a specific examination of the configuration of representative vessels. These concerns are further described elsewhere in this report.

3.2.8 Spill Impact Analysis

A qualitative analysis of the spill impact for several selected spill scenarios was reported in the Consequence Analysis Report. Although this report presents a large quantity of detailed information, none of it is actually utilized as part of the risk assessment. Essentially the study concludes that impact of a large oil spill at certain vulnerable locations would be severe and undesirable; a conclusion that was probably well established before this part of the analysis commenced. The examination of the spill impacts is entirely descriptive, although the selected scenarios are ranked in order of perceived severity. However, this ranking is entirely relative and gives no insight into the absolute level of impact associated with each selected scenario.

The process by which the studied scenarios were selected is not clear.

As each impact of an oil spill is often measured in a different physical parameter, the generally accepted industry convention is to convert those many different physical parameters into a single monetary parameter that allows the different impacts to be aggregated. That was not done in the CIRA consequence analysis report.

3.2.9 Aggregate Risk

The conventional approach to presenting oil spill aggregate risk metrics is to combine the frequency and cost of impact information to get a measure of oil spill risk ($ per year). For the Cook Inlet, this should be at selected representative locations.

As the CIRA impact analysis work was just qualitative, descriptive and relative (rather than quantitative, absolute and aggregate) it was not possible to generate any numerical metrics for the baseline oil spill risk in the Cook Inlet, and thus did not deliver against its primary objective. Therefore, this portion of the CIRA is inadequate.

3.2.10 Risk Assessment and the Need for Risk Reduction

As the CIRA work did not generate any numerical metrics for the baseline oil spill risk in the Cook Inlet, and as the CIRA did not define any suitable risk tolerability criteria, it therefore did not establish the need for risk reduction.

The need for risk reduction was nevertheless presumed by the CIRA.

3.2.11 Identification of Risk Reduction Options

A formal and structured approach to the identification of potential risk reduction options should be employed. A key input into that exercise would be the BTD. These already show the different causes to the oil spill event together with the existing preventative and mitigative controls. An effective method of organizing the causes on the left-hand side of the BTD is in order of their contribution and ordering the controls on a particular path in accordance with their effectiveness (with strong controls to the left and weak controls to the right).

The best opportunities for risk reduction are then in the upper routes through the BTD (because these have the largest contribution) and on those routes with few or weak controls (because those have the greatest potential for increased control).

The hierarchy of controls should be applied as a checklist for the search for risk reduction options associated with each cause. The list below presents a version of the hierarchy of controls:

- Elimination or substitution
- Separation
- Prevention of loss of containment

- Control of magnitude of consequences
- Mitigation of impact
- Recovery

The process employed by CIRA seems to have been more ad hoc, with Advisory Board members simply being asked to contribute ideas. Whereas a more structured approach links the identified risk reduction options to specific gaps in the existing situation, the ad hoc approach is prone to including options based on personal preference and bias.

3.2.12 Screening of Risk Reduction Options

The basis upon which risk reduction options were either not selected for consideration, or where they were rejected upon consideration, is not adequately documented by the CIRA and is therefore not known.

3.2.13 Cost-Benefit Analysis of Risk Reduction Options

Quantitative cost-benefit analysis was only attempted for one of the risk reduction options (subsea pipeline). However, there are serious concerns about that analysis which are further described elsewhere in this report.

Cost-benefit is discussed qualitatively for the other recommended risk reduction options.

Substantiated cost-benefit analysis is difficult where quantitative baseline risk information is not available.

3.2.14 Report

The purpose of the study report is to present the study objectives, basis, approach, results, conclusions and recommendations in a clear and structured manner. For risk assessment studies, it is conventional to have a main report with an executive summary that together provide a comprehensive overview of the study. Detailed information is provided in appendices.

The CIRA has an executive summary.

However, the main body of the report does not contain much of the information usually found in conventional reports. There is no consolidated description of the study approach and methodology. Furthermore, the report does not present the baseline risk information developed in the first phase of the study. A large proportion of the main body of the report is used to provide the consideration of the risk reduction options.

The CIRA report has several appendices. However, the CIRA website also provides a number of key project documents that were developed as part the first phase of the CIRA. These documents contain information that is important to the baseline risk analysis, but which is not repeated in the study report. Many of these documents should be formal appendices to the CIRA report.

3.3 Management of the CIRA

The TRB recommendations for the management of the risk assessment exercise are sensible. However, it is noted that the CIRA Management Team composition may have benefited from some Industry involvement. The TRB recommendation of a Peer Review Panel serves to offset the potential for bias to be introduced in what can be a somewhat subjective analysis. Thus, the CIRA decision to utilize a single Subject Matter Expert instead of a Peer Review Panel raises the concern that such potential bias may exist in the analysis. The deficiencies undermine the original intent of the TRB recommendations.

It is considered that the stakeholder engagement (Section 2) was limited and potentially flawed. The comment periods for many of the documents were very short, given the quantity of information which they contained.

It is understood that some bias may have been exhibited in that the subsea pipeline project proponents were consulted extensively whilst the operators of the Drift River Terminal (DRT) were not. The CIRA documentation suggests that the Cook Inlet Pipeline Company input was never provided; however, Hilcorp advises that they were not allowed to provide input despite requesting to do so.

The CIRA Advisory Panel also seems limited and potentially skewed. Arguably the most consequential industry associated with this effort, oil and gas production, is represented by a single individual who works for one of the smaller operators. Further, he appears to be the only representative without an alternate.

3.4 Study Resources

The CIRA report notes that a modest budget of $870K limited the scope of the analysis. The budget and available timeline for the given scope of the analysis should have been considered as generous and sufficient to undertake a thorough assessment of the relevant issues.

4 PEER REVIEW DETAILED COMMENTS

4.1 Introduction

The peer review detailed comments have been structured around the key components of the CIRA, namely:

- Executive Summary
- Main Report Sections 1 and 2
- Cook Inlet Vessel Traffic Study (Cape 2012)
- Spill Baseline and Accident Causality Study (Glosten 2012)
- Consequence Analysis Report (Nuka 2013)
- Main Report Section 3
- Main Report Section 4
- Appendix A: Estimate of Reduced Risk of Tanker Spill with Cross-Inlet Pipeline (Glosten)
- Appendix C: Benefit-Cost Analysis for the Trans-Foreland Pipeline (Northern Economics)
- Main Report Sections 5 to 7
- Appendix B: Tugboat Response Times and Drifting Vessel Ability to Self-Arrest (Glosten 2013)
- Main Report Section 8
- Main Report Section 9
- Appendix D: Advisory Panel and Management Team Members
- Appendix E: Zone of No Save Methodology

4.2 Executive Summary

The CIRA report does contain an executive summary.

However, the executive summary presents no information about the baseline risk assessment other than to reference the TRB methodology. A summary of the results and conclusions from the baseline assessment of the oil spill risk should have been presented in the executive summary. These conclusions should have substantiated the need for risk reduction and provided insight in where best to seek the most effective risk reduction.

The executive summary does confirm that 21 risk reduction options were developed through stakeholder engagement, of which 13 are recommended for implementation by CIRA. The executive summary does not indicate why the remaining 8 options were not recommended for implementation, nor does it indicate why the other 13 risk options were selected for recommendation.

4.3 Main Report Sections 1 and 2

Sections 1 and 2 of the main report present an introduction and address the baseline oil spill risk assessment. These sections suffer from much of the same weakness as the executive summary, in that very little information about the baseline risk assessment is presented. There is reference to the TRB methodology and to the CIRA management structure. The three main reports that make up the baseline risk assessment (traffic study, spill baseline and consequence analysis) are addressed in less than four pages. Section 2 presents selected information from each study, but does not indicate how that information was used to develop an overall appreciation of the oil spill risk in the Cook Inlet.

To gain any understanding of the work undertaken in the baseline risk assessment, a reader is forced to make reference to the detailed study reports themselves. Those detailed study reports are not provided as appendices to the CIRA report, but instead are provided elsewhere in the CIRA website hidden amongst other technical reports, progress reports and press statements. For example, the Spill Baseline and Accident Causality Report is simply labeled as “CIMRA Task 4 Report”.

The main report should provide a far better summary of these important technical reports and explain how the information they developed was used in the overall baseline risk assessment. These sections of the main report need to address one of the primary objectives of the CIRA; to definitively present the current and future oil spill risk to the Cook Inlet.

4.4 Cook Inlet Vessel Traffic Study

This study was undertaken by Cape International.

The overall methodology employed in the study is robust and in line with other industry practice. However, there are concerns that some of the data utilized in the study may be flawed.

A specific data of concern relates to the number of transits associated with tank vessels departing the DRT.

Hilcorp has confirmed that the annual number of laden tankers departing the DRT has been between 17 and 21. This seems to be at odds with the 83 tanker movements quoted in the traffic study. It is also noted that Appendix A indicates that 38 transits per year would be eliminated by construction of the subsea pipeline.

A possible explanation for some of this difference may be that ballasted transits have been mistakenly considered as laden transits. It is recommended that CIRA review the data upon which the traffic study was based is correct in general and specifically to confirm that ballasted transits have not been mistakenly considered as laden transits.

A further potential flaw relates to the vessel cargo load size attributed to DRT traffic. Hilcorp have noted that laden tankers leaving DRT have a maximum capacity of 310,000 barrels of oil (13,000,000 gallons) or less; where as the traffic study suggests a maximum cargo size of 342,000 barrels.

4.5 Spill Baseline and Accident Causality Study

This report was undertaken by the Glosten Associates.

The Spill Baseline and Accident Causality Study report is highly detailed; however it does not appear that these details has been utilized by the CIRA. All that is presented in the CIRA report is the following Table 4.1(as shown as Table 1 on page 7 of the CIRA main report):

Table 4.1: 50^{th} to 95^{th} Percentiles Spill Volumes by Vessel Type and Incident Type

Vessel Type	Incident Type	Oil Volume (gallons)	
		Moderate (50^{th} percentile)	Large (95^{th} percentile)
Tank Ship (Product Carrier)	Impact	5,000	4,000,000
	Non-impact	1,000	150,000
	Transfer Error	10	2,000
Tank Ship (Crude Carrier)	Impact	20,000	15,000,000
	Non-impact	2,000	8,000,000
	Transfer Error	10	2,000
Tank Barge	Impact	500	300,000
	Non-impact	200	300,000
	Transfer Error	10	2,000
Non-tank Vessel	Impact	1,000	300,000
	Non-impact	100	300,000
	Transfer Error	10	2,000
Workboat	Impact	100	20,000
	Non-impact	10	20,000
	Transfer Error	10	1,000

This analysis significantly over estimates the expected spill volumes at a particular spill probability. For example, the table above suggests a spill size (of at least 15 million gallons) which is greater than that entire cargo contents of vessels servicing the DRT (13 million gallons) occurs in about 5% of spills involving that type of vessel. Clearly such a frequency is not supported by the actual experience of the Cook Inlet as recorded in the Cook Inlet Incident Database which records 121 marine incidents in the 15 year period from 1995 to 2010. The largest spill from these incidents was 6,000 gallons.

The worldwide historical record shows that a cargo vessel losing its entire contents of cargo is feasible, but only occurs in a very small proportion of incidents. A more realistic assumption of probability of that size of spill would be several orders of magnitude below the 95 percentile quoted in the table above.

The Cook Inlet Incident Database 1995 to 2010 is provided; however the historical incident database upon which this study is undertaken is not. The report indicates that it is compiled from ADEC, US Coast Guard and Environmental Research Consulting (private consulting firm) internal databases. CIRA should publish the incident database utilized in this study, so that the validity of the event frequencies derived from the database can be verified.

This study makes use of the traffic study data discussed above. As there are concerns relating to the number of laden tanker transits assumed in the traffic study, similar concerns transfer to the spill frequency study.

CIRA should undertake a critical review of the frequency/spill size data presented in this report.

4.6 Consequence Analysis Report

This study was undertaken by Nuka Research and Planning.

This report presents a review of the potential ultimate consequences of several selected oil spill scenarios within the Cook Inlet. More widely, this aspect of such an analysis is often referred to as the impact analysis (with consequence analysis being used to address the direct physical consequences, amount of oil spilled, from an incident).

The analysis presented in this report is entirely qualitative. The resulting information is comprehensive and detailed and does provide a good illustration of the nature of the impact that might result from the selected spill scenarios. The selection of the scenarios for consideration was meant to be representative of the range of different spills that might be experienced in the Cook Inlet (covering different spill locations, spill sizes and oil types).

However, although the large quantity of detailed information is useful for illustrative purposes, none of it is actually utilized directly as part of the risk assessment. Essentially, the study concludes that impact of a large oil spill at certain vulnerable locations would be severe and undesirable; a conclusion that was probably well established before this part of the analysis commenced.

The examination of the spill impacts is entirely descriptive. The selected scenarios were ranked in order of severity. However, this ranking is entirely relative and gives no insight into the absolute level of impact associated with each selected scenario.

4.7 Main Report Section 3

Section 3 of the main report addresses how the risk reduction options were identified and selected for further study. This description suggests a largely ad hoc process with various stakeholders suggesting measures, including some that have already been promulgated in the revision of existing regulation. A more structured approach to the identification of potential risk reduction options should be implemented to ensure that best opportunities for such risk reduction are fully explored.

This section does however contain a figure (Figure 3) illustrating the generic accident chain. This is similar in concept to the hierarchy of controls mentioned earlier. Figure 3 is considered to be a very useful summary of the identified potential risk reduction options.

For CIRA the structure presented in Figure 3 appears to have been used to group and sort the identified potential risk reduction options, rather than being used as tool to search for new risk reduction options.

This section also notes that the following risk reduction options were eliminated by the Advisory Board in February 2013, but no basis for that elimination decision is provided:

- Traffic separation scheme
- Establish a “Particularly Sensitive Sea Area” through IMO
- Satellite tracking of vessels
- Use of long range tracking and identification (LRIT)
- Improving aids to navigation
- Removing out-of-service platforms and subsea pipelines

- Placing quick release mooring hooks at the Port of Anchorage
- Positioning or pre-approving the use of the Oil Spill Eater Product

As the basis for their elimination is not provided, ERM is unable to comment on the appropriateness of those decisions. However, it is difficult to understand why some level of improvement to the navigational aids available in areas prone to groundings, collisions or strikings would not be considered cost-beneficial.

4.8 Main Report Section 4

Section 4 of the main report provides an examination of the risk reduction option relating to the elimination or reduction of the root causes of oil spills. It considers four risk reduction options:

- Construction of a subsea pipeline across the Cook Inlet
- Establish a Harbor Safety Committee
- Sustain and enhance training for Pilots, Captains and Crew
- Harbormasters to notify US Coast Guard of unsafe vessels and Identify communication limits to all users

Each of these recommendations is addressed in turn.

4.8.1 Subsea Pipeline

A significant amount of analysis has been devoted to this risk reduction option (refer to Appendices A and C), however the analysis provided does not support the recommendation.

The underlying hypothesis supporting the recommendation to construct a subsea pipeline across the Cook Inlet is that its construction would eliminate a number of the current laden tanker ship transits and thereby reduce the likelihood of an oil spill in the Cook Inlet. The CIRA work further contends that monetized value of the risk being avoided outweighs the cost of this construction project.

The construction of a subsea pipeline to replace the current tanker transits across the Cook Inlet would reduce the risk of an oil spill in the Cook Inlet, but the CIRA has:

- Over-estimated the risk that would be eliminated by the existence of the subsea pipeline
- Under-estimate the risk that would be added by the construction of the subsea pipeline
- Over-estimated the monetized benefit of this risk reduction by not factoring the monetary value for spill likelihood
- Not taken account of other adverse economic impacts of replacing the current tanker transits with a subsea pipeline facility
- Reached the wrong conclusion regarding the justification for this risk reduction option

The basis for these comments is further explained in the review of Appendices A and C.

The last paragraph on page 11 of the main study report misuses risk analysis. The author of the main report suggests that the Northstar pipeline experience of no leaks in 13 years of operation whilst three spills were experienced by tankers in the Cook Inlet during the same period supports the observation that tanker spills occur more frequently than subsea pipeline spills. The information presented does not support or oppose such a conclusion. It is the equivalent of suggesting that the higher incidence of vehicle collisions on a busy urban highway, than in a remote agricultural location, indicate that sedans are more prone to collision than tractors.

Page 13 of the main report contends that spills from pipelines tend to be smaller than spills from tankers. An average pipeline spill size of 928 gallons is presented. However the actual experience of the Cook Inlet (contained in the Cook Inlet Incident Database 1995 to 2010) suggests that average spill sizes experienced from marine traffic in the Cook Inlet is 145 gallons (from 55 spill events). This comparison is not material to whether investment in the construction of a subsea pipeline is justified, but rather illustrates how different data may be manipulated to support a particular position.

Table 3 on page 13 of the main report is not representative of the Cook Inlet actual marine traffic. The tanker vessels servicing the DRT have a maximum cargo capacity of 13 million gallons making the worst case discharge of 28 million gallons from such vessels to be unrealistic. Similarly, ERM has no concept of a transfer incident that results in a 75 million gallon spill.

The benefit to cost information presented in Section 4.1.4 compares the absolute cost of an oil spill incident with the cost of the proposed risk reduction option suggesting a benefit to cost ratio of 0.05 for medium spills, 5.8 for large spills and 18.1 for worst case discharge (WCD) spills. These ratios would be valid if the specified spill event were to occur within the lifetime of the pipeline. They are not. So these ratios need to be adjusted by the probability of that event occurring during the pipeline lifetime. To illustrate, a $10 million event that occurs once in a thousand years has an annual risk value of $10,000.

If the large size spill and WCD spill benefit to cost ratios are adjusted for the likelihood of such events, the resulting ratios become much less than 1 (and therefore suggest that the investment would not be worthwhile).

4.8.2 Harbor Safety Committee

A Harbor Safety Committee (HSC) for the Cook Inlet should be established.

The list of possible topics for consideration by the HSC is useful, as are the accompanying explanations. The list provides a valuable starting point for the Cook Inlet and a foundation that the HSC can further build upon.

In order to take the HSC's establishment to the next level, focus should be aimed at overcoming the practicalities of setting up a committee of this nature. The CIRA report should support this movement and make more definitive recommendations regarding the funding and composition of the HSC. A combination of volunteer and paid participation should be explored in order to ensure the HSC a successful and sustainable future.

4.8.3 Training for Pilots, Captains and Crew

Training Pilots, Captains and Crews can have a significant effect on the risk of an oil spill in the Cook Inlet and the Alaska Vocational training Center (AVTEC) Marine Training Facility in Seward should be considered as an important resource.

Thus, CIRA's recommendation to encourage Cook Inlet Pilots, Vessel Officers and shore-side vessel management personnel to engage in simulator training above and beyond that required through normal qualifications is good in concept.

However, it is the practicalities of persuading those groups to attend such training that remains the challenge. By including more definitive and encouraging recommendations regarding funding/subsidy for the cost of the recommended attendance, there is more of an incentive for people to attend that training. If a purely volunteer participation is considered sufficient, then CIRA could make more specific recommendations to the promotion of, and understanding the benefits of, such training. By encouraging Pilots, Captains and Crew to attend extra simulator training, CIRA is simultaneously creating a safer and more sustainable workplace. Therefore, more definitive and attractive recommendations may be worthwhile.

The risk assessment work undertaken by CIRA was not necessary to develop this recommendation.

4.8.4 Information from Harbormasters and Port Directors

The recommendations regarding notifying the US Coastguard of unsafe vessels, and informing their users of the limitations of the harbor/port communication and coverage facilities, are sensible. They should be straight forward to implement without significant costs and would deliver benefit.

However, once again, the risk assessment work undertaken by CIRA was not necessary to develop this recommendation.

4.9 Appendix A

This appendix presents the estimate of the reduction in oil spill risk that would result from the construction of a cross Cook Inlet subsea pipeline. The work was carried out by the Glosten Associates.

Risk reduction resulting from the construction of the subsea pipeline has been over-estimated for the following reasons:

1. Appendix A assumes that 38 crude transits would be displaced by the subsea pipeline, however it is understood that only 17 to 21 laden cargoes depart the DRT each year. Use of the correct transit data would approximately halve the benefit assumed in Appendix A.
2. For the 38 transits, Appendix A assumes that there would be 35.1 traffic days in the system and a spill rate for tankers is applied (0.003 spills per traffic day). However of these 35.1 traffic days, only 2.6 days would be spent in transit whilst the remaining 32.5 traffic days would be at the dock. The likelihood of a spill whilst at the dock is very different to that whilst a tanker is in transit. However a single frequency and probability distribution has been used for both situations. The likelihood of a spill at the dock is generally lower than in transit and the size distribution of possible spills is much lower. Correcting these assumptions would also serve to significantly reduce the amount of risk displaced by the subsea pipeline.
3. Comments have already been made about the spill size probability distribution. Appropriately adjusting those assumptions would also serve to reduce the amount of risk displaced by the subsea pipeline.
4. The analysis has not offset the risk reduction with the additional oil spill risk that would be experienced from the operation of the subsea pipeline. Such a risk might be less than the tanker transit risk but would but would nevertheless be significant. Similarly, the oil spill resulting from the marine activities involved in the construction of the subsea pipeline should be included.

4.10 Appendix C

This appendix presents the benefit-cost analysis for the subsea pipeline as a risk reduction option. The work was carried out by Northern Economics.

Risk reduction resulting from the construction of the subsea pipeline has been over-estimated for the following reasons:

1. Appendix C uses Appendix A as input. Therefore the over-estimates contained in Appendix A are carried into the analysis in Appendix C.
2. Although the event cost information developed in this appendix is realistic for the stated spill sizes, those spill sizes are not credible. The benefit cost analysis has assumed that spill events occur during the pipeline lifetime. That assumption may be valid for a smaller size leak, but it would not be valid for the large and worst

case leak events. Those events should have a probability of occurrence during the pipeline life of much less than 1, and so any benefit-ratio factor should also be adjusted by a similar proportion. A large leak in more than 10 pipeline lifetimes and a worst case leak in more than 20 pipeline lifetimes would result in the benefit-cost ratios falling below 1.

4.11 Main Report Sections 5 to 7

Sections 5 to 7 of the main report provide an examination of additional risk reduction options, namely:

- Water depth at Knik Arm
- Expand cellular and VHF coverage
- AIS Broadcast to enhance situational awareness
- Third party workboat inspections
- Tug of opportunity (TOO) rescue
- Vessel self-arrest
- Update subarea C Plan
- Improve spill response equipment

Each of these recommendations is addressed in turn.

4.11.1 Water Depth at Knik Arm

The challenge of silt build up and the need to increased dredging to continue to reduce the likelihood of vessel grounds in that vicinity is well explained. Knik Arm should continue to be dredged to maintain the project water depth.

However, this dredging is the responsibility of the US Army Corps of Engineers (USACE) who were not part of the CIRA stakeholder group.

Thus, this recommendation should be expanded to address how the CIRA management team should reach out to the USACE in order to obtain their agreement for the continued dredging activities. This risk reduction option would be a good subject for a cost-benefit analysis to demonstrate the value of continued investment in the dredging activities.

4.11.2 Expand Cellular and VHF Coverage

Enhancing cellular and VHF coverage in the Cook Inlet would enhance mariner's situational awareness and facilitate operational and emergency communications. All of this will serve to reduce the risk of oil spills in the Cook Inlet.

However, once again it is the practicalities of achieving this end that needs further attention in the CIRA report. Then potential leverage that could be applied to service providers seeking to expand their services elsewhere in Alaska was mentioned and should be further explored.

As desirable as the aspiration might be, the recommendation has little value in its current form. It needs to be strengthened by practical suggestions as to how that end might be achieved.

Once again, the risk assessment work undertaken by CIRA was not necessary to develop this recommendation.

4.11.3 AIS Broadcast

The efforts by the Marine Exchange of Alaska (MXAK) together with the US Coast Guard to enhance the quality of information transmitted by the AIS system are to be commended. Similarly, the desire for AIS software vendors to update their software allow more vessels to take advantage of the improved information would enhance the mariner's situational awareness. This in turn would serve to reduce the risk of oil spills in the Cook Inlet.

Again, it is the practicalities of achieving this end that needs further attention in the CIRA report. As desirable as the aspiration might be, this recommendation also has little value in its current form. It needs to be strengthened by practical suggestions as to how that end might be achieved.

The risk assessment work undertaken by CIRA was not necessary to develop this recommendation.

4.11.4 Third Party Workboat Inpections

Although the benefit of third party inspections for workboats is well established, the value of this recommendation is not clear. The survey undertaken by CIRA shows that most workboat operators already participate in voluntary third party inspections and audits. It would seem that implementation of this recommendation has already been achieved.

4.11.5 Tug of Opportunity Rescue

Section 6 of the main report and Appendix B contain substantial information about the present tug capabilities within the Cook Inlet and their ability to intervene with a large drifting vessel. It is clear that this matter has received significant attention by the study team. Yet, the recommendation is simply for more study.

More specific conclusions should be distilled from the analysis work already undertaken. Those conclusions should then be used to better scope any further study work deemed necessary.

With regard to reducing the oil spill risk in the Cook Inlet, the primary options are either to increase the responding tug capacity in the Cook Inlet (by getting additional vessels) or through the more effective distribution of the existing assets in the area. Thus, the future study work should focus on demonstrating the cost-benefit of such measures.

Some of the information developed in the baseline oil spill risk assessment could be used to support that cost-benefit analysis.

Unlike some of the other recommendations discussed above, this recommendation does address the specifics and practicalities of improving the existing tug capabilities, and thus is to be commended.

4.11.6 Vessel Self-Arrest

Section 6 of the main report and Appendix B also contain substantial information about the ability and desirability of a large drifting vessel to self-arrest through deployment of their anchors. As with the TOO risk reduction option, it is clear that this matter has received significant attention by the study team. But, the recommendation is again simply for more study.

Unlike the TOO option, it less clear what CIRA hopes to achieve from this further study. The understanding is that if a vessel Master has his ship in danger but believes that attempting to self-arrest may help his situation, then he is likely to attempt to do. Further study may give greater insight into how a Master might behave in such a circumstance, but it is unlikely to significantly alter that behavior.

4.11.7 C Plan

Effective contingency plans can significantly affect the impact of oil spill events, and thereby reduce the associated risk. Regulation (appropriately) requires the Cook Inlet subarea to have a suitable contingency plan (C Plan). Such a plan exists and has an established review and improvement cycle. The next major update is expected in 2015.

The CIRA recommendation related to the C Plan simply states the obvious; that the C Plan should be reviewed and updated.

The purpose of CIRA was to develop a detailed understanding of the oil spill risk in the Cook Inlet. CIRA should thus have undertaken a detailed review of the current C Plan, using the substantial insight that should have been developed through the baseline risk assessment, to offer specific advice as to where the C Plan should be enhanced.

There is still the opportunity for such a review to be undertaken.

4.11.8 Spill Response Equipment

No actual recommendation is made by CIRA regarding oil spill response equipment. Rather, the report simply notes that current support is provided by two response organization; Cook Inlet Spill Prevention and Response, Inc. and Alaska Chadux Corporation. It further notes that ongoing operations exercise their equipment and procedures and seek new technologies to improve on-water oil spill containment and recovery.

A review of the optimum equipment and oil spill response capability should be integrated into the C Plan review proposed above.

4.12 Appendix B

Appendix B contains detailed information on the availability and capacity of TOO and on the ability and desirability of a large vessel to self-arrest through deployment of their anchors.

Comments have already been made regarding the recommendations resulting from this analysis and there are no further comments to offer on this detail.

4.13 Main Report Section 8

Section 8 of the main report presents the CIRA conclusions.

The conclusion makes no reference to baseline risk assessment. It correctly acknowledges the importance of the Cook Inlet resource and that the area benefits from an experienced maritime community with a proven commitment to working together to improve safety. It also recognizes the challenges of the maritime environment in the Cook Inlet.

It closes with reference to the CIRA recommendations (that have been discussed above).

4.14 Main Report Section 9

There are no detailed comments to offer on the report reference list.

4.15 Appendix D

Comments have already been made regarding the composition of the management team and advisory board, together with the stakeholder engagement activities.

4.16 Appendix E

There are no detailed comments to offer on this appendix.

5 CONCLUSIONS

The CIRA was to establish the baseline oil spill risk in the Cook Inlet, use the insights gained to determine the need for risk reduction and where that risk reduction might best be found, and finally to identify/assess potential risk reduction options with a view to making recommendations for implementation.

The CIRA has not established the baseline risk of oil spills in the Cook Inlet. It has examined and assessed certain aspects of that risk in a qualitative and semi-quantitative manner. However, that information is poorly presented with the CIRA main report and this peer review has suggested that some aspects of that analysis may be flawed.

The poor reporting of the components of a baseline assessment of Cook Inlet oil spill risk may well be due to the circumstance that the analyses are largely irrelevant. With the exception of the subsea pipeline option, the identification of risk reduction options together with their review, assessment and eventual recommendation/rejection does not appear to have been informed by the baseline risk assessment work. It might therefore be suggested that the investment made in the work associated with first phase of CIRA returned little value.

In the case of the subsea pipeline option, data from the baseline risk assessment was utilized. However the flawed and incomplete nature of that analysis does not make a case for investment in that risk reduction option.

Some of the other risk reduction options recommended in the CIRA are either poorly defined (with no specific action actually suggested) or are already underway. These recommendations therefore deliver little value.

The study report did however recommend some other risk reduction options that have merit and their implementation will serve to reduce the oil spill risk in the Cook Inlet.

However, this is largely an opportunity lost. A project of this access, schedule and level of resource could have had a major impact in achieving a justified reduction of oil spill risk in the Cook Inlet. Instead a significant amount of effort was invested in analyses that have not been subsequently correctly utilized. Most of the useful conclusions and recommendations from the CIRA could have been obtained without the bulk of the analysis having been undertaken.

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October 27, 2014

Cook Inlet Risk Assessment Advisory Panel

Submitted by email to: Cira.Comments@Nukaresearch.com

Re: Cook Inlet Risk Assessment

The Alaska Oil and Gas Association (AOGA) appreciates the opportunity to comment on the Cook Inlet Risk Assessment (CIRA). AOGA is the professional trade association representing the majority of exploration, development, production, refining, marketing, and transporting of oil and gas in the State of Alaska. Our member companies that operate in Cook Inlet are Apache, Hilcorp, Tesoro and XTO Energy. Our mission is to foster the long-term viability of oil and gas in Alaska. The industry has been proudly operating in the Cook Inlet for more than 50 years, and values the management of safe and responsible operations.

The purpose of the Cook Inlet Risk Assessment was to "summarize the technical studies and additional analysis conducted to inform the Advisory Panel's recommendations on risk reduction options." This was done in two phases: first, establishing the baseline risk of marine accidents in the Cook Inlet; and second, identifying and assessing potential risk mitigation options. The report states that this is the risk assessment process outlined by the Transportation Research Board (TRB), with some modifications due to funding limits. AOGA contends that these modifications are significant limitations to the methods, scope and subsequent recommendations in the report.

I. Participants

The opportunity for bias was introduced in the decision to use a single Subject Matter Expert instead of the Peer Review Panel, as was recommended by the Transportation Research Board. In an "abbreviated timeline and smaller budget," the removal of a Peer Review Panel allows personal opinion and subjective assessments to skew the risk analysis.

It is also concerning that the Management Team and the Advisory Panel were comprised of representatives from Cook Inlet RCAC, ADEC and the USCG, with limited opportunity for involvement by the oil and gas industry, who would arguably see some of the greatest impact from policy implications based on this report.

Comment periods were brief, and allowed little time to submit substantial input from other industry stakeholders.

II. Approach

The TRB recommends utilizing the insights gained from the baseline risk analysis to determine the need for risk reduction and to guide future risk reduction activities. Therefore, the risk mitigation options are only as good as the baseline assessment. There are some critical flaws in the general approach to this study, which could ultimately have a directing and standing impact on vessel traffic Inlet-wide.

The initial goal of the report aimed to set a baseline risk of marine accidents in Cook Inlet, however the CIRA focused only on potential oil spills associated with large vessel traffic. Operational and intentional discharges were not considered, nor were risks associated with petroleum exploration and production operations. The risk assessment should identify all possible risks and their probability of occurrence, lest demonstrating a limited view of marine accidents and reasonable spill reduction measures.

The Advisory Panel convened a two-day workshop to create a semi-quantitative analysis of potential spill consequences. Section 3.3.3, Table 2 lists the comparison rankings of spill scenarios by subject matter experts, and their lack of consensus on a single item demonstrates that experts do not reach the same conclusion when given identical scenarios. Reliable data is critical to establishing a baseline and designing future policy, and should not be based on qualitative methods or single Subject Matter Expert experience.

The CIRA report fails to meet certain general expectations for documents of this scope. A complete study methodology was not outlined, nor was the baseline risk information. Detailed reports used for the baseline were not provided as appendices, requiring cumbersome steps to find and understand the data used for measurement. In relation to risk reduction, the report confirms that 21 risk reduction options were developed through stakeholder engagement although only 13 are recommended for implementation. The report fails to indicate the omitted 8 options and the reason for their exclusion.

III. Spill Baseline and Accident Causality Study

Another area of concern is the projected spill rates and potential. Section 2.3.2, Table 1 listed a spill potential of 15,000,000 gallons, which is greater than the maximum capacity of the entire cargo contents of transport tankers from the Drift River Terminal at 12,600,000 gallons. Very rarely does a spill involve a crude carrier (5% of spills), and more rare is the loss of the entire cargo contents. Over a 15 year period 1995- 2010, the largest spill in the Cook Inlet incident Database was approximately 6,000 gallons.

The study also projects a spill rate of 3.9 spills per year for the years 2015 through 2020 across all vessel categories, up from the historical spill rate of 3.4 spills per year. Although the spill rate is projected to increase, Section 2.3.1 forecasts that vessel traffic will remain flat or show only moderate increases. The report lists no basis for the projection of spill increases. AOGA encourages the Advisory Panel to publish the traffic study data used in this report so that third-party researchers or a Peer Review Panel can validate the baseline and projections.

IV. Risk Reduction Options- Subsea Pipeline

Considerable detail was devoted to the risk reduction option of constructing a subsea pipeline across Cook Inlet. The report hypothesizes that a subsea pipeline will reduce the overall spill risk by reducing the number of tanker transits, and therefore overall exposure. However, the baseline data used for this hypothesis was flawed. The Cook Inlet transit data of 38 one-way tanker transits was data from 2010, when the Drift River Terminal was not in service. Since that time, more storage tanks have been placed into service and one-way tanker transits have been cut in half. Additionally, data from other pipelines was unsuitably applied to Cook Inlet and general observations were used to characterize the frequency of pipeline spills versus tanker spills. Over-estimation of the risk of spills due to transit traffic skews the risk reduction benefits of a subsea pipeline and reduces the benefit-cost ratio of such a pipeline.

V. Tugboat Response

Significant attention in the report was paid to tug response for disabled vessels in Cook Inlet. However, the basis for the recommends, *The Evaluation of 2012 Tugboat Response Times* (Glosten, 2013), is severely flawed. The baseline data does not account for, or makes limited mention of the M/V Perseverance and the M/V Endeavor, both of which are Cook Inlet Spill Prevention and Response, Inc. vessels. Both of these vessels reside year-round in the Middle to Upper Cook Inlet, and are equipped and manned for Offshore Response and Emergency Towing. The exclusion of these two vessels paints a distorted image of the actualities of emergency tug towing in the Upper Cook Inlet, and renders the entire tug response section unsound.

VI. Self-Arrest

AOGA members disagree with the subjective, qualitative observation in the report that self-arrest is not a viable risk reduction option. The CIRA relied on a limited 2013 Glosten Associates report and Advisory Panel opinion to draw this conclusion, stating that it was "not within the scope of this analysis to quantify" the success rate of self-arrest. There are numerous examples of successful self-arrest to reduce the risk of spills and other emergencies, and future policy should not be based on conjecture or the risk of rupturing a subsea pipeline that does not yet exist.

VII. Other Risk Reduction Options

Four other risk reduction options discussed in the main report are either at the will of non-stakeholders or are already being addressed. Active dredging, expanded cellular service, and AIS broadcast are each effective risk reduction techniques, however, they are the responsibility and at the determination of organizations that are outside the scope of the Advisory Panel. It would be appropriate for the Advisory Panel to make specific recommendation regarding approaching outside organizations with a strategic plan for further involvement. Third- party workboat inspects are already taking place voluntarily by all operators. It was unnecessary to undertake a formal risk assessment to address these four options.

VIII. Conclusion

While this report recommended a few risk reduction measures that are valid, the majority of the recommendations are based on flawed baseline data or poor cost-benefits analyses. Decisions made regarding the approach and participants may have reduced the cost of the assessment, but have also reduced the quality of the product. There are significant limitations to the report, similar to the feedback given from the Transportation Review Board to Nuka Research on the Buzzards Bay Risk Assessment. As recommended by the TRB in that case, no policy decisions should be made based on this Cook Inlet Risk Assessment.

Thank you for the opportunity to comment. If you have any questions, please do not hesitate to contact me at 907-222-9602 or Blair@AOGA.org.

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SUBMITTED VIA EMAIL ONLY
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October 29, 2014

TO WHOM IT MAY CONCERN:

A. Introduction

Please consider these comments as a supplement to the comments Inletkeeper submitted September 25, 2014, before the eight-day comment period was extended.

B. Comments

1. **Outreach & Public Participation**

Inletkeeper appreciates the time extension on the comment period. It's unfortunate, however, CIRCAC and its partners chose not use this extra time to hold public events in communities around Cook Inlet to explain the complexities of the issues presented in the draft CIRA. Such basic outreach efforts would have resulted in considerably more public understanding and engagement.

2. **Tug Escorts**

Inletkeeper simply wants to clarify the intent of its previous comments: tug escorts for laden tankers and other large vessel carrying refined or crude products are long overdue in Cook Inlet. Additional studies are not needed to recognize such vessels pose the greatest risk of large spills in the radical navigational conditions of Cook Inlet, and that the addition of suitably-equipped tug escorts would greatly reduce such risks.

C. Conclusion

It's a common practice to study an issue *ad nauseam* to avoid the costs of proper risk reduction and maintain the status quo. Such is the case with tug escorts in Cook Inlet. Attached find two opinion pieces for the record on this matter.

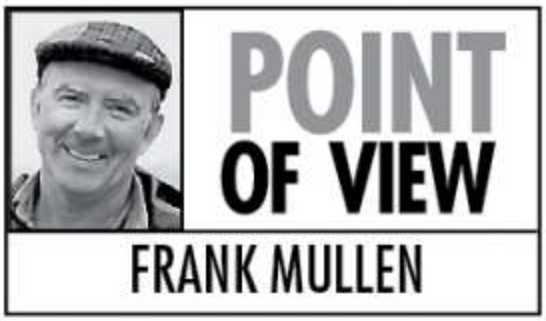
Bob Shavelson
Cook Inletkeeper

YOUR TOWN | YOUR NEWS | YOUR PAPER | SINCE 1964

HOMER NEWS

Are we better prepared for big Cook Inlet spill?

Posted: September 24, 2014 - 3:38pm | **Updated:** September 25, 2014 - 2:19pm



Crude oil tankers and non crude fuel barges transit Cook Inlet all year round, and no one is prepared for a "worse case" scenario oil spill in Cook Inlet.

Subsequent to the 1989 Exxon Valdez oil spill, laws have been written, organizations created, and 25 years worth of meetings and stacks of paper and studies have gathered on shelves.

Are we "readier for a spill" than we were in 1989? Yes. But not much readier.

Here is the scenario that we are NOT ready for: A fully laden oil tanker is transiting Cook Inlet, destination Nikiski. It is a dark and stormy night. A 20-foot flood tide and a Southwest 30 wind blowing steadily. Somewhere abeam of the south end of Kalgin Island, the tanker loses power at 2 a.m. Maydays are transmitted, phones ring, men and women in pickup trucks drive to command centers and spill staging areas.

But, nothing can be done to prevent the forces of nature from driving the tanker onto "The Sisters" rocks at Clam Gulch by 4 a.m. Or the beach at Humpy Point or Kalifornsky. The tanker is damaged and a big oil spill occurs.

There is only one method available to prevent this accident: A tug boat with adequate horsepower should be escorting the tanker. Every time. Every trip up and down the inlet, winter or summer.

The Oil Pollution Act of 1990 created Citizen Advisory Councils fashioned after a similar system that was in place in Sullom Voe, Scotland. The idea was to provide monitoring and oversight of the industry with a stated goal of oil spill prevention. Congress (in the Act) warned of complacency.

In my view, complacency has arrived, and it is a strong force to behold.

There is a Cook Inlet Citizens Advisory Council in place, created by OPA '90, and whose job it is to provide oversight and prevention, so that the Exxon Valdez scenario will never happen again. They have not done their job, because they have avoided the tanker escort issue. They should be advocating for this method of prevention, as we as citizens should be.

In their recent "risk assessment" it is recognized that "self arrest" or anchoring a stricken tanker is not only dicey but an improbable solution.

There are no vessels of opportunity in Cook Inlet with adequate horsepower for the job. Tractor tugs in Prince William Sound, 24 hours away, would be of no use. CIRCAC has a study on its shelf (the Dickson Report, available on its website) that was done in 1993 that clearly states that anchoring a stricken tanker is not a reliable option and that tug escorts are recommended.

Why is this blatant oversight allowed to exist? In a word, money. Tractor tugs are expensive, and the industry is unwilling to discuss this option seriously. The Cook Inlet Citizens Advisory Council is dominated by its funding interests, has demonstrated that it is more of a lapdog than a watchdog, and the regulators that sit at the table are spineless. The Alaska Department of Environmental Conservation and the U.S. Coast Guard are partners in the complacency because they don't insist on tanker escorts. If protection of Cook Inlet coastlines from windrows of oily goo from Chickaloon to Nanwalek and beyond is the goal, our regulators and citizen council are in the process of failing at their jobs, because the chronic risk of an oil tanker losing power on a dark and stormy night is allowed to continue.

CIRCAC recently commissioned a study with regard to risk assessment of oil transportation in Cook Inlet. Go to www.circac.org, and take a look.

Please submit a comment insisting on tanker escorts. (better hurry though, this window for public comment is only open for nine days through Sept. 26).

It seems like an issue of this import out to deserve a little more time for public comment.

In the aftermath of the Exxon Valdez, there was untold amounts of wailing and gnashing of teeth as the multi-year disaster damaged a thousand miles of beaches. This could easily happen again.

Envision an oil plastered Kachemak Bay, oiled beaches up and down Cook Inlet, Snug Harbor, Kamishak, Kodiak.

Municipalities up and down the Inlet and Kodiak should be sponsoring resolutions asking for tug escorts. The public needs to come out from behind the shroud of complacency and demand tug escorts. If this doesn't occur, the dead birds and otters and post spill wailing and gnashing of teeth are a potential outcome.

Frank Mullen is a lifelong Alaskan and Cook Inlet fisherman. He served three terms on the Kenai Peninsula Borough Assembly. He lives in Homer. Editor's Note: The Prince William Sound Regional Citizens' Advisory Council meets in Homer Sept. 25 and 26 at the Alaska Islands and Ocean Visitor Center.

PENINSULA CLARION

Cook Inlet navigation - safe as can be?

Posted: October 19, 2014 - 5:34pm
By Robert Archibald

Most people don't think about the safety of marine navigation in Cook Inlet. They didn't before the Exxon Valdez, and they still don't, because it's not an issue that normally comes up at the family breakfast table or the local coffee shop.

Oil spill prevention is complicated, distant stuff. But when a spill occurs, it's everybody's business.

I'd like to share my thoughts about the safety of navigation in Cook Inlet from my experience with over 48 years at sea, and 27 years as a Chief Engineer.

I first started work in Cook Inlet in the summer of 1965. The first Oil Platform, Shell A, was up and drilling, and the Pan American Oil Platform B was under construction. There was lots of activity and excitement in the area as new plans for oil development progressed.

Since then, I can recall lots of near misses, oil spills, pipeline leaks and vessels sinking. I've also seen the addition of more oil and gas platforms, more docks and more pipelines. Commercial ship traffic has grown along with the state population, and today, with generous tax incentives to induce oil and gas development — and the prospect of more LNG ships and other vessel traffic on the horizon — Cook Inlet is clearly a water body requiring basic navigational safeguards.

Today we have modern ships operating in Cook Inlet with professional crews. The use of Marine Pilots further kicks up the safety factor. But as the past has shown, there are numerous examples of machinery failures due to fires, mechanical breakdown, automation failure or lack of crew training which have resulted in vessels losing power. As an engineer who has logged thousands of hours working around boat engines, I know Murphy's Law can strike at any time and any place.

Recently, the Cook Inlet Regional Citizens Advisory Council (CIRCAC), the Alaska Department of Environmental Conservation (ADEC) and the Coast Guard released the draft Cook Inlet Risk Assessment. The report includes some positive aspects, including the recommendation for a pipeline across the inlet to lower tanker spill risks. But it also refuses to recognize that tug escorts for laden tankers is the best way to reduce spill risks, and instead calls for more study around the issue of "self arrest."

"Self Arrest" refers to the practice of dropping and dragging an anchor to slow or stop a vessel which has lost power. Cook Inlet is unique in bathymetry, bottom type and current speed. Throw into the mix fixed oil platforms, shoals, pipelines and power lines, and the argument that a disabled vessel can self-arrest anywhere becomes questionable. Throw in winter conditions with ice flows, heavy winds and high seas and the situation becomes worse.

My experience in the Inlet is that the bottom varies greatly with some areas that are good holding bottom and others which are rock or smooth bottom that anchors will not hold. To make the assumption that this can be a safe alternative for the entire Inlet is, in my opinion, a dangerous statement. This has been pointed out by past studies, including the 1992 Dickson Report and information from Risk Assessment's own consultant, Glosten Associates.

As a practical note, any mariner who has been involved in setting anchors for oil exploration operations in the Inlet, be it for Mobile Offshore Drilling Units (MODU) or pipe-laying barges, knows the difficulties in getting anchors to set. Imagine the stresses at play if you drop anchors on a laden tanker with no power moving with the current at 6 knots in heavy ice. Dropping anchors on a ship making way is always a dangerous operation and has caused fatalities and injuries.

In Prince William Sound, two escort and oil response tugs escort laden tankers, and they have prevented serious problems when engine or steering troubles have developed in the past. These tugs also have firefighting capabilities with foam systems and spray rails for close in operation to a ship on fire. There are no such vessels in the Cook Inlet area.

Cook Inlet deserves as much protection as Prince William Sound. A funding system must be developed by all shippers to finance a response-escort system.

Alaska is on the verge of developing a large LNG export industry with the major facilities in Cook Inlet. This will increase shipping traffic significantly. The time is past due for all regulators and stakeholders to address the need for tug escorts to protect the Cook Inlet area, its people and the mariners who crew these ships.

Robert Archibald is a retired Chief Engineer. He lives in Homer.

Management Team Response to Comments

The purpose of this annex is to provide responses to comments on the Final Report of the Cook Inlet Risk Assessment (CIRA). Similar comments are grouped into topics for consistency and conciseness. We have not provided responses in the case where reviewers agreed with and endorsed the reports recommendations.

Topic 1: Escort Tugs

Summary: A number of commenters suggested that the CIRA Report should have included a recommendation for an escort tug system for Cook Inlet. Reviewers were not specific about their proposed configuration for a tug escort system, the type(s) of vessels requiring escort, or the vessel transit areas where the escort would occur. Some of the reviews mention the tug escort system recommended in the 1992, J. T. Dickson, Report on the Safety of Navigation and Oil Spill Contingency. Some of the reviewer comments are not clear as to whether they are recommending a tug escorts system (such as the system used in Prince William Sound) or an emergency stand-by rescue tug (such as used in the State of Washington). Most reviewers recommend the escort tugs to prevent a drift grounding due to a loss of propulsion.

Response: A number of potential risk reduction measures were mandated in the 2010 U.S. Coast Guard Re-authorization Act for consideration as part of the Cook Inlet Risk Assessment – including "towing, response, or escort tugs." The approved Work Plan for the risk assessment project also identifies *towing, response, or escort tugs* as a risk reduction measure for consideration and further states that the project managers will work with the Advisory Panel to evaluate risk reduction measures on the basis of the following criteria:

- Benefits,
- Cost,
- Ease of implementation, and
- Potential negative consequences.

Escort tugs are a subset of the variations of rescue towing capability that ranges from rescue vessels of opportunity, stand-by rescue tugs, sentinel escorts, close escorts, and tethered escorts. The Advisory Panel met on February 13, 2013 to consider all the potential risk reduction measures. At that meeting they choose to advance "Increase Rescue Towing" as a measure for further evaluation. The discussion at that meeting focused on evaluating existing rescue towing capability in Cook Inlet rather than an escort tug system.

The discussion was informed by the June 29, 2012, *CIRA Spill Baseline and Accident Causality Study* conducted by The Glosten Associates, and the Advisory Panel's experience and professional judgment. The study identified drift grounding of a tank ship as a high consequence but very low probability event in Cook Inlet.

Glosten's estimate for the frequency of drift grounds by tankers in Cook Inlet in the period between 2010 and 2014 was:

Area	Number of Spill per Year	Overall Probability	Overall Consequence
Central	.000049	Very low	Very high
Lower	.000012	Very low	Very high
Upper	.000002	Very low	Very high

Similar numbers were reported for the time period 2015 to 2020.

Table 26 on page 30 of the report lists the 15 highest risk scenarios for marine vessel incidents in Cook Inlet. Ten of these scenarios involve tank ships but none of the scenarios are a result of a drift grounding. Appendix E of that report is a record of vessel incident data from 15 years, 1995 to 2010. This record identifies the follow incidents of groundings:

DATE	VESSEL NAME	VESSEL TYPE	OIL PERSISTENCE	RELEASED (gallons)	INCIDENT TYPE
09/28/99	SEALAND TACOMA	CARGO VESSEL	HEAVY PERSISTENT	0	GROUNDING
09/26/99	SEALAND ANCHORAGE	CARGO VESSEL	HEAVY PERSISTENT	0	GROUNDING
01/19/98	RENEW	TANK BARGE	LOW PERSISTENT	0	GROUNDING
04/08/04	GLACIER WIND	TOWBOAT/TUGBOAT	PERSISTENT	5	GROUNDING
02/02/06	SEABULK PRIDE	PRODUCT TANKER	HEAVY PERSISTENT	200	GROUNDING
04/17/07	SNUG HARBOR	TANK BARGE	PERSISTENT	20	GROUNDING

In summary, the report recognized that a drift grounding of a tank vessel could result in a very high consequence, but the overall probability of this type of incident in Cook Inlet is very low.[1] This conclusion is further supported by the historic data.

Still, because the potential consequence is so large, the Advisory Panel recognized that emergency towing is an important capability needed to respond to a distressed vessel that has lost propulsion or steering in order to prevent a drift grounding. They also recognized that a stand-alone escort tug system is a very expensive risk reduction option that would potentially have unintended consequences.

Unintended consequences include: increased risk of marine accidents that could result in additional pollution events or threaten the life safety of the crew, contribution of green house gases to the environment, and increased cost of living for residents of the region. Escort tugs are additional vessels operating regularly in the waterway and each operating hour in the transportation system equates to additional risk of collisions, groundings, or other accidents. One of the most significant incidents in Prince William

[1] The average return period for a tanker grounding was 4,719 years.

Sound since the beginning of the operation of the escort system there was the grounding of one of the escort tugs.

Any year-round maritime operation, such as escort tugs, also puts the lives of the tug crew at risk in a harsh environment. Accidents and resulting injuries or deaths are a function of the number of man hours worked. Although the rate is unknown, it is certain that over time accidents and injuries will occur in a tug escort system.

Escort tugs consume a large amount of marine diesel, especially when underway providing escorts. This contributes to the buildup of greenhouse gases in the atmosphere and that in turn contributes to ocean acidification. While the consequences of this process in not fully known, the contribution of a tug escort system to these processes is not insignificant.

The cost of a tug escort system would run into tens of millions of dollars per year. This cost would certainly be borne by the users of the petroleum products. No oil is exported out of Cook Inlet. All of the oil produced and imported into the Inlet is used in Alaska, so the cost would be passed on to the residents of the region.

Given these considerations and their knowledge of the waterway, the Advisory Panel chose to study the existing emergency towing and self arrest capability in Cook Inlet, to determine if it is sufficient to prevent drift groundings from loss of power incidents and to determine the areas highest vulnerability.

The methods and result of this study are presented in Section 6 of this report. The study determined that there are a number of emergency towing vessels already operating in Cook Inlet capable of rescuing a distressed vessel and that in many cases these tugs of opportunity could likely reach a distressed vessel before it would ground. But, there are vulnerabilities in the system, particularly in the Lower Inlet where there are fewer capable emergency towing vessels and in the Upper Inlet when ice is present.

The Advisory Panel recommendations that are a result of that study are presented in Section 6.3. They suggested that a Harbor Safety Committee should conduct additional analysis on the requirements to arrest and control a deep draft vessel in the Upper Inlet in sea ice. They recommended that the existing rescue capabilities in Cook Inlet be maximized by facilitating coordination between potential distressed vessels and rescue vessels, establishing a monitoring program, and conducting a training and exercise program. Finally, they encouraged the Harbor Safety Committee to identify and promote best practices for implementation, particularly in waters outside the pilotage area.

These recommendations are not insignificant or without cost, but they are prudent first steps that should be implemented to reduce the risks associated with drift groundings. Once those recommendations are implemented, the Cook Inlet Harbor Safety Committee should continue to study the need, cost, and unintended consequences of an escort system for Cook Inlet.

Topic 2: Self-arrest Using a Ship's Anchor

Summary: Two commenters suggested that ship's anchors could not be relied on to arrest the drift of a distressed vessel and suggested that an escort system was the only sure way to prevent drift groundings.

Response: As noted in the response to Topic 1, the Advisory Panel sought to study the effectiveness on using a ship's anchor to arrest the drift of a disabled vessel. Unfortunately, the initial cost estimate for a fully quantitative study of this topic was well beyond the available funds for the project. The Glosten Associates were contracted to produce a literature review of the topic and submitted their report December 13, 2013, Evaluate Drifting Vessel's Ability to Self-Arrest for consideration. Based on their review of available literature, The Glosten Associates concluded that the probability of a deep draft self-arresting using its anchors was low and that the technique cannot be considered a reliable risk reduction option. A similar conclusion was put forth in the 1992, J. T. Dickson, Report on the Safety of Navigation and Oil Spill Contingency report.

The Advisory Panel and Safe Guard Marine, LLC reviewed The Glosten report. Both took exceptions with the Glosten report's conclusion. Summaries of these review comments are listed in Appendix B of this report. Given that there remained conflicting opinions on the viability of using an anchor to self-arrest a disabled ship's drift in Cook Inlet, the Advisory Panel chose to recommend that this risk reduction option be further studied by demonstration or quantitate study (see Section 6.3). This is another topic that should be addressed by the Harbor Safety Committee.

Topic 3: Harbor Safety Committee Membership

Summary: Two commenters supported the concept of the Harbor Safety Committee with the caveat that the Harbor Safety Committee membership be open and inclusive of all stakeholders.

Response: The Management Team and Advisory Panel are in complete agreement with this comment. Harbor Safety Committees should be conducted in as transparent and inclusive a manner as possible in order to have the credibility necessary to conduct business effectively. This tenet is clearly set out in the US Coast Guard guidance in establishing a harbor safety committee[2] and was strongly supported at the November 12, 2014 meeting held in Kenai on the topic of establishing a Harbor Safety Committee.

Topic 4: Potential Places of Refuge

Summary: One commenter mentioned that the report fails to discuss ports of refuge and should identify specific risk reduction measures that can be brought into play when/if Kachemak Bay is used as a place of refuge for a stricken vessel.

Response: Section 7.1 of the report does address updating and improving the Subarea Oil and Hazardous Substance Contingency Plan, which contains a section on Places of Refuge. The comment has merit and should be considered during the next revision of this contingency plan, which is scheduled to begin in 2015.

[2] See http://www.uscg.mil/auxiliary/missions/msep/NVIC%20Circular%201-00.pdf

Topic 5: Community Engagement

Summary: One commenter felt that it was unfortunate that the risk assessment project did not hold public meetings in Cook Inlet communities to present the risk assessment and explain the complexities of issues associated with the risk assessment.

Response: Throughout the risk assessment project, the Management Team and Risk Assessment Contractor have worked hard to engage and involve the public. A project website was established and used as a focus for open and transparent communication. Addition communication tools included monthly newsletters, news releases and an extensive email list. Every meeting of the Advisory Panel was open to the public and allowed for public comment. There were numerous opportunities for public comment on interim work products and a public solicitation was made for Advisory Panel members and for potential Risk Reduction Measures to be considered. To date there have been two public presentations on the Final Report: one in Kenai at the Harbor Safety Committee informational meeting on November 12, 2014 and one in Anchorage at the Cook Inlet Regional Citizen's Advisory Committee meeting on December 12, 2014. Another presentation is schedule for the Alaska Forum on the Environment on February 9, 2015. The Management Team and Contractor welcome the opportunity to present the result of the risk assessment at any time at other venues.

Topic 6: Methodology

Summary: Two commenters questioned the methodology and approached utilized to conduct the risk assessment and favored a strictly quantitative methodology. They stated that the process was biased because the oil and gas industry was not represented on the Management Team and a single risk assessment expert was used instead of a peer review panel. They did not like the way the information was organized and presented. They questioned the baseline data and the methods used throughout the study.

Response: There are several methodologies available for conducting risk assessments of maritime or transportation systems. The CIRA follows the process the Transportation Research Board (TRB) of the National Academies[3] developed, which was a semi-quantitative, expert judgment consensus-driven methodology. It favors the collective expert judgment of the Advisory Panel members who are informed by semi-quantitative studies over a strictly quantitative approach. The CIRA work plan approved by the Management Team emphasized a stakeholder/expert judgment approach best suited to considering the complexities of the of marine transportation system in Cook Inlet. The Management Team recognized that a quantitative methodology would require more money, incomplete or inappropriate data and non-transparent modeling assumptions, which would result in essentially the same conclusions without the consensus around the table achieved through the expert judgment process.

Topic 7: Spill Baseline and Accident Causality Study

Summary: Two commenters questioned the results of the Spill Baseline and Accident Causality Study conducted by The Glosten Associates and Environmental Research Consultant on July 2, 2012. The analysis in question is associated with the spill percentile volumes for vessel types.

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[3] Transportation Research Board of the National Academies. (2008). Risk of vessel accidents and spills in the Aleutian Islands: Designing a comprehensive risk assessment. Special Report 293. Washington, DC.

Response: The Spill Baseline and Accident Causality Study examined spill percentile volumes based on data from historical spills. There are insufficient data in the small dataset of incidents that occurred between 1995 and 2011 in Cook Inlet to determine the distribution of percentage outflow for each combination of vessel type and incident type. For this reason, the results of outflow analyses conducted on much larger datasets (U.S. Waters) were used to determine the percentile spill volumes for vessel spills in Cook Inlet (References 6, 7). The oil outflow analyses by vessel type (double-hull and single hull) and incident type are shown in Tables A4 to A9, and Figures A3 to A8 of Attachment 1 of the report.

Topics: Out of Scope

Summary: A number of comments were received on topics outside the scope of this risk assessment, including:

- Risk of spills from the drift river terminal,
- Risk of spills from other industries activities,
- Risk of spills from smaller vessels, and
- Risk associated with climate change.

Response: While these risks certainly exist and deserve consideration, they were outside the federal mandate and scope of this study. The risk assessment specifically targeted all marine vessels of more than 300 gross tons and smaller vessels having a fuel capacity of at least 10,000 gallons.

Appendix E. Members of CIRA Management Team and Advisory Panel

Management Team Members

First Name	Last Name	Organization	Start	End
Berna, Chief	James	USCG	08/15/14	
Chung, CDR	Eugene	USCG	08/15/14	
Gary	Folley	ADEC	8/12/11	
Jason, CAPT	Fosdick	USCG	8/12/11	7/31/12
Burt	Lahn	USCG	12/7/12	
Evans, LT	Kion	USCG Planner, Sector Anchorage	12/7/12	8/15/14
Paul, CAPT	Mehler	USCG	7/31/12	
Matthew, LT	Mitchell	USCG	08/15/14	
Mike	Munger	CIRCAC	8/12/11	
Steve	Russell	ADEC	8/12/11	

Advisory Panel Members

First	Last	Primary / Alternate	Stakeholder Category	Start	End
Louis	Audette	Alternate	Marine - Tug	9/16/11	
Catherine	Berg	Primary	Land/Resource	9/16/11	11/15/13
Owen	Boyle	Alternate	Mariner - Other	9/16/11	
Jim	Butler	Primary	Fishing	9/16/11	
David	Devilbiss	Primary	Salvor	9/16/11	
Gregory	Duggin	Primary	Oil Platform	9/16/11	
Paul	Hankins	Alternate	Salvor	9/16/11	
Jack (John)	Harrald	Subject Matter Expert		9/22/11	
Bryan	Hawkins	Primary	Port	9/16/11	
Jack	Jensen	Primary	Mariner - Tanker	9/16/11	
Philip	Johnson	Primary	Land / Resource	11/15/13	
Ron	Long	Primary	NGO	9/16/11	
George	Lowery	Primary	Mariner - Container	9/16/11	
Sarah	Melton	Alternate	Fishing	9/16/11	
Michael	Opheim	Primary	Native/ Subsistence	9/16/11	
Greg	Pavellas	Primary	Mariner - Tug	9/16/11	
Bob	Pawloski	Alternate	NGO	9/16/11	
Jeffery	Pierce	Primary	Marine Pilot	9/16/11	
A John (Jack)	Rasmussen	Alternate	Mariner - Container	9/16/11	
Stephen	Ribuffo	Primary	Port	9/16/11	
Mike	Stone	Alternate	Marine Pilot	9/22/11	12/20/12

First	Last	Primary / Alternate	Stakeholder Category	Start	End
Brenda	Trefon	Alternate	Native/ Subsistence	9/16/11	12/20/12
Marie	Steele	Alternate	Land/Resource	9/16/11	
Christina	Waterfield	Alternate	Mariner - Tanker	9/16/11	3/16/12
Marc	Van Dongen	Primary	Port	9/16/11	
Richard	Wilson	Primary	Mariner - Other	9/16/11	

Appendix F – Methodology for Zone of No Save Analysis

Concept

The Zone of No Save is the area in which rescue could be expected to be impossible, given a certain set of tug locations and wind conditions. This zone is dependent on the distribution of wind speeds and directions, this drift rate of a vessel for a given wind-speed, and on the location of the shore or other hazard. Because wind conditions vary along a continuum, the Zone of No Save is expressed as a probability. In this analysis, we used a 10% Zone of No Save--the area in which a drifting vessel has a 10% chance of hitting a hazard before being rescued. Because a successful rescue can occur any time before a vessel hits the hazard, a "just in time" save occurs when a rescue tug secures a drifting vessel just before it arrives at a hazard. Thus response times are based on the distance from the starting point of the rescue vessel to the hazard, rather than to the location where a hypothetical vessel lost power.

Inputs and Assumptions

Hazard Mapping: Whether or not a drifting vessel will collide with an obstacle that might rupture the hull depends strongly on tide state and vessel draft. To develop a threshold between hazardous waters and open waters, we drew polylines in a GIS based on National Oceanic and Atmospheric Association (NOAA) navigational charts provided via the Statewide Digital Mapping Initiative. We applied several "rules of thumb" to choose the threshold:

Minimize complexity: Where most of the character of a section of coast could be captured with a simple straight line, we chose that over more detailed curves that would suggest greater precision than we actually had.

Intertidal rocks are hazards: In all cases, the threshold passes outside of emergent rocks, and rocks marked with depth 0.

Reefs are hazards: In all cases, our threshold passes outside of mapped reefs. In Kamishak Bay some of these reefs are not associated with many rocks, but are bedrock, so we considered them hazards.

Soft coasts are not hazards, but are mapped: In areas like Trading Bay, where there are no rocks, we mapped a very simple threshold for stranding. This is not considered a hazard in our analysis. This also applies to soft shoals mapped on charts.

Human facilities are hazards: In Upper Cook Inlet we mapped the offshore oil and gas platforms, the Drift River Terminal, and a disused pipe protruding from the middle of the inlet as hazards.

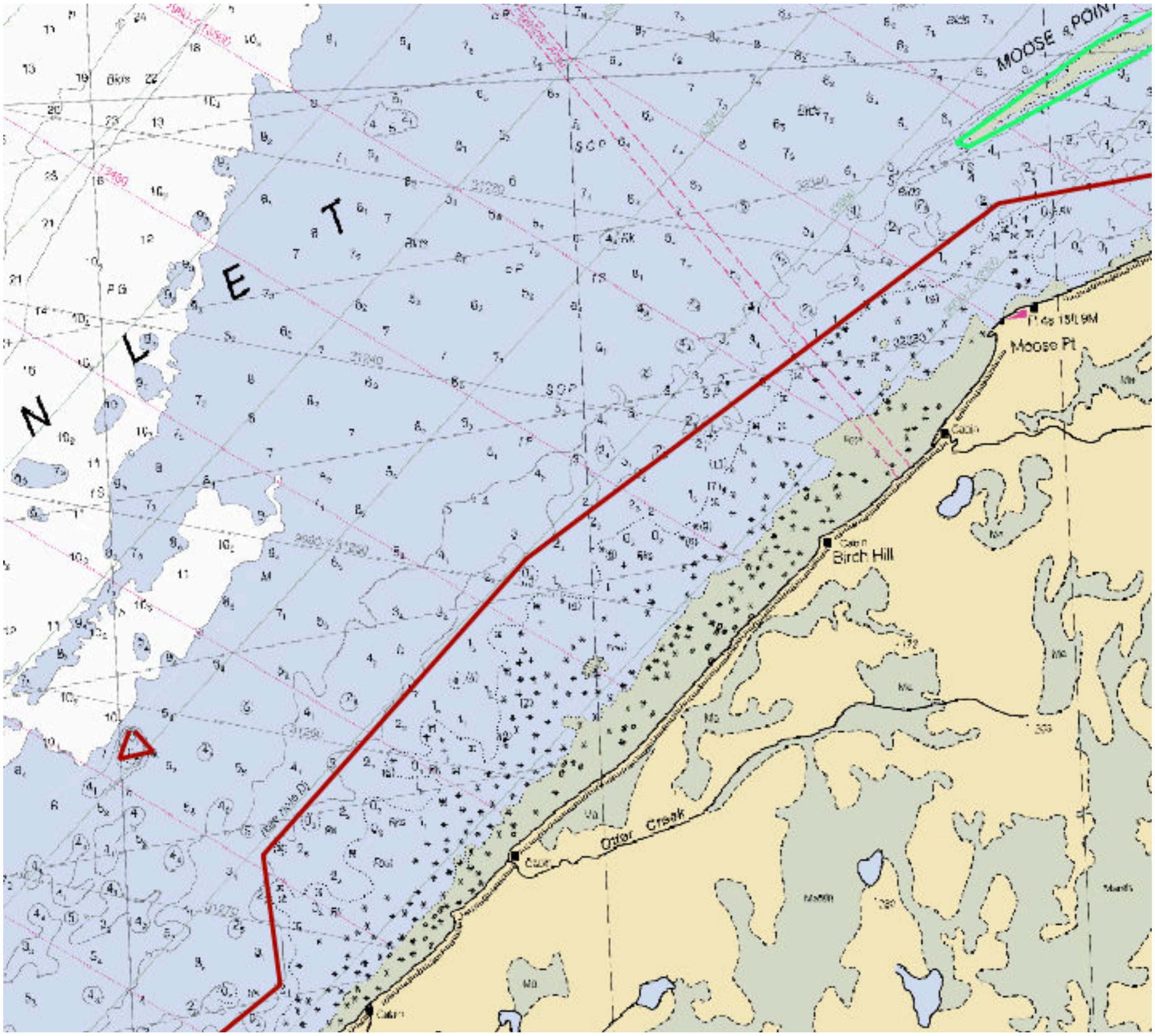

Figure E-1. Upper Cook Inlet example of hazard mapping, showing both the transition to boulder-ridden waters (red line) and to a soft coast (green line in NE corner), in this case a soft shoal.