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Uninspected Towing Vessel Industry Analysis Project

Final Report

Sponsored by:

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Prepared by ABSG Consulting Inc.

EXECUTIVE SUMMARY

This project was sponsored by the United States Coast Guard (Coast Guard) to support the ongoing development of a proposed regulation to require the inspection of towing vessels. It was intended to assist the Coast Guard with making regulations that reflect the risks of the towing industry, both those faced by towing vessels and crews and those posed by towing vessels to other maritime infrastructure (e.g., bridges, locks).

The project consisted of a number of activities, which are documented in this report, including: (1) analysis of towing industry vessel population and characteristics (e.g., age, size, service), (2) visits to selected towing companies to discuss industry issues and concerns, (3) risk evaluation of towing vessel accident history, (4) analysis of economic impacts of towing vessel inspections, and (5) development of recommendations for Coast Guard consideration as the proposed regulation is developed

During this project there was no publicly available draft of a proposed towing vessel inspection regulation. Therefore, this report does not provide an evaluation of the potential risk-reduction impact of such a new regulation, nor does it provide a complete regulatory cost analysis. However, the information in this report is intended to help the Coast Guard make decisions about potential regulatory options and will help support a more comprehensive regulatory impact analysis when required.

Results of the work are presented in this report and are highlighted below:

Industry Analysis and Characterization − There are numerous difficulties in trying to use the Marine Information for Safety and Law Enforcement vessel registry to examine the number of towing vessels in the industry and the characteristics of those vessels (e.g., age, length, horsepower, service).

Comparison with and use of U.S. Army Corps of Engineers data sources can contribute to better understanding of the portion of the towing industry involved in waterborne commerce, but lack of data and conflicting data still present problems − Based on the reviews performed in this effort, the project staff estimated that there are 5,100 to 5,200 towing vessels that are likely to be covered by a towing vessel inspection regulation. (This estimate does not include approximately 1,200 towing assistance vessels and an unknown number of small workboats supporting marine-related construction.)

Risk Evaluation of Towing Vessel Accident History (1994-2003) − The project implemented a Coast Guard risk evaluation approach that allows the evaluation of the historical risk profile of the towing vessel industry, including safety, economic, and environmental impacts. Although there are only a limited number of large consequence events (only 12 events out of more than 3,600 examined were assigned to the Coast Guard severe or major severity categories), those events presented more than 75% of the consequences over that time period. Many of the same causes that in very specific circumstances cause major losses occur much more frequently with only minor, if any, consequences. This indicates that although major events are what the Coast Guard wants to prevent, it requires focusing on the underlying contributing factors for all accidents - and the majority of the data comes from minor events.

Analysis of Economic Impacts of Towing Vessel Inspections − Evaluation by the Coast Guard of the economic impact of a towing vessel inspection regulation that involves a specific requirement to implement a towing company safety management system (SMS) will be difficult. This project examined costs for both potential equipment requirements and the development, implementation, and maintenance of an SMS. To structure the cost evaluation, the project used equipment and SMS recommendations made by the Towing Safety Advisory Committee (TSAC) Work Group (WG) on Vessel Inspection (in its report dated 9/29/05).

The potential costs of equipment addition are relatively easy to evaluate, and some of the towing industry personnel consulted indicated that many towing vessels already included most of that equipment. Because of that, the actual cost impact of a requirement similar to the TSAC WG would be small for those vessels. However, that same conclusion may not apply to the large number of vessels that belong to companies that are not active in TSAC WG and/or members of American Waterways Operators. A comprehensive regulatory impact will need to address that issue.

The results of the examination of the economic impact of requiring that an SMS be provided for all towing vessel suggest a wide range of costs for SMS development and implementation. The range not only is affected by the size and towing activities of the companies, but also reflects the starting point for the specific company and the level of detail the company management chooses to include in its SMS implementation. This variation in cost is consistent with what has been experienced in other regulatory imposition of performance-based SMSs.

Observations from Discussions with Selected Towing Companies − Project personnel and Coast Guard representatives met individually with a small number of towing companies to review example SMSs and identify issues of concern to the towing industry. Issues that were raised by the towing company personnel are provided in Section 2.2 of this report and address potential economic impacts of towing vessel inspection, including direct costs (e.g., for equipment, documentation, inspections), business impacts (e.g., down time required to accommodate Coast Guard inspections or mandated drydock inspections.), and other regulatory implementation issues.

Recommendations for Coast Guard Consideration − The project team developed a number of recommendations for consideration by the Coast Guard. These recommendations are:

1. Consider excluding workboats and towing assistance vessels from the proposed regulations for inspection of towing vessels. **(See Section 6.2.1)**
2. Ensure that large horsepower towing vessels (i.e., greater than 5,000 horsepower) receive the regulatory attention they deserve based on historical accident experience examined in risk terms. **(See Sections 6.1 and 6.2.2)**
3. Consider providing effective training when the final rule for the towing vessel inspection regulation is released and then providing periodic training for Coast Guard inspectors and third-party personnel who will be involved in towing vessel inspections, in order to help ensure consistency in regulatory review and enforcement. **(See Section 6.2.3)**
4. Consider encouraging small business outreach/assistance programs by industry organizations or by the Coast Guard to assist small towing companies in SMS development and implementation, both for compliance purposes and to help them achieve real human factors improvements. **(See Section 6.2.4)**

5. Consider offering alternative inspection approaches (i.e., that do not require a company safety management system) for companies that prefer being subject to a more prescriptive inspection regime. **(See Section 6.2.5)**

Each of these recommendations is described in more detail in the sections of the report referenced here. However, they will need to be examined further by the Coast Guard as a more specific regulatory proposal is developed.

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LIST OF ACRONYMS

AWO	American Waterways Operators
COTP	Captain of the Port
FRP	Fiber reinforced plastic
GRT	Gross registered tons
hp	Horsepower
ICW	Intracoastal waterway
ISM	International Safety Management
ISO	International Standards Organization
ITV	Inspected towing vessel
MISLE	Marine Information for Safety and Law Enforcement
NFPA	National Fire Protection Association
RCP	Responsible Carrier Program
RIN	Risk index number
RWG	Report of the Working Group
SMS	Safety management system
SOLAS	Safety of Life at Sea Convention
TSAC	Towing Safety Advisory Committee
USACE	United States Army Corps of Engineers
UTV	Uninspected towing vessel
WCUS	Waterborne Commerce of the United States
WTLUS	Waterborne Transportation Lines of the United States

1. INTRODUCTION

1.1 UNINSPECTED TOWING VESSEL (UTV) REGULATORY PROJECT

In the U.S. Coast Guard and Maritime Transportation Act of 2004 (Pub. L. 108-293), Congress added towing vessels to the list of vessels subject to inspections and authorized the United States Coast Guard (Coast Guard) to consider establishing a safety management system appropriate for towing vessels.

The specific language in the Act related to towing vessel inspection is as follows :

> *SEC. 415. INSPECTION OF TOWING VESSELS.*
> *(a) VESSELS SUBJECT TO INSPECTION.--Section 3301 of title 46, United States Code, is amended by adding at the end the following:*
>
> > *(15) towing vessels.*
>
> *(b) SAFETY MANAGEMENT SYSTEM.--Section 3306 of chapter 33 of title 46, United States Code, is amended by adding at the end the following:*
>
> *(j) The Secretary may establish by regulation a safety management system appropriate for the characteristics, methods of operation, and nature of service of towing vessels.*

To implement adding towing vessels to the list of inspected vessels, the Coast Guard has to develop the specific regulations under which towing vessels will be inspected. It is important to note that "uninspected vessel" is not equivalent to "unregulated vessel." Although towing vessels under 300 gross tons, operating inside the boundary line (as defined in 46 CFR 7), are currently uninspected, there are numerous regulations that apply to them, including measures for:

- Manning requirements and crew licensing
- Fire protection and fire suppression
- Lifesaving equipment
- Pollution prevention
- Navigation rules

Although the Coast Guard is not required to periodically examine uninspected towing vessels for compliance with these regulations, compliance is expected and enforcement actions are taken if noncompliance is recognized (e.g., in a post-accident investigation).

Additional input was provided to the Coast Guard regulatory development by Congress in the conference report on the act (U.S. Congress, 2004), which states:

> *Section 415. Inspection of Towing Vessels*
> *The House bill does not contain a comparable provision.*

The Senate amendment does not contain a comparable provision.

The Conference substitute adds towing vessels, as defined in section 2101 of title 46, United States Code, as a class of vessels that are subject to safety inspections under chapter 33 of that title. Section 3306 of title 46 details the items that are to be regulated under the chapter to secure the safety of individuals and property on board the vessel. This includes design, construction, alteration and repair of the superstructures, hulls, fittings, equipment appliances, propulsion equipment, machinery, lifesaving equipment, firefighting equipment, and vessel stores and other supplies of a dangerous nature.

The Coast Guard may prescribe different standards for towing vessels than for other types of inspected vessels. Similarly, the Coast Guard can prescribe different standards for the various types of towing vessels based on size, horsepower, type of operation, area of operation. For example, the Coast Guard can prescribe different standards with regard to propulsion machinery and hulls for a towing vessel pushing barges down the Mississippi River than for vessels that provide towing assistance for recreational vessels.

New section 3306(j) of title 46, United States Code, authorizes the Secretary of the department in which the Coast Guard is operating to establish by regulation a safety management system appropriate for the characteristics, methods of operation, and nature of service of towing vessels. Safety management systems allow the Coast Guard to oversee the maintenance and repair of vessel equipment and ship systems subject to inspection through an approved safety management plan that includes maintenance schedules and system tests. The Coast Guard may enforce the plan through audits of the vessel's logs and vessel operator's records rather than having to directly oversee the repair or maintenance work conducted on a particular piece of equipment or ship system.

This action by Congress resulted from many influences, among them:

- Publicity regarding towing vessels and associated barges being involved in several large consequence events (e.g., pollution events, bridge strikes, fatal accidents) over the previous decade

- Input by maritime labor organizations regarding their view of the working conditions aboard towing vessels and the overall safety of the towing vessel crews

- Input from the towing industry that an inspection regime primarily based on onboard inspection by Coast Guard assets was not the only way that an effective vessel inspection program could be organized

- The desire by the towing industry to consolidate its regulatory involvement with the Coast Guard, rather than having to deal with the Coast Guard on some issues and the Occupational Safety and Health Administration (OSHA) on others

Note: Federal law requires OSHA not to take steps to regulate an industry or activity where the industry/activity's hazards are adequately addressed by the regulations of another federal agency

(OSHA, 1996). This has traditionally meant that OSHA did not generally involve itself in regulating conditions on vessels formally inspected by the Coast Guard, but could choose to do so on uninspected vessels.

In response to this congressional mandate, the Coast Guard provided two notices in the *Federal Register* to announce public meetings and to ask for public and industry input (Fed Reg, 2004 and Fed Reg, 2005). The public meetings were held in four locations around the country in January and February 2005. The notices requested input regarding the following questions:

(1) *Towing vessels of a certain size (300 or more gross register tons) are already inspected vessels and are subject to a variety of existing requirements. Should the Coast Guard use any of these existing standards (or standards for other types of inspected vessels) for incorporation into the new regulations regarding the inspection of towing vessels? If so, which regulations or standards should be incorporated into these new regulations?*

(2) *Title 46, United States Code, specifies the items covered with regard to inspected vessels including lifesaving, firefighting, hull, propulsion equipment, machinery and vessel equipment. However, the legislation that added towing vessels to the list of inspected vessels, authorized that the Coast Guard may prescribe different standards for towing vessels than for other types of inspected vessels. What, if any, different standards should be considered with regard to inspected towing vessel requirements from other inspected vessels?*

(3) *Towing vessels vary widely in terms of size, horsepower, areas of operation, and type of operation. Under what circumstances, if any, should a towing vessel be exempt from the requirements as an inspected vessel?*

(4) *Should existing towing vessels be given time to implement requirements, be ''grandfathered'' altogether from them, or should this practice vary from requirement to requirement?*

(5) *Should existing towing vessels be treated differently from towing vessels yet to be built?*

(6) *The same act that requires inspection of towing vessels authorizes the Coast Guard to develop a safety management system appropriate for the towing vessels. If such a system is developed, should its use be required for all inspected towing vessels?*

(7) *Examples of existing safety management systems include the international safety management (ISM) code and the American Waterways Operators Responsible Carrier Program. If a safety management system is used, what elements should be included in such a system?*

Responses to those questions and other input from the public and industry have been collected in the docket for this proposed regulatory action (i.e., Docket USCG–2004–19977) and are being considered by the Coast Guard in its regulatory development.

1.2 OBJECTIVES AND TASKS FOR THIS INDUSTRY ANALYSIS PROJECT

The objective of this project is to provide technical support services required to aid the Coast Guard in developing regulations governing the inspection of towing vessels. Its technical tasks (and the chapter of this report that provides information from those tasks) are as follows:

- Characterization/Categorization of the UTV Industry
- Accident History Data Gathering for the Inspected and Uninspected Towing Vessels
- Risk Analysis of Towing Vessel Accident History
- Economic Impacts Analysis Associated with Inspection Requirements
- Preparation of a UTV Industry Analysis Report

The ABSG Consulting Inc. (ABS Consulting) team included personnel from ABS Consulting and Abt Associates (the economics analysis subcontractor for this effort). They worked closely with the Coast Guard regulatory development team during this effort. This resulted in several changes in the original focus of the project, including:

1. Modification of proposed project approaches that required detailed, defined regulatory alternatives – Those alternatives were not yet developed to allow the project to be as specific in this analysis as originally proposed. This issue was discussed with the Coast Guard project team and the project effort was revised as necessary.

2. Elimination of the analysis of the risks associated with potential illegal activities involving towing vessels (e.g., drug smuggling, customs violations, transporting of illegal aliens) – The Coast Guard project team did not believe that the inspection regulation development and implementation were expected to address the reduction of potential illegal activities involving towing vessels; therefore, such an analysis was not necessary.

3. Increased effort applied to the economic analysis – The resources saved by deleting the illegal activities analysis discussed above were applied to increased collection of economic impact data. However, that data collection was limited in detail because of change 1 noted above.

These changes in project focus were (1) discussed in meetings or conference calls with the Coast Guard regulatory development team and (2) documented in the original project management plan (dated 11-29-05) or in the monthly reports submitted to the Coast Guard as required under the contract.

1.3 DEFINITIONS

The most important definitions for this project are for towing vessels and various types of towing vessels or service, including definitions from various Coast Guard regulations:

Towing vessel is a commercial vessel engaged in, or intending to engage in, pulling, pushing, or hauling alongside, or any combination of pulling, pushing, or hauling alongside. (46 CFR 27, Fire Protection; 33 CFR 164.70, Navigation Safety Regulations)

Towing vessel is any commercial vessel engaged in towing another vessel astern, alongside, or by pushing ahead. (33 CFR 161.2, Vessel Traffic Management)

Fleeting or assist towing vessel is any commercial vessel engaged in towing astern, alongside, or pushing ahead, used solely (1) within a limited geographic area, such as a particular barge fleeting area or commercial facility, and (2) for restricted service, such as making up or breaking up larger tows (33 CFR 157.03, Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk).

Additional definitions provided below have been extracted from 46 CFR 10.103 Part 10 — Licensing Of Maritime Personnel, Subpart A—General, § 10.103.

Assistance towing means towing a disabled vessel for consideration.

Disabled vessel is a vessel that needs assistance, whether docked, moored, anchored, aground, adrift, or under way, but does not mean a barge or any other vessel not regularly operated under its own power.

Harbor assist is the use of a towing vessel during maneuvers to dock, undock, moor, or unmoor a vessel, or to escort a vessel with limited maneuverability. Note: Also called "ship assist" in some cases.

Inland waters are the navigable waters of the United States shoreward of the Boundary Lines as described in 46 CFR part 7, excluding the Great Lakes and, for towing vessels, excluding the Western Rivers. For establishing credit for sea service, the waters of the Inside Passage, between Puget Sound and Cape Spencer, Alaska, are inland waters.

Near coastal means ocean waters not more than 200 miles offshore.

Oceans are the waters seaward of the Boundary Lines as described in 46 CFR part 7. For the purposes of establishing sea service credit, the waters of the Inside Passage, between Puget Sound and Cape Spencer, Alaska, are not considered oceans.

Rivers are any river, canal, or other similar body of water designated by the Officer in Charge, Marine Inspection.

Western Rivers are the Mississippi River, its tributaries, South Pass, and Southwest Pass, to the navigational demarcation lines dividing the high seas from harbors, rivers, and other inland waters of the United States, and the Port Allen-Morgan City Alternate Route, and that part of the Atchafalaya River above its junction with the Port Allen-Morgan City Alternate Route, including the Old River and the Red River, and those waters specified in 33 CFR 89.25.

Additional definitions from 46 CFR 27, the regulation defining fire protection requirements for towing vessels include:

Accommodation includes any:

(1) Messroom
(2) Lounge
(3) Sitting area
(4) Recreation room
(5) Quarters
(6) Toilet space
(7) Shower room
(8) Galley
(9) Berthing facility
(10) Clothing-changing room

Engine room is the enclosed area where any main-propulsion engine is located. It comprises all deck levels within that area.

Fixed fire-extinguishing system is:

(1) A carbon-dioxide system that satisfies 46 CFR subpart 76.15 and is approved by the Commandant;

(2) A manually operated clean-agent system that satisfies the National Fire Protection Association (NFPA) Standard 2001 (incorporated by reference in Sec. 27.102) and is approved by the Commandant; or

(3) A manually operated water-mist system that satisfies NFPA Standard 750 (incorporated by reference in Sec. 27.102) and is approved by the Commandant.

Fleeting-area is a separate location where individual barges are moored or assembled to make a tow. The barges are not in transport, but are temporarily marshaled, waiting for pickup by different vessels that will transport them to various destinations. A fleeting-area is a limited geographic area.

Harbor-assist means docking and undocking ships.

Limited geographic area is a local area of operation, usually within a single harbor or port. The local Captain of the Port (COTP) determines the definition of local geographic areas for each zone.

Operating station is the principal steering station on the vessel from which the vessel is normally navigated.

Towing vessel is a commercial vessel engaged in, or intending to engage in, pulling, pushing, or hauling alongside, or any combination of pulling, pushing, or hauling alongside.

Towing vessel in inland service is a towing vessel that is not in ocean or coastal service.

Towing vessel in ocean or coastal service is a towing vessel that operates beyond the baseline of the U.S. territorial sea.

Work space is any area on the vessel where the crew could be present while on duty and performing their assigned tasks.

The project team also found it necessary to agree on working definitions for other terms that are commonly used by the industry (and sometimes in Coast Guard regulations) but are not explicitly defined in the Coast Guard regulations. These terms are:

Boundary line is a line of demarcation established under Section 2(b) of 33 U.S.C. 151. Generally, boundary lines follow the general trend of the shoreline and cross entrances to small bays, inlets, and rivers. For specific descriptions of boundary lines refer to 46 CFR Part 7.

Certificate of Inspection is a Coast Guard document issued to U.S. vessels inspected by the Coast Guard and which contains, among other information: the description of the vessel, the route the vessel may travel, the minimum crew requirements, the safety equipment and appliances required to be on board, the total number of persons that may be carried, and the names of the owners and operators. [46 USC Section 3309]

1.4 REPORT ORGANIZATION

The remainder of this report describes the steps taken by the analysis team and the results of the analyses to describe the UTV community and to help the Coast Guard estimate the impact of towing vessel regulations they will develop.

Section 2	Results of Specific Project Tasks
Section 3	Analysis of Towing Industry Vessel Characteristics
Section 4	Towing Vessel Accident History and Risk Evaluation
Section 5	Analysis of Economic Impacts of Towing Vessel Inspection
Section 6	Project Conclusions and Recommendations
Section 7	References

2. RESULTS OF SPECIFIC PROJECT TASKS

Two specific tasks that the Coast Guard requested be performed in this project were:

- Estimation of the size of the current towing vessel fleet
- Performance of a selected number of port visits to discuss towing vessel inspection issues with towing company personnel

These tasks are described in Subsections 2.1 and 2.2, respectively.

2.1 ESTIMATION OF TOWING INDUSTRY VESSEL POPULATION

The UTV industry analysis project team performed a detailed analysis of data to gain an understanding of the towing vessel community operating in US waterways by reviewing a number of data sources, including:

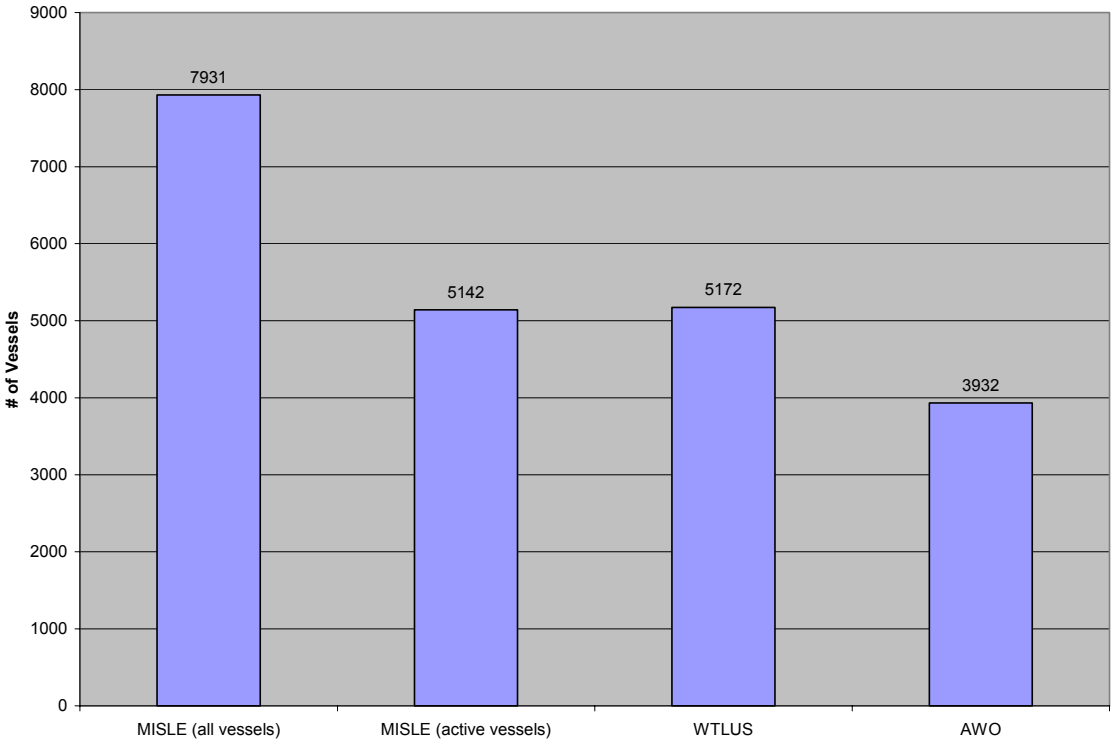
- MISLE vessel registry (2005)
- Snapshots of the MISLE vessel registry for previous years (1997 to 2004)
- USACE 2003 Waterborne Transportation Lines of the United States (WTLUS) vessel registry (WTLUS, 2003)
- *Inland River Record* (IRR, 2006)
- Owner/operator vessel lists obtained during site visits

In addition to these databases, the project team also consulted industry data provided by the American Waterways Operators (AWO), some of which were developed in conjunction with the Coast Guard as part of the Coast Guard-AWO Safety Partnership. (Selected AWO statistics are provided on the internet at http://www.americanwaterways.com/industry_stats/index.html).

As shown in Figure 2.1, the Coast Guard's MISLE database contains more than 7,900 towing vessel records, but about 2,800 of them are recorded as "inactive." This leaves MISLE with 5,142 active towing vessels. This number is similar to the 5,172 vessels reported in the USACE WTLUS database (WTLUS, 2003), and manual comparison of entries in the two databases shows there is a very large overlap. However, each source contains some vessels that do not appear in the other source. For example, the MISLE database primarily consists of vessels documented with the Coast Guard; however, if a state-registered vessel (e.g., which could be a towing vessel less than 26 feet in length) is involved in an accident report to the Coast Guard, a MISLE entry would appear for that vessel. However, if the vessel was not involved in commercial towing as reported to the USACE, it would not appear in the WTLUS data source. The analysis team found that because of the quality of the data and the lack of consistently common data fields, it was not practical to make a reliable one-to-one comparison of the vessels in the two sources. Even within a single data set, the towboat population varies from year to year. The WTLUS, which is developed based on reports for vessels in waterborne commerce for that year, varies from year to year. For example, the WTLUS towboat population reported by the WTLUS varies from 4,954 to 5,314 in the years

from 1999 to 2004. However, the reported population did not steadily increase between those years, because it was higher in 2001 (at 5,127 vessels) than in 2002 (at 4,995 vessels).

Obviously, there are numerous ways for boats to become active or to change to inactive status, the largest of which is likely to be the entry into and withdrawal out of active service by vessels as economic and industry conditions change. Given this type of population, the project team suggests that the Coast Guard consider 5,100 to 5,200 as a reasonable estimate of the active towing vessel population. This number may not include all of the towing vessels in service as construction support workboats, but based on checking a limited number of known workboats, many of them are included in the two databases used here.



Note: The AWO estimate was stated as "active towing vessels operating in the towing industry." It is not intended to include towing vessels used in other roles (e.g., marine construction support). The other estimates are based on databases of vessels defined as towing vessels, regardless of service.

Figure 2.1 Estimates of Number of Active Towing Vessels

The analysis team found that because of the quality of the data and the lack of consistently common data fields, it was not practical to make a reliable one-to-one comparison of the vessels in the two sources. Also, it appears that each database has some vessels included that are no longer in service. Because of this, the project team suggests use of 5,100 vessels as an estimate of the number of towing vessels in active commercial service.

Specific observations regarding this project's estimate of 5,100 vessels:

- The team believes the estimate represents the number of line haul boats on inland rivers, vessels operating on the intracoastal waterways and ocean routes, fleeting vessels that support towing operations, and harbor assist vessels. It also includes some tugboats that provide support to dredging and marine construction operations.

  However, with the current Coast Guard data, it is not possible to identify the number of boats in each class of service. The WTLUS divides inland commercial vessels into "tugboats" and "towboats/push boats"; however, it provides no additional service breakdown. AWO personnel who were consulted suggest that the number of vessels currently in the commercial towing industry (including harbor-assist vessels) is about 4,000, and the AWO Web site shows an estimate of 3,942 (as of 2002).

- The team believes the estimate of 5,100 vessels includes very few of the vessels providing assistance towing services to recreational boaters.

  These vessels are often less than 26 ft in length, are generally modified recreational boats, and are typically state registered. Based on discussions with the industry associations and major towing assistance franchise organizations (e.g., C-Port, Sea Tow, Boat US) that are involved in assistance towing, it appears that there are about 250 to 275 companies that provide assistance towing services, with somewhere between 1,200 and 1,400 vessels involved.

- Although there are a number of industry "workboats" (i.e., tugboats or pushboats that support marine construction, dredging, and other limited geographic area operations such as marine support) included in the 5,100 vessels reported in the Coast Guard MISLE and USACE WTLUS databases, it is likely that there may be many more of these vessels that are not included.

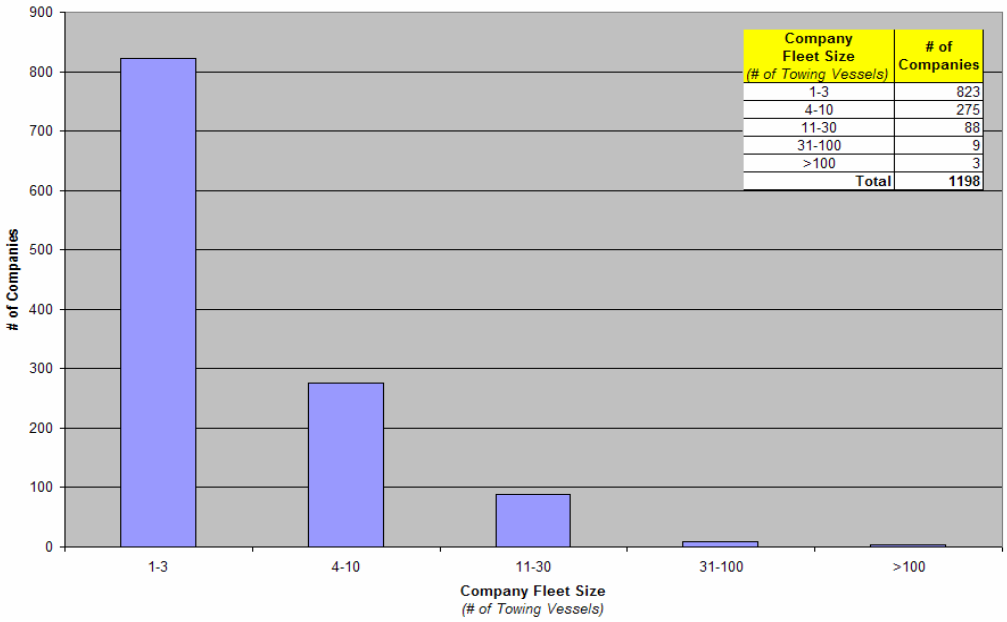
  These vessels represent a large variety of sizes (and are sometimes less than 26 ft in length). Many of them are only operated on an intermittent basis and often operate only in a limited geographic area.

Another important characterization of the industry is the distribution of towing vessels per company. Figure 2.2 displays the distribution of the size of towing vessel fleets by company (using the "TS Operator" designation from the WTLUS). This presents the 1,198 towing vessel companies from the WTLUS Volume 2 data, by size of their fleet. Figure 2.2 shows that there are more than 800 of the towing companies that have from 1 to 3 vessels, while only 3 towing companies reported ownership of more than 100 vessels. (Of the small towing companies, 474 companies report operating only one towing vessel.) This presents a challenge for the Coast Guard to communicate new requirements to so many small companies, many of which are not members of industry organizations like AWO and the Offshore Marine Service Association (OMSA).

There are some issues with the data regarding vessel ownership:

- In some cases, the WTLUS listed two companies with very similar names (e.g., names like "ABCD Marine Company" and "ABCD Marine Co."). If, based on knowledge of the industry and internet research, we believed them to be the same company, we combined the fleets for purposes of this graphic. In other cases, we chose to use the company designations as found in the WTLUS.

- The WTLUS reports company fleets based on the regional location of the company operation (i.e., by USACE Engineer Division/District) where they operate. McAllister Towing and Moran Towing are examples of that approach, with each of their fleets reported as operated by eight or nine regional subsidiaries. We did not choose to combine these designations, so some of the large towing companies appear as a number of smaller companies. Once there is a towing vessel inspection regulation, some large companies may choose to have different management systems for vessels operated out of different offices. That is a decision that will need to be documented in any safety management system that is developed in response to the new towing vessel regulations.



Company Fleet Size (# of Towing Vessels)	# of Companies
1-3	823
4-10	275
11-30	88
31-100	9
>100	3
Total	1198

Figure 2.2 Towing Vessel Companies by Fleet Size (Based on WTLUS 2003)

2.2 PERFORMANCE OF VISITS TO TOWING COMPANIES IN VARIOUS PORTS

As part of this project, ABS Consulting personnel accompanied Coast Guard representatives on trips to several ports to discuss towing vessel inspection issues with various towing companies. The information gathered during those visits contributed to other activities in this project and to the conclusions and recommendations in this report (see Section 6).

Table 2.1 provides the dates and locations of the trips made, indicating which towing companies were visited and the project and Coast Guard staff participants.

Table 2.1 Towing Company Visits by Project Personnel

Date	Location	Towing Companies (Locations)	Project and Coast Guard Participants
1/10/06 to 1/11/06	Houston	• G&H Towing (Galveston) • Kirby Inland Marine • Higdon Marine	Casada Dolloff Elsenburg
1/23/06 to 1/25/06	Seattle	• Crowley Marine • Harley Marine • Tidewater (Vancouver, WA)	Casada Dolloff
2/7/06 to 2/9/06	Norfolk	• Allied Transportation • Moran Towing • McAllister Towing	Casada Kuhaneck
2/21/06 to 2/23/06	Tampa	• Seabulk Towing • Maritrans, Inc. • Dann Ocean Towing • Local towing assistance franchisee	Casada Dolloff
3/28/06 to 3/30/06	St. Louis	• American River Transportation Company • Ingram Barge Company • JB Marine Service • Osage Marine Services • National Maintenance and Repair (drydock and repair facility)	Casada Kuhaneck

ABS Consulting personnel involved: Myron Casada and Eddie Elsenburg
Coast Guard personnel involved: David Dolloff and Scott Kuhaneck

Activities during the towing company visits generally included:

- Discussions with towing company management and safety personnel, including areas such as:
  - Company operations in terms of number of vessels, types of service, locations of operations
  - Company experience (if any) with safety management systems
  - Existing company procedures and policies pertinent to towing vessel safety
  - Approaches regarding vessel crew training and management of change
  - Hardware provided on vessels beyond what is required by current regulations (e.g., equipment for lifesaving, fire protection, communications, and navigation)
  - Opinions regarding the need for and appropriate focus of towing vessel inspection programs

- Discussions with engineering and maintenance personnel regarding:
  - Standards for towboat design and maintenance
  - Qualifications of port captains and inspection/survey personnel
  - Frequency of drydocking and tasks accomplished in drydock
  - Standards used for determining vessel fitness for service
- Review of established safety management systems, including examination of procedures and policies that addressed:
  - Compliance with current Coast Guard and other applicable regulations
  - Compliance with the AWO Responsible Carrier program
  - Requirements established by towing company clients (e.g., major petroleum shipping companies) as a contractual condition
- Visits onboard selected towing vessels to:
  - Examine safety management system documentation and procedures maintained by the crew
  - Observe the general condition of the vessel wheelhouse, engine room, and deck areas
  - Review the availability of lifesaving equipment
  - Discuss safety programs and needs with vessel crews, including vessel masters, pilots, engineers, and other towboat personnel

During the St. Louis visit, the project team visited fleeting companies and a major drydock/vessel maintenance facility, in addition to towboat operating companies. In Tampa, the team also visited a company that provides assistance towing throughout a large section of the Gulf Coast of Florida as a member of a nationwide towing assistance organization.

Many of the issues were discussed in the meetings with industry personnel. Not all of these issues were raised by every towing company, but the ones listed were either discussed in several meetings or were very important to the industry personnel who raised them. Many of these issues have also been discussed in meetings with the TSAC and its towing vessel inspection working group. (Note: These issues are not presented in any specific order, and simply because they are reported here does not mean that ABS Consulting or Coast Guard representatives who attended these meetings agree with the points raised.)

- **Potential for Business Impacts of Inspection Activity**
  In many cases, the industry representatives expressed concern about the business impacts (largely the potential for delays and business interruption) that could be imposed by inspection activities. Use of third parties to assist the Coast Guard in performing inspection-related activities was considered more flexible than scheduling all activities with Coast Guard inspectors.

- **Level and Location for Documentation Required for Inspected Status**
  There appeared to be a wide range of levels of documentation developed by companies to satisfy the Responsible Carrier Program (RCP) and other safety management systems (SMSs). While everyone understood that a management system has to be documented, there was concern that the level of documentation was driven by auditor preferences, rather than the requirements or the "value" of the document for managing safety. Also, several companies indicated that they chose to maintain many vessel-related records in company offices rather than onboard the towing vessel; therefore, they believed that companies should be free to document record storage locations in their SMS. Of course, this could require vessel auditors to obtain access to company record locations.

- **Location of Towing Vessel Requirements in Numerous Regulations**
  On several occasions, industry representatives expressed frustration with the organization of the current regulations that apply to towing vessels. They pointed out that the pertinent regulations were widely scattered across many different sections of Title 33 and Title 46. This makes it difficult to keep track of what applies to a towing vessel and makes training personnel harder. They expressed the hope that the new inspection towing vessel regulations could bring those requirements together, or at least provide a clearer roadmap to the pertinent regulations.

- **Need to Maintain Some Existing Exemptions**
  On several occasions, industry personnel made the point that there are many different services provided by towing vessels, and that existing regulations sometimes recognize this by providing appropriate exemptions. For example, harbor assist tugs and assistance towing vessels are not currently required to meet all of the fire protection requirements in 46 CFR Part 27. The industry personnel requested that the new towing vessel inspection regulations be carefully drafted so that there are no "unintended consequences" of simply reorganizing existing requirements.

- **Desire to Take Credit for Oil Company Vetting as Internal or External Audits**
  Major oil companies that contract with towing companies to move oil in barges generally evaluate potential towing service suppliers, both prior to placing a contract and then periodically during the term of the contract. This process, called "vetting" by the industry, is considered an important aspect in assuring safety and environmental compliance in the oil industry. Several towing industry personnel expressed a desire to take credit for oil company vetting examinations as part of their in-house safety management audit and review process (e.g., in lieu of a separate internal audit performed by towing company personnel). They believed that the vetting process provides comprehensive reviews of the same topics an SMS audit would examine. However, vetting activities are not generally documented in the same manner that an internal or external audit would be and would not likely address issues not related to oil movements.

- **Need for Auditors to Have Appropriate Towing Industry Experience**
  There has been extensive discussion of using third-party personnel to provide independent audits of towing company safety management systems and other regulatory

compliance activities. Coast Guard representatives have indicated that such personnel would have to meet specific qualification standards. The feedback from the industry personnel was that the auditors would need to have experience appropriate to the industry segment they would be auditing. They maintained that safety policies, practices, and equipment were different between brownwater (i.e., Western Rivers towing) and bluewater (i.e., coastal or ocean) towing operations. Simply because an auditor can meet some specified years of towing experience criteria, the opinion was that he or she might not have the right experience to provide an appropriate audit, depending on the service in which the vessel operates.

- **Lack of Experience of Some Coast Guard Inspectors**
  Similarly, industry personnel emphasized the need for Coast Guard inspectors to receive training regarding the towing vessel industry and the specifics of any new regulations. Industry personnel realize that, because of the breadth of the Coast Guard's responsibilities, all Coast Guard inspectors cannot have detailed experience with the industry segment they may need to inspect. However, they pointed out the need to provide adequate training and resources to Coast Guard inspection personnel so that early implementation of the towing vessel inspection regulations will not be dominated by the need to appeal inspector actions to the local Coast Guard chain of command. Because towing vessels are widely distributed across all of the Coast Guard areas of operations, training programs and inspection aids (e.g., CG-840 books, inspection guidelines, navigation and vessel inspection circulars) will need to be developed and provided to the field early enough to help address this problem.

- **Impact and Difficulty of SMS Development for Small Companies**
  Project personnel realize that the companies visited in this project were almost entirely AWO members, so they had at least implemented the RCP program, and some of them were also ISO or ISM certified. However, the industry personnel were clear that effective implementation of a safety management system was a very difficult task for a company that had not previously been highly structured and had not formally documented its policies and procedures. They pointed out three issues:

  1. It will be difficult for small companies to dedicate the time needed to develop and implement an effective SMS, in part because they have a limited number of people who are not involved in vessel operations on a day-to-day basis. Typically, AWO members have safety managers who have shared the SMS development task with port engineers and/or port captains. Small companies often do not include any of these positions, making program development difficult.

  2. On a relative basis, SMS costs will be high for small companies (i.e., costs-per-vessel will be high), and those companies may not be able to afford to hire the outside assistance (i.e., consultants) that many larger companies use.

  3. For small companies (e.g., those involving one to three boats) there is less value in having a large number of detailed, written procedures and an associated audit

process. With a small number of employees, it is often possible to achieve consistent operation with company policies by direct supervision and coordination rather than more formal (i.e., written) management systems approaches.

Industry personnel indicated that these issues make it essential that the Coast Guard and industry associations examine ways to provide compliance assistance to small companies. This assistance could take the form of template programs, training assistance, or other outreach activities. Such assistance would serve to help reduce the difficulty and cost of compliance, improve the level of compliance, and improve the safety performance of smaller towing companies. Another alternative discussed during the visits was to allow companies to opt for compliance with a more prescriptive regulation rather than develop their own safety management system.

- **Ability to Provide Documentation of Industry Vessel Survey/Inspection for Credit**
  During the visits, industry personnel stressed the need for flexibility regarding drydocking schedules and for allowing companies to take credit for inspections performed by company and drydock facility personnel. Particularly for inland river vessels, the industry tends to drydock vessels frequently because of damage to propellers or other nonroutine maintenance needs. In some cases, depending on how long it has been since overall vessel inspection and repair, other drydock activities (like hull survey) might be performed. They expressed the need to be able to document such activities and make that documentation available to the Coast Guard inspector or third-party auditor as evidence of meeting required drydock inspections. Otherwise, there would have to be a separate drydock schedule simply for regulatory inspection purposes. In addition to seeing this as an unnecessary expense, they indicated that, at least for freshwater service, corrosion was not a significant threat to vessel serviceability or a significant contributor to the potential for a vessel loss; therefore, they did not believe that drydock surveys are an important risk mitigation measure.

- **Need for Consistency in Regulatory Review and Enforcement**
  One issue that was raised by several companies was the need for consistency of regulatory review and enforcement by all of the various Coast Guard sectors and Captains of the Port (COTP). The companies generally want to develop and implement a safety management system on a companywide basis so they have the greatest flexibility to move vessels and personnel around. However, if safety management system review and vessel inspection activities vary from port to port, it makes compliance very difficult. Although any safety management system needs to ensure that vessel crews comply with local requirements that reflect real differences in local situations, the industry personnel were concerned that differences in opinions and interpretations would occur. If those differences result in different requirements for safety management systems in different areas, it is a problem. The industry personnel suggested that guidance documents and Coast Guard training for any local personnel involved in towing vessel inspection activities need to be provided in a timely manner (i.e., before the local personnel are expected to take action).

- **The Need to Treat Towing Assistance Differently**
  Both traditional towing companies contacted and the towing assistance company visited during the Tampa visit stressed how different the towing assistance industry, vessels, and daily operations are from other towing industry sectors. The masters operating towing assistance vessels are generally owners/operators for the vessels involved, although they may operate within a franchise system. They provide the waterway equivalent of roadside assistance available from an automobile club or tow truck company. Towing assistance masters are licensed by the Coast Guard, but very few of the other Coast Guard regulations that apply to the towing industry apply to towing assistance vessels. The general opinion expressed by the towing assistance and other towing industry personnel was that towing assistance vessels should either (1) be exempted entirely from the current regulations being developed or (2) be subject to new regulations developed specifically for them. It seemed clear to all involved that whatever potential industry risks are contributing to the pressure for inspection of towing vessels, they are not presented by the towing assistance industry.

3. ANALYSIS OF TOWING INDUSTRY VESSEL CHARACTERISTICS

The first task in the data analysis was to create an in-depth profile of the towing vessel industry. This involved comparing and contrasting the registry of towing vessels in the two primary data sources, MISLE and WTLUS. The analysis team identified a number of vessel and operator characteristics of interest to help describe the industry. The key characteristics defining the industry are:

- Length over deck (ft)
- Gross registered tons (GRT)
- Age
- Horsepower
- Waters
- Service
- Construction material

For each of the characteristics, the team created a number of criteria to categorize each vessel. Table 3.1 illustrates the categories used for each of the characteristics.

These characteristics and associated categories provided a number of criteria to subdivide the towing vessel industry. The following sections break down the industry based on the two primary vessel registries (Coast Guard's MISLE and USACE's WTLUS) for each of the characteristics.

3.1 MISLE VESSEL REGISTRY

The MISLE database is the Coast Guard enterprisewide repository for vessel and incident data; therefore, it was the primary source of data used in this analysis. At the time the towing vessel data were downloaded from the MISLE database (September 2005), there were 7,931 vessels registered as towing vessels with a status of either "Active" or "Unspecified." Of these 7,931 vessels, 2,789 had a status of "Unspecified," while 5,142 had a status of "Active."

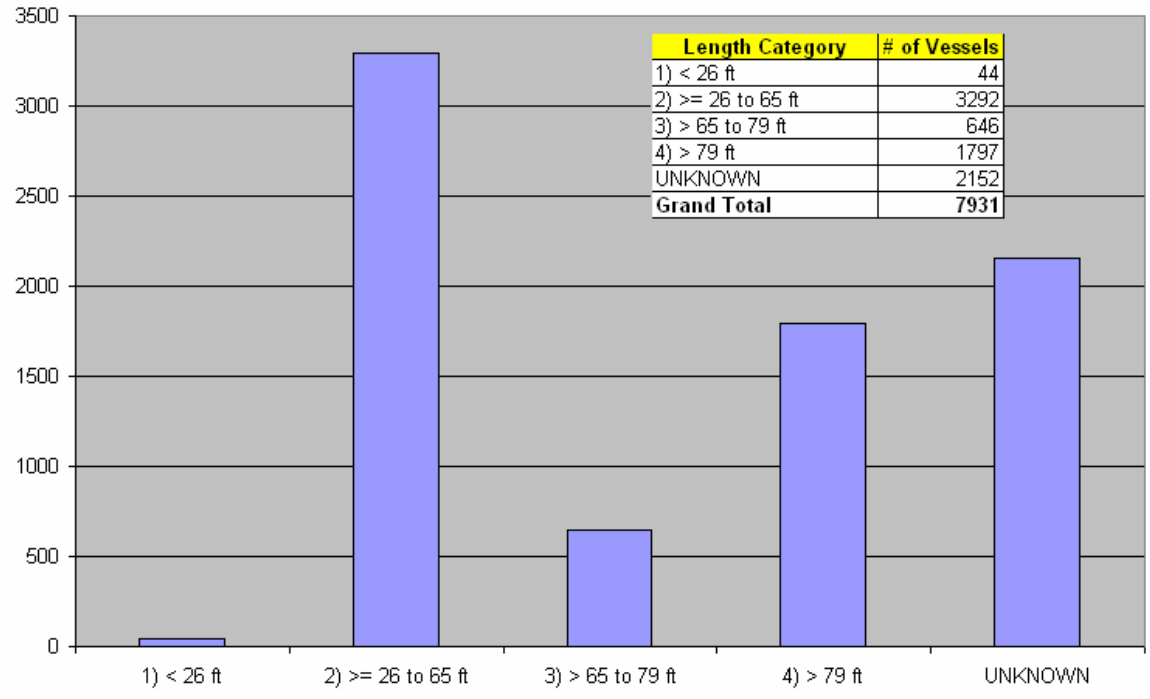
Please note that the datafile supplied to the project team by the Coast Guard did not include any vessels that the Coast Guard knew to have been scrapped or declared inactive by their owners. Those vessels are included in Coast Guard data the team did not use (i.e., vessel status of "Inactive") and comprise about 2,500 additional vessels. This industry profile also does not contain undocumented vessels or assistance towing vessels.

Figures 3.1 through 3.6 illustrate the towing vessel profile for each of the characteristics, with the exception of "Service," based on the data from the MISLE database.

Table 3.1 Categories for Vessel Characteristics

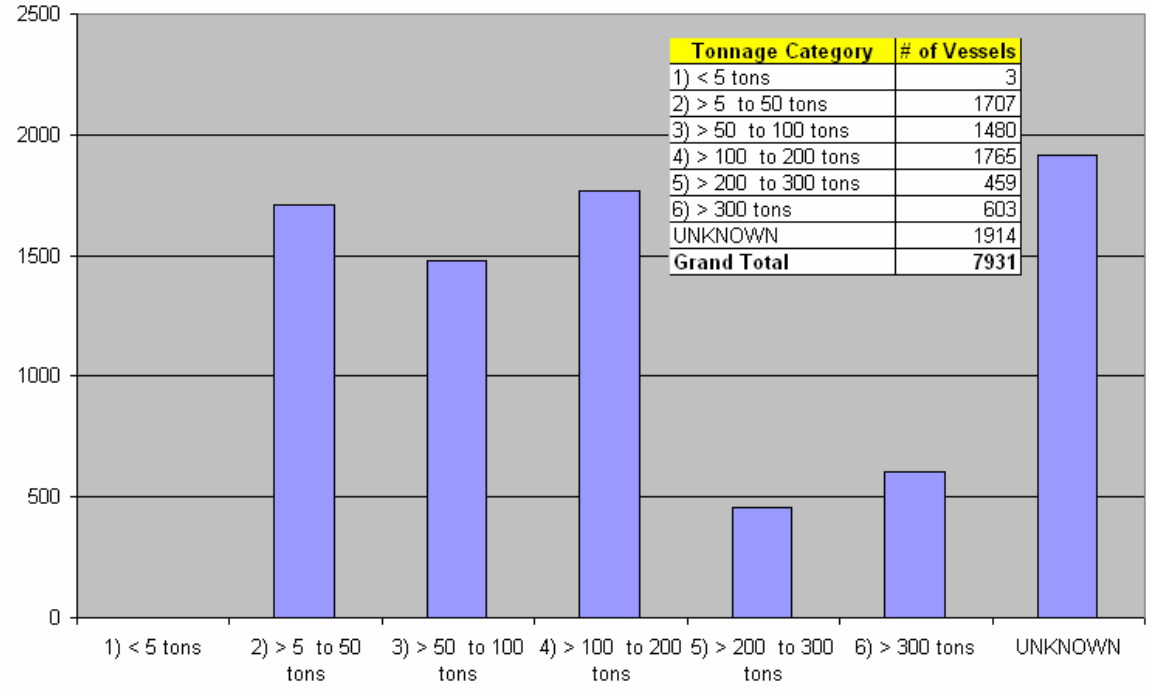
Characteristic		Category					
		1	2	3	4	5	6
Length Over Deck (ft)		0 to <25	26 to ≤65	>65 to <79	79+	N/A	N/A
Gross Registered Tons (GRT)		0 to <5	5 to <50	50 to <100	100 to <200	200 to <300	≥300
Age		0 to 5	6 to 10	11 to 15	16 to 25	>25	
Horsepower		< 100 hp	101 to 500 hp	500 to 1000 hp	1000 to 5000 hp	5000 to 10,000 hp	> 10,000 hp
Waters		Western Rivers	Inland	Great Lakes	Lakes, Bays, and Sounds	Coastwise Not More Than 20 Nautical Miles from Shore	Oceans
Service		Intraport (local area of operation, usually within a single harbor or port) 33 CFR 27.101	Intraport	Interport	Interport	Oceans	Oceans
		Limited Geographic Area such as fleet, ship assist, harbor assist	Extended Limited Geographic Area such as rivers, lakes, bays, and sounds	Rivers, Lakes Bays, and Sounds ICW	Coastal	Non-SOLAS	SOLAS
Construction Material	Hull	Steel	Wood	Aluminum	FRP	Other	N/A
	Superstructure	Steel	Wood	Aluminum	FRP	Other	N/A

Note: The Coast Guard uses gross tons for most of its regulations related to vessels. That is what is reflected in this table. However, the Army Corps of Engineers generally reports net tons in its data sets because that number is more pertinent to the cargo carrying capacity of the vessel.



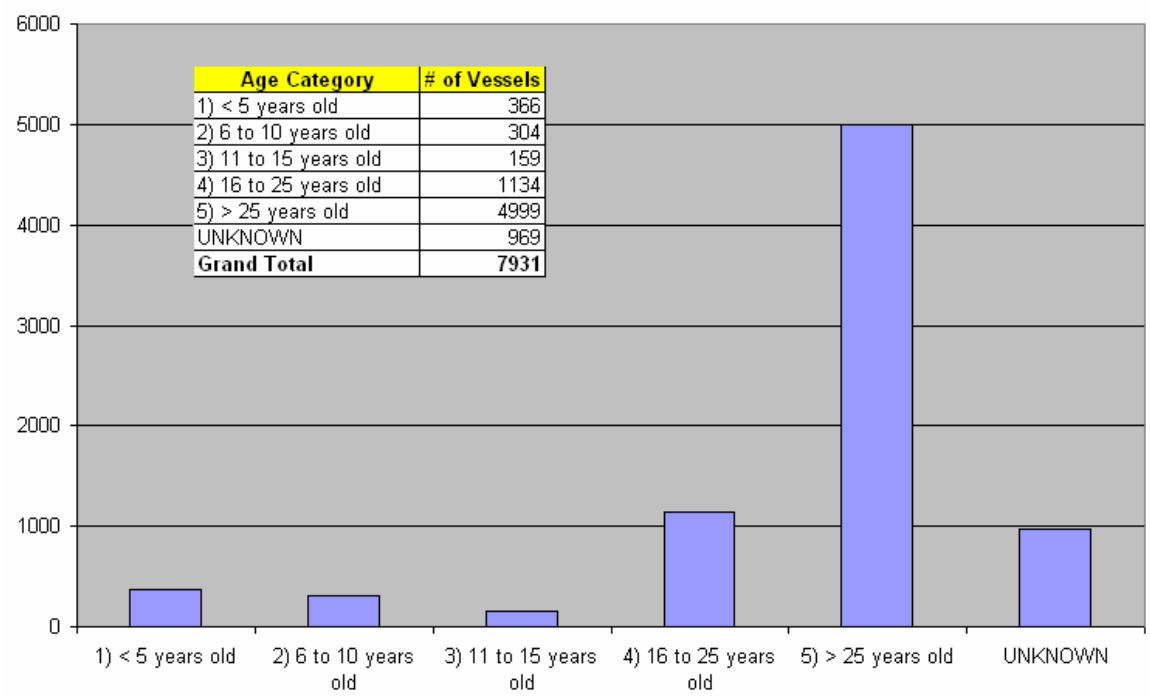
Length Category	# of Vessels
1) < 26 ft	44
2) >= 26 to 65 ft	3292
3) > 65 to 79 ft	646
4) > 79 ft	1797
UNKNOWN	2152
Grand Total	**7931**

Figure 3.1 Length Over Deck (ft) Categorization (MISLE Data)



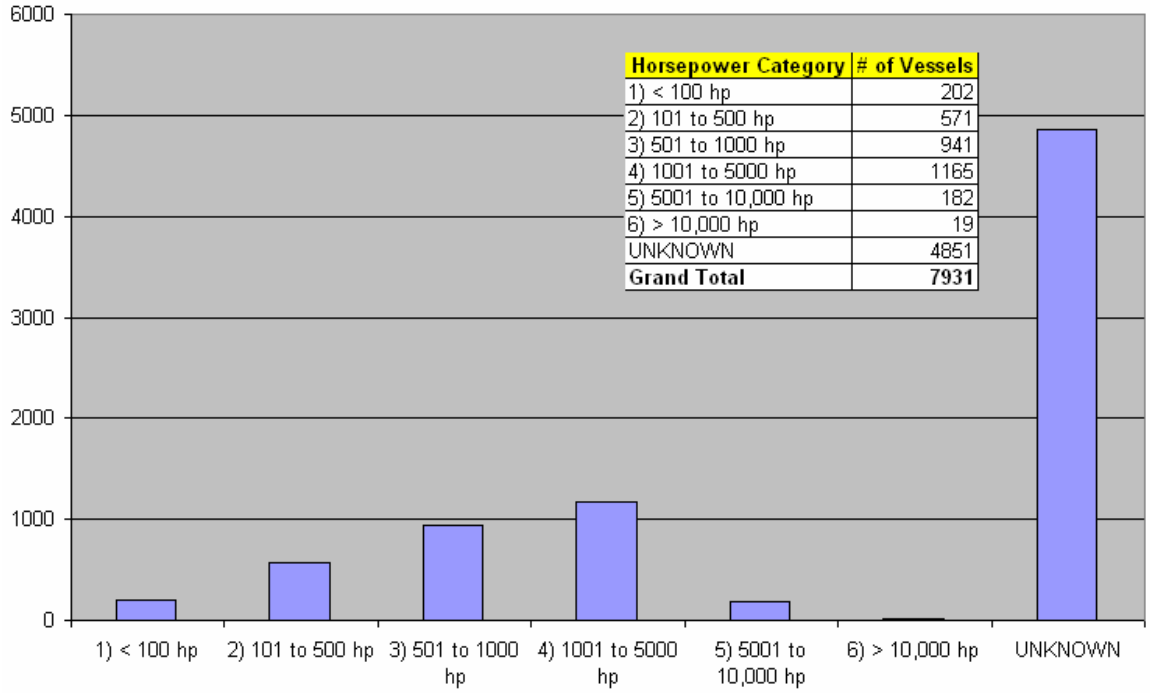
Tonnage Category	# of Vessels
1) < 5 tons	3
2) > 5 to 50 tons	1707
3) > 50 to 100 tons	1480
4) > 100 to 200 tons	1765
5) > 200 to 300 tons	459
6) > 300 tons	603
UNKNOWN	1914
Grand Total	**7931**

Figure 3.2 Gross Registered Tons (GRT) Categorization (MISLE Data)



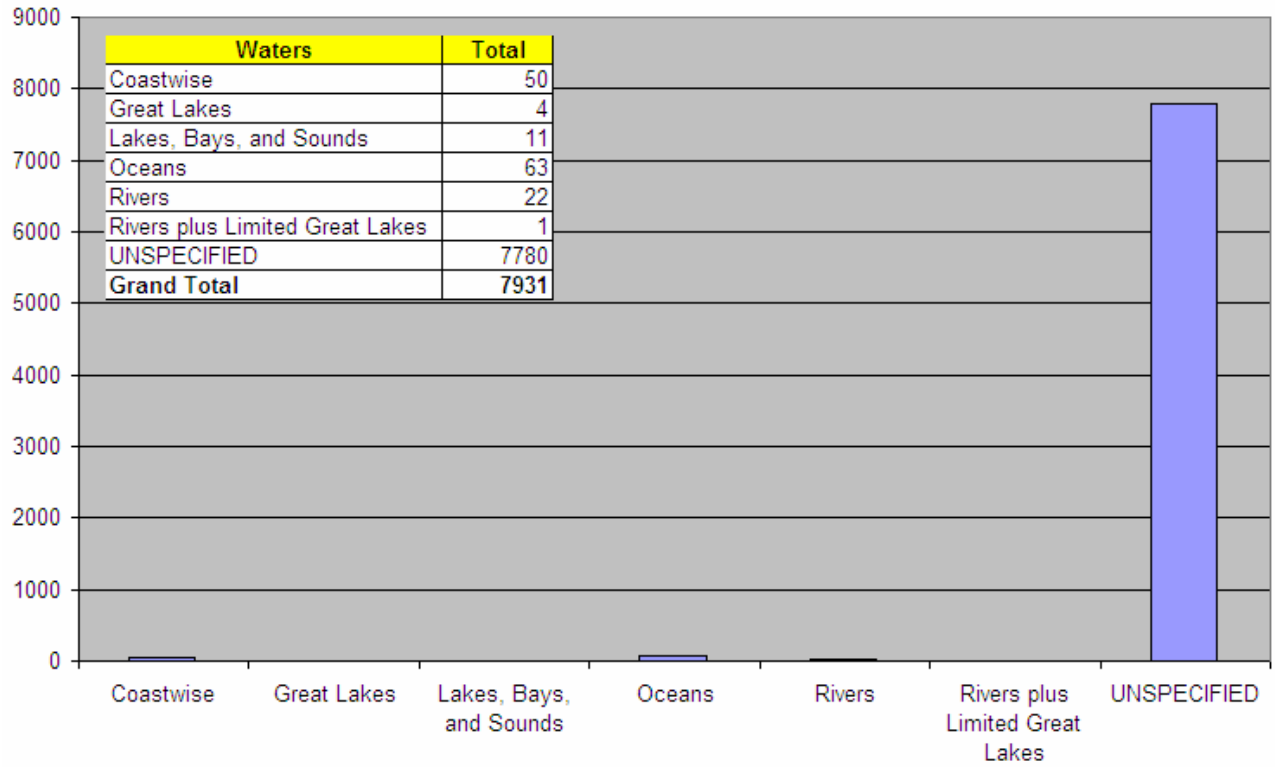
Age Category	# of Vessels
1) < 5 years old	366
2) 6 to 10 years old	304
3) 11 to 15 years old	159
4) 16 to 25 years old	1134
5) > 25 years old	4999
UNKNOWN	969
Grand Total	**7931**

Figure 3.3 Age Categorization (MISLE Data)



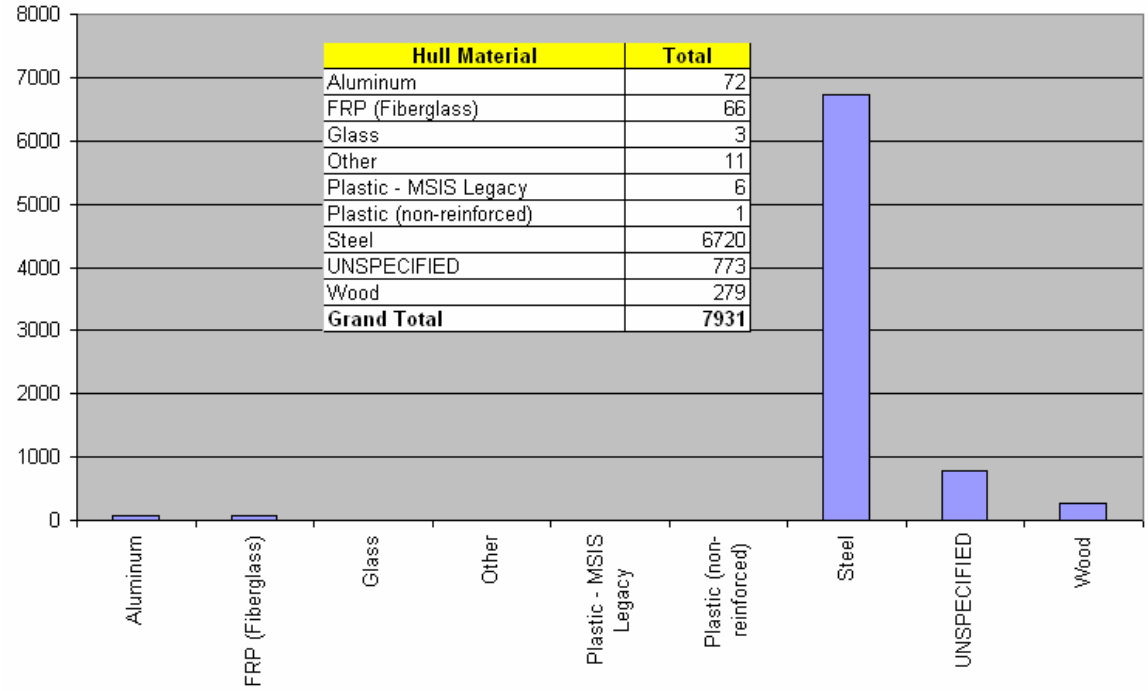
Horsepower Category	# of Vessels
1) < 100 hp	202
2) 101 to 500 hp	571
3) 501 to 1000 hp	941
4) 1001 to 5000 hp	1165
5) 5001 to 10,000 hp	182
6) > 10,000 hp	19
UNKNOWN	4851
Grand Total	**7931**

Figure 3.4 Horsepower Categorization (MISLE Data)



Waters	Total
Coastwise	50
Great Lakes	4
Lakes, Bays, and Sounds	11
Oceans	63
Rivers	22
Rivers plus Limited Great Lakes	1
UNSPECIFIED	7780
Grand Total	**7931**

Figure 3.5 Waters Categorization (MISLE Data)



Hull Material	Total
Aluminum	72
FRP (Fiberglass)	66
Glass	3
Other	11
Plastic - MSIS Legacy	6
Plastic (non-reinforced)	1
Steel	6720
UNSPECIFIED	773
Wood	279
Grand Total	**7931**

Figure 3.6 Construction Material – Hull (MISLE Data)

Note: Data concerning vessel service and superstructure material are not available within MISLE.

3.1.1 MISLE Vessel Registry Conclusions

The MISLE vessel registry is the central data repository for the Coast Guard and contains a wide breadth of vessel characteristics; however, the quality of the data varies widely, depending on the characteristics, with the level of UNKNOWN entries dominating some of the characteristics (e.g., waters, horsepower). The industry profile represented by Figures 3.1 through 3.6 also includes 22 vessels that the MISLE registry identified as inspected under subchapter I.

3.2 USACE WTLUS VESSEL REGISTRY

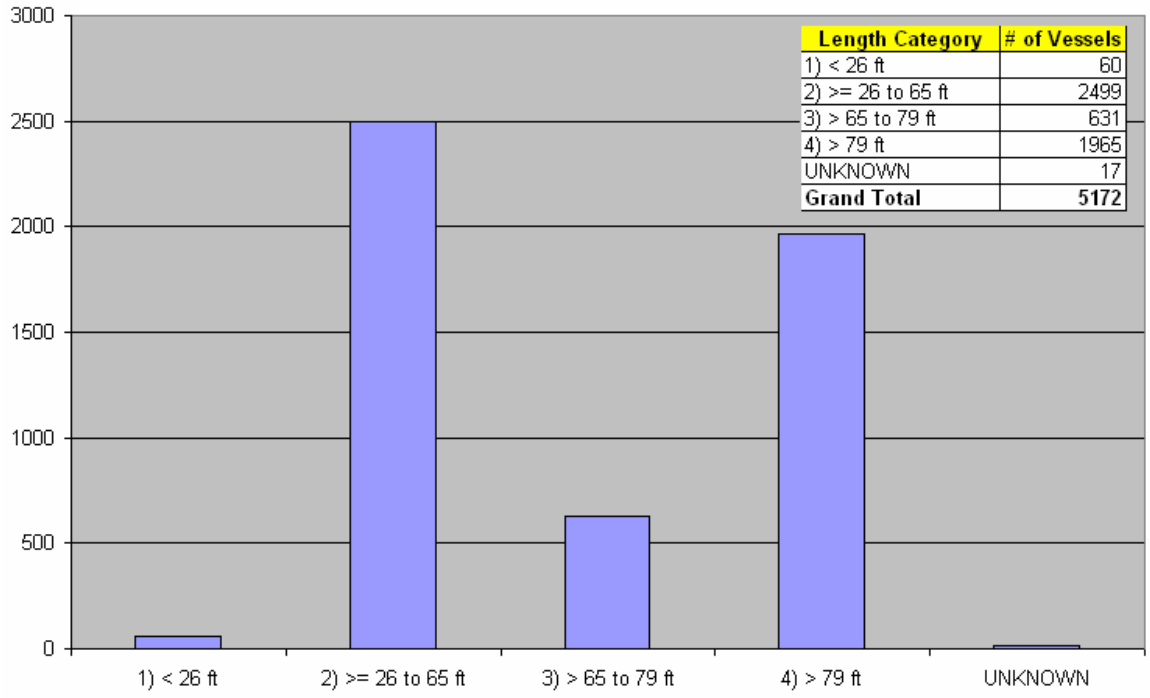
The WTLUS database used for this analysis effort contains summary information of the vessel companies and American flag vessels operating or available for operation on August 1, 2004, in the transportation of freight. Specifically, this analysis used the WTLUS Vessel Characteristics database. The Vessel Characteristics database does not contain the breadth of information on each vessel compared to MISLE, but does have many of the characteristics of interest mentioned earlier. The available data include:

- Vessel name
- Vessel number
- Coast Guard number
- Net tonnage (Note: gross tonnage is not available)
- Length
- Breadth
- Horsepower

The WTLUS registry contains entries for 5,172 towing vessels, and the WTLUS database does not distinguish between inspected and uninspected vessels. Figures 3.7 through 3.10 illustrate the towing vessel profile for each of the characteristics based on the data from the WTLUS.

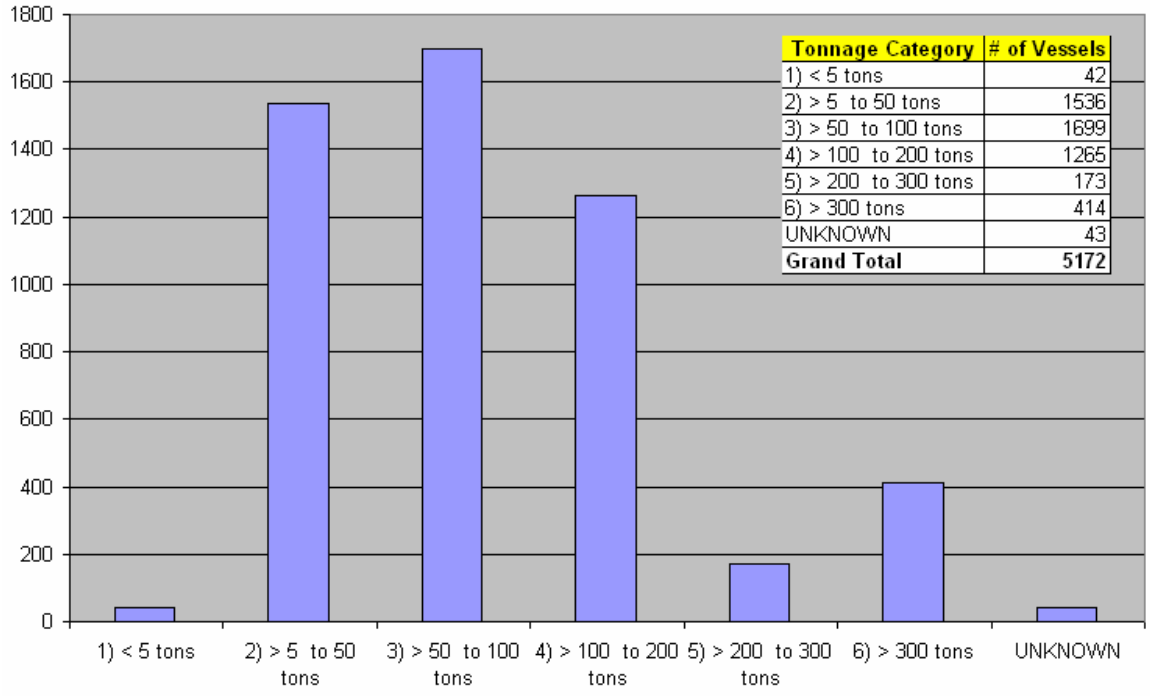
3.2.1 WTLUS Vessel Registry Conclusions

The WTLUS vessel registry tracks the operation of towing vessels through US waterways and records a number of the vessel characteristics of interests. Overall, the quality of the WTLUS data is better than the MISLE repository because of the much smaller percentage of unknowns for each characteristic. As noted previously, the WTLUS registry does not track gross tonnage (only net tonnage), service, waters, or hull construction material; however, it does track the primary characteristics of length, age, net tonnage, and horsepower.



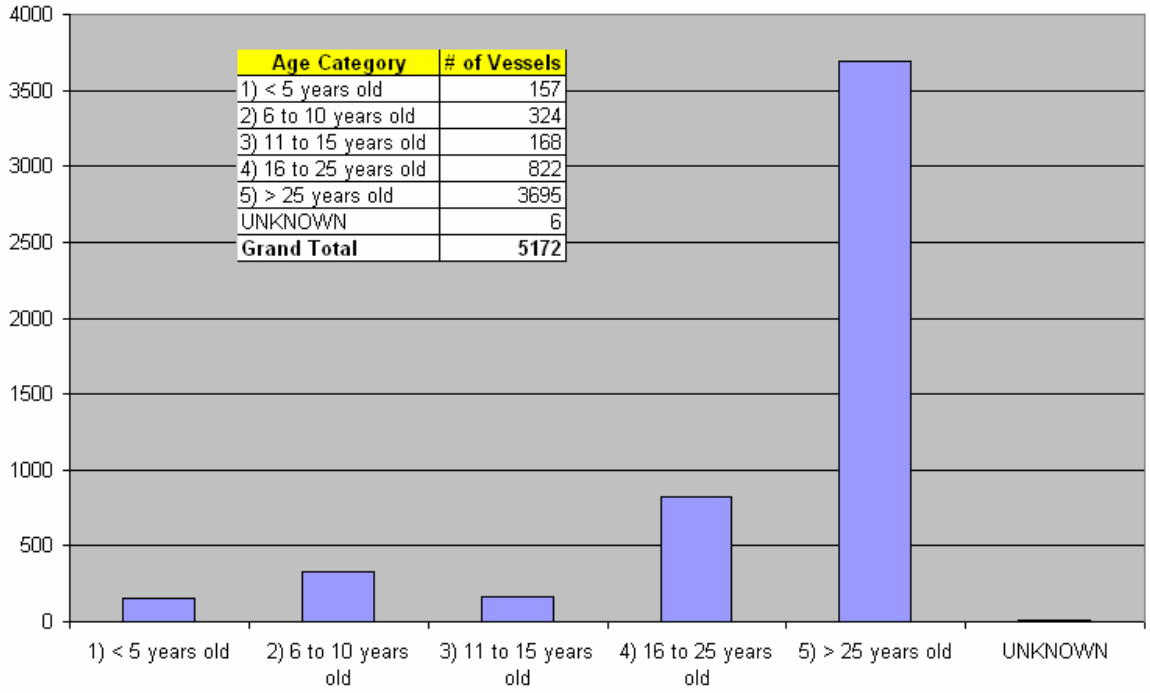
Length Category	# of Vessels
1) < 26 ft	60
2) >= 26 to 65 ft	2499
3) > 65 to 79 ft	631
4) > 79 ft	1965
UNKNOWN	17
Grand Total	**5172**

Figure 3.7 Length Over Deck (ft) Categorization (WTLUS Data)



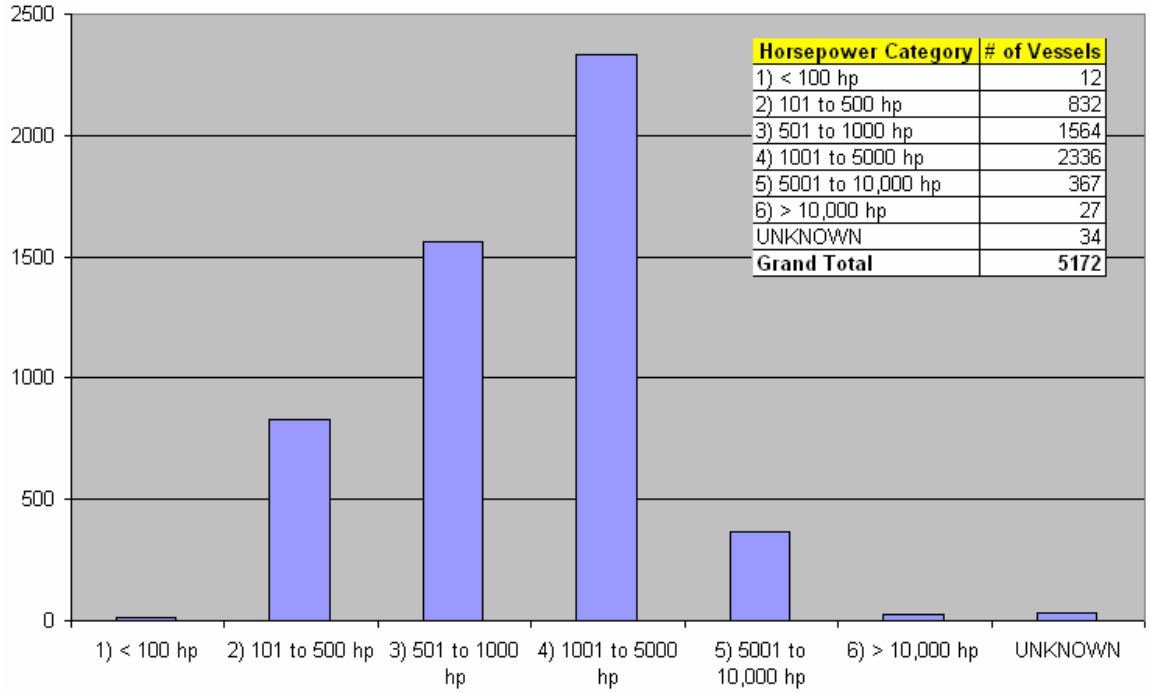
Tonnage Category	# of Vessels
1) < 5 tons	42
2) > 5 to 50 tons	1536
3) > 50 to 100 tons	1699
4) > 100 to 200 tons	1265
5) > 200 to 300 tons	173
6) > 300 tons	414
UNKNOWN	43
Grand Total	**5172**

Figure 3.8 Net Tonnage Categorization (WTLUS Data)



Age Category	# of Vessels
1) < 5 years old	157
2) 6 to 10 years old	324
3) 11 to 15 years old	168
4) 16 to 25 years old	822
5) > 25 years old	3695
UNKNOWN	6
Grand Total	**5172**

Figure 3.9 Age Categorization (WTLUS Data)



Horsepower Category	# of Vessels
1) < 100 hp	12
2) 101 to 500 hp	832
3) 501 to 1000 hp	1564
4) 1001 to 5000 hp	2336
5) 5001 to 10,000 hp	367
6) > 10,000 hp	27
UNKNOWN	34
Grand Total	**5172**

Figure 3.10 Horsepower Categorization (WTLUS Data)

3.3 MISLE TO WTLUS COMPARISON

There is a significant difference in the number of towing vessels in the MISLE (7,931 vessels) and WTLUS (5,172 vessels) data repositories. One reason for this difference is that the WTLUS is limited to vessels operating in 2004 while MISLE is a registry for all towing vessels. The MISLE data repository contains a vessel status field that indicates whether the vessel is active or not. If the MISLE data set (queried in October 2005) is limited to only active vessels, there is better agreement between the two data sets. The number of active vessels in each source is very consistent: MISLE (5,142 vessels) and WTLUS (5,172 vessels).

A comparison of the "Active" MISLE data set to the WTLUS data set portrays a relatively consistent profile of the towing vessel industry across all of the characteristics of interest. As mentioned earlier, the quality of the MISLE data is generally lower than the WTLUS data asset as indicated by the higher number of UNKNOWN entries for every characteristic; however, the relationships between categories for each of the characteristics yield similar profiles between MISLE and WTLUS.

If the UNKNOWN vessels in the MISLE registry are distributed proportionally, based on the known values for each characteristic, the values for each characteristic are comparable.

Example:
The MISLE data for the length characteristic are:

Category	# of Vessels	% of Total
1) < 26 ft	6	0.16%
2) >= 26 to 65 ft	1,877	50.12%
3) > 65 to 79 ft	459	12.26%
4) > 79 ft	1,403	37.46%
UNKNOWN	1,397	

The 1,397 UNKNOWNs were distributed among the four length categories based on the proportion of the length category to the total (e.g., 50.12% of 1,397, or 700 vessels, were added to category 2).

Figures 3.11 through 3.14 illustrate the industry profiles for the characteristics for three data sets: (1) active MISLE vessels, (2) WTLUS vessels, and (3) active MISLE vessels with UNKNOWN values distributed based on known values. Each bar represents the count of vessels in each characteristic category.

As mentioned earlier, the WTLUS reports indicate that the WTLUS data set is a registry of towing vessels operating or available for operation in the transportation of freight. However, lists of individual ship assist vessels obtained during port visits show that many of the ship assist vessels are in the WTLUS vessel registry. The WTLUS does not track the smaller, assistance towing vessels.

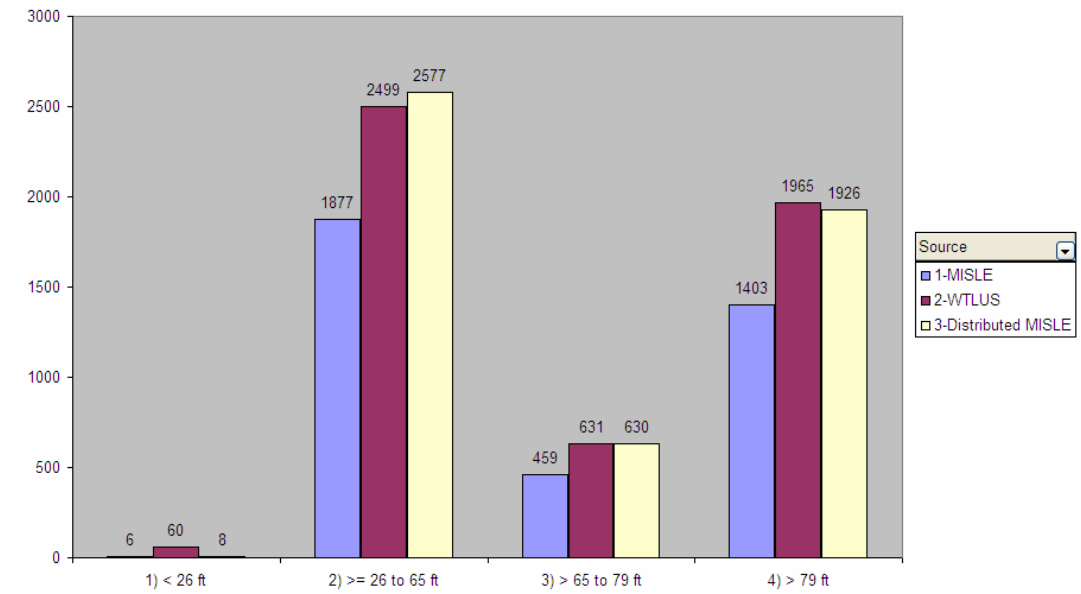


Figure 3.11 Length Over Deck (ft) Categorization ("Active" MISLE Vessels vs. WTLUS Vessels vs. "Active" MISLE with Distributed Unknowns)

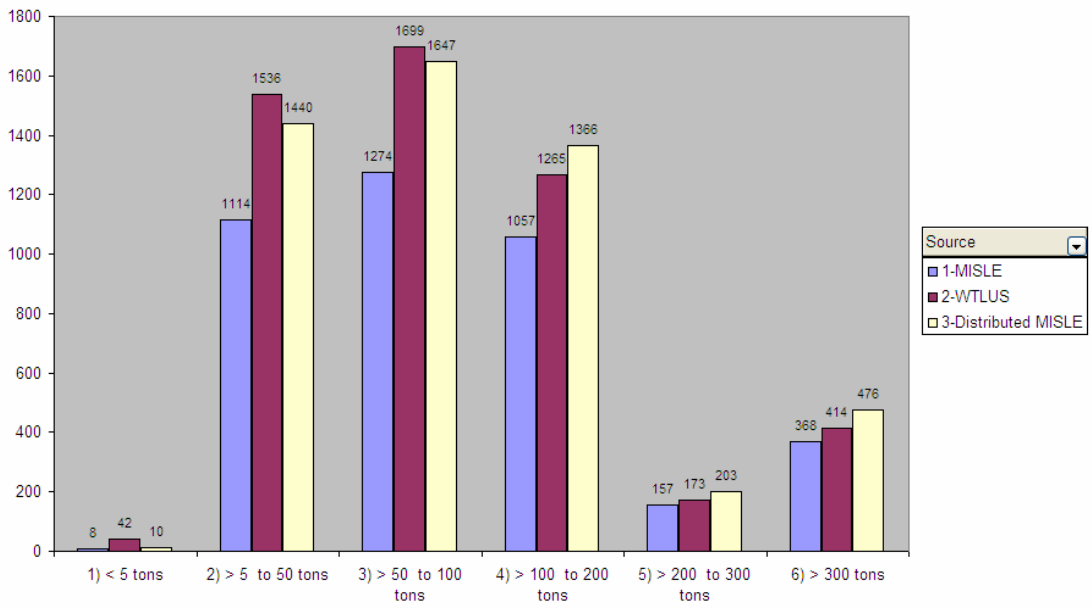


Figure 3.12 Net Tonnage Categorization ("Active" MISLE Vessels vs. WTLUS Vessels vs. "Active" MISLE with Distributed Unknowns)

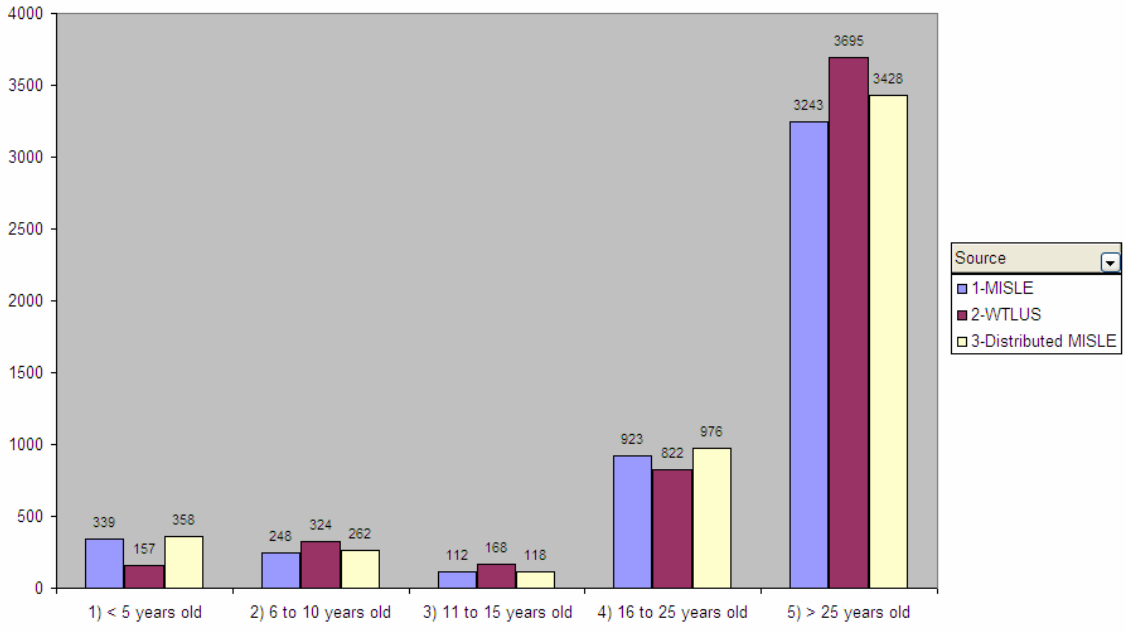


Figure 3.13 Age Categorization ("Active" MISLE Vessels vs. WTLUS Vessels vs. "Active" MISLE with Distributed Unknowns)

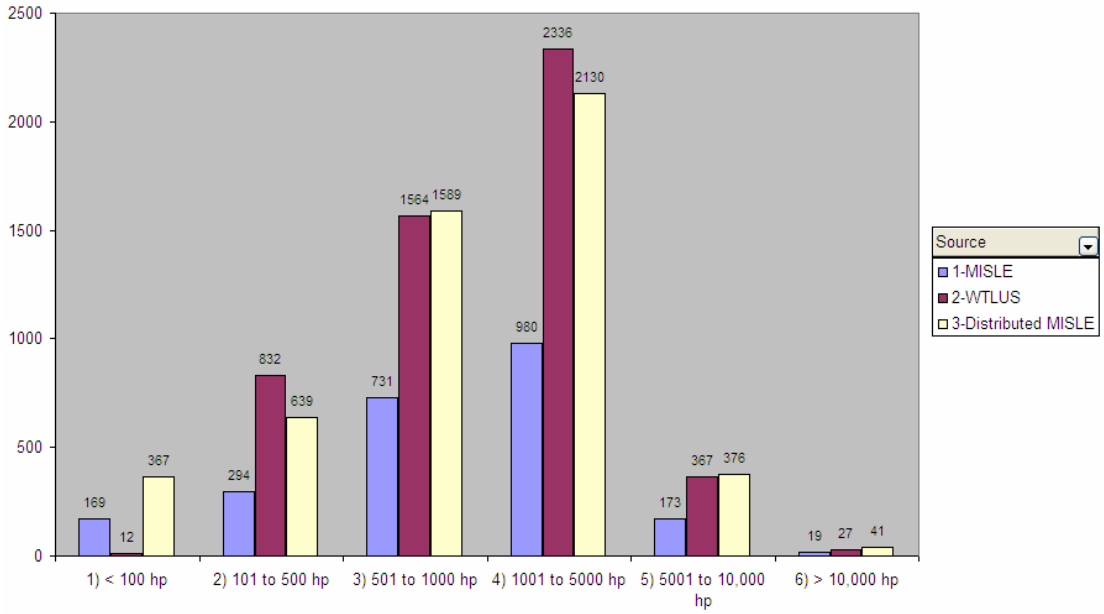


Figure 3.14 Horsepower Categorization ("Active" MISLE Vessels vs. WTLUS Vessels vs. "Active" MISLE with Distributed Unknowns)

Note: Data concerning waters and hull material are not available in the WTLUS data set.

Similarly, because the Coast Guard does not require towing vessels < 5 net tons to be documented, the MISLE data set does not include many of the assistance towing vessels or other small towing vessels.

The goal of the in-depth analysis of the uninspected towing vessel industry is twofold:

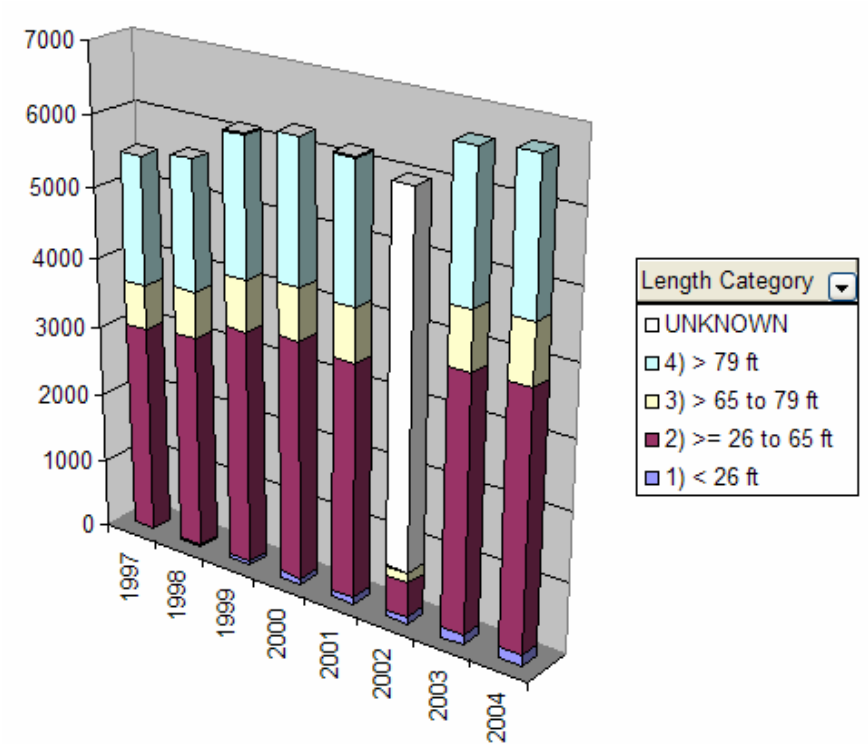
- Provide an estimate of the number of vessels and companies that would be affected by an inspection regime that applied to towing vessels of various sizes and service
- Understand the level of incident exposure to the MTS offered by the UTV industry

3.4 INDUSTRY TRENDING ANALYSIS

The MISLE and WTLUS vessel registries represent the UTV industry at a snapshot in time, 2005 and 2004, respectively. To understand how the industry has changed over time, the analysis team requested a snapshot of the MISLE registry for each year (1997 through 2004). Figures 3.15 through 3.18 represent the trending analysis for the four primary vessel characteristics: length, gross tonnage, age, and horsepower.

3.4.1 Trending Analysis Conclusions

Few conclusions can be drawn from the trending analysis. Generally, the analysis points to relative proportional growth through the years for each of the characteristics. The conclusion of overall growth may be skewed due to the common practice of creating duplicate records in the MISLE database when vessels are involved in reportable incidents. Ferreting out duplicate records is an arduous process, beyond the scope of this effort. The primary conclusion from this analysis is that the towing vessel industry is a relatively stable and aging industry.



Note: The high number of UNKNOWN lengths in 2002 is assumed to be attributable to the switchover of Coast Guard data systems from MSIS to MISLE. The data anomaly was corrected and the overall quality improved over MSIS in subsequent years.

Figure 3.15 Length Over Deck (ft) Trending Analysis (1997 – 2004).

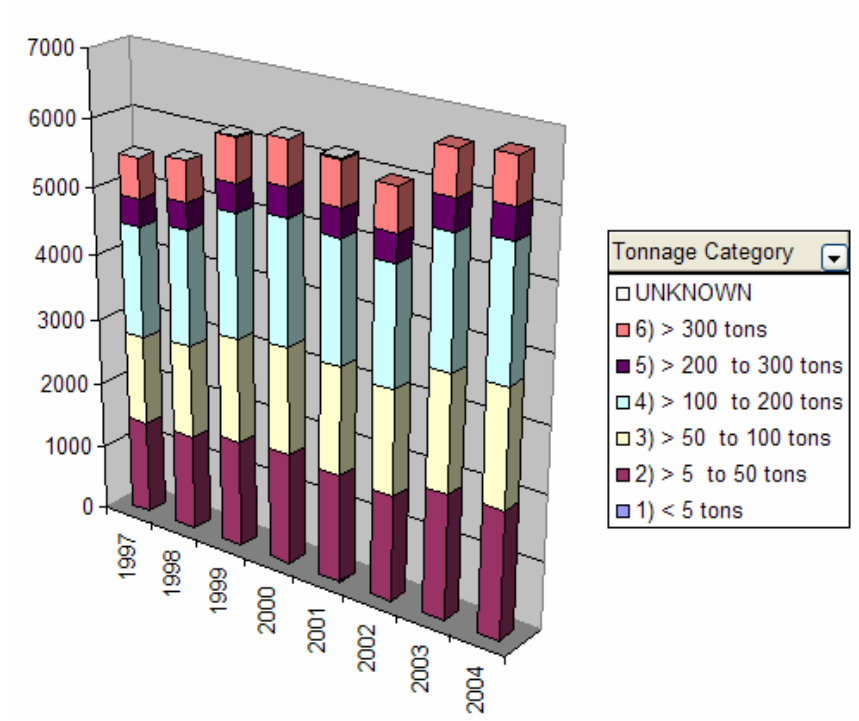
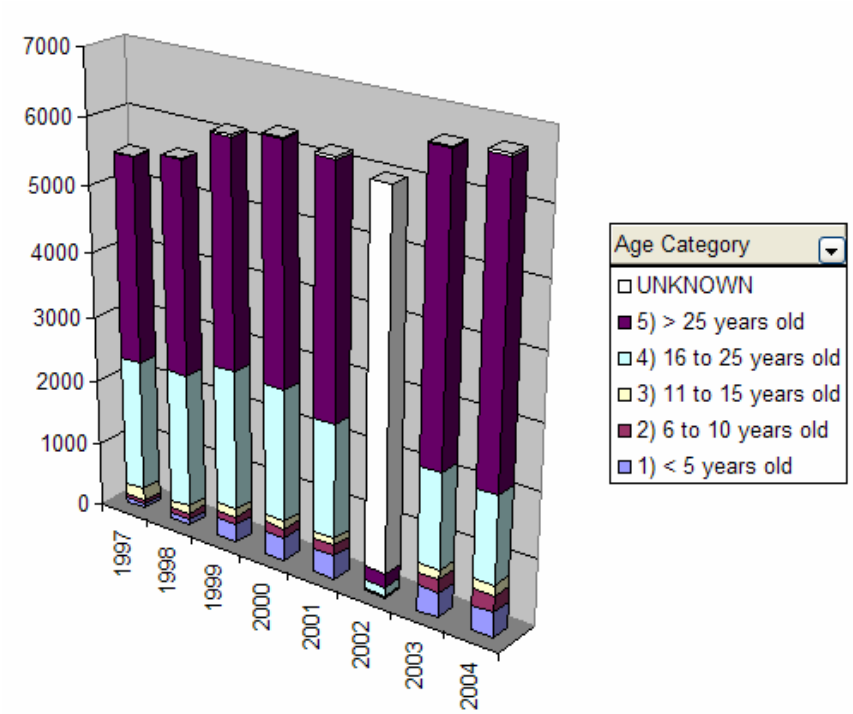


Figure 3.16 Gross Tonnage Trending Analysis (1997 – 2004)



Note: The high number of UNKNOWN ages in 2002 is attributable to the switchover of Coast Guard data systems from MSIS to MISLE. The data anomaly was corrected in subsequent years.

Figure 3.17 Age Trending Analysis (1997 – 2004)

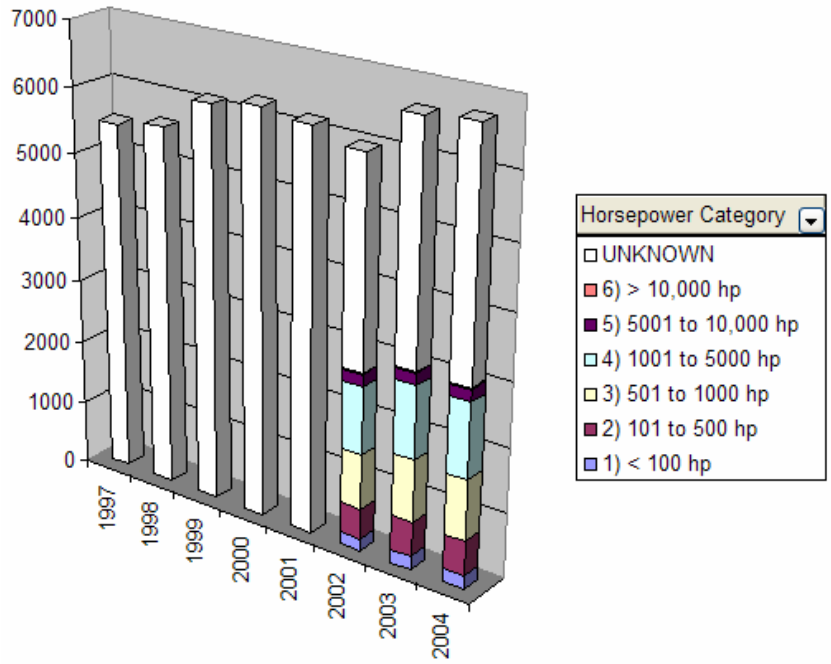


Figure 3.18 Horsepower Trending Analysis (1997 – 2004)

4. TOWING VESSEL ACCIDENT HISTORY AND RISK EVALUATION

4.1 PREVIOUS EXAMINATIONS OF TOWING VESSEL ACCIDENT HISTORY

There have been several studies of accidents and accident rates for the towing industry. This section presents two of them to allow comparisons to what was found during this project.

The specific studies described here are:

- The TSAC Towing Vessel Inspection Working Group report (TSAC, 2005)
- A report by the Coast Guard – AWO Bridge Allision Working Group (BAWG, 2003)

4.1.1 Report of the TSAC Working Group on Towing Vessel Inspection

As part of TSAC's Working Group on Towing Vessel Inspection activities, the working group formed a Risk-Based Decision-Making Subgroup to consider the casualty data and other evidence that should be reviewed to ensure that the working group's recommendations considered appropriate risk information (TSAC, 2005). The subgroup used Coast Guard casualty data for the period 1994 to 2003 as the basis for its work and provided reports to the working group on its findings and analyses throughout the working group's deliberations. A summary report of the subgroup's work is attached as Appendix C of the TSAC Working Group report. Among the subgroup's key findings (taken from the TSAC report) were:

- 89% of towing vessel casualties examined were low-severity events, 7% were medium-severity events, and 5% were high-severity events. Note: The TSAC Working Group used the Coast Guard's 6 level vessel casualty damage classes (Class 0 to 5) and divided the classes into 3 severity levels.

- Approximately 13% of towing vessel casualties were caused by external factors; that is, events, actions, or decisions that arise from outside the towing vessel. The subgroup did suggest that safety management systems could help mitigate the impact of those casualties.

- Equipment failures accounted for 33% of the medium- and high-severity incidents and about 45% of the low-severity incidents. (Note: The subgroup defined a low-severity incident as involving no personnel injuries or fatalities, pollution [if any] of 10 gallons or less, and dollar damages [if any] of $50,000 or less.)

- A detailed analysis of the medium- and high-severity equipment failure incidents showed the systems that had failures were, in descending order of frequency:

  - Propulsion
  - Cables and lines
  - Electrical
  - Hull

- Fuel
- Steering
- Deck machinery
- Navigation
- Cargo handling equipment

The leading preventive measure, where one could be identified, was maintenance standards, which the subgroup concluded could have played a role in preventing 43% of the medium- and high-severity incidents. The following vessel systems play a role in casualty mitigation:

- Firefighting
- Crew safety equipment such as chains and handrails
- Pollution prevention

- A technical analysis of the vessel systems involved in towing vessel equipment failures concluded that a comprehensive inspection regime for towing vessels should include these components:

  - The vessel owner/operator's safety management system
  - Visual examinations of the vessel on dry dock
  - Operational tests
  - Other visual examinations
  - Regular external audits of the safety management system
  - Regulatory or manufacturer's equipment standards

- Human factors accounted for 54% of the medium- and high-severity incidents and about 40% of the low-severity incidents. Of the medium and high-severity human factor incidents, 69% were related to failures in situational awareness or task performance. The leading preventive measures, where they could be identified, were planning in 25% of the cases and training in 36% of the cases. Planning and training are both important elements of a safety management system.

Section 4.3.5 of this report compares the TSAC WG results to those found in this project's review of a set of towing vessel accidents examined for causal factor information.

4.1.2 Coast Guard – AWO Bridge Allision Working Group Causal Factor Results

In 2003, the Coast Guard and AWO reported on their joint Bridge Allision Working Group activities (BAWG, 2003). The working group examined 459 bridge allisions in detail in order to investigate the causal factors behind the bridge allisions. These included 160 higher-severity allisions that had occurred, plus a random subset of all allisions for the years 1992 to 2001 (for a total of 459 events).

The BAWG report indicates that the casualty reports posed a significant challenge to the work group. Coast Guard standards for gathering casualty facts and information, especially human factors information, were incompatible with the intent of the work group to conduct a detailed analysis. In many cases, the detail necessary to determine precisely the causal factors of an allision was not available. Work group members were therefore forced to rely on their own operational experience, judgment, and knowledge of a particular waterway in interpreting the limited information in the Coast Guard casualty reports and classifying allisions by mishap type and causal factor.

With this admittedly significant caveat, the work group concluded that:

- 90% of the cases were related to human performance (78% to pilot error and 12% to other operational errors)
- Only 5% were related to mechanical problems
- For the remaining 5% there was insufficient information to assign a cause

The work group's analysis of the performance-based cases showed that the predominant causal factor in bridge allisions was decision-making error on the part of the towing vessel operator, which surfaced as a causal factor in 68% of the 435 sampled cases in which a mishap category could be identified. Significantly, this pattern was the same for cases across the range of severity classes, meaning that both high- and low-consequence cases exhibited the same causal factors.

The BAWG went on to make specific recommendations regarding the prevention of bridge allisions; however, they are not directly applicable to towing vessel risks in general, so they are not repeated here.

Section 4.3.5 of this report also compares these results to those found in the UTV industry analysis project's review of a set of towing vessel accidents examined for causal factor information.

4.2 UTV INDUSTRY ANALYSIS PROJECT RISK EVALUATION

While risk is a commonly used term (especially within the Coast Guard), it is not always well understood. Figure 4.1 describes the key elements of risk understanding.

Risk requires us to understand (1) what can go wrong, (2) how likely (frequent) it is, and (3) what are the impacts (consequences). By considering all three elements together, risk is a measure of expected loss over a period of time. Risk can be used to assess many different types of issues, with the approach varying, depending on the type of issue and the information available. For issues with limited historical information (like very severe accidents), the assessment process has to make use of the knowledge and experience of subject matter experts.

For issues that have a long history and ample data, such as UTVs, the risk elements are best described by an evaluation of the historical incident data supplemented with the expertise of industry experts. The approach of the UTV data analysis team was to use the available incident data from a risk perspective to best describe the current risk environment for UTVs.

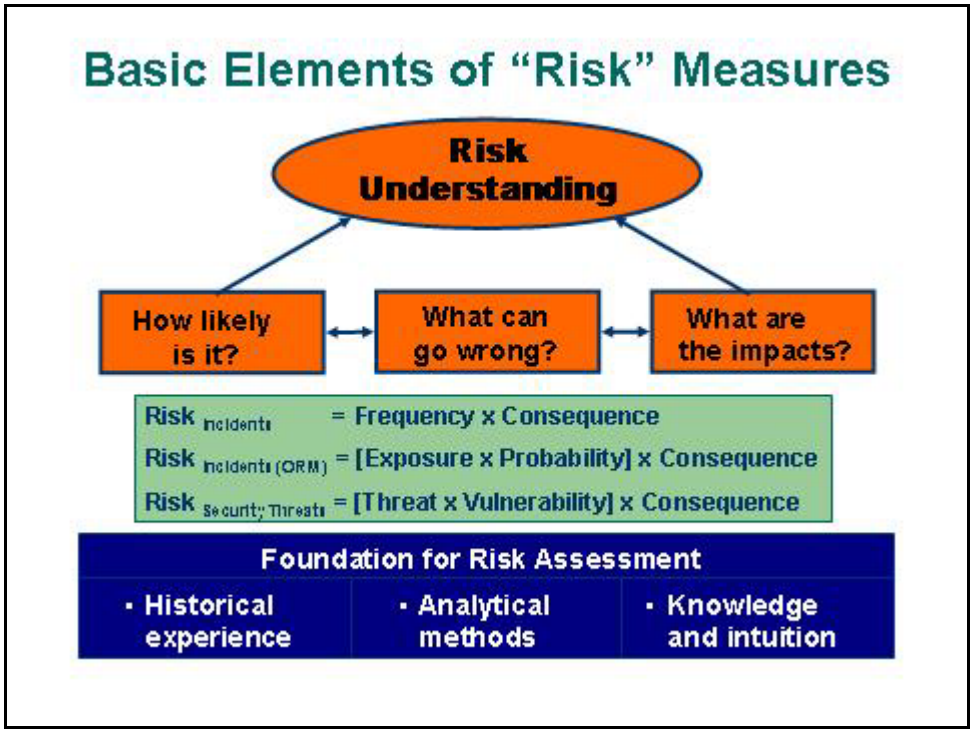


Figure 4.1 Basic Elements of Risk Measures

4.3 UTV HISTORICAL RISK PROFILE

The UTV data analysis team executed a number of tasks to translate the MISLE historical incident record into a historical risk profile. The following sections will detail the steps in the process, the results, supporting assumptions, and gaps. Throughout the process, the team worked closely with the Coast Guard's HQ G-PCA staff to execute queries from MISLE to provide the foundational elements for the data analysis.

4.3.1 Step 1 – Gather Incidents Involving UTVs

The first step in the process was to gather a record of incidents involving towing vessels. The UTV analysis team requested a query of the MISLE database for all incidents involving or potentially involving towing vessels. Because towing vessels are often associated with barges, incident reports where a towing vessel was involved can report either the towing vessel or the barge as the vessel involved. G-PCA personnel queried the MISLE database for all incidents involving towing vessels or barges for the years of 1994 through 2003. They subsequently ran the same query for 2004, and the project team appended the data to the initial data set. There were a total of 19,039 towing vessel or barge incidents investigated by the Coast Guard over the 11-year period.

Because of the reporting issue described above, many of these incidents were barge-only incidents (e.g., barge breakaways and subsequent allisions). Based on a sampling analysis of the data, about 90% of the incidents in the database involved towing vessels.

The UTV risk analysis is divided into two distinct portions: vessel casualty incidents, and nonvessel casualty incidents. For instance, if a UTV crew member was injured due to slipping and falling when an allision with a dock occurred, the incident would be a vessel casualty incident; however, if a UTV crew member was injured due to slipping and falling during normal operation of the towing vessel, the incident would be classified as a nonvessel casualty incident.

4.3.2 Step 2 – Apply Consequence Matrix to Vessel Casualty Incidents

To enable systematic comparison of the impacts of incidents, the team applied a standard Coast Guard approach used in numerous risk studies, in the form of a consequence equivalency matrix, to determine the level of cumulative consequence, across impacts on (1) people, (2) property, and (3) the environment, for each incident in the data set. This matrix (see Table 4.1) equates levels of impact across different consequence types, using a unit called the risk index number (RIN).

Each category of consequence has a different level of RIN (e.g., minor is 0.15 RIN while major is 1650 RIN); however, across impact types, each category has the same value (e.g., the substantial category for impacts on people category is the same RIN level as the substantial category for environmental).

Table 4.1 Consequence Matrix

Impact Types	CONSEQUENCE CATEGORY						
	Minimal (0 RIN)	**Minor (0.155 RIN)**	**Moderate (1.65 RIN)**	**Substantial (16.5 RIN)**	**Severe (165 RIN)**	**Major (1650 RIN)**	**Catastrophic (16,500 RIN)**
Impact on People	Injuries that are not life-threatening	1 life-threatening injury and no deaths	>1 life-threatening injury and no deaths	1 to 9 deaths/ serious injuries	10 to 99 deaths/ serious injuries	100 to 999 deaths/serious injuries	> 1,000 deaths/ serious injuries
Property Damage/ Economic Loss	<$10,000 in damage/loss	$10,000 to $299,999 in damage/loss	$300,000 to $2.9 million in damage/loss	$3 million to $29 million in damage/loss	$30 million to $299 million in damage/loss	$300 million to $3 billion in damage/loss	≥ $3 billion in damage/loss
Environmental Impact	<1.5 bbls of oil/ HAZMAT spilled	1.5 bbls < 15 bbls of oil/ HAZMAT spilled	15 bbls < 150 bbls of oil/ HAZMAT spilled	150 bbls < 1,500 bbls of oil/ HAZMAT spilled	1,500 bbls < 15,000 bbls of oil/HAZMAT spilled	15,000 bbls < 150,000 bbls of oil/HAZMAT spilled	>150,000 bbls of oil/HAZMAT spilled

The data analysis team applied this consequence matrix to the MISLE incident repository to categorize the impacts for each incident. Tables 4.2 through 4.4 illustrate the counts of incidents in each severity category for each impact type.

Table 4.2 Number of Vessel Casualty Incidents per Severity Category for Impacts on People

Year	Minor	Moderate	Substantial	Severe	Major	Catastrophic
1994	21	4	8			
1995	9	8	6			
1996	17	1	5			
1997	13	3	5			
1998	7	8	7			
1999	14	5	10			
2000	14	3	4			
2001	17	4	5			
2002	22	7	7	1		
2003	14	3	3			
2004	23	7	6			
Total	171	53	66	1	0	0

Table 4.3 Number of Vessel Casualty Incidents per Severity Category for Economic Impacts

Year	Minor	Moderate	Substantial	Severe	Major	Catastrophic
1994	323	32		1		
1995	298	24	3			
1996	287	22	6			
1997	323	28	1			
1998	259	27	1			
1999	292	15				
2000	293	21	2			
2001	305	26	2			
2002	315	32	2	1		
2003	277	30				
2004	383	33	3			
Total	3355	290	20	2	0	0

Table 4.4 Number of Vessel Casualty Incidents per Severity Category for Impacts on the Environment

Year	Minor	Moderate	Substantial	Severe	Major	Catastrophic
1994	13	11	2		1	
1995	9	5	4	1		
1996	8	12	5	1	1	
1997	10	3	2		1	
1998	11	4	1			
1999	4	8	3			
2000	6	3	1			
2001	8	2	3	1		
2002	3	3				
2003	4	5	3	2		
2004	11	10	3	1		
Total	87	66	27	6	3	0

Total Consequence

One incident can have different levels for each type of impact. To calculate the level of impact for each incident in the historical record, the team used the equivalencies implicit in the consequence matrix listed in Table 4.1. The equivalencies relate impacts on people and the environment to dollar values. The equivalencies used are:

- One death = $3 million
- One barrel of oil/HAZMAT = $20,000

With these equivalencies, the total consequences of an incident could be calculated across the three impact types. For example, a towing vessel collides with another commercial vessel, resulting in:

- One death – Substantial Category (3 RIN)
- $1 million property damage – Moderate (1 RIN)
- Spill of 10 barrels of diesel – Minor (0.2 RIN)

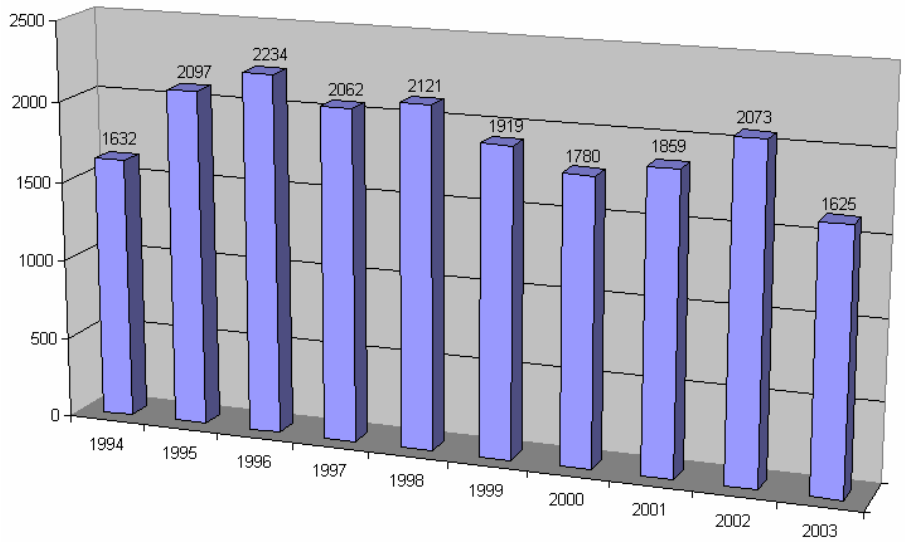
The total impact of the incident is 4.2 RIN (3 + 1 + 0.2). The team applied this approach to determine the total consequence for each of the incidents in the record. Table 4.5 illustrates the count of incidents within a range of RIN points for each year (1994 through 2004).

Table 4.5 Count of Incidents by Year and RIN Range

Year	Counts of Incidents by RIN Range				
	0 RIN	>0 to 100 RIN	100 to 1000 RIN	1000 to 2000 RIN	Total
1994	1049	407	1		**1457**
1995	1535	359			**1894**
1996	1690	344	1		**2035**
1997	1476	381		1	**1858**
1998	1643	320			**1963**
1999	1455	345			**1800**
2000	1338	340			**1678**
2001	1367	370			**1737**
2002	1361	383	1		**1745**
2003	1072	327	1		**1400**
2004	994	478			**1472**
Total	**14980**	**4054**	**4**	**1**	**19039**

4.3.3 Step 3 – Identify Vessels Involved in Incidents

In addition to the characteristics of the incidents themselves, the team was interested in the characteristics of the UTVs involved in incidents. To determine the relationships between vessel characteristics and incidents, the team requested PCA to query the MISLE database for a listing of UTVs involved in incidents. This query yielded a count of 19,402 UTVs involved in incidents. Figure 4.2 represents the count of UTVs associated to incidents for each year 1994 through 2003.



Note: Reporting policy guidance issued in 1995 increased the number of minor incidents reported; however,guidance was revised in 1999, which reduced the reporting and/or investigation of minor incidents.

Figure 4.2 Number of Vessel Casualty Incidents Related to Towing Vessels per Year (1994 – 2003)

4.3.4 Step 4 – Generate Historical Risk Profile for Vessel Characteristics

This section presents the historical risk profile for each of the primary vessel characteristics: length, tonnage, age, and horsepower. As discussed in Section 4.2, risk is a measure of expected loss over time. The application of the impact equivalencies to the historical incident data to generate a total consequence in terms of RIN (step 2) is a measure of historical loss. To determine the risk, this consequence must be divided by a time period to get an expression representing historical loss over time.

A couple of options for the time denominator are available. The analysis team could have used calendar years as a denominator in the risk equation; however, since the UTV industry was analyzed in detail, the team chose to use exposure years (i.e., total operating years for the pertinent class of vessel) as the denominator. The ideal denominator would be the exact number of hours each vessel operated; however, these data are unavailable. The exposure year approach is the best approximation using available information.

As described in earlier sections, there is a unique distribution among the categories for each characteristic. To determine exposure years for each characteristic and category, the analysis team used the WTLUS vessel registry and calculated the years of exposure over the 10 years of the incident data (1994 through 2003) for each vessel. This approach assumed that the vessel was in full-time operation over the years of the time period for which the vessel was reported in the MISLE registry.

Example:

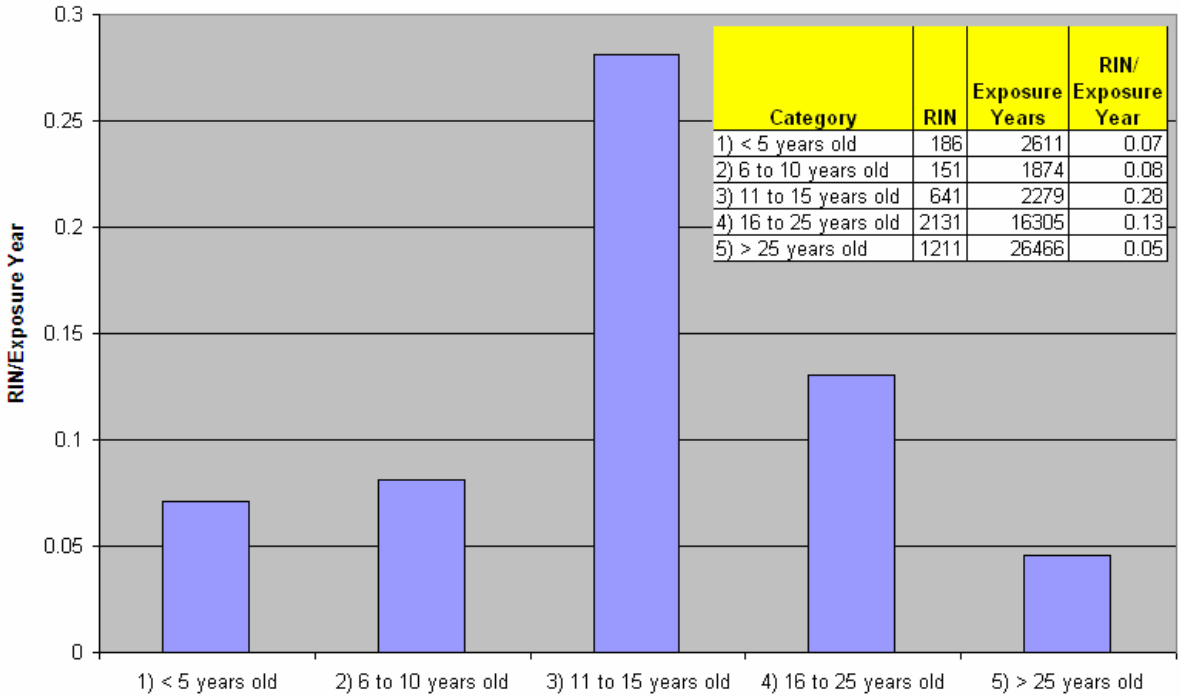
"Tugboat A" has the following characteristics:

- Built in 1963
- 75' long
- 250 tons
- 6,000 horsepower
- UNKNOWN operation
- UNKNOWN service

Based on those characteristics, 10 years of exposure (since the vessel was in operation all 10 years of interest) were added to the following categories for "Tugboat A":

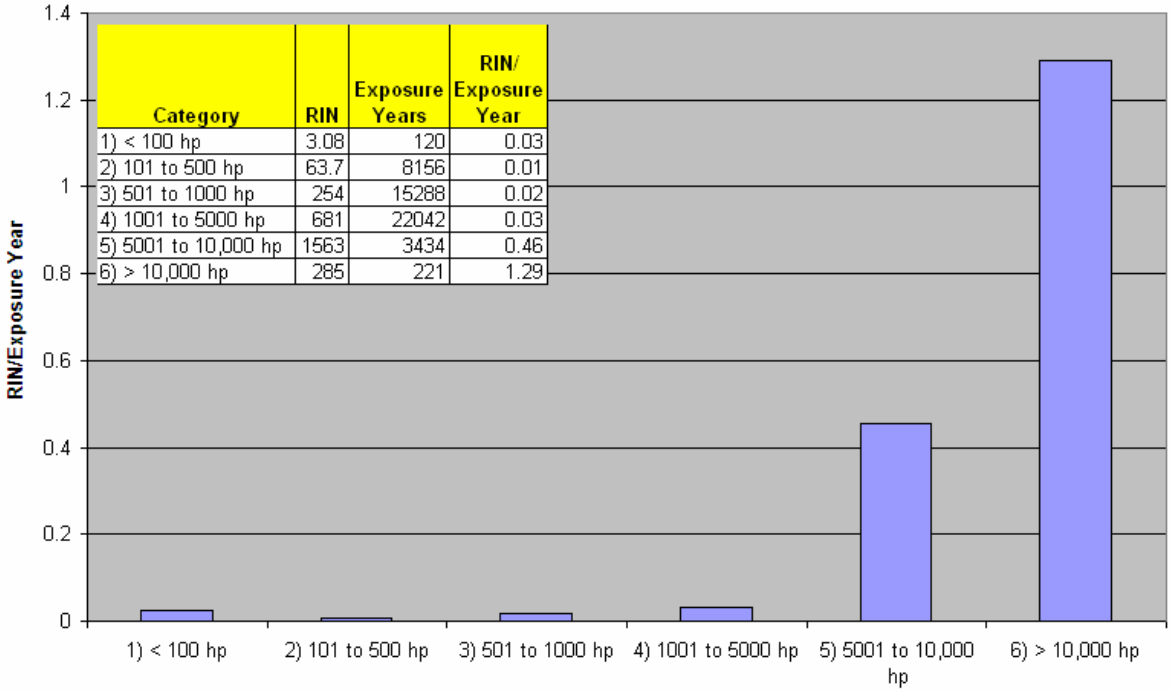
- **Age Category 5:** >25 years old
- **Length Category 3:** 65 to 79'
- **Tonnage Category 5:** 200 to 300 tons
- **Horsepower Category 5:** 5,000 to 10,000 horsepower

With this, the team calculated an exposure-year denominator for each characteristic category. Then, the total consequence for the characteristic category was divided by the corresponding exposure year to determine the risk (RIN/exposure year) for the characteristic category. Figures 4.3 through 4.6 present the historical risk profiles for each of the primary characteristics. The relative size of the bars in each graph represent the level of risk per exposure year for each category of vessel.



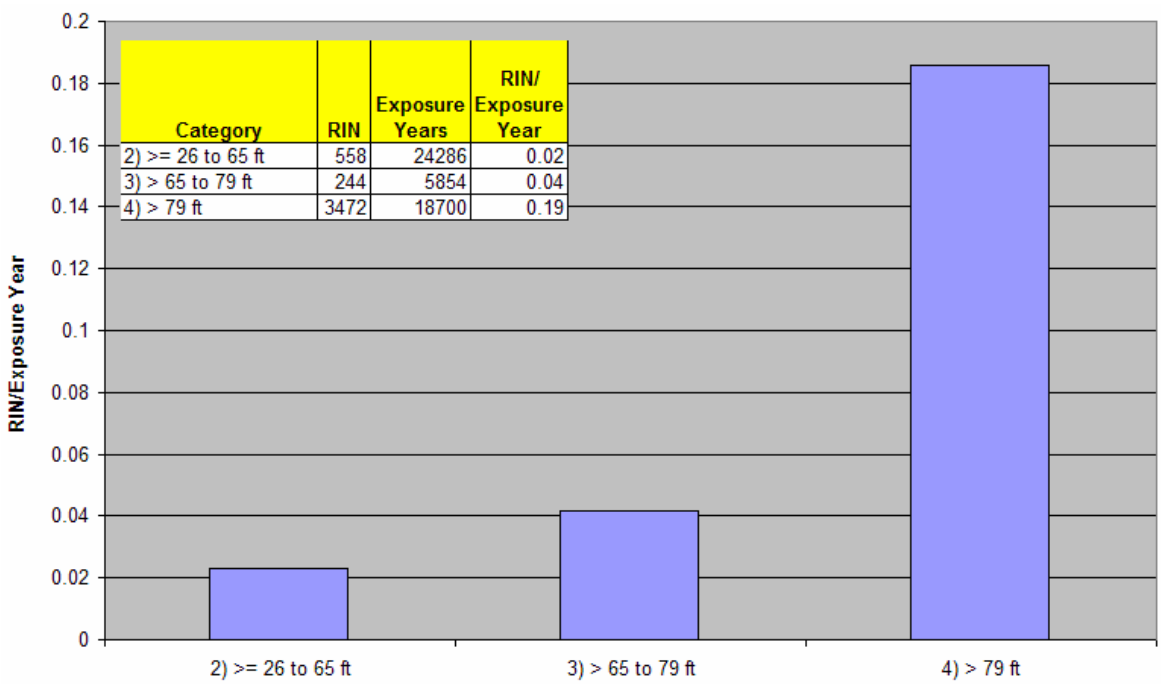
Category	RIN	Exposure Years	RIN/ Exposure Year
1) < 5 years old	186	2611	0.07
2) 6 to 10 years old	151	1874	0.08
3) 11 to 15 years old	641	2279	0.28
4) 16 to 25 years old	2131	16305	0.13
5) > 25 years old	1211	26466	0.05

Figure 4.3 Risk by Age Categories (RIN/Exposure Year)



Category	RIN	Exposure Years	RIN/ Exposure Year
1) < 100 hp	3.08	120	0.03
2) 101 to 500 hp	63.7	8156	0.01
3) 501 to 1000 hp	254	15288	0.02
4) 1001 to 5000 hp	681	22042	0.03
5) 5001 to 10,000 hp	1563	3434	0.46
6) > 10,000 hp	285	221	1.29

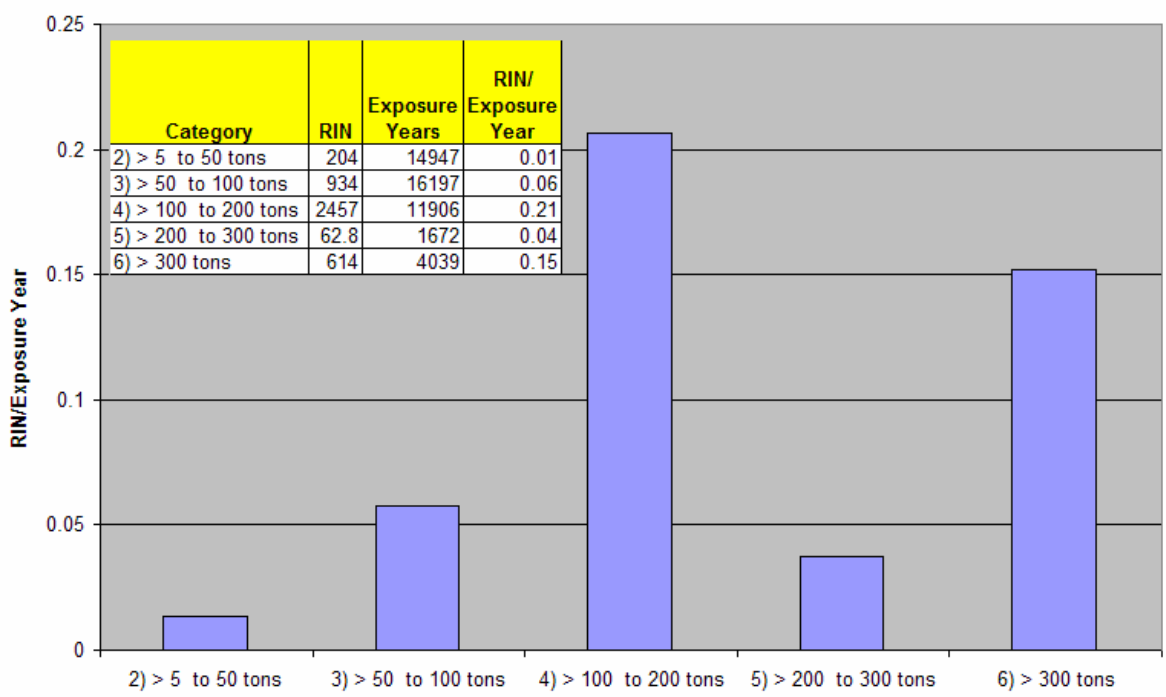
Figure 4.4 Risk by Horsepower Categories (RIN/Exposure Year)



Category	RIN	Exposure Years	RIN/ Exposure Year
2) >= 26 to 65 ft	558	24286	0.02
3) > 65 to 79 ft	244	5854	0.04
4) > 79 ft	3472	18700	0.19

Note: Since small vessels (i.e., less than 5 net tons) are not required to register with the Coast Guard, they are often only entered into the MISLE vessel registry when involved in an incident, resulting in an underreporting of exposure years for smaller vessels and a skewed risk profile. The <26 ft vessel category was removed from the risk profile for this reason.

Figure 4.5 Risk by Length Categories (RIN/Exposure Year)



Category	RIN	Exposure Years	RIN/ Exposure Year
2) > 5 to 50 tons	204	14947	0.01
3) > 50 to 100 tons	934	16197	0.06
4) > 100 to 200 tons	2457	11906	0.21
5) > 200 to 300 tons	62.8	1672	0.04
6) > 300 tons	614	4039	0.15

Note: Since smaller vessels are not required to register with the Coast Guard, they are often only entered into the MISILE registry when involved in an incident, resulting in an underreporting of exposure years for smaller vessels and a skewed risk profile. The <5 ton vessel category was removed from the risk profile for this reason.

Figure 4.6 Risk by Net Tonnage Categories (RIN/Exposure Year)

Historical Vessel Casualty Risk Profile Conclusions

By reviewing the historical risk profile for each characteristic, a number of conclusions can be drawn. As mentioned in the UTV industry analysis section, smaller towing vessels are underrepresented in the vessel registries (both MISLE and WTLUS); therefore, the risk presented by smaller vessels (e.g., < 5 ton, < 26') is overestimated because the denominator (exposure years) is too small. Towing vessels less than 5 tons are not required to be documented; therefore, they are often only recorded in the MISLE registry when they are involved in an incident.

If the smaller vessels are ignored, the dominant risks lie with the largest and most powerful vessels (based on horsepower and length). This is intuitive because these vessels inherently have the greatest consequence potential because they move larger loads. This represents more potential to damage other vessels or infrastructure in collision/allison events and the potential for larger spills of cargo.

4.3.5 Step 5 – Causal Factor Analysis for High Consequence and Sampled Low Consequence Vessel Casualty Incidents

The previous sections have described the steps taken by the analysis team to answer the historical who, what, and when questions for incidents involving towing vessels. This section will explore why these incidents are occurring. As mentioned earlier, over 19,000 vessel casualty incidents involving towing vessels and/or barges occurred between the years of 1994 and 2004.

In this step, the project team restricted the analysis to reported loss events where the consequence (i.e., safety, economic, or environmental impact) occurred in an event that was initiated by a vessel casualty (e.g., a collision, allision, grounding). Therefore all of the results in Step 5 are only related to vessel casualties. However, in many cases safety consequences can result from events that do not involve a vessel casualty. For that reason, in Step 6, the project team went on to examine safety impacts for events that did not in a vessel casualty.

The team did not have time to perform a detailed review of the causes of each of these incidents. Instead, the team reviewed the reports and case files (MISLE and NTSB, when available) for the highest consequence incidents (i.e., incidents with >3 RIN). In Step 2 the team had identified what were the highest consequence incidents that happened between 1994 and 2004, and the team reviewed case files for the 132 highest consequence incidents. The purpose of this review was to identify the primary causal factors for these high consequence incidents. In addition to the high consequence incidents, the team sampled 150 lower consequence incidents and performed the same causal factor analysis to see if the factors contributing to the lower consequence incidents were similar.

In addition to determining the causal factors associated with the incidents, review of the individual case files offered an opportunity for the team to identify some of the vessel characteristics that were often unspecified in the MISLE and/or WTLUS vessel registries. Specifically, the team identified the vessel's service and where it was operating at the time of the incident.

The team used the following categorization approach to capture information about the incident and the vessel involved in the incident. Primary causal factors were divided into four main categories. For each main category, there were a number of subfactors (see Table 4.6).

The team also categorized the vessel's service (Table 4.7) and where it was operating at the time of the incident (Table 4.8).

Table 4.6 Causal Factors/Subfactor Categories

Human Factors
Situational Awareness
Voyage Planning
Helmsman Error
Construction Accidents
Loss of Stability/Overload
Ballast Control Failure
Other – Describe
Equipment Failure
Cables and Lines
Generator
Hull
Navigation Equipment
Propulsion
Pumps
Steering
Communication
Other – Describe
Personnel Injury
Medical
Overboard
Impact Injury
Strain
Other – Describe
Other

Table 4.7 Vessel Service Categories

Vessel Service
Assistance Towing
Barge Fleeting
Coastal Towing
Other – Describe
River Towing
Ship Assist
Unknown
Work Site

Table 4.8 Vessel Operation Categories

Vessel Operation
Coastwise NMT 20 NM fm shore
Foreign
Great Lakes
Lakes, Bays, and Sounds
Oceans
Other – Describe
Other River
Western Rivers

As discussed earlier in Section 4.1, some of incidents in the incident repository involve barge-only incidents; however, these cannot be separated from incidents involving barges and towing vessels without a review of the case file. During the causal factor analysis, the team flagged all of the incidents that did not involve towing vessels. Similarly, some incidents were clearly not the fault of the towing vessel. The team also flagged all of the incidents where other parties were at fault for the incident.

Figure 4.7 plots the distribution of the 132 high consequence incidents geographically on a map of the United States. The color, ranging from yellow to dark orange, and size of the dots correspond to the level of consequence (RIN) associated with the incident.

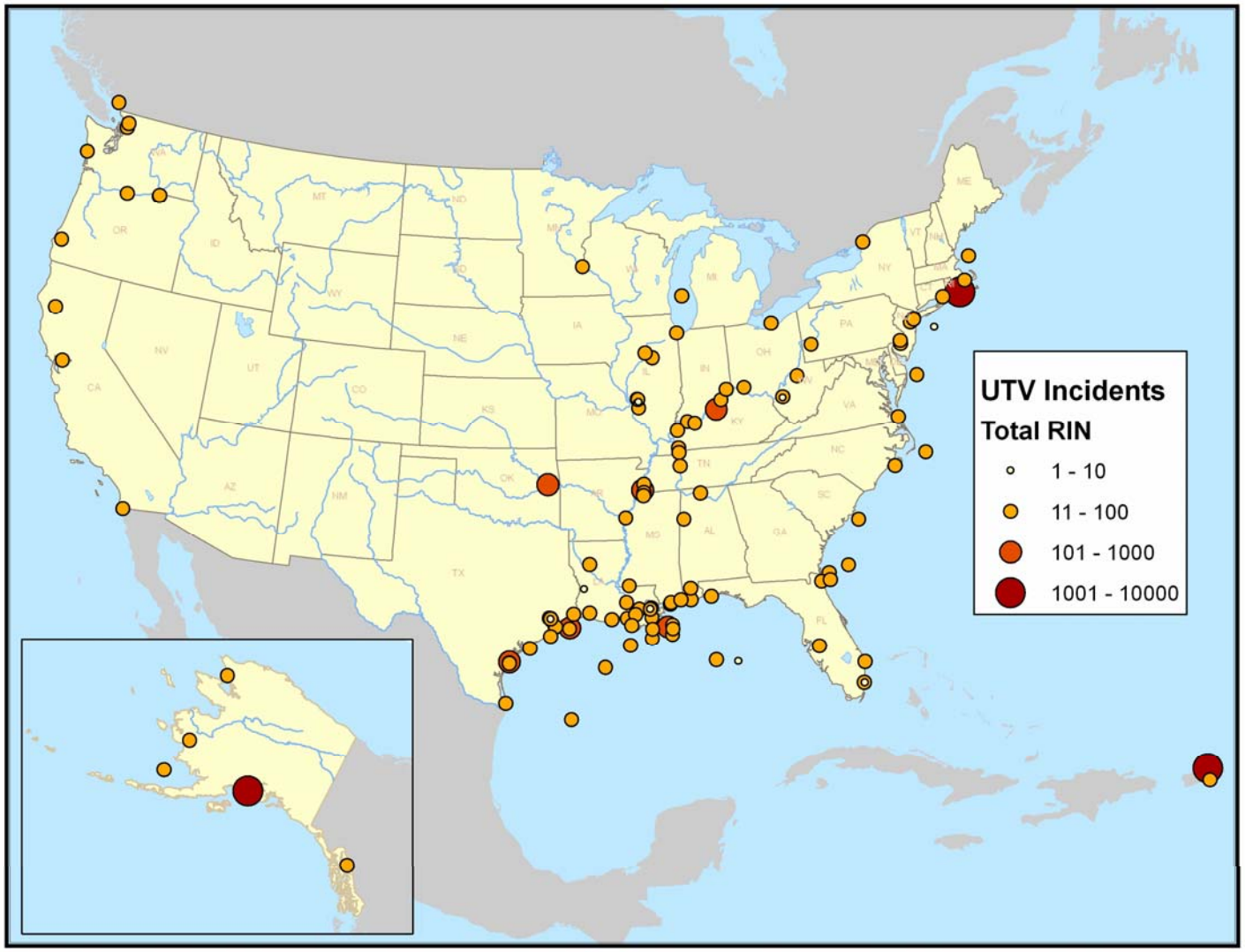


Figure 4.7 Geographic Distribution of High Consequence Incidents

Figures 4.8 through 4.16 illustrate the percentage of the 132 high consequence vessel casualty incidents and the sample of 150 low consequence vessel casualty incidents that were caused by different factors and subfactors. These results are consistent with those of previous reviews by the TSAC Towing Vessel Inspection Working Group (discussed in Section 4.1.1) and the Bridge Allision Working Group.

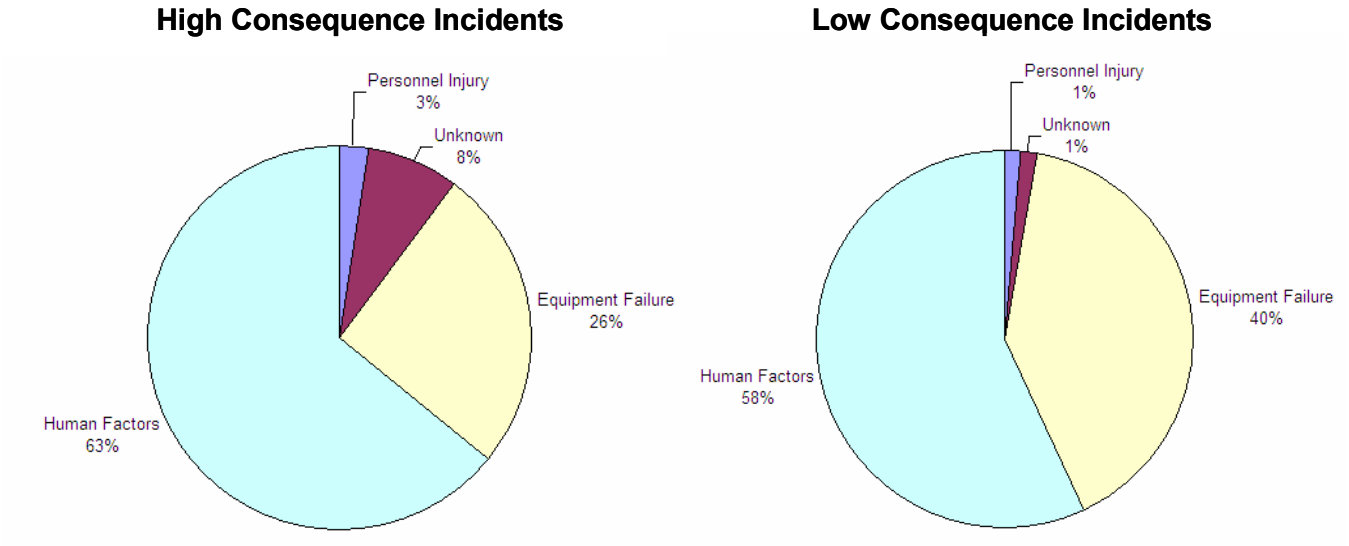


Figure 4.8 Percent of Incidents by Causal Factors

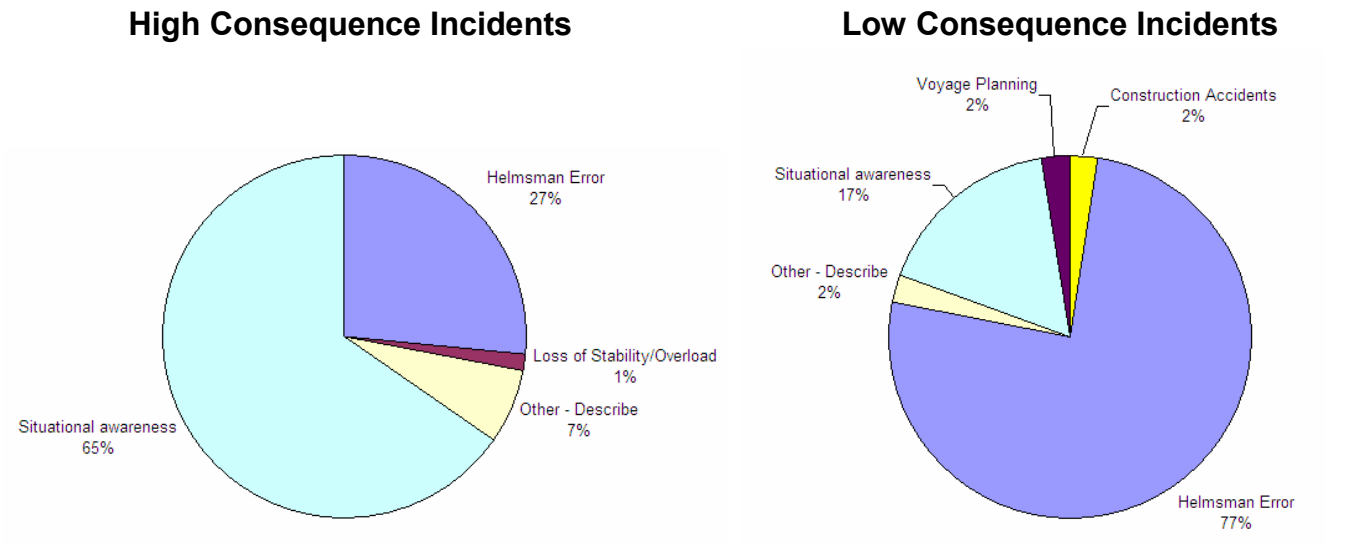


Figure 4.9 Percent of Human Factor Incidents by Subfactors

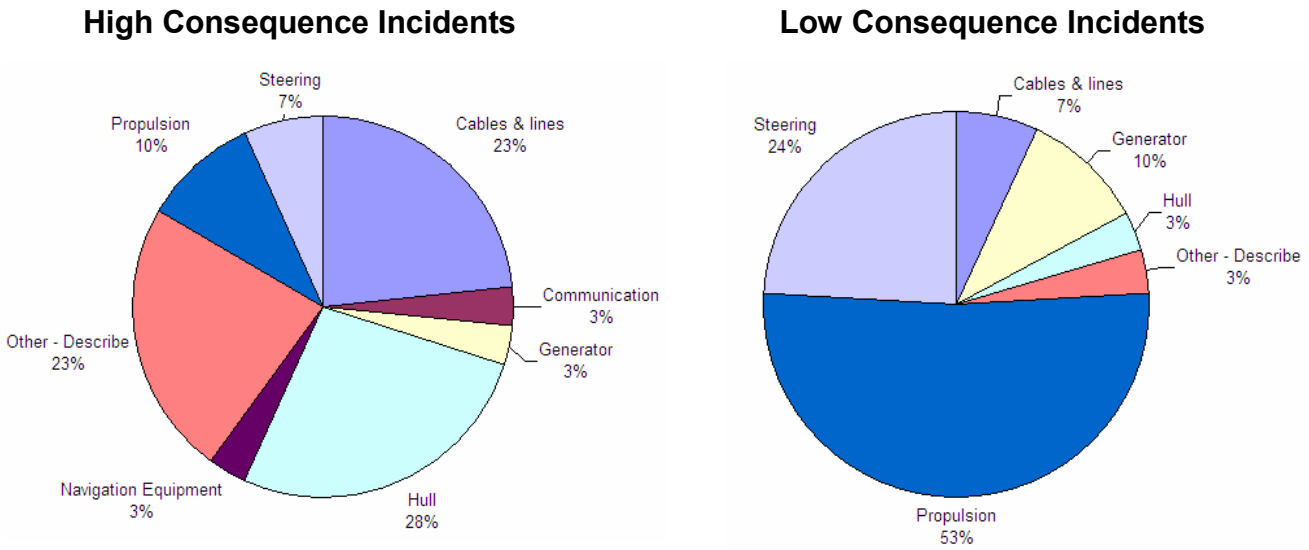


Figure 4.10 Percent of Equipment Failure Incidents by Subfactors

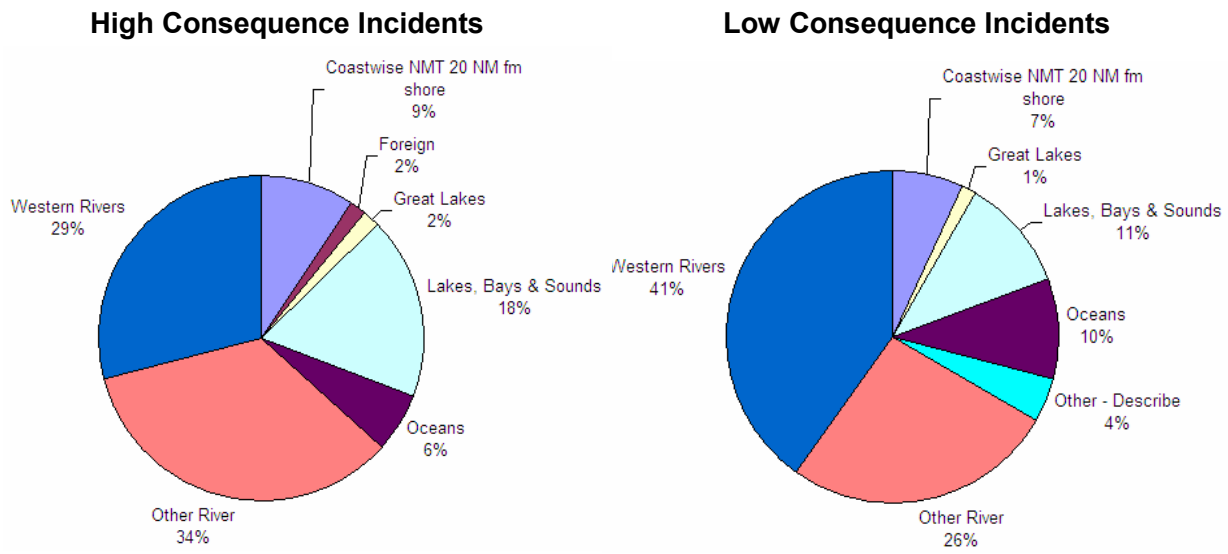


Figure 4.11 Percent of Incidents by Operation

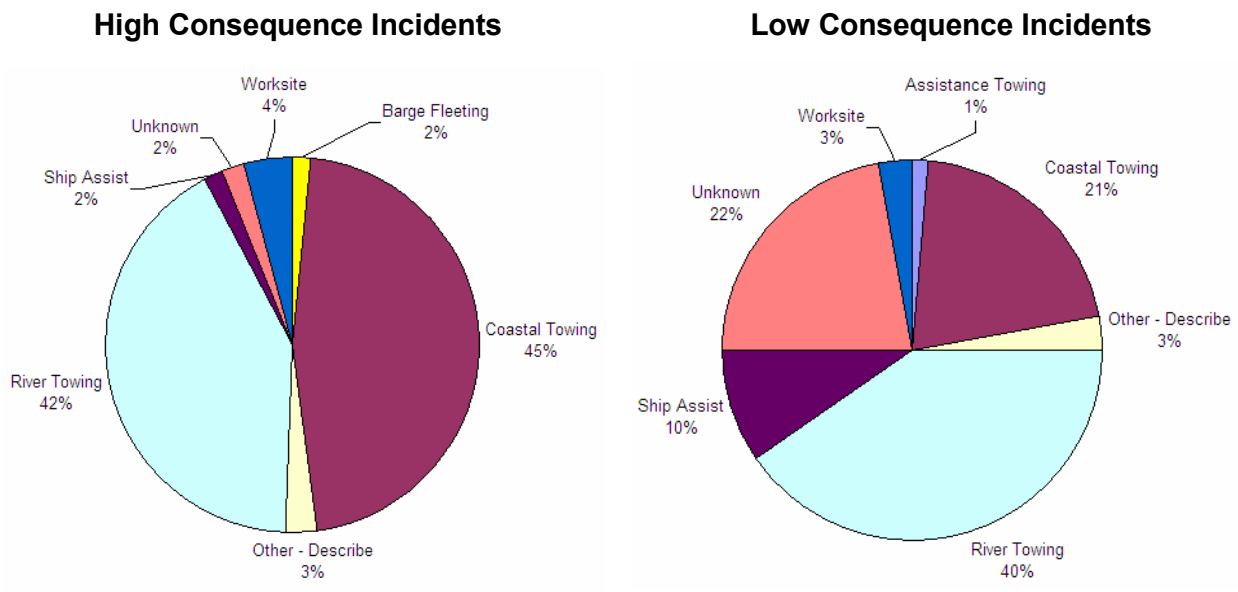


Figure 4.12 Percent of Incidents by Service

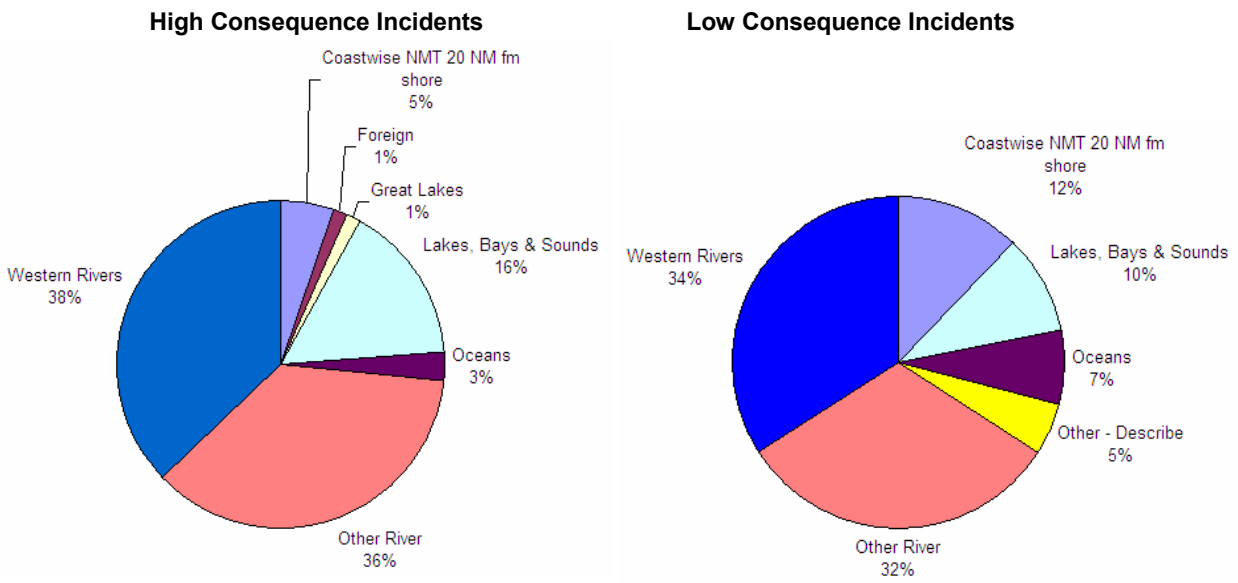


Figure 4.13 Percent of Human Factor Incidents by Operation

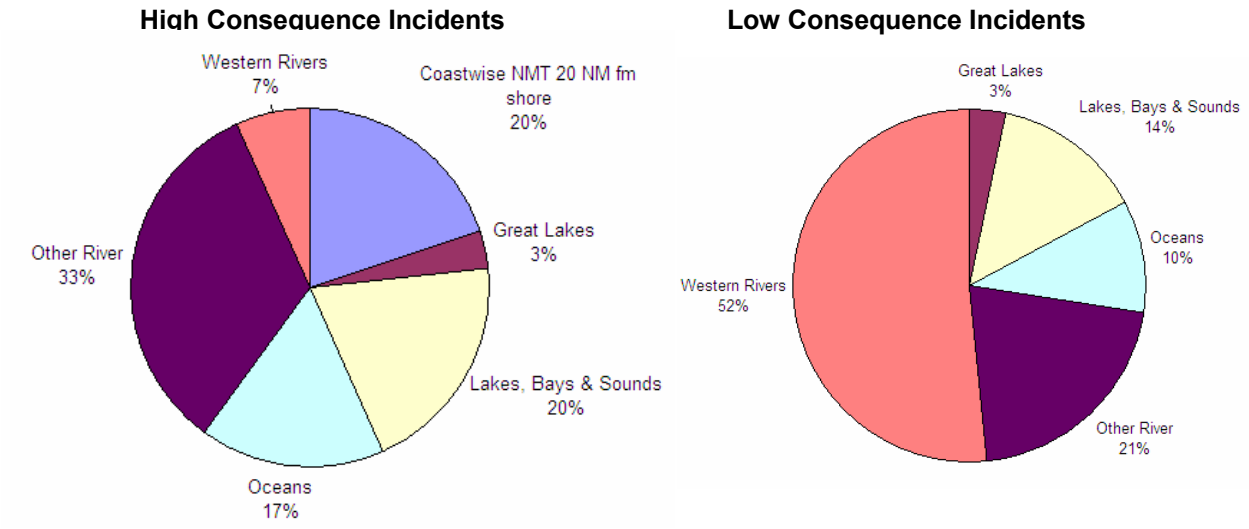


Figure 4.14 Percent of Equipment Failure Incidents by Operation

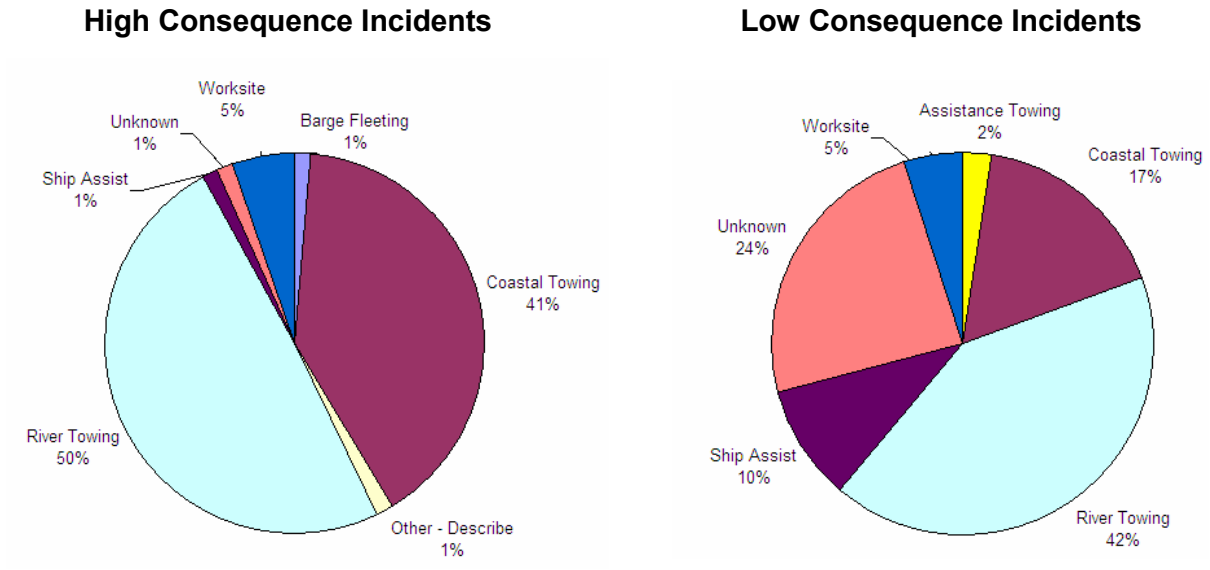


Figure 4.15 Percent of Human Factor Incidents by Service

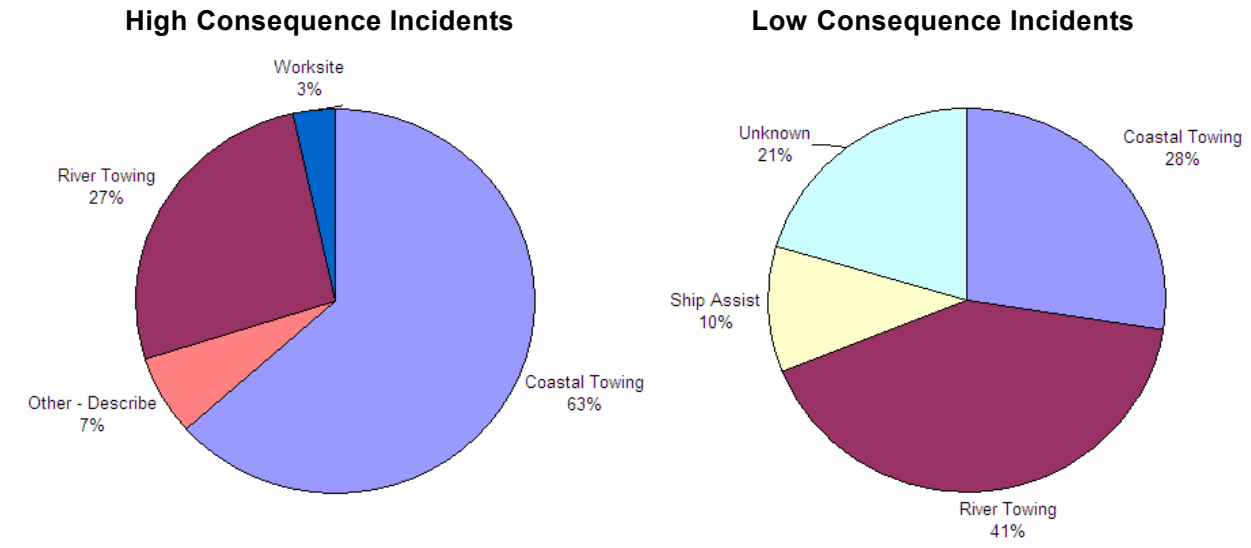


Figure 4.16 Percent of Equipment Failure Incidents by Service

Causal Factor Analysis Conclusions for Vessel Casualty Incidents

Based on review of the incident case files, human factors are the cause of incidents the majority of the time (58 to 63%), with lack of situational awareness and helmsman errors making up the dominant subfactors in this group. However, equipment failures should not be ignored because they cause 26 to 40% of the events.

These results, along with those from previous studies (discussed in Sections 4.1.1 and 4.1.2), point out the importance of activities that help reduce human factors-related incidents, such as:

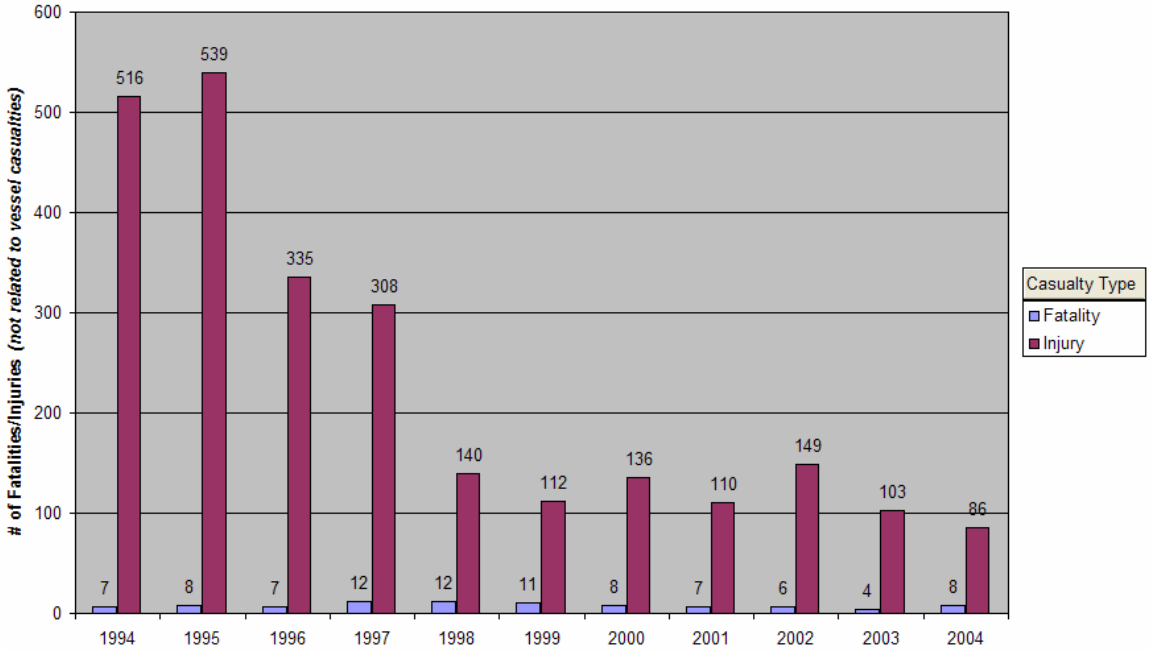
- Effective safety policies and procedures
- Crew training
- Voyage planning
- Adequate rest periods and consideration of crew endurance issues

These are just a few of the types of activities that need to be addressed in a towing vessel safety management system. Although adequate, properly maintained hardware is a necessary condition for safe operation, equipment improvements alone cannot address what has consistently been demonstrated as the key to significant improvements in the towing industry. A focus on "human factors" is necessary to help prevent these types of incidents. Human factors does not mean more pressure on and enforcement action related to crew members. It means taking the steps to ensure that the Coast Guard, the industry, and individual employers contribute to providing an environment aboard towing vessels that helps reduce the likelihood of errors.

For the high consequence incidents, the equipment failure subfactors are spread over many systems, with hull failures and cables/line failure providing the most significant percentages. For the low consequence incidents, propulsion system failure is the dominant subfactor, resulting in a high percentage of minor collisions/allision incidents.

4.3.6 Step 6 – Generate Historical Risk Profile for Nonvessel Casualties by Vessel Characteristic

The goal of this section is to generate the historical risk profile for those incidents not involving vessel casualties to gain additional understanding of the frequency with which injuries and fatalities have occurred in the towing vessel industry. Figure 4.17 illustrates the number of injuries and fatalities that occurred from 1994 to 2004 in the towing vessel industry that were not related to vessel casualties (e.g., collisions, groundings)



Note: Incident reporting guidance in 1995 decreased the number of minor injury reports.

Figure 4.17 Injury vs. Fatality Trending Analysis (1994 – 2004)

The causes of nonvessel casualty injuries and fatalities are varied, and the next section documents the causes of these incidents. The MISLE incident repository separates the causes into three main categories (contact, noncontact, overexertion) with each having a number of subcategories. The following figures (Figures 4.18 through 4.24) will identify each cause and the percentage of injuries/fatalities caused by it.

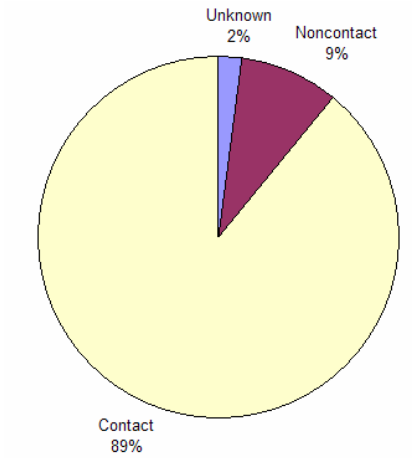


Figure 4.18 Fatalities by Accident Category (90 Fatalities) (1994 – 2004)

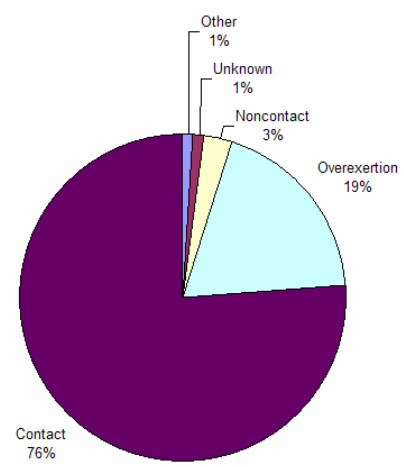


Figure 4.19 Injuries by Accident Category (2,534 Injuries) (1994 – 2004)

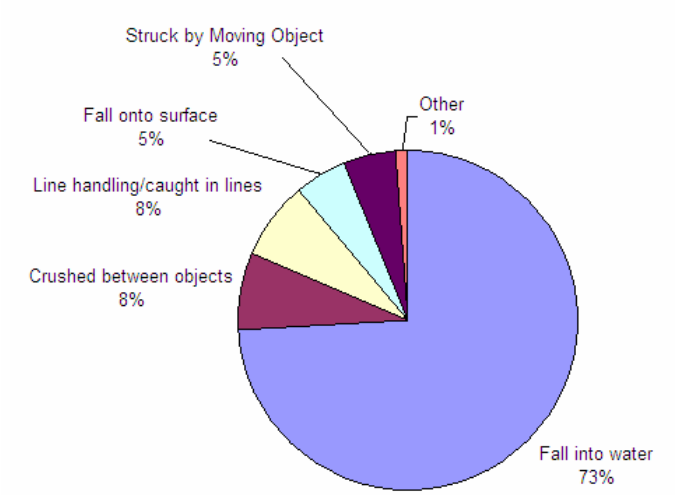


Figure 4.20 Contact Fatalities by Accident Type (80 Fatalities) (1994 – 2004)

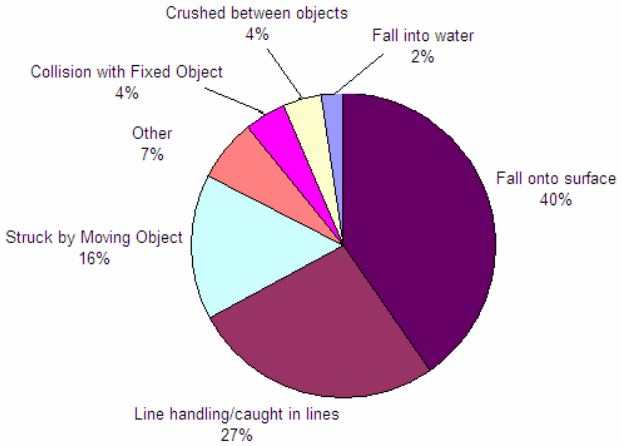


Figure 4.21 Contact Injuries by Accident Type (1,935 Injuries) (1994 – 2004)

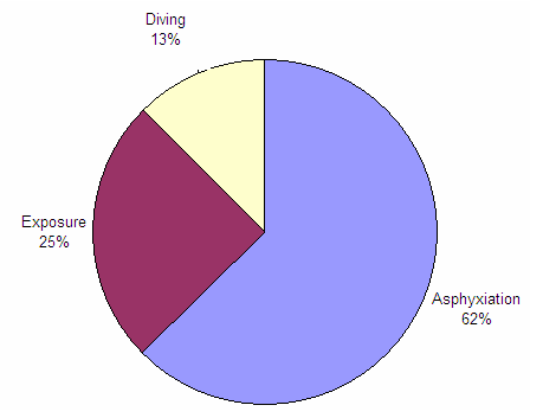


Figure 4.22 Noncontact Fatalities by Accident Type (8 Fatalities) (1994 – 2004)

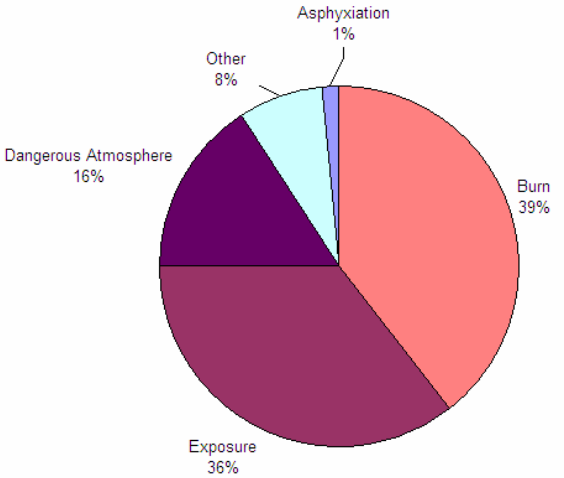


Figure 4.23 Noncontact Injuries by Accident Type (69 Injuries) (1994 – 2004)

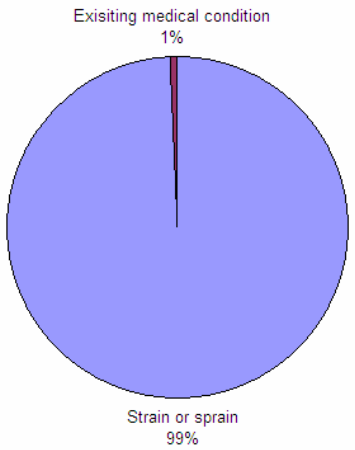


Figure 4.24 Overexertion Injuries by Accident Type (481 Injuries) (1994 – 2004)

The effects of injuries can vary widely from minor cuts/bruises to life-threatening wounds. Until recently, MISLE investigators were not required to capture the severity of injuries. Since 2005, investigators have begun to consistently categorize injury severity within the MISLE data repository. Table 4.9 shows the severity categories used in the MISLE incident data repository.

Based on this characterization, Table 4.9 presents the counts of nonvessel casualty injuries by accident type and severity category from July 2005 to June 2006.

Table 4.9 Injury Severity Counts (July 2005 to June 2006)

Accident Type	Minor	Moderate	Serious	Severe	Total
Contact Injury – Fall onto Surface	12	15	6	1	**34**
Contact Injury – Line Handling/Caught in Lines	2	6	5	2	**15**
Contact Injury – Struck by Moving Object	3	5	4		**12**
Contact Injury – Crushed Between Objects	1	6	2	1	**10**
Contact Injury – Other	2	4			**6**
Contact Injury – Collision with Fixed Object	1	4			**5**
Contact Injury – Fall into Water				1	**1**
Overexertion Injury – Strain or Sprain	7	12	1		**20**
Noncontact Injury – Other	3	2			**5**
Noncontact Injury – Burn	1				**1**
Unknown Injury Type	2	3			**5**
Other Injury Type	1	1			**2**
Total	**35**	**58**	**18**	**5**	**116**

Note: Injury severities were not actively tracked until July

4.3.7 Step 7 – Generate Historical Risk Profile for Nonvessel Casualties by Vessel Characteristic

Section 4.3.4 characterized the historical risk profiles for vessel casualty incidents based on four primary vessel characteristics: age, horsepower, net tonnage, and length. The same approach of characterizing risk using consequence in terms of RIN and vessel exposure years was taken to view

the risk from nonvessel casualties. Because these incidents only concerned people, not property or the environment, the "Impact on People" (see consequence matrix, Table 4.1) impact category was the only type of impact considered.

As noted in Table 4.1, the consequence matrix does not give any weight (0 RIN) to minor injuries. Only injuries classified as life-threatening are given any RIN weight. Since the vast majority of the incidents occurring over the selected period (1994 to 2004) do not characterize the severity of the incident, the analysis team was forced to estimate the percentage of towing vessel injuries that were life-threatening. To determine a percentage, the team used the recent injury severity data (July 2005 to June 2006) ratio as a reasonable estimate. Roughly 20% of injuries occurring over that period were categorized as "Serious" or "Severe." Using the 20% estimate, each injury was given a RIN weight of 0.6 RIN. This was calculated using the following equation:

$$3.0 \text{ RIN} * 20\% + 0 \text{ RIN} * 80\% = 0.6 \text{ RIN}$$

The analysis team requested a query from G-PCA, which associated the incident information with the characteristics of the towing vessel involved. This enabled the analysis team to calculate a total RIN value for each of the vessel characteristics/categories. Since the data's time period is the same as the vessel casualty data, the same vessel characteristic exposure years were used as the denominator to calculate the historical risk profile for each vessel characteristic. Figures 4.25 through 4.28 illustrate the nonvessel casualty historical risk profile.

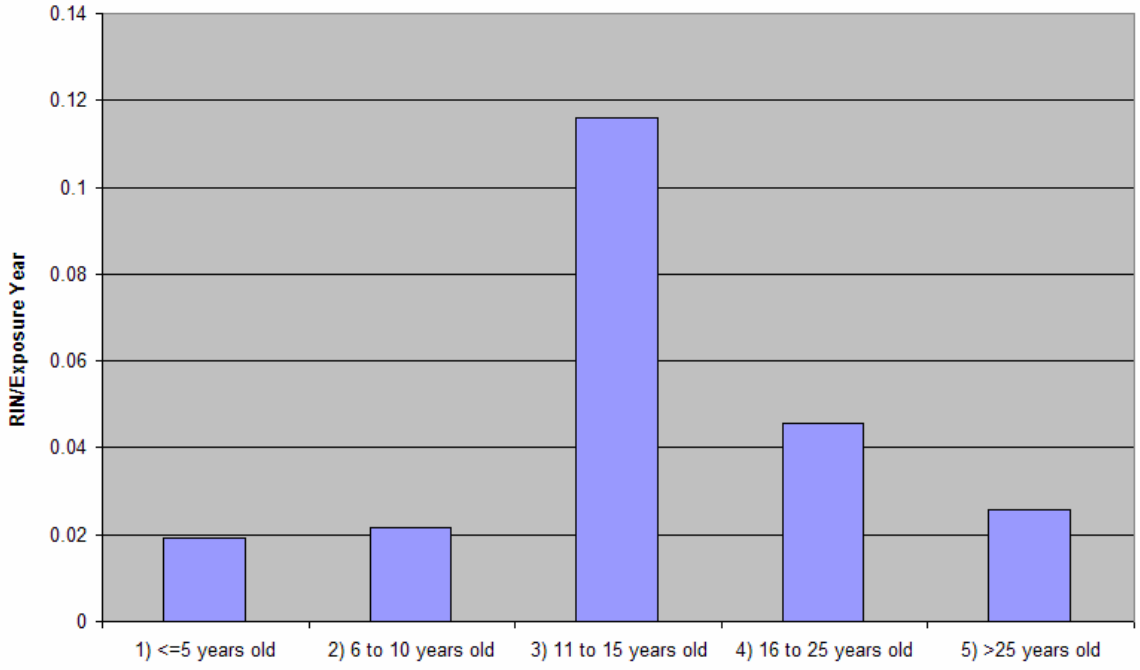


Figure 4.25 Nonvessel Casualty Risk by Age Categories (RIN/Exposure Year) (1994 – 2004)

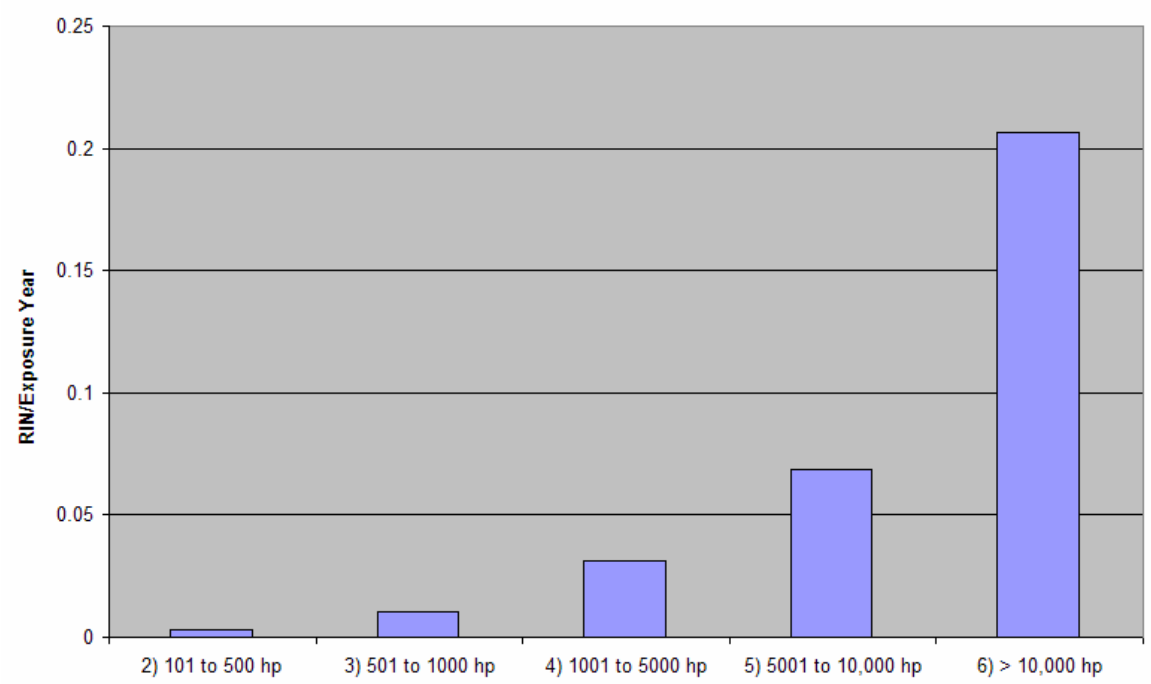
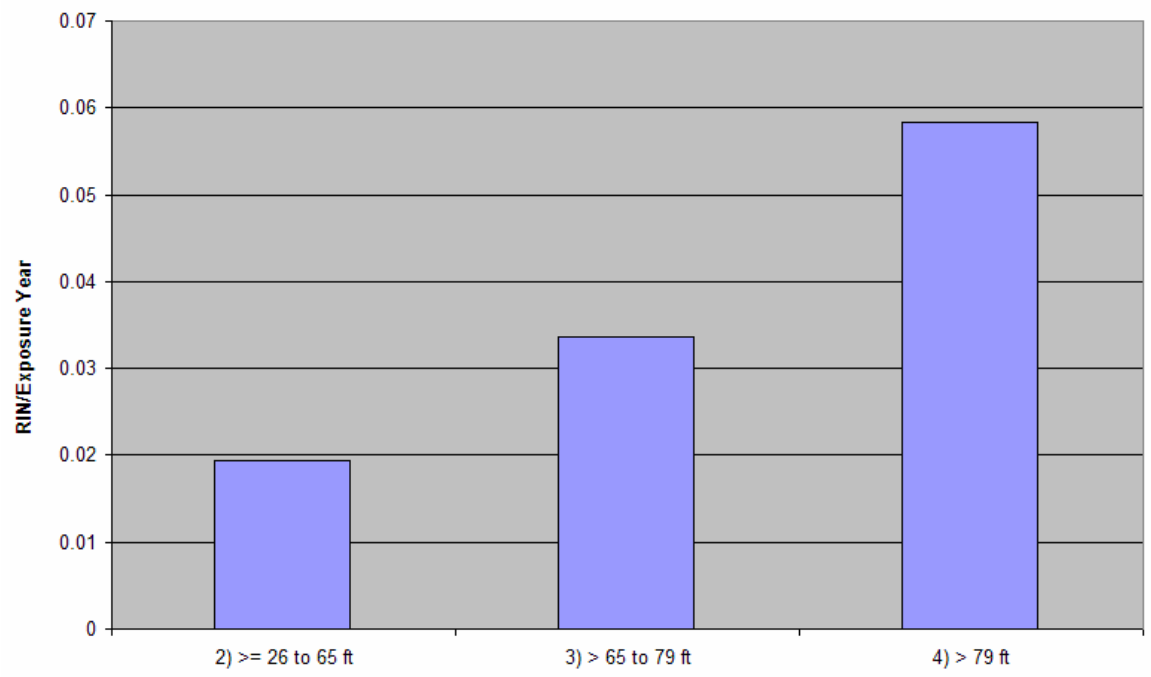
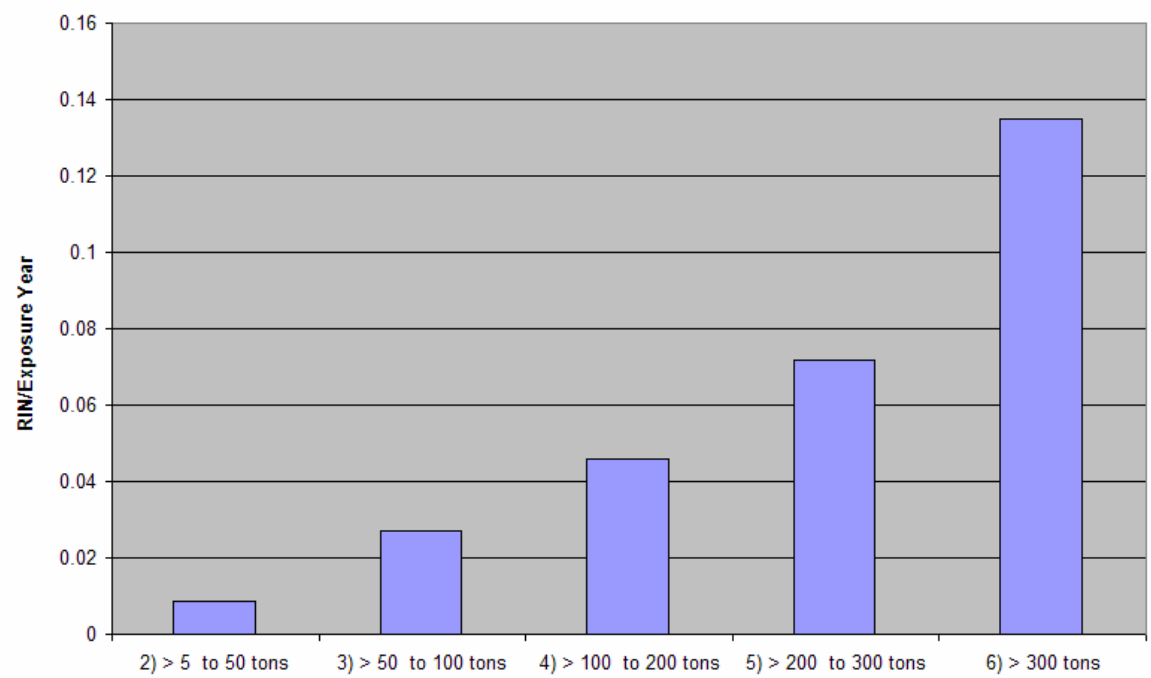


Figure 4.26 Nonvessel Casualty Risk by Horsepower Categories (RIN/Exposure Year) (1994 – 2004)



Note: Since smaller vessels are not required to register with the Coast Guard, they are often only entered when involved in an incident, resulting in an underreporting of exposure years for smaller vessels and a skewed risk profile. The <26' vessel category was removed from the risk profile for this reason.

Figure 4.27 Nonvessel Casualty Risk by Length Categories (RIN/Exposure Year) (1994 – 2004)



Note: Since smaller vessels are not required to register with the Coast Guard, they are often only entered when involved in an incident, resulting in an underreporting of exposure years for smaller vessels and a skewed risk profile. The <5 ton vessel category was removed from the risk profile for this reason.

Figure 4.28 Nonvessel Casualty Risk by Net Tonnage Categories (RIN/Exposure Year) (1994 – 2004)

Historical Nonvessel Casualty Risk Profile Conclusions

As with the vessel casualty risk profile, the larger vessels present a greater risk per exposure year. This is due to their generally larger crews, which represent more working hours per vessel when compared to the smaller vessels.

Upon review of the historical risk profile for each characteristic, a number of conclusions can be drawn. As mentioned in the UTV industry analysis section, smaller towing vessels are underrepresented in the vessel registries (both MISLE and WTLUS); therefore, the risk presented by smaller vessels (e.g., < 5 ton, < 26') is overestimated because the denominator (exposure years) is too small. Towing vessels less than 5 tons are not required to be documented; therefore, they are often only recorded in the MISLE registry when they are involved in an incident.

5. ANALYSIS OF ECONOMIC IMPACTS OF TOWING VESSEL INSPECTION

As part of this project, the Coast Guard requested that the project team develop economic inputs to help it assess the economic impact that potential regulatory requirements might cause. However, the Coast Guard did not release a set of proposed regulatory alternatives, so the team was unable to provide a specific regulatory impact analysis.

In the absence of specific proposed regulatory requirements, the Coast Guard, ABS Consulting, and Abt Associates developed burden categories (i.e., areas of potential future economic costs associated with an inspection regime for UTVs) by reviewing the recommendations of the Report of the Working Group (RWG) on Towing Vessel Inspection of the Towing Safety Advisory Committee (TSAC).

The burden categories the team developed are based on those recommended in the TSAC RWG, and they consider potential onboard vessel equipment standards, drydocking requirements, and safety management requirements that are not already required by law. As a result, the assessment provides data that can be used to estimate the potential compliance costs that may be incurred by individual UTVs as a result of rulemaking.

The report from Abt Associates is presented as Appendix A to this report.

6. PROJECT CONCLUSIONS AND RECOMMENDATIONS

Based on the activities performed in this project, the project team offers the following conclusions and recommendations. Obviously, there are other missions and constraints on the Coast Guard in addition to those that were examined in this study; therefore, the Coast Guard will need to evaluate the recommendations in light of its overall responsibilities.

6.1 CONCLUSIONS

- Resource issues for the Coast Guard and limited potential for involvement in high consequence events suggest exemption status for "workboats" and "assistance towing vessels"

  Volume 1 of the WTLUS indicates that there were nearly 9,000 self-propelled U.S.-flag vessels operating or available for operation in 2004 (not including floating equipment used for construction, fishing vessels, and recreational craft). Of these vessels, more than 5,000 are towing vessels, with the vast majority being currently uninspected vessels. The remainder of the 9,000 vessels are in cargo, passenger, offshore support, ferry, and tanker services and are generally already inspected vessels, along with a large number of barges currently subject to inspection. The 5,100 to 5,200 towing vessels do not include workboats less that 26 ft in length or towing assistance vessels. However, simply adding the 5,100 to 5,200 as inspected vessels represents a large increase in vessel inspection activities that will be a challenge for the Coast Guard. Choosing not to also include workboats and towing assistance vessels in the proposed regulations (as recommended by TSAC) is one way to help limit the size of the task facing the Coast Guard (see Recommendation 6.2.1). In the case of towing assistance vessels, it would also eliminate an economic impact on a group of individuals and small companies that would otherwise bear the largest cost burden relative to their current cost of operation.

- Risk information from the MISLE accident database indicates that historical accident risks are dominated by large horsepower vessels

  After adjusting for the fact that most small towing vessels (i.e., less than 26 ft) are not included in the MISLE vessel database unless they are involved in an accident, it is clear that the historical risk is dominated by large horsepower towing vessels. There are about 400 towing vessels that are reported in the WTLUS as greater than 5,000 horsepower (see Figure 3.10). On an annual basis, these vessels pose risks that are 15 to 120 times larger than vessels of lower horsepower (see Figure 4.4). Ensuring that these vessels receive the most attention in a new inspection regime should be an objective of the regulatory strategy (see Recommendation 6.2.2).

- An effective safety management systems requirement can be an important step in addressing both equipment issues that occur over time and human factors issues; however,

safety management systems invoked by regulations have been difficult for regulated communities to implement effectively

Safety management systems offer the flexibility to have company policies, vessel operations procedures, and equipment maintenance procedures that are specific to the towing services and conditions under which the company and its vessels operate. If properly developed and implemented, a safety management system approach can be cost-effective and contribute to safety improvements. However, implementation of safety management systems elsewhere in the marine industry (e.g., ISM requirements for vessels subject to SOLAS) and in other US industries (process safety management for highly hazardous chemicals) has required years to be effectively implemented. It has required strong initial implementation efforts by industry, followed by improvements based on several audit cycles, effective application of lessons learned over time, and effective regulatory oversight for such systems to make real differences in industry safety performance. Preparing a new regulation and getting it approved is only the start of the process that needs attention and resources devoted to it for a long period of time (see Recommendation 6.2.4).

6.2 RECOMMENDATIONS

6.2.1 Consider excluding workboats and towing assistance vessels from the proposed regulations for inspection of towing vessels.

Workboats are vessels that operate in limited geographic areas and do not participate in transportation of goods or support to vessels that do. However, developing a definition of workboats to define this category of service may be difficult. The issue of differentiating between workboats and other small boats in towing service or supporting towing operations (e.g., fleeting boats) is likely to arise. Towing assistance vessels will be easier to define for purposes of exclusion, and as discussed in the previous section, may suffer a disproportionate economic impact if regulated like towing vessels.

In addition, the risk review performed in this project did not indicate that either workboats or towing assistance vessels have been significantly involved in high consequence events in the time frame examined. Also, the characteristics of the vessels (e.g., length and horsepower) and their operations (i.e., not involving very large cargoes or hazardous materials) make it unlikely that such vessels pose significant risks in the future.

Excluding these vessels from the proposed regulations does not mean they will be "unregulated." They will still be subject to numerous regulations, several of which (e.g., licensing and fire protection) have been revised recently. However, this assumes that the references in those current regulations that apply to existing towing vessels will not all be eliminated as new towing vessel regulations are promulgated.

6.2.2 Ensure that large horsepower towing vessels (i.e., greater than 5,000 horsepower) receive the regulatory attention they deserve based on historical accident experience examined in risk terms.

See the risk analysis results in Section 4.3 and the discussion in the conclusion about risk information discussed above.

6.2.3 Consider providing effective training when the towing vessel inspection regulation is released and then additional periodic training for Coast Guard inspectors and third-party personnel who will be involved in towing vessel inspections, in order to help ensure consistency in regulatory review and enforcement.

Some of the personnel who will be involved in enforcing or auditing the new towing vessel regulations will have experience with ISM or RCP systems; however, it is likely that the safety management system developed for the towing vessel regulations will have some unique aspects. Providing regulation-specific training is essential to ensuring effective implementation.

6.2.4 Consider encouraging small business outreach/assistance programs by industry organizations or by the Coast Guard to assist small towing companies in SMS development and implementation, both for compliance purposes and to help them achieve real human factors improvements.

This effort will need to begin with an industry outreach program to first communicate that the regulation applies to them and then what they need to do in order to comply. Typically, small towing companies will not have any experience with SMSs for regulatory purposes. They will require a significant level of assistance or they will be risking noncompliance or having to leave the towing business. Also, to really reduce the potential for error-likely situations, an SMS needs to be well structured and implemented. It is unlikely that small towing companies without SMS experience can achieve that goal without assistance.

6.2.5 Consider offering alternative inspection approaches (i.e., that do not require a company safety management system) for companies that prefer being subject to a more prescriptive inspection regime.

The incentive to have a towing vessel inspection regime that incorporates a safety management system is largely applicable to the companies that comprise the AWO and have already implemented the RCP program, which they expect to help them meet most of any Coast Guard inspection requirement that involves a safety management system. That same benefit does not apply to many other companies. And for small towing companies, a safety management system may not a very cost-effective way to achieve safer operations. The Coast Guard should consider offering such companies a more traditional inspected vessel option, where the Coast Guard (or an authorized third party) provides inspection to a more prescriptive set of rules.

7. REFERENCES

AWO, 2002. American Waterways Operators, *Our Compass Always Points to Safety: What You Should Know About Tugboat, Towboat and Barge Industry Safety*, 2002.

AWO, 2005. American Waterways Operators, *Responsible Carrier Program,* 2005.

AWO, 2006. American Waterways Operators, ABS Consulting Discussions with AWO Staff, March, 2006.

AWO, 2006a. American Waterways Operators, Towing Industry Statistics on the Internet at http://www.americanwaterways.com/industry_stats/index.html, 2006.

BAWG, 2003. *Bridge Allision Working Group Report*, U.S. Coast Guard and American Waterways Operators, May 2003.

Fed Reg, 2004. *Federal Register,* United States Coast Guard Notice in *Federal Register***,** Vol. 69, No. 250, Thursday, December 30, 2004, Notices, p. 78471.

Fed Reg, 2005. *Federal Register,* United States Coast Guard Notice in *Federal Register***,** Vol. 70, No. 22, Thursday, February 3, 2005, Notices, p. 5691.

IRR, 2006. *Inland River Record*, Waterways Journal, Inc., 2006.

OSHA, 1996. Occupational Safety and Health Administration, *OSHA/U.S. Coast Guard Authority Over Vessels*, Compliance Policy Letter CPL 02-01-020, 11/08/1996.

TSAC, 2005. Towing Safety Advisory Committee, *Report of the Working Group on Towing Vessel Inspection*, September 29, 2005.

USACE, 2003. Department of the Army, Corps of Engineers, *Waterborne Commerce of the United States, Calendar Year 2003, Part 1 - Waterways and Harbors, Atlantic Coast*, IWR-WCUS-03-1, 2003.

USACE, 2003a. Department of the Army, Corps of Engineers, *Waterborne Commerce of the United States, Calendar Year 2003, Part 2 - Waterways and Harbors - Gulf Coast Mississippi River System and Antilles*, IWR-WCUS-03-2, 2003.

USCG, 46 CFR 27. United States Coast Guard, Subpart A, General Provisions for Fire-Protection Measures and Fire-Suppression Equipment on Towing Vessels.

U.S. Congress, 2004. 108th Congress, 2nd Session, *House Of Representatives Report 108-616*, July 20th, 2004.

WTLUS, 2003. *Waterborne Transportation Lines of the United States, Calendar Year 2003, Volume 1 - National Summaries,* Department of the Army, Corps of Engineers.

APPENDIX A

Preliminary Unit Cost Assessment of an Inspection Regime for the Uninspected Towing Vessel Industry

Preliminary Unit Cost Assessment of an Inspection Regime for the Uninspected Towing Vessel Industry

Final Report

Abt Associates Inc.
August 30, 2006

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EXECUTIVE SUMMARY

This preliminary cost assessment was prepared to aid the United States Coast Guard (USCG or "Coast Guard") in developing regulations governing a potential inspection regime for currently uninspected towing vessels ("UTVs"), pursuant to Section 415 of Public Law 108-293, "The Coast Guard and Maritime Transportation Act of 2004" ("the Act"). The Act added towing vessels to the list of vessels requiring inspection for certification. Prior to formulating a proposed rule regulating the UTV industry, the Coast Guard is interested in understanding the general scope of potential economic costs that the industry may incur as a result of new regulatory requirements.

In the absence of specific regulatory requirements such as those that might be found in a proposed rulemaking, the Coast Guard, ABS Consulting, and Abt Associates Inc. developed burden categories - areas of potential future economic costs associated with an inspection regime for UTVs - through review of the following three sources:

- Voluntary, industry-developed codes of practice developed by the American Waterways Operators' ("AWO") Responsible Carrier Program ("RCP");
- Compliance with regulatory standards included in the International Safety Management ("ISM") Code; and
- Recommended requirements for UTVs contained within the Report of the Working Group on Towing Vessel Inspection ("RWG") of the Towing Safety Advisory Committee ("TSAC").

The burden categories developed are almost entirely those recommended by the TSAC RWG, and consider potential onboard vessel equipment standards, examination and drydocking requirements, and safety management requirements that are not already required by law. As a result, this assessment provides estimates of the potential unit compliance costs that may be incurred by individual UTVs as a result of rulemaking pursuant to Section 415 the Act.

Exhibits ES-1 through ES-3 present cost estimates for each recommended requirement included in the preliminary cost assessment. Specifically, Exhibit ES-1 presents cost estimates for equipment standard recommendations, Exhibit ES-2 presents cost estimates for drydocking recommendations, including inspection standards, and Exhibit ES-3 presents cost estimates for safety management system recommendations.

Equipment Standards

Recommended equipment standards for UTVs contained in the TSAC RWG fall into five major categories: hull and machinery, navigation and communication, pollution prevention, lifesaving, and firefighting equipment. For each standard, the TSAC RWG provides information on the type of equipment that would allow a UTV to come into compliance. This information was used as the basis for the cost research conducted in this assessment. In addition, for some standards, the TSAC RWG indicates whether the standard applies to new (i.e., constructed after the date of regulation) or existing UTVs only, or provides different requirements for new and existing

UTVs. It is important to note, however, that for many equipment standards the TSAC RWG does not differentiate between new and existing UTVs.

Research into the costs associated with potential equipment standards generally began with a Web site search of relevant equipment suppliers. Companies involved in manufacturing, supplying, or purchasing the item in question were contacted by telephone and they either provided information or pointed to another supplier who might be able to provide the information. Ultimately, sources were selected for their involvement and expertise in the towing industry. To the extent possible, interviews were conducted with representatives from a variety of sources (large-scale/large-vessel towing operations, small-scale/small-vessel towing operations, marine equipment manufacturers or distributors, and shipbuilders) in order to obtain a range of potential compliance costs. Multiple sources were contacted for relatively expensive equipment items, with a minimum of three sources for all items over $100. Finally, the assessment prioritized obtaining commercial vessel cost data (as opposed to recreational vessel cost data) that would be relevant to commercial UTV operations.

Research demonstrated that towing vessel design decisions and associated costs of compliance with potential equipment standards are based on a large number of factors, including vessel size, area and type of intended use, speed, power, and the needs of the particular vessel owner. Accordingly, as shown in Exhibit ES-1, cost estimates obtained from data sources frequently vary, and are presented as ranges where necessary to capture a range of costs representative of different vessel types and data sources. Costs in Exhibit ES-1 are presented separately for new and existing UTVs in those cases where the TSAC RWG differentiated standards between the two.

Potential future costs of compliance will also vary with the degree of current compliance on a per vessel basis and within the UTV industry as a whole, and with UTV company size. While interview responses suggest that many of the recommended standards are already met by most towing vessels with which particular architects are familiar, there are standards for which there was no consensus on current levels of compliance among the sample of interviewees.

Exhibit ES-1

Summary of Potential Per Vessel Costs of Prescribed Equipment Standards for the UTV Industry

Standards Category	Cost Element	Level of Current Compliance [1]	Potential Per-Vessel Range of Unit Costs to Comply with Standard [2]
New UTVs (Constructed after effective date of regulation)			
Hull and Machinery	Design and construction to American Bureau of Shipping (ABS) or other standards	High	Unknown
	Emergency egress	High	$7,000 to $15,000
	Steering	Variable	$10,000 (average)
	Electrical equipment and wiring	Variable	$21,000 to $708,000
	Electrical generating systems	Variable	$2,000 to $100,000
Firefighting	Heat or flame detector in galley	Unknown	$14 to $184
	Remote manual engine shutdown	High	$1,500 to $8,000
Existing UTVs (Constructed prior to effective date of regulation)			
Hull and Machinery	Handrails and bulwarks	High	$10,000 to $50,000
	Freeing ports and scuppers	High	$1,000 to $30,000
	Guards for exposed hazards	High	$20 per linear foot
	Alarms/monitoring and gauges	Variable	$4,500 to $200,000
	Steering	Variable	$9,500 to $12,000
	Electrical equipment and wiring	Variable	Minimal [3]
	Fuel systems	High	$4,000 to $5,000
	Electrical generating systems	Variable	Minimal [4]
	Lighting	High	Unknown
Navigation and Communication	Connect VHF radio to battery backup	Unknown	$2,000
	Handheld VHF radio	Unknown	$100 to $300
	Second radar	Unknown	$3,850 to $6,650
	Rudder angle indicator	Unknown	$750 to $2,500
	Onboard crew communications	Unknown	$2,000 to $10,000
	Pilothouse window visibility	High	$1,000 to $15,500
	Emergency communications capability	Unknown	$200 to $2,000
Pollution Prevention	Bilge pumps	High	$5,000 to $80,000
	Oily water separators	High	$10,600 to $27,800
	Spill kit	Unknown	$320 to $600
	Closable scuppers	Unknown	$100 to $17,200
Lifesaving	Visual distress signals	Unknown	$171 to $504
	First aid kit/trauma kit	Unknown	$85 to $695
	Immersion suits	Unknown	$1,060 to $4,260
	Inflatable life raft	Unknown	$3,400 to $6,400
Firefighting	Fire axe	Unknown	$45 to $65
	Smoke alarms	Unknown	$10 to $70,000
	Placarded storage area	Unknown	$2,000

[1] Naval architects and other interviewees were asked about the level of general current compliance of vessels in the UTV industry with each recommended requirement. A "high" level of compliance indicates that all interviewees thought that most UTVs were already in compliance with the recommended requirement; a "variable" level of compliance indicates that interviewees differed in their statements about current levels of compliance; and an "unknown" level of compliance indicates that all interviewees did not know or did not provide information on the current level of compliance with the recommended requirement.

[2] Non-compliance is assumed in calculating cost impacts; therefore, these cost impacts may be overstated to the extent that vessels are partly or fully in compliance.

[3] TSAC's recommended electrical equipment and wiring requirement for existing UTVs consists of relatively minor actions such as labeling and ensuring that all elements are in proper working condition. The analysis assumes that UTV owners/operators already conduct appropriate maintenance of electrical equipment and wiring for UTVs in the absence of regulation; therefore, potential costs are assumed to be minimal for this recommended requirement and may consist of such activities as equipment labeling.

[4] TSAC's recommended electrical generating system requirement for existing UTVs consists of proper maintenance. The analysis assumes that UTV owners/operators already conduct appropriate maintenance of these systems for UTVs in the absence of regulation; therefore, potential costs are assumed to be minimal for this recommended requirement.

Drydocking

Recommended drydocking inspection requirements may pose direct and delay (opportunity) costs on vessel owners and operators. Direct costs include the costs of renting drydock slip space and labor costs associated with inspection. Potential delay costs under a regulation requiring a USCG or third party inspection may arise where UTVs must be drydocked for marginally longer periods of time than would occur in the absence of regulation. Delay costs may result from 1) longer periods of time required to ready the vessel for inspection; 2) longer periods of time required to inspect a vessel in accordance with all regulatory requirements; 3) time required for inspection by the U.S. Coast Guard or a third party inspector; and 4) time required to implement corrections to issues raised by the inspection. These delays may lead to economic opportunity costs in which the vessel in question is not being put to its intended economic purpose for a longer period of time than would have occurred in the absence of regulation. In this case, opportunity costs are likely to consist primarily of lost revenue associated with the day rate of the vessel.

Six companies that provide drydocking services were interviewed about the cost and time required to perform internal and external inspections of vessels. Companies were selected for an interview if they maintained a Web site outlining their basic services, if they operated at least two drydocks, and if they offered ship repair as well as drydocking services for towing vessels. The interviewees were asked a variety of questions associated with the hourly labor rate for drydock internal and external inspections of vessels, the cost of renting drydock space, and the time required to perform an inspection.

As summarized in Exhibit ES-2, direct costs for potential drydocking requirements as recommended by the TSAC RWG may range from $410 to $5,000 per vessel. These costs include both drydock slip rental and labor costs for inspectors. The range in potential costs results from variations in company hourly rates, inspection times, and vessel size characteristics such as length and weight.

While the assessment obtained cost estimates associated with direct drydocking inspection costs as shown in Exhibit ES-2, opportunity costs of delay are not estimated. Without information about new regulatory requirements associated with drydocking inspections, and given the wide range of differences in vessel operations, it was not feasible, given the resources available for this cost assessment, to estimate meaningful dollar delay costs for all vessels affected by a future regulation. However, the assessment does note that there may be opportunity costs of delay associated with a future regulation that may consist of foregone profits if regulations require a vessel to spend longer periods of time out of service, or drydocked, and less time performing operations that generate revenue.

Exhibit ES-2 Summary of Per Vessel Cost Estimates for Compliance with Potential Drydocking Requirements	
Cost Category	**Estimated Range of Potential Per Vessel Cost [1]**
Direct Inspection Costs [2]	$410 to $5,000
Delay Cost [3]	Not Estimated
Notes: [1] Interviewees were asked to estimate the time and cost required to comply with standards recommended by TSAC in its September 2005 Report of the Working Group on Towing Vessel Inspection. [2] Direct inspection costs include the total cost for a company to conduct a drydock inspection, including drydock slip rental, and varies by company, vessel length, weight, and the time required to conduct an inspection. [3] Delay poses opportunity costs on vessel owners and/or operators. Opportunity cost includes the economic activities that a vessel could undertake if it were not out of service. These activities vary by company, vessel weight, and vessel length, among other factors, and therefore complicate cost estimation.	

Safety Management Systems

The TSAC RWG recommends that the UTV industry be required to develop, implement, and maintain a safety management system (SMS) as part of any future proposed rule creating an inspection regime for the UTV industry. An SMS is a structured and documented system that enables company personnel to effectively implement the company's safety and environmental protection policy.

Information sources for the SMS cost data include nine telephone interviews with SMS auditors and vessel companies and a leave-behind questionnaire delivered to ports during ABS Consulting port visits. SMS interviewees were selected through Web-site searches and from the AWO RCP auditor list to represent a range of geographic regions in the United States. Interviewees were asked a variety of questions associated with SMS costs, such as the relative comprehensiveness of the SMS process, the method through which SMS fees are determined, factors that impact SMS development and/or implementation time and cost, documentation and recordkeeping procedures, and external and internal auditing procedures. Both small and large companies that prepare SMSs for vessel companies were interviewed. The geographic range of companies as well as company size differences yielded a broad sample of the SMS auditing industry. Research conducted revealed the following elements of SMSs:

- *SMS development* involves laying out requirements and the collection and compilation of relevant company information (policies, procedures, processes, and other documentation as listed above) into a single, organized document system. Most companies already maintain many of the SMS components in some form, and require simply integrating these information resources, thereby incurring a relatively low cost for SMS development. Other companies that do not maintain much relevant documentation incur higher costs of SMS development, as the missing policies or procedures must be developed.

- *SMS implementation* generally involves implementing methods to achieve established safety objectives, training to ensure proper application of the SMS, and internal audits to ensure compliance. Interviewees indicated that SMS implementation generally takes 12 to 18

months but can take as little as one month. This depends, in part, on company motivation and management buy-in, and the stringency of its implementation. Reportedly, companies may shelve SMS plans because they do not have consistent vessel/shore-side communication, because they do not have the commitment of management, or because they have high rates of turnover or have not administered training, which can be expensive.

- *Ongoing SMS maintenance and activities* include staff training, updates to the SMS documents, recordkeeping, and internal audits.

- An *internal auditing program* is the foundation of an oversight system, and serves to assess compliance with the requirements of the particular SMS program. The internal audit helps to maintain the SMS, including detecting and rectifying problems before an external audit. The AWO and ISM standards explicitly recommend establishing internal auditing programs. Internal auditing procedures are generally company-specific, and can be conducted by trained company personnel or outsourced to companies such as those that develop SMSs.

- Once the SMS is prepared and implemented, a qualified external auditor must perform initial and periodic *external audits* in order for the company to obtain and maintain certification under a formal certification program. While the external audits discussed with interviewees are specifically associated with AWO's RCP or ISM Code compliance, cost estimates may be indicative of costs that could be incurred for companies to undergo an audit to demonstrate compliance with potential Coast Guard SMS requirements, if audits are required by personnel outside the company.

Costs associated with these SMS elements are summarized in Exhibit ES-3. Actual costs incurred by UTV industry members may differ from the estimated potential costs summarized in Exhibit ES-3 for the following reasons:

- Because the current SMSs associated with the entities interviewed for this assessment differ in scope and content from TSAC's recommended requirements for SMSs and those requirements that may be finalized in a future UTV regulation, cost estimates obtained may overstate or understate the actual future costs to comply with a future UTV regulation.

- Costs of implementing SMSs are likely to vary according to company size and other company-specific characteristics that may differ from the average-sized towing vessel company used for many of the cost estimates. For this reason, cost estimates summarized in Exhibit ES-3 may overstate or understate future costs.

- While employee training costs comprise a large percentage of initial SMS implementation costs as reported in the leave-behind questionnaire, training on such issues as safety and emergency response may already be conducted in the absence of regulation. To the extent that this is true, all training costs presented may not be attributable to a future Coast Guard SMS regulation. Similarly, ongoing SMS maintenance and activities that may already be conducted in the absence of regulation such as safety program drill performance, safety meetings, and emergency drills and exercises, comprise a large percentage of ongoing SMS maintenance and activities. To the extent that these are already conducted in the absence of

regulation, costs presented for ongoing SMS maintenance and activities may not be attributable to a future Coast Guard SMS regulation.

Exhibit ES-3

Summary of Cost Estimates for Potential Safety Management System Requirements

Cost Element [1]	Estimated Potential Costs [2]
SMS development [3]	$750 to $70,000 (One-time cost)
SMS initial implementation	$311,000 overall for an average towing vessel company $1,680 per employee for an average towing vessel company (One-time cost)
Ongoing SMS maintenance and activities [4]	$2.5 million for an average towing vessel company $14,490 per employee for an average towing vessel company (Annual cost)
Internal auditing	$5,000 to $18,000 audit cost (Per audit) $1,700 training cost (Per employee trained as auditor)
External auditing	$750 to $6,000

Notes:
[1] Safety management cost elements included in this exhibit represent only a portion of the recommended standards included in TSAC's RWG. To the extent that certain recommended SMS components are not included in these cost estimates, the estimates will understate potential future costs of complying with RWG recommendations.
[2] Per employee costs for SMS initial implementation represent training costs only; per employee costs for ongoing SMS maintenance and activities represent personal protective equipment and maintenance, safety program drill performance, safety meetings, emergency drills and exercises, recordkeeping, and period refresher training programs for personnel policies; per employee costs for other activities were not estimable given the lack of data on the number of employees implementing those activities. To the extent that these activities are already conducted in the absence of a future Coast Guard SMS regulation, these costs will overstate potential future costs of complying with RWG recommendations.
[3] The range of potential costs for SMS development is estimated using cost information obtained from interviews with towing vessel companies, interviews with SMS development professionals, the response to the leave-behind questionnaire distributed to towing vessel companies during ABS Consulting port visits, and from personal communication with the company that completed the leave-behind questionnaire on August 25, 2006.
[4] The reported company cost for ongoing SMS maintenance and activities represents the sum of the cost of company safety, health, and security policy; SMS updating; emergency preparedness and response procedures; personnel policies and procedures; documentation and recordkeeping; and incident reporting. These costs represent costs reported in the leave-behind questionnaire by a single average-sized towing vessel company with 24 vessels and between 100 and 200 employees, and may not be representative of towing vessel companies in the UTV industry.

Caveats to the Preliminary Cost Assessment

A variety of factors may cause estimates summarized in Exhibits ES-1 through ES-3 to overstate or understate actual future costs. These factors and their potential impacts on cost estimates are as follows:

- Uncertainty regarding future regulatory requirements. The Coast Guard has not issued a proposed rule, so the specific potential requirements for UTVs are currently unknown. In addition, regulations could be scaled according to vessel size, horsepower, type of operation, area of operation, number of vessels, and the nature of the risk associated with the vessel operation. To the extent that future regulatory requirements are either more or less stringent than TSAC RWG recommendations, cost estimates contained within this report will either be underestimated or overestimated, respectively.

- Degree to which UTVs are currently in compliance with TSAC RWG recommendations. This preliminary assessment does not account for UTVs' current level of compliance with TSAC RWG recommendations. For example, some towing companies are already in partial or full compliance with the ISM code; other towing companies may be in compliance with and certified by the AWO RCP. If the Coast Guard accepts compliance with ISM and/or AWO standards as sufficient in meeting SMS standards for UTVs, UTV operations in compliance would not incur SMS costs associated with the regulation, and those in partial compliance would have reduced costs. To the extent that this is true, upper-bound estimates (assuming zero compliance within the industry) will be overestimates.

- Potential grandfathering provisions. If certain UTV regulations are "grandfathered" in situations where it is impractical for the Coast Guard to require vessel reconfigurations that are prohibitively expensive, such vessels would not incur costs of compliance.

- UTV characteristics. UTVs vary widely in length, tonnage, age, area and type of operation, and construction material (see Exhibit 2). The costs of compliance depend significantly on these characteristics. For example, the cost of electrical wiring increases with vessel size. Costs of such requirements are presented as ranges to account for differing vessel sizes. To the extent that a particular vessel is smaller or simpler, etc., than the vessel size designated for the corresponding upper-bound estimate, the upper-bound estimate will be overstated.

1. INTRODUCTION

This preliminary cost assessment is intended to aid the United States Coast Guard (USCG or "Coast Guard") in developing regulations governing a potential inspection regime for currently uninspected towing vessels ("UTVs"), pursuant to Section 415 of Public Law 108-293, "The Coast Guard and Maritime Transportation Act of 2004" ("the Act"). The Act added towing vessels to the list of vessels requiring inspection for certification. Prior to formulating a proposed rule regulating the UTV industry, the Coast Guard is interested in understanding the general scope of potential economic costs that the industry may incur as a result of new regulatory requirements.

In the absence of specific regulatory requirements such as those that might be found in a proposed rulemaking, the Coast Guard, ABS Consulting, and Abt Associates Inc. developed burden categories - areas of potential future economic costs associated with an inspection regime for UTVs - through review of the following three sources:

- Voluntary, industry-developed codes of practice developed by the American Waterways Operators' ("AWO") Responsible Carrier Program ("RCP")[1];
- Compliance with regulatory standards included in the International Safety Management ("ISM") Code[2]; and
- Recommended requirements for UTVs contained within the Report of the Working Group on Towing Vessel Inspection ("RWG") of the Towing Safety Advisory Committee ("TSAC").[3]

The burden categories developed are almost entirely those recommended by the TSAC RWG, and consider potential onboard vessel equipment standards, examination and drydocking requirements, and safety management requirements that are not already required by law. As a result, this assessment provides an estimate of the potential unit compliance costs that may be incurred by individual UTVs as a result of rulemaking pursuant to Section 415 the Act. The TSAC RWG was formed in September 2004 to assist the Coast Guard in developing an inspection regime for the UTV industry, and is therefore an appropriate source of potential regulatory requirements.[4]

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[1] The American Waterways Operators is the national trade association of the U.S. tugboat, towboat, and barge industry. AWO's Responsible Carrier Program consists of best industry practices for company management policies, vessel equipment, and human factors. Compliance with the program is certified through a third-party AWO-certified auditor. Information on the Responsible Carrier Program, including the RCP document available for download, is available from the AWO website at http://www.americanwaterways.com.

[2] The International Safety Management Code is the international standard for safe management and operation of ships, and for pollution prevention. Flag states are responsible for ISM Code Certification of flagships. The ISM Code is available for download on the International Maritime Organization website, at http://www.imo.org.

[3] Working Group on Towing Vessel Inspection, "Report of the Working Group on Towing Vessel Inspection." Memorandum submitted to the Towing Safety Advisory Committee, September 29, 2005. Recommended requirements contained within the TSAC RWG are reproduced in Attachment 1 of this report.

[4] The ISM code and AWO RCP were consulted in the preparation of the TSAC RWG.

1.1 Regulatory and Industry Background

Section 415 of Public Law 108-293 added all towing vessels to the list of regulated vessels that must comply with prescribed equipment, drydocking, and safety standards in order to pass an inspection and obtain certification for operation from the Coast Guard. As a result, vessels that were not previously inspected would incur two related sets of costs: the costs of complying with new standards (e.g., purchasing a previously unrequired piece of equipment) and inspection costs. Prior to the Act, the Coast Guard was required to inspect only towing vessels greater than or equal to 300 gross registered tons that operate beyond the boundary line.[5] Vessels that did not require inspection prior to the Act are termed *uninspected towing vessels* ("UTVs").[6] UTVs are also characterized by length and propulsion parameters: UTVs range from less than 26 feet in length with outboard motor propulsion to vessels up to 1,800 gross tons with propulsion power inside the boundary line, winch systems, and lengths of 180 feet or greater.[7]

A proposed rulemaking governing inspection of the UTV industry would revise current Coast Guard regulations by adding a new Subchapter M to Title 46 of the Code of Federal Regulations. Under Subchapter M, the Coast Guard would issue a Certificate of Inspection (COI) to UTVs that meet specified equipment, drydocking, and safety management standards. For example, the new regulations may prescribe equipment standards for hulls, fittings, equipment, appliances, propulsion machinery, auxiliary machinery, boilers, unfired pressure vessels, piping, electrical installations, accommodations, lifesaving equipment and its use, firefighting equipment and its use, precautionary measures to guard against fire, inspections and tests related to the list above, and the use of vessel stores and other supplies of dangerous nature. The new regulations may also require drydocking and related inspections within a specified time period. Finally, the new regulations may outline required elements of safety management systems for UTVs, including internal and external audits, in which all regulated towing vessels would be required to participate.

The TSAC RWG recommends the following vessels for exemption:

- Towing vessels under 26 feet in length;
- Workboats and tenders that do not engage in commercial towing for hire but may intentionally move a piece of equipment in a limited geographic area, such as a dredging or construction jobsite or a vessel maintenance yard; and
- Vessels that tow disabled vessels for consideration (assistance towing vessels).[8]

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[5] A boundary line is a line of demarkation established under Section 2(b) of 33 U.S.C. 151. Generally, boundary lines follow the general trend of the shoreline and cross entrances to small bays, inlets and rivers. For specific descriptions of boundary lines refer to 46 CFR Part 7.

[6] While inspection by the Coast Guard is not currently required for UTVs, the Coast Guard regulates these vessels as uninspected commercial vessels pursuant to Subchapter C of Title 46 of the Code of Federal Regulations.

[7] The precise number of UTVs is unknown; however, the Coast Guard estimates that roughly 7,000 such vessels (including towing assistance vessels) constitute the industry and would be regulated pursuant to the Act.

[8] This assessment considers impacts to assistance towing vessels separately from the other classes of vessels irrespective of whether they are recommended for exclusion from new regulations by the TSAC RWG. Research findings associated with assistance towing vessels are presented in Attachment 2 of this report.

To the extent that the Coast Guard accepts the TSAC RWG recommendations regarding applicability of the regulation and includes them in future rulemaking, the universe of potentially regulated towing vessels would be reduced.

2. SCOPE AND METHODOLOGY

This section outlines the scope of the preliminary cost assessment and the methodology used to develop the estimates. The section first discusses the collaborative process used to identify burden categories and cost elements for inclusion in the assessment. Then, sources of data are discussed, followed by an explanation of the results and of the inclusion of towing assistance vessels in the report. Finally, caveats to the assessment are presented and discussed.

2.1 Burden Categories and Cost Elements

Without information about new regulatory requirements such as those that might be contained in a proposed rulemaking, the Coast Guard, ABS Consulting, and Abt Associates developed burden categories (areas of potential future economic costs associated with UTV inspection requirements) through review of existing vessel inspection standards of the AWO RCP, the ISM Code, and the TSAC RWG.[9] As stated previously, the burden categories developed are almost entirely those recommended by the TSAC RWG, and consider potential onboard vessel equipment standards, examination and drydocking requirements, and safety management requirements that are not already required by law.

The TSAC RWG recommendations for a new inspection regime for UTVs, including existing regulations, are reproduced in Attachment 1 of this report. Exhibit 1 presents burden categories and cost elements included in the preliminary cost assessment, which represent a subset of the information provided in Attachment 1. In developing the content for Exhibit 1, the Coast Guard, ABS Consulting, and Abt Associates determined that burden categories and cost elements should be limited to potential requirements that are not currently covered by existing towing-vessel regulations. As a result, this assessment provides an estimate of the potential unit compliance costs that may be incurred by individual UTVs as a result of rulemaking pursuant to Section 415 the Act.

[9] The TSAC RWG recommends that all of the requirements for inspected towing vessels be housed in a single subchapter. Further, they suggest that whenever possible, existing requirements be relocated to, or cross-referenced in, a new Subchapter M to Title 46 of the Code of Federal Regulations.

Exhibit 1

Burden Categories and Cost Elements Included in the Preliminary Cost Assessment

BURDEN CATEGORY	COST ELEMENT [1]	Report Section
COMPLIANCE WITH PRESCRIBED EQUIPMENT STANDARDS	**Hull and Machinery**	3.1
	▪ Design, construction, alteration, and repair of vessel components in accordance with ABS Rules or other recognized standards*	3.1.1
	▪ Handrails and bulwarks	3.1.2
	▪ Emergency egress*	3.1.3
	▪ Freeing ports and scuppers	3.1.4
	▪ Guards for exposed hazards	3.1.5
	▪ Alarms/monitoring and gauges	3.1.6
	▪ Steering	3.1.7
	▪ Electrical equipment and wiring	3.1.8
	▪ Fuel systems	3.1.9
	▪ Electrical generating systems	3.1.10
	▪ Lighting	3.1.11
	Navigation and Communication Equipment	3.2
	▪ Capability of connecting a VHF to battery backup	3.2.1
	▪ Handheld VHF radio	3.2.2
	▪ Second radar	3.2.3
	▪ Rudder angle indicator or means to visually indicate rudder position	3.2.4
	▪ Onboard crew communications	3.2.5
	▪ Means of ensuring visibility through pilothouse windows	3.2.6
	▪ Emergency communications capability	3.2.7
	Pollution Prevention Equipment	3.3
	▪ Bilge pumps or other dewatering capability	3.3.1
	▪ Oily water separators	3.3.2
	▪ Spill kit	3.3.3
	▪ Closable scuppers or other containment method	3.3.4
	Lifesaving Equipment	3.4
	▪ Visual distress signals	3.4.1
	▪ First aid kit/trauma kit	3.4.2
	▪ Immersion suits	3.4.3
	▪ Inflatable life raft	3.4.4
	Firefighting Equipment	3.5
	▪ Fire axe	3.5.1
	▪ Smoke alarms to protect all sleeping spaces	3.5.2
	▪ Heat or flame detector in galley*	3.5.3
	▪ Remote manual engine shutdown	3.5.4
	▪ Placarded storage area appropriate for flammable products	3.5.5
DRY-DOCKING	**Drydocking Costs**	4
	▪ Direct inspection costs	4.1
	▪ Delay costs	4.2
SAFETY MANAGEMENT SYSTEM	**SMS Costs:**	5
	▪ SMS development & initial implementation	5.1
	▪ Ongoing SMS maintenance & activities	5.2
	▪ Internal auditing programs	5.3
	▪ External auditing programs	5.4

Notes:
[1] Equipment, drydocking, and safety management cost elements included in this table represent new potential standards that may be required under Section 415 of the Act.
*For some equipment standard recommendations, the TSAC RWG specifies whether the recommendation is for new and/or existing vessels. The asterisk indicates that the requirement is recommended for new vessels only (i.e., vessels constructed after the effective date of the regulations). Recommended equipment standards for which asterisk(s) are not used indicates that the TSAC RWG does not specify whether the requirement is recommended for new or existing vessels.

2.2 Data Sources

This section discusses the methodology followed to identify data sources and obtain cost information for each burden category. Information was obtained through online searches of products and services; telephone interviews with suppliers, ship builders, shipyards, naval architects, drydocks, and Safety Management System (SMS) auditors and preparers; and information supplied by towing companies and vessels during port visits.[10, 11] In order to comply with the Office of Management and Budget's (OMB) Information Collection Request (ICR) requirements, no more than nine individuals were contacted for cost information on the same recommended requirement. Given the small number of interviews and surveys, the unit cost estimates cannot be extrapolated reliably to the entire UTV industry. Nevertheless, the estimates do supply useful information regarding the relative magnitude of potential costs to the UTV industry.

UTV vessel specification categories provided by the Coast Guard and reproduced in Exhibit 2 guided telephone interviews, online research, and survey development; however the preliminary cost assessment does not disaggregate costs into these categories.

Exhibit 2

UTV Vessel Specification Categories

Specification		Category					
Length Over Deck (ft)		0 – <25	26- ≤65	>65 - <79	79+		
Gross Registered Tons (GRT)		0 -<5	5 - <50	50-<100	100-<200	200-<300	≥300
Age		0-5	6-10	11-15	16-25	>25	
Propulsion							
Waters		Western Rivers	Inland	Great Lakes	Lakes, Bays & Sounds	Coastwise NMT 20 NM fm shore	Oceans
Service		Intraport [1]	Intraport	Interport	Interport	Oceans	Oceans
		Limited Geographic Area (e.g., Fleet, Ship Assist, Harbor Assist, TBD)	Extended Limited Geographic Area (e.g., rivers, lakes, bays & sounds)	Rivers; lakes bays & sounds ICW	Coastal	Non-SOLAS	SOLAS
Construction Material	Hull	Steel	Wood	Aluminum	FRP	Other	
	Superstructure	Steel	Wood	Aluminum	FRP	Other	

Source: Coast Guard.
Notes:
[1] An intraport is a local area of operation, usually within a single harbor or port.

[10] In addition, docket materials associated with regulations similar in subject and content in the Federal Docket Management System were reviewed but did not yield relevant information.

[11] Web site references are not cited in this report to prevent the appearance of the assessment's endorsement of specific vendors. In addition, interviewees and survey respondents are not cited individually, to respect their desire to remain anonymous. Nevertheless, Attachment 3 of this report provides a list of individuals interviewed along with their affiliations.

Equipment

Research into the costs associated with potential equipment standards generally began with a Web site search of relevant equipment suppliers. Companies involved in manufacturing, supplying, or purchasing the item in question were called and they either provided information or pointed to another supplier who might be able to provide the information. Ultimately, sources were selected for their involvement and expertise in the towing industry. To the extent possible, interviews were conducted with representatives from a variety of sources (large-scale/large-vessel towing operations, small-scale/small-vessel towing operations, marine equipment manufacturers or distributors, and shipbuilders) in order to obtain a range of potential compliance costs. Multiple sources were contacted for relatively expensive equipment items, with a minimum of three sources for all items over $100.[12] Finally, the assessment prioritized obtaining commercial vessel cost data (as opposed to recreational vessel cost data) that would be relevant to commercial UTV operations.

Interviewees were asked a variety of questions, beginning with how much they thought it would cost to install the specific piece of equipment on a towing vessel. Follow-up questions generally addressed price ranges across the spectrum of potentially regulated vessels (e.g., large vs. small), breakdown of cost (e.g., "Does that include installation?" and "How might installation costs vary?"), the use of alternative options (e.g., "What if the vessel operator decided to meet the requirement using another method?"), and alternate sources for information. Interviewees were also asked about the level of current compliance in the UTV industry overall for each recommended requirement.

For certain standard products with minimal installation requirements, (e.g., handheld VHF radios), price data were obtained from multiple online marine retailers selected for high Web site rank and large product stock.[13] Phone interviews with industry professionals confirmed the use of the Web sites as reliable data sources.

Drydocking

Six companies that provide drydocking services were interviewed about the cost and time required to perform internal and external inspections of vessels. Companies were selected for an interview if they maintained a Web site outlining their basic services, if they operated at least two drydocks, and if they offered ship repair as well as drydocking services for towing vessels. The interviewees were asked a variety of questions associated with the hourly labor rate for

[12] Where possible, the assessment used commercial vessel sources of information, given that these represent vendors that would normally supply UTV owners and/or operators. Where commercial information was unavailable, or where UTVs are likely to use recreational vessel sources of equipment, recreational sources were consulted. Specifically, the assessment relies on recreational vessel equipment cost data for visual distress signal costs and for first aid/trauma kit costs, but uses commercial vessel cost data for all other equipment cost estimates presented.

[13] Assuming that the existence of a Web site suggests that the supplier's audience is nationwide in scope, data were obtained from a subgroup of marine equipment suppliers with Web sites. A link popularity tool [www.marketleap.com/publinkpop] was applied to the universe of all marine equipment supplier Web sites to justify the use of a subset of Web sites as a source of economic data.

drydock internal and external inspections of vessels, the cost of renting drydock space, and the time required to perform an inspection of vessels.

Safety Management Systems

Information sources for the SMS section of this report include nine telephone interviews with SMS auditors and vessel companies and a leave-behind questionnaire delivered to ports during ABS Consulting port visits.[14] To comply with ICR requirements, no more than nine interviewees or vessel companies were asked for the same information.

SMS interviewees were selected through Web-site searches and from the AWO RCP auditor list to represent a range of geographic regions in the United States. Interviewees were asked a variety of questions associated with SMS costs, such as the relative comprehensiveness of the SMS process, the method through which SMS fees are determined, factors that impact SMS development and/or implementation time and cost, documentation and recordkeeping procedures, and external and internal auditing procedures. Both small and large SMS companies that prepare SMSs for vessel companies were interviewed. The geographic range of companies as well as company size differences yield a broad sample of the SMS auditing industry.

2.3. Presentation of Results

For each cost element, quantitative estimates are provided wherever possible; in some cases, only qualitative information is available. Quantitative cost estimates are provided as ranges or data points, as appropriate. Overall, research demonstrated that some UTVs are more in compliance than others, and that some UTVs will require less costly equipment than others to come into compliance due to vessel-specific characteristics such as size, area of operation, and other characteristics summarized in Exhibit 2 of this report.

All findings are presented as unit costs. When the Coast Guard proposes new requirements for UTVs, these costs can be incorporated into a regulatory impact analysis to evaluate total compliance costs for the UTV industry as a whole.

2.4 Inclusion of Towing Assistance Vessels

The TSAC RWG recommends the exclusion of towing assistance vessels from future inspection requirements; however, it is uncertain whether the new regulations will follow this recommendation. For this reason, Appendix B of the report includes an assessment of potential impacts to these vessels, to assist the Coast Guard in evaluating the recommended exclusion.

[14] "Leave-behind questionnaire" refers to a questionnaire distributed to vessel companies by ABS Consulting during port visits, to distinguish it from a shorter questionnaire that was also distributed. After the initial distribution of the leave-behind questionnaire yielded just one response, an abbreviated version of the questionnaire was created and distributed to the same set of companies. Two responses to the abbreviated version were subsequently received. Attachment 4 reproduces the questions asked in both the initial and abbreviated questionnaires.

2.5 Caveats to the Preliminary Cost Assessment

A variety of factors may cause the preliminary cost assessment to overstate or understate actual future costs. These factors and their potential impacts on cost estimates are as follows:

- Uncertainty regarding future regulatory requirements. The Coast Guard has not issued a proposed rule, so the specific potential requirements for UTVs are currently unknown. In addition, regulations could be scaled according to vessel size, horsepower, type of operation, area of operation, number of vessels, and the nature of the risk associated with the towing vessel operation. To the extent that future regulatory requirements are either more or less stringent than TSAC RWG recommendations, cost estimates contained within this report will either be under- or overestimated, respectively.

- Degree to which UTVs are currently in compliance with TSAC RWG recommendations. This preliminary assessment does not account for UTVs' current level of compliance with TSAC RWG recommendations. For example, some towing companies are already in partial or full compliance with the ISM code; other towing companies may be in compliance with and certified by the AWO RCP. If the Coast Guard accepts compliance with ISM and/or AWO standards as sufficient in meeting SMS standards for UTVs, UTV operations in compliance would not incur SMS costs associated with the regulation and those in partial compliance would have reduced costs. To the extent that this is true, upper-bound estimates (assuming zero compliance within the industry) will be overestimates.

- Potential grandfathering provisions. If certain UTV regulations are "grandfathered" in situations where it is impractical for the Coast Guard to require vessel reconfigurations that are prohibitively expensive, such vessels would not incur costs of compliance.

- UTV characteristics. UTVs vary widely in length, tonnage, age, area and type of operation, and construction material (see Exhibit 2). The costs of compliance depend significantly on these characteristics. For example, the cost of electrical wiring increases with vessel size. Costs of such requirements are presented as ranges to account for differing vessel sizes. To the extent that a particular vessel is smaller or simpler, etc., than the vessel size designated for the corresponding upper-bound estimate, the upper-bound estimate will be overstated.

3. POTENTIAL COSTS OF RECOMMENDED EQUIPMENT STANDARDS

This section presents the potential unit costs of compliance for UTV owners and operators to purchase and install sufficient equipment to meet the TSAC RWG recommended standards. Potential costs are estimated quantitatively where possible; where quantitative estimates were not feasible, a qualitative discussion of cost factors is provided. In addition, costs are presented separately for those recommended requirements that differ for new and existing vessels.[15] Finally, costs are presented on a per-unit or per-vessel basis, and are not aggregated to the UTV industry.

Towing vessel design decisions and associated costs of compliance with potential equipment standards are based on a large number of factors, including vessel size, area and type of intended use, speed, power, and the needs of the particular vessel owner. Accordingly, cost estimates obtained from data sources frequently vary, and are presented as ranges where necessary to capture a range of costs representative of different vessel types. Potential future costs of compliance will also vary with the degree of current compliance on a per vessel basis and within the UTV industry as a whole, and with UTV company size. While interview responses suggest that many of the recommended standards are met by most towing vessels with which particular architects are familiar, there are standards for which there was no consensus on current levels of compliance among the sample of interviewees.

Exhibit 3 provides a range of potential future costs for each recommended equipment standard. The following sections provide more detail on the results. In each section, the proposed standard from the TSAC RWG is presented in italics and is followed by a discussion of cost information obtained from the sources listed above.

[15] Exhibit 1 identifies the equipment standards recommended by TSAC RWG specifically for new or existing vessels.

Exhibit 3

Summary of Potential Per Vessel Costs of Prescribed Equipment Standards for the UTV Industry

Standards Category	Cost Element	Level of Current Compliance [1]	Potential Per-Vessel Range of Unit Costs to Comply with Standard [2]
New UTVs (Constructed after effective date of regulation)			
Hull and Machinery	Design and construction to American Bureau of Shipping (ABS) or other standards	High	Unknown
	Emergency egress	High	$7,000 to $15,000
	Steering	Variable	$10,000 (average)
	Electrical equipment and wiring	Variable	$21,000 to $708,000
	Electrical generating systems	Variable	$2,000 to $100,000
Firefighting	Heat or flame detector in galley	Unknown	$14 to $184
	Remote manual engine shutdown	High	$1,500 to $8,000
Existing UTVs (Constructed prior to effective date of regulation)			
Hull and Machinery	Handrails and bulwarks	High	$10,000 to $50,000
	Freeing ports and scuppers	High	$1,000 to $30,000
	Guards for exposed hazards	High	$20 per linear foot
	Alarms/monitoring and gauges	Variable	$4,500 to $200,000
	Steering	Variable	$9,500 to $12,000
	Electrical equipment and wiring	Variable	Minimal [3]
	Fuel systems	High	$4,000 to $5,000
	Electrical generating systems	Variable	Minimal [4]
	Lighting	High	Unknown
Navigation and Communication	Connect VHF radio to battery backup	Unknown	$2,000
	Handheld VHF radio	Unknown	$100 to $300
	Second radar	Unknown	$3,850 to $6,650
	Rudder angle indicator	Unknown	$750 to $2,500
	Onboard crew communications	Unknown	$2,000 to $10,000
	Pilothouse window visibility	High	$1,000 to $15,500
	Emergency communications capability	Unknown	$200 to $2,000
Pollution Prevention	Bilge pumps	High	$5,000 to $80,000
	Oily water separators	High	$10,600 to $27,800
	Spill kit	Unknown	$320 to $600
	Closable scuppers	Unknown	$100 to $17,200
Lifesaving	Visual distress signals	Unknown	$171 to $504
	First aid kit/trauma kit	Unknown	$85 to $695
	Immersion suits	Unknown	$1,060 to $4,260
	Inflatable life raft	Unknown	$3,400 to $6,400
Firefighting	Fire axe	Unknown	$45 to $65
	Smoke alarms	Unknown	$10 to $70,000
	Placarded storage area	Unknown	$2,000

[1] Naval architects and other interviewees were asked about the level of general current compliance of vessels in the UTV industry with each recommended requirement. A "high" level of compliance indicates that all interviewees thought that most UTVs were already in compliance with the recommended requirement; a "variable" level of compliance indicates that interviewees differed in their statements about current levels of compliance; and an "unknown" level of compliance indicates that all interviewees did not know or did not provide information on the current level of compliance with the recommended requirement.
[2] Non-compliance is assumed in calculating cost impacts; therefore, these cost impacts may be overstated to the extent that vessels are partly or fully in compliance.
[3] TSAC's recommended electrical equipment and wiring requirement for existing UTVs consists of relatively minor actions such as labeling and ensuring that all elements are in proper working condition. The analysis assumes that UTV owners/operators already conduct appropriate maintenance of electrical equipment and wiring for UTVs in the absence of regulation; therefore, potential costs are assumed to be minimal for this recommended requirement and may consist of such activities as labeling of equipment.
[4] TSAC's recommended electrical generating system requirement for existing UTVs consists of proper maintenance. The analysis assumes that UTV owners/operators already conduct appropriate maintenance of these systems for UTVs in the absence of regulation; therefore, potential costs are assumed to be minimal for this recommended requirement.

3.1 Hull and Machinery

3.1.1 Design and construction (new vessels only)

Inland towing vessels built after the effective date of the regulations must be designed and constructed in accordance with ABS Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways (version in effect as of the date the contract was signed), or other published, recognized standards, to be determined. Coastal/ocean towing vessels built after the effective date of the regulations must be designed and constructed in accordance with ABS Rules for Building and Classing Steel Vessels Under 90 Meters (295 feet) in Length (version in effect as of the date the contract was signed), or other published, recognized standards, to be determined. Classification by a recognized classification society is not required.

Vessels constructed after the effective date of the regulations that are essentially sister vessels of a class or series of previously built vessels may be constructed to the same design as previously built vessels in the class or series, provided that 1) the class or series of vessels has a history of safe operation and 2) the new vessels meet all of the requirements outlined in items c) through r) below, including the provisions for vessels constructed after the effective date of the regulations[16]

New designs that deviate from applicable ABS Rules for Building and Classing Steel Vessels or other published, recognized standards may be permitted if approved by the Coast Guard or a recognized classification society.

Vessel plans must be reviewed and approved by a Professional Engineer with marine expertise. Builder must certify that vessel was built in accordance with approved plans. Vessel owner must retain a copy of the approved plans in the company office. Plan approvals and builder certifications must be available for review by Coast Guard or third-party auditor.

Existing vessels that undergo substantial modification may be rebuilt as original or to the standards above.

The American Bureau of Shipping (ABS) is a classification society that sets forth standards for materials and welding, hull construction and equipment, and vessel equipment and machinery.[17] Vessels that meet these standards are eligible for an ABS-issued certificate of classification. This classification, in turn, may be a requirement for vessel insurance.[18]

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[16] Items c) through r) in the TSAC RWG correspond to recommended hull and machinery equipment standards in Section 3.1 of this report; however, this report does not assess costs of all recommended hull and machinery equipment standards contained in the TSAC RWG as per agreement with ABS Consulting and the Coast Guard.

[17] ABS rules applicable to most UTVs are contained within "Rules for Building and Classing Steel Vessels Under 90 Meters (295 Feet) in Length – 2006" available for download from www.eagle.org. Most vessels over 300 feet in length are already currently inspected.

[18] However, vessels can choose to meet ABS standards even if they do not require classification for insurance or other purposes.

Vessel owners that would not comply with ABS standards in the absence of a regulatory requirement would incur costs for this recommended requirement. These costs could include labor costs associated with using a marine architect to ensure compliance, the cost of materials and equipment required to comply with ABS structural standards, and the cost of ABS plan review and surveying where ABS classification is required.

While a majority of existing vessels do not meet ABS standards, discussions with marine architects and experienced towing industry personnel indicate that most new vessels designed by reputable marine architects are designed to these standards. However, there are some new vessels built by shipyards based on previous vessel designs that would not meet ABS standards.

Potential costs of this required recommendation are not estimated in this report due to a lack of information on the degree to which vessel designs for noncompliant vessels deviate from ABS standards; however, the assessment notes that certain vessel owners and/or operators may incur costs of compliance associated with bringing new vessels into compliance.

3.1.2 Handrails and bulwarks

Rails or equivalent protection must be installed near the periphery of all decks accessible to crew. Equivalent protection may include lifelines, wire rope, chains, and bulwarks that provide strength and support equivalent to fixed rails. Where space limitations make deck rails impractical, such as at the narrow catwalks in the deckhouse sides, hand grabs may be substituted.

The incremental costs of this standard to the UTV industry will depend on the extent to which all towing vessels already have bulwarks or handrails. Per vessel costs will depend on a number of vessel-specific factors such as the length of the deck accessible to the crew and the extent to which hand grabs are substituted for handrail requirements.

While the percentage of towing vessels that already have bulwarks or handrails is unknown, the naval architects interviewed indicated that towing vessels with which they are familiar do have handrails or bulwarks. To estimate per vessel costs for UTVs that might not currently be in compliance with this recommended requirement, shipyards were consulted for cost estimates associated with installing handrails and bulwarks.[19] One shipyard stated that providing a cost estimate is impossible given the variation of potential costs across vessels. A second shipyard noted that the cost of installing a handrail or bulwark may include multiple components, such as the cost of materials, surface preparation of the steel, structural modification, and labor costs. This shipyard estimated that installing a bulwark on a 35-foot vessel would cost between $10,000 and $12,000, while installing a bulwark on a 100-foot vessel would cost between $40,000 and $50,000. Similar estimates for installing handrails were not provided by this shipyard, but handrails are typically less expensive than bulwarks. Costs for this recommended requirement are estimated to range from $10,000 to $50,000 for installing bulwarks depending

[19] Shipyards were also consulted regarding the cost of hand grabs. One shipyard stated that there are many variables that influence the cost of hand grabs, including length, material, and any required modification of the vessel to install the hand grab. This shipyard offered a rough estimate of $1,000 to $2,000 for installing hand grabs on a five-foot section of a vessel.

on vessel size; however, to the extent that handrails are used rather than bulwarks, this range may be an overestimate of actual costs.

3.1.3 Emergency egress

A towing vessel constructed after the effective date of the regulations must have at least two means of egress from the engine room and the overall crew accommodations area. This does not mean individual spaces, such as staterooms, within the accommodations area. Doors and escape hatches must be operable from either side. The lower section of the engine room must be provided with at least two means of egress to the upper engine room or the exterior of the vessel.

Interviews with naval architects suggest that this requirement is currently met by most towing vessels. Two of the naval architects indicated that small towing vessels might not currently be designed with two means of egress from the lower engine room to the upper engine room, because the lower engine room in small towing vessels is very small. Small towing vessels may also not have two-level engine rooms.

Conversations with shipyards indicated that the potential per vessel costs of meeting this requirement may depend on the method through which two means of egress is achieved on the vessel. One shipyard noted that parts and installation for an escape hatch and ladder would cost between $7,000 and $8,000. Another shipyard stated that this requirement would usually be met using a vertical escape trunk, which would cost approximately $15,000. Per vessel costs for this recommended requirement are therefore estimated to range from $7,000 to $15,000.

3.1.4 Freeing ports and scuppers

For each towing vessel that is fitted with installed bulwarks around the exterior of the main deck, sufficient freeing ports and/or scuppers must be provided and maintained to allow water to run off the deck quickly without adversely affecting the stability of the vessel.

All interviewees stated that towing vessels that have bulwarks generally have sufficient freeing ports or scuppers to allow water to run off the deck quickly. To the extent that this is true of all vessels within the UTV industry, this requirement would have a marginal impact on the industry.

Individual vessels that do not have sufficient freeing ports or scuppers will incur costs of meeting this recommended requirement. One shipyard noted that adding a freeing port or scupper in an open bulwark would cost approximately $1,000. In a closed bulwark, the cost would range from $2,000 to $2,500. Small vessels have fewer scuppers than larger vessels, which may have up to twelve. Costs are therefore assumed to range from $1,000 to $30,000 (twelve scuppers at $2,500 each) per vessel for this recommended requirement.

3.1.5 Guards for exposed hazards

An exposed hazard, such as gears or rotating machinery, must be properly protected by a cover, guard, or rail.

Most interviewees indicated that this standard would already be met by most towing vessels because vessels typically contain guards for exposed hazards; however, where the requirement is not met, guards could be engineered in a wide variety of ways for a wide variety of exposed hazards, leading to a wide range in potential costs for non-compliant vessels. For this reason, shipyards provided examples of the costs of installing guards around specific exposed hazards, but were unable to provide a general per vessel cost for this required recommendation.

One shipyard stated that it may cost $3,500 to build a guard for a towing winch, while another shipyard stated that a sheet metal guard around a rotating coupling may cost $1,500. One naval architect also stated that a guardrail could be installed at the cost of $20 per linear foot; however, the number of feet required per vessel is unknown for the reasons previously listed. Given the significant uncertainty surrounding potential costs associated with this recommended requirement on a per vessel basis, a specific range of costs is not provided. Rather, potential costs are assumed to vary considerably across all UTVs.

3.1.6 Alarms/monitoring and Gauges

Each towing vessel must be equipped with an alarm system that includes main engine lubricating oil pressure, main engine cooling water temperature, auxiliary generator engine lubricating oil pressure, auxiliary generator engine cooling water temperature, hydraulic steering fluid levels, and bilge levels. Alarms must be audible and visible at the primary operation station.

Each towing vessel must be equipped with gauges for the following: main engine lubricating oil pressure, main engine cooling water temperature, auxiliary generator engine lubricating oil pressure, auxiliary generator engine cooling water temperature, and hydraulic steering fluid pressure if equipped with hydraulic steering systems. Gauges must be accessible to crew-members for monitoring.

The extent to which towing vessels already meet the alarm requirement is unknown. Three interviewees indicated that most towing vessels currently have these alarms. Two other interviewees indicated that alarms for hydraulic steering fluid levels, main and auxiliary engine lubricating oil pressure, and main and auxiliary engine cooling water temperature are standard, but that bilge level alarms and gauges are present on only some towing vessels. Similar to the recommended alarm standard, the impact at the industry level of requiring gauges for oil pressure, cooling water temperature, and steering fluid pressure on towing vessels is unknown due to disagreement over current levels of compliance. Most interviewees indicated that virtually all new vessels already have these gauges, while one said that vessels frequently do not have these gauges, but have alarms and warning lights. Further, one interviewee said that older vessels often do not have these gauges. For this reason, it is possible that some UTVs will already have alarm systems, but will require adding gauges to the alarm system in order to comply with this recommended requirement.

While some UTVs may require adding gauges to an existing alarm system, interviewees provided combined costs for this recommended requirement because alarm systems and gauges are typically installed together. The cost estimates provided varied significantly. One interviewee noted that the cost of a bilge level alarm and gauge varies with vessel size, but

averages approximately $4,500. One shipyard stated that it would cost between $10,000 and $12,000 to add the recommended gauges and alarms to a vessel. Another shipyard noted that there is a wide variety of quality and complexity, and therefore costs, among different systems. This shipyard stated that purchasing and installing a simple system would cost between $30,000 and $40,000, while a complex system may cost between $100,000 and $200,000. However, the high-end estimate of this range is likely to be rare because a vessel requiring this type of equipment would be a large, relatively expensive vessel which would probably already contain the recommended requirement. In addition, costs for vessels that have to add gauges to an existing alarm system would be lower than the combined cost estimates provided. Overall, the cost range for an alarm and gauge system to meet the recommended requirements for alarms and gauges are estimated to range from $4,500 to $200,000.

3.1.7 Steering

A towing vessel constructed after the effective date of the regulations must be equipped with two independently operating sources of power (e.g., two steering pumps and two fluid reservoirs) for the steering system. Each source of power must be capable of operating the entire steering system.

An existing towing vessel that has only one source of power for the steering system must have an emergency backup system or process that will allow the vessel to be moved to a safe location in the event of a steering failure.

Cost estimates for this recommended requirement as applied to new towing vessels vary widely, based primarily on differing assumptions regarding the degree of current compliance in the UTV industry and on vessel size. For example, one interviewee stated that two independent sources of power for the steering system are not standard on towing vessels, while one interviewee stated that fully independent sources of power are common in large towing vessels, but are rare in small vessels such as harbor tugs. Yet another two interviewees indicated that this potential requirement is normally met on large vessels, as it is a requirement for vessel inspection and classification; however, the potential requirement is not currently met on some smaller towing vessels. In contrast, two interviewees suggested that all towing vessels would probably meet this requirement. While some small vessels may not meet the requirement, one interviewee suggested that the additional cost of meeting this requirement on a small vessel would be relatively low.

The cost of steering equipment depends on the size of the vessel, the size of the rudder(s), and the speed at which the vessel travels. One interviewee suggested that having two independent sources of power for the steering system would add approximately $10,000 on average to the cost of a new vessel. This interviewee further estimated that retrofitting a vessel with only one source of power for the steering system with a backup source of power would cost approximately $7,500 to $10,000 for materials and $2,000 for installation, yielding a range of $9,500 to $12,000. Therefore, potential per vessel costs for this recommended requirement are estimated to be $10,000 on average for new vessels, and to range from $9,500 to $12,000 per vessel for existing vessels.

3.1.8 Electrical equipment and wiring standards

A towing vessel constructed after the effective date of regulations must have electrical equipment and wiring that meet the standards of 46 CFR subchapter L or appropriate equivalent standard.

For existing towing vessels, all electrical equipment and wiring must be maintained in good operating condition such that no fire hazards or other hazards to personnel are present. All wiring terminations must be made in junction boxes or other electrical fixtures suitable for the purpose intended. All machinery switches, energizers, and circuit breakers must be labeled and maintained in good operating condition. When electrical equipment or wiring must meet UL Marine standards or an appropriate equivalent standard.

Impact and cost estimates for this recommended requirement vary widely. While new UTVs owners/operators may incur costs of installing electrical equipment and wiring that is more expensive than what they would have installed in the absence of regulation, cost impacts to existing vessels may be limited to such actions as labeling machinery switches, energizers, and circuit breakers. In addition, the extent of cost impacts to new UTVs will vary according to the type of system that would have been installed in the absence of regulation. For example, while one interviewee stated that wiring on towing vessels designed by his company frequently complies with ABS standards or an Institute of Electrical and Electronics Engineers (IEEE) standard, which appears to meet this requirement, two interviewees indicated that towing vessel wiring is not typically done to the specifications of a particular standard. Another interviewee suggested that wiring might be done to standard for large vessels but not for small vessels.

As stated above, cost estimates for this recommended requirement vary according to the extent of new construction required for new vessels. One interviewee stated that wiring relatively small vessels to meet a standard would add at least $20,000 to $30,000 to the cost of the vessel, and that large vessels would already meet the requirement. By contrast, a second interviewee indicated that the additional cost of vessel wiring to comply with a standard would be small. One shipyard stated that electrical systems on vessels are usually designed and constructed to this standard, but that it is impossible to separate the cost of meeting the standard from the total cost of installing an electrical system on a vessel, which may range from $500,000 to $700,000. Another interviewee stated that an additional cost of this requirement would be the cost of engineering and plan submittal required to document compliance with the standard, which may range from $1,000, for the simplest towing vessel, to $8,000 for the most complex. The assessment adds estimated electrical system costs to documentation costs to estimate per vessel costs for this recommended requirement of $21,000 to $708,000 for vessels constructed after the date of regulation. Under regulation, existing vessels would incur marginal costs of labeling and other maintenance activities.

3.1.9 Fuel systems

Vessels whose construction was contracted for after January 18, 2000, must comply with the requirements for fuel systems at 46 CFR 27.211.

For all towing vessels, the fuel systems for the vessel and for main engine propulsion and auxiliary generator systems must be maintained in good operation condition. Each towing vessel must be able to supply clean fuel to the main engines and auxiliary generator engines via a filtering system that may include filters, a centrifuge, and/or a day tank. A towing vessel equipped with a day tank must be equipped with a low fuel level alarm.

Because the fuel filter on vessels eventually becomes fouled, TSAC recommends that UTVs either have multiple fuel filters or the ability to rapidly change the fuel filters. All marine architects contacted indicated that all towing vessels have systems to supply clean fuel to the engines; for this reason, current compliance in the UTV industry is considered high. According to these individuals, most vessels accomplish this using fuel filters. Two shipyards also stated that all towing vessels have fuel filters that can be changed while the vessel is underway. One shipyard stated that most towing vessels accomplish this standard using duplex filter systems, but some larger vessels may use a centrifuge for fuel filtration. One shipyard stated that if a vessel did not have this capability, adding a duplex valve system may cost between $4,000 and $5,000. A centrifuge would cost considerably more, in the tens of thousands of dollars.

3.1.10 Electrical generating systems

A towing vessel constructed after the effective date of the regulations must be equipped with two electrical generating systems. Each electrical generating system, regardless of type, must be capable of carrying the essential electrical load of the vessel under normal operating conditions. Electrical generating systems on existing towing vessels must be maintained in good operating condition.

Impact and cost estimates for this recommended requirement vary widely. One interviewee indicated that this requirement is frequently not met, while another stated that new vessels generally have two electrical generating systems, but that very small towing vessels may not. Another interviewee stated that a backup generator is included on all vessels that his company designs. Given differences in interviewee comments on current compliance, the overall level of current compliance with this recommended requirement in the UTV industry is unknown.

Per-vessel cost estimates provided for this recommended requirement for new UTVs range from $2,000 for a backup generator to $100,000 or more for an additional generator, switchboard, exhaust system, and cooling system. Actual costs incurred for new UTVs will depend on the degree of current compliance of the vessel design with the recommended requirement. Existing UTVs are likely to require minimal maintenance costs in excess of maintenance costs incurred by vessel owners/operators in the absence of regulation.

3.1.11 Lighting

A towing vessel must be equipped with appropriate illumination in crew work areas.

All interviewees indicated that virtually all towing vessels are constructed with appropriate illumination in crew work areas. Two shipyards contacted were unable to provide specific per vessel costs of lighting to meet this standard, stating that there are too many variables that may

determine potential costs on a per vessel basis; however, the costs may be similar to costs of wiring.

3.2 Navigation and Communication Equipment

3.2.1 Capability of connecting a VHF radio to battery backup

At least one VHF radio required under 33 CFR 164.72(a)(3) must be installed at the operating station in the pilothouse and connected to a properly operating battery backup.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Where UTVs are not in compliance, one towing vessel company employee stated that the cost of connecting a VHF radio to battery backup is approximately $2,000. Much of this cost derives from the fact that the backup battery will slowly lose charge and thus needs to be wired into the ship's main power supply for trickle charging.

3.2.2 Handheld VHF radio

Each towing vessel must have at least one properly operating handheld VHF radio.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Several vendors supply handheld VHF radios, with prices varying from $100 to $300 depending on the make and type. Variables affecting price include size, display, battery life, durability, water-resistance (splash-proof or submersible), and the ability to receive weather alerts. High-end models include additional features such as sending GPS coordinates with distress calls.

3.2.3 Second radar

Each towing vessel that operates on oceans, near coastal, or on Great Lakes routes more than 12 miles from shore, must be equipped with second radar.[20] *The second radar must meet the requirements of the Federal Communications Commission specified by 47 CFR part 80, and TRCM Standard for Marine Radar Equipment Installed on Ships of Less than 300 Tons Gross Tonnage, TRCM Paper 71-95/SC 112-STD, Version 1.1, display Category II and stabilization Category Bravo.*

The current level of compliance with this recommended requirement in the UTV industry is unknown. Radar systems are available from several online recreational marine vendors and range in price from $1,000 to $2,500; however, these recreational cost estimates may be low for UTVs. Variables affecting the price of recreational radars include display quality, range, water-resistant, and automatic image optimization software.

A representative from the marine electronics industry indicated that radars are not made differently for commercial and recreational use, but that they do come in a wide range of models, with varying strength, range, resolution, and other specifications. Exhibit 4 summarizes cost

[20] The first radar is required on vessels by 33 CFR 164.72(a)(1).

information for two radars recommended by this individual. As shown, per vessel costs for radars that meet this recommended requirement are estimated to range from $3,850 to $6,650.

Exhibit 4

Sample Radar Costs

Model	Price	Installation Cost	Total Cost
Dome Model (smaller vessels)	$3,200	$650	$3,850
Array Model (larger vessels)	$6,000	$650	$6,650

3.2.4 Rudder angle indicator or means to visually indicate rudder position

Each towing vessel must be equipped with a rudder angle indicator if it is fitted with non-follow-up steering gear. Towing vessels fitted with follow-up type of steering are not required to have a separate rudder angle indicator as long as the position of the towing vessel's rudders is appropriately indicated by the relative position of the steering levers.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Costs for rudder angle indicator (RAI) systems vary by vessel size: smaller vessels would generally use a "Standalone RAI System," which may cost approximately $750, while larger vessels would generally use a "Panoramic Read-out System," which may cost approximately $2,500. The majority of the total cost (and cost variation) is installation-related and depends on factors such as rudder shape, whether the installation company has outfitted similar vessels previously (and already has an established installation plan), and the amount of wiring required. Large vessels with many waterproof bulkheads can be especially expensive, because water-proofness must be restored after the cable has been run. Retrofits are likely to be less expensive than new installations, because some of the wiring may already be in place.

3.2.5 Onboard crew communications

Each towing vessel must have an internal communication system or other means of communication that allows the vessel operator to communicate with crewmembers on watch.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Advanced onboard crew communications systems may not be necessary for small vessels on which all crewmembers are within earshot of the others. On larger vessels, communication typically involves a PA system with speakers in several locations throughout the vessel, and a warning light that activates in the engine room (because announcements cannot be heard over the sound of the machinery).

One interviewee estimated $5,000 to $10,000 to outfit a large vessel with an onboard crew communications system. Another interviewee estimates this system would cost $1,000 to $2,000 for equipment, and $1,000 to $5,000 for labor, depending on factors including the difficulty of the wiring and the size of the vessel, yielding a range of total costs of $2,000 to $7,000. Per

vessel costs for this recommended requirement are therefore estimated to range from $2,000 to $10,000.

3.2.6 Means of ensuring visibility through pilothouse windows

Each towing vessel must have a means of ensuring that the window immediately forward of the steering station in the wheel house allow for adequate visibility to ensure safe navigation.

According to TSAC, the main components of the recommended pilothouse visibility system are windshield wipers and defogging/defrosting capabilities installed for the window immediately forward of the steering station in the wheelhouse. The size of this window will most likely determine the method selected to achieve this recommended requirement: oceangoing vessels tend to have smaller windows and are more likely to use window heaters whereas inland vessels tend to have larger windows and are more likely to use warm air blowers for defogging. For this reason, potential costs of meeting this recommended requirement will vary according to the vessel's specific characteristics. In addition, vessels are likely to already be equipped with a means of ensuring visibility through pilothouse windows, as this is a standard and practical feature for a vessel.

A system for ensuring visibility through the pilothouse window may include several components, including heat and defogging equipment, wiper kits, and de-icing sprays; however, it is uncertain whether all of these components will be required as part of future UTV regulations. Industry estimates for these components vary widely, from $1,000 to $15,500. For example, an estimated price for a 4-wiper system suitable for a large vessel of over 100 feet, with wash capabilities, wiring, and controls, is roughly $15,500. For this system, the wash capability is over 50 percent of the cost, because it requires piping from a water source. Estimates for minimal systems on small vessels are much lower, ranging from $1,000 to $3,000.

3.2.7 Emergency communications capability

Each towing vessel must maintain an emergency communications capability appropriate for the vessel's area of operation.

The current level of compliance with this recommended requirement in the UTV industry is unknown. As suggested by the recommended requirement, the appropriate emergency communications system will vary based on the vessel's area of operation. Interviewees suggested that one to two handheld VHF radios were sufficient within the United States or in U.S. coastal waters, ranging in cost from $200 to $500 each. Several other systems include emergency position indicating radio beacons (EPIRGs), which broadcast identifying information if a vessel sinks, and satellite communications systems, each of which may cost approximately $2,000. Per vessel cost of this recommended requirement are therefore estimated to range from $200 to $2,000.

3.3 Pollution Prevention Equipment

3.3.1 Bilge pumps or other dewatering capability

All towing vessels must have either an installed bilge pump or another method for emergency dewatering, such as a portable pump with hoses.

The price of dewatering systems is a function of variables such as pump size, vessel type, and number of vessel compartments and their location. Water pumped from vessel compartments must be piped out through the hull, making installation costs very specific to individual vessels and setups. Pumping also has an electrical impact, requiring switchboard modification in many cases and sufficient generator capacity. Most UTVs are expected to already be in compliance with this recommended requirement.

While large towing vessels that do not have a bilge pump or other dewatering capability may incur costs from $10,000 to $80,000, a commercial tugboat might incur costs for bilge pumps at a cost of $5,000 per vessel. One interviewee suggested a cost of $43,000 for a 130-foot vessel, which falls within the range mentioned previously. Per vessel costs of this recommended requirement are therefore estimated to range from $5,000 to $80,000.

3.3.2 Oily Water Separators (OWS)

The requirement to manage oily waters already applies to UTVs as stated at 33 CFR 155.350, 155.360, 155.370, and 155.380.[21] Vessels may comply with the requirement by either storing oily water onboard and discharging to specified locations, or by using an oily water separator. While this requirement already applies to UTVs, the Coast Guard requested that cost estimates associated with oily water separators be included for purposes of this preliminary cost assessment.

Exhibit 5 provides cost estimates for typical OWS systems. As shown, costs vary with the size and model of the OWS. In addition to the cost of the system, installation and training may range from at least $800 to $900 per day, and may take one to two days.

[21] 33 CFR 155.350 applies to oily mixture (bilge slops)/fuel oil tank ballast water discharges on oceangoing ships of less than 400 gross tons; 155.360 applies to oily Mixture (bilge slops) discharges on oceangoing ships of 400 gross tons and above but less than 10,000 gross tons, excluding ships that carry ballast water in their fuel oil tanks; 155.370 applies to oily mixture (bilge slops)/fuel oil tank ballast water discharges on oceangoing ships of 10,000 gross tons and above and oceangoing ships of 400 gross tons and above that carry ballast water in their fuel oil tanks; and 155.380 contains oily-water separating equipment, bilge alarm, and bilge monitor approval standards.

Exhibit 5 Typical OWS Equipment Cost Estimates		
Size of OWS	Models for OWS	
	USCG certified MEPC 60(33) [1]	USCG certified MEPC 107(49) [2]
2 Gallons per Minute (GPM)	$5,600 to $9,500	$9,800 to $26,000
5 GPM	$83,00+	$12,700+
Notes: [1] This system was the standard prior to January 2005, but can be still used by boats under 400 gross tons. [2] This system is the new standard after January 2005.		

To estimate potential per vessel costs of meeting this recommended requirement, the assessment assumes that UTVs will be required to have USCG-certified MEPC 107(49) OWS system, which is the currently active standard. As shown in Exhibit 5, the cost of such a system may range from $9,800 to $26,000. Assuming a lower-bound estimate of installation and training of $800 and an upper-bound estimate of $1,800 ($900 per day for two days), the assessment estimates a range of per vessel costs for this recommended requirement of $10,600 to $27,800.

3.3.3 Spill kit

During fueling operations, each towing vessel must have ready for immediate use equipment and supplies to clean up and remove an on-deck oil spill of at least one barrel. The equipment and supplies must include sorbents; non-sparking hand scoops, shovels, and buckets; containers suitable for holding recovered waste; emulsifiers for deck cleaning; and protective clothing.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Recommended oil spill kits typically include absorbents, containers, and protective goggles, are sold commercially, and cost between $200 and $350. The kits generally do not contain non-sparking scoops and shovels, emulsifiers, and full-body protective clothing, which may be purchased separately. Tyvek disposable full-body protective suits are available for $10 to $20, depending on size. Non-sparking shovels are available for $20 to $50, depending on length, capacity, and strength. Non-sparking scoops are available for under $10 each. Purchasing two of each item, which is standard in larger-volume spill kits that do include scoops and shovels, may cost between $80 and $160. A high-end emulsifier (Hydroclean HT-504) is $90 for a five-gallon container; on non-porous surfaces, Hydroclean's HT-40 is sufficient at $40 for five gallons. Adding the costs of recommended spill kit components, the total per vessel cost incurred for an appropriately stocked spill kit to comply with this recommended requirement may range between $320 and $600.

3.3.4 Closable scuppers or other containment method

Each towing vessel must be capable of preventing spills to the deck during oil or fuel transfers from reaching the water, whether by 1) pre-closing of the scupper/freeing ports, if the vessel is so equipped, or 2) pre-deploying absorbent booming/pads on the deck around vents and fills.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Two possible options can contain oil flow during oil transfer operations: closeable scuppers or the use of absorbents to block the flow of oil from the deck. A common method currently in use involves plugging gunwale scuppers with an appropriately sized piece of wood or metal. Larger vessels may have drains with special valves on the deck that run through the vessel and drain overboard. A typical large vessel might have four such drains; smaller vessels would have only gunwale scuppers that could be blocked by wood or metal.

The cost of the required absorbents may range from $100 for a small vessel to $1,000 for a large vessel. In both cases, the absorbents would require replacement only in the event of a spill.

Large vessels with deck drains would need special valves installed to block the flow of oil (regardless of the choice between absorbents and closeable scuppers). Costs may include $300 per valve for equipment and $1,000 per valve for installation, yielding a total of $1,300 per valve. The number of drains per vessel varies, but a typical large vessel might have four drains requiring valves, yielding a total of $5,200 for deck drain valves.

Large vessels may choose to use closeable scuppers instead of absorbents. The cost to make a scupper closeable is approximately $1,000 per scupper. The number of scuppers per vessel varies, but a large vessel may have 12 scuppers, yielding a total cost of $12,000 to equip a large vessel with closeable scuppers. Vessels with closeable scuppers would not require the absorbents discussed above. Rather than install closeable scuppers, interviews suggested that small towing vessels likely use absorbents or blocks.

Exhibit 6 summarizes costs of closeable scuppers and other containment methods discussed. As shown, costs will vary depending on the size of the vessel and the method of containment selected. Exhibit 6 shows a range of potential per vessel costs for this recommended requirement of $100 (small vessels) to $17,200 (large vessels).

Exhibit 6

Summary of Potential Containment Costs

Containment Method	Large Vessels With Deck Drains	Small Vessels
Choosing to use absorbents	$1,000 absorbents $5,200 deck drains $6,200 total	$100 absorbents
Choosing to use closeable scuppers	$5,200 deck drains $12,000 scuppers $17,200 total	N/A

3.4 Lifesaving Equipment

3.4.1 Visual distress signals

Each towing vessel operating on oceans, near coastal, or on Great Lakes routes, must carry six red flares and six smoke distress signals. Each towing vessel operating on lakes, bays, and sounds must carry three red flares and three smoke distress signals.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Red flares range in cost from $15 to $42, depending on intensity, yielding a total potential cost per vessel of $45 to $252. Smoke distress signals cost approximately $42, yielding a total potential cost per vessel of $126 (assuming three signals) to $252 (assuming six signals). Given uncertainty associated with vessel operating areas, the costs per flare and signal, per vessel costs are estimated to range from $171 to $504 for this recommended requirement.

3.4.2 First aid kit/trauma kit

Each towing vessel must be equipped with an industrial type first aid cabinet/kit appropriate to the size of the crew. A vessel operating on oceans, near coastal, or Great Lakes routes must have a means to take blood pressure readings, provide splints for broken bones, and provide large bandages for serious wounds.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Exhibit 7 summarizes costs for typical first aid kits, which vary based on area of operation and kit components. As shown, per vessel costs for this recommended requirement are estimated to range from $85 to $695.

Exhibit 7

Summary of Typical First Aid Kit Costs

Type of First Aid Kit	Price
Designed for use while at sea or in a remote harbor, but within 24 hours of medical care. Includes required blood pressure cuff, splints, and bandages.	$630
Designed for voyages over 48 hours away from professional help. Contains required blood pressure cuff, splints, and bandages.	$695
Contains major wound treatment module, fractures module. Does not contain blood pressure cuff. Manual and automatic blood pressure monitors are available for $15-$100.	$85

3.4.3 Immersion suits

Each towing vessel operating on oceans, near coastal, or on Great Lakes routes whose voyage takes it above Latitude 32 degrees North, must carry an appropriately sized immersion (survival) suit for each person onboard.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Immersion suits vary in price based on quality, material, and added features. Less expensive survival suits tend to be one-piece neoprene suits. The drawbacks of these suits include deterioration over time, difficulty putting the suit on, and reduced dexterity to the wearer. The Mustang Ocean Commander, a high-end suit, is not made of neoprene; instead it has a urethane coated nylon shell, with closed-cell foam for insulation and buoyancy. It is warmer, and contains removable gloves and replaceable components.

Immersion suits that meet the SOLAS standards and are Coast Guard-approved cost between $265 and $710. Given an average crew size of four to six, the total cost of immersion suits per vessel may range from $1,060 to $4,260.

3.4.4 Inflatable life raft

Each towing vessel operating on oceans, near coastal, or on Great Lakes routes more than one mile from shore, must carry an inflatable life raft appropriate for the number of persons on board.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Life rafts vary in cost, based on the quality of material of the raft and its components and the quality of construction, both of which influence the durability of the rafts. Importantly, a more expensive life raft may have a better, more advanced design, which can improve the raft's ease of use.

A SOLAS-certified life raft would meet or exceed regulations for towing vessels. An estimated average cost of a four-person life raft, including a cradle and hydrostatic release for mounting and installing the life raft, is $3,400. A six-person life raft with similar specifications ranges from $5,200 to $6,400. Given uncertainty associated with crew size on each UTV vessel, per vessel costs for this recommended requirement are estimated to range from $3,400 to $6,400.

3.5 Firefighting Equipment

3.5.1 Fire axe

Each towing vessel must be equipped with at least one fire axe that is readily accessible for use from the exterior of the vessel.

The current level of compliance with this recommended requirement in the UTV industry is unknown. The average price of a fire axe ranges from $45 to $65, which is the estimated range of per vessel costs for this recommended requirement, assuming that each vessel purchases one axe.

3.5.2 Smoke alarms to protect all sleeping spaces

Each towing vessel must be equipped with a means to detect smoke in the sleeping spaces and lounges that will alert individuals in those spaces. This can be accomplished via an installed

detection system or by using individual battery-operated detectors. Detection systems or individual detectors must be kept in operational condition at all times.

The current level of compliance with this recommended requirement in the UTV industry is unknown. Residential smoke alarms are typically different than commercial smoke alarm systems in both specifications and price. Residential smoke alarms range in price from $10 to $40, while smoke alarm systems provided by specialist companies may range in price from $60,000 to $70,000 for the whole vessel or $15,000 to $20,000 for the sleeping accommodation areas of the vessel only. One shipyard stated that residential smoke alarms could be used on towing vessels, while another shipyard stated that these vessels may use specialized smoke alarm systems. Given the range in smoke alarms vessels may be able to use, per vessel costs are estimated to range from $10 to $70,000 for this recommended requirement.

3.5.3 Heat or flame detector in galley

Each towing vessel constructed after the effective date of the regulations and equipped with a galley must have a heat or flame detector with an audible alarm at the primary operating station. (Galley = a space containing appliances with cooking surfaces that may exceed 250 degrees Fahrenheit).

The current level of compliance with this recommended requirement in the UTV industry is unknown. Heat detectors vary in price according to their specifications, as summarized in Exhibit 8. As shown, given the range of available heat detectors, costs may range from $14 to $184 per vessel for this recommended requirement, assuming that each vessel uses only one detector at the primary operating station.

Exhibit 8 Summary of Costs of Typical Heat Detectors	
Relevant Specifications	**Price**
135°F fixed temperature/rate-of-rise	$14
194°F fixed temperature/rate-of-rise	$14
Signals alarm if temperature > 135 F or rate of temperature increase > 15 F/minute	$47
Heat detector signals if temperature is > 140°F. Horizontal Flush Unit.	$184

3.5.4 Remote manual engine shutdown

Each towing vessel constructed after the effective date of the regulations must have a remote manual main engine shutdown for each main engine and auxiliary generator engine, which can be operated from a location outside the machinery spaces where engines are located. The required fuel shutoff may serve as this shutdown if each engine is fitted independently.

According to the interviewees consulted for this analysis, a remote manual engine shutdown is already standard equipment on towing vessels and therefore would impose little to no additional cost to the industry.[22] Individual vessels that do not meet the standard will, however, incur costs. One shipyard stated that the cost of installing remote manual engine shutdown on a towing vessel ranges from $1,500 to $2,000. Another shipyard stated that, while almost all towing vessels have this feature, installing it would cost approximately $6,000 to $8,000. Taking both cost estimates into account, the per vessel cost of this recommended requirement is estimated to range from $1,500 to $8,000.

3.5.5 Placarded storage area appropriate for flammable products

Placarded storage area appropriate for flammable products. A towing vessel that has paints, coatings, or other flammable products on board must have a designated storage area for unopened containers of flammable products. Previously opened containers of flammable products should be located away from ignition sources, and protected by a nearby fire extinguisher.

One shipyard stated that a storage cabinet for flammable materials may cost $1,000, and installation may cost another $1,000, yielding a total potential cost of $2,000. Signs vary in price from $2.50 to $11 per sign, or $6.75 per sign on average. Per vessel costs of one placarded storage area with one sign are therefore estimated to be roughly $2,000 for this recommended requirement.

[22] Fuel shutoff requirements are described at 46 CFR Part §27.340(f) as follows: "A positive shut-off valve must be fitted on any fuel line that supplies fuel directly to an engine or generator to stop the flow of fuel in the event of a break in the fuel line. The valve must be located near the source of supply (for instance, at the day tank, storage tank, or fuel-distribution manifold). Furthermore, the positive shut-off valve must be operable from a safe place outside the space in which the valve is located. Each remote station for fuel shut-off should be marked in clearly legible letters at least 25 millimeters (1 inch) high indicating the purpose of the valve and the way to operate it."

4. DRYDOCKING

Recommended drydocking procedures contained within the TSAC RWG specify drydocking intervals and inspection components/standards required during each drydock as follows:

Intervals:

Drydocking intervals should be based on time of service in salt water. The most restrictive schedule would require inspections twice in five years, with no more than three years between inspections. Five-year intervals shall be permitted for vessels in fresh water service. A vessel will be deemed to be in fresh water service if it has operated in fresh water for at least six months in every 12-month period since the last required drydocking.

Underwater inspections in lieu of drydocking may be permitted for alternating examinations if no obvious defects are present and the vessel has a satisfactory operating record.

A drydocking that meets the standards below, conducted within the specified intervals, will satisfy this requirement. Drydocking due dates will be based on the last drydocking conducted that meets the standards below.

Components/Standards:

Towing vessels required to have a loadline will be considered to meet the requirements below for hull and seachest examinations only. Towing vessels whose hull is classed by a recognized classification society will be considered to meet all the drydocking requirements specified below. For other towing vessels, a drydocking for regulatory credit must satisfy the following requirements:

> *The vessel owner or operator shall ensure that all components that affect the safe operation and hull integrity of the vessel are inspected.*
>
> *The vessel owner or operator must maintain documentation of: 1) the condition of the hull, underwater propulsion, and steering system as inspected; and 2) all repairs and alterations to the hull, underwater propulsion, and steering systems. Documentation must be retained for review by the Coast Guard or approved third-party auditor.*
>
> *At a minimum, the following inspections shall be performed and documented:*
>
> - *Hull: Inspect on drydock the hull bottom, sides, headlog and stern for indentation, fractures, holes, and other deficiencies that may affect the watertight integrity of the vessel. Assess by appropriate means the condition of the hull for watertight and structural integrity. Any steel replacement must be done to original construction or better. Hull fractures in any plating except an oil tank may be covered with an*

appropriately sized double plate, installed using good marine practice, if the hull thickness and condition is suitable.

- *Tailshafts: Inspect for bends, cracks, and damage from rope, wires, or other foreign objects. The tailshaft need not be removed for inspection if these items can be properly evaluated without doing so. Repair or replace as necessary to ensure safe operation and avoid excessive vibration. Inspect the sleeve (or other bearing contact surface) on the tailshaft for wear. Repair or replace as necessary for safe operation.*

- *Rudders: Inspect for skin or plate damage or fractures, upper and lower bearing wear, and bent rudder stock. Rudders need not be removed for inspection if these items can be properly evaluated without doing so. Repair or replace as necessary in accordance with good marine practice.*

- *Propellers: Inspect for cracks and damage from foreign objects. Propellers need not be removed for inspection if these items can be properly evaluated without doing so. Repair or replace as necessary in accordance with good marine practice.*

- *Keel Coolers: Inspect the exterior components of the machinery cooling system for leaks or damage. Repair or replace as necessary to ensure proper operation of the system.*

- *Seachests and Through-Hull Fittings: Inspect condition of seachest and through-hull fittings. Repair or replace as necessary in accordance with good marine practice. Ensure proper operation of associated valves.*

Generally, direct inspection costs associated with meeting these recommended requirements primarily involve labor and drydock rental costs. In addition to these primary direct inspection costs, UTV owners and operators may also incur economic opportunity costs associated with delay. While most UTV owners and operators probably drydock their vessels periodically, current drydocking procedures may not include inspection sufficient to meet recommendations contained within the TSAC RWG. For this reason, implementation of TSAC's drydocking recommendations may also result in delays to normal vessel operations arising from 1) longer periods of time required to ready the vessel for inspection; 2) longer periods of time required to inspect a vessel in accordance with all regulatory requirements; 3) time required for inspection by the U.S. Coast Guard or a third party inspector; and 4) time required to implement corrections to issues raised by the inspection. These delays may lead to economic opportunity costs in which the vessel in question is not being put to its intended economic purpose. In this case, opportunity costs are likely to consist primarily of lost revenue associated with the day rate of the vessel.

The preliminary assessment considers the incremental economic costs to UTVs that may be associated with direct inspection costs and delays pursuant to TSAC's recommended drydocking requirements. Exhibit 9 summarizes cost estimates assessed in this section.

Exhibit 9 Summary of Per Vessel Cost Estimates for Compliance with Potential Drydocking Requirements	
Cost Category [1]	**Estimated Range of Potential Per Vessel Cost**
Direct Inspection Costs [2]	$410 to $5,000
Delay Cost [3]	Not Estimated
Notes: [1] Interviewees were asked to estimate the time and cost required to comply with standards recommended by TSAC in its September 2005 Report of the Working Group on Towing Vessel Inspection. [2] Direct inspection costs include the total cost for a company to conduct a drydock inspection, including drydock slip rental, and varies by company, vessel length, weight (displacement), and the time required to conduct an inspection. [3] Delay poses opportunity costs on vessel owners and/or operators. Opportunity cost includes the economic activities that a vessel could undertake if it were not out of service. These activities vary by company, vessel weight, and vessel length, among other factors, and therefore impede cost estimation.	

4.1 Direct Inspection Costs

Cost factors that determine the cost of an inspection include drydock rental costs and the labor costs associated with hiring a drydock inspector. These potential costs will vary with the length and frequency of inspections, which in turn relate to the number and type of inspection requirements. UTV owners will incur additional direct costs to the extent that the recommended requirements presented in italics above increase the duration of a drydocking period over the normal duration absent regulation, thereby requiring the owner to incur higher total labor and slip rental costs.

Drydock Rental and Inspection Costs

While drydock rental costs are theoretically separate from labor costs, cost estimates obtained for rental include the cost of inspection, because most drydock inspection businesses interviewed for this assessment contract externally for inspectors and were unwilling to disaggregate costs into their respective rental and labor components. The numbers reported therefore represent the cost of both rental and external inspection. Exhibit 10 summarizes cost information obtained from inspection businesses, and estimates a range of future costs associated with potential drydocking requirements. As shown, costs for potential drydocking requirements as recommended by the TSAC RWG may range from $410 to $5,000 per vessel. The range in potential costs results from variations in company fees per hour, inspection times, and vessel size characteristics such as length and weight.

Exhibit 10 Summary of Per Vessel Drydock Costs (Drydock Rental and Inspection)				
Company	**Cost Variables**	**Company Cost Estimate (Drydock Rental and Inspection)**	**Estimated Inspection Time**	**Estimated Total Per Vessel Inspection Costs**
A [1]	Vessels 60 to 85 feet	$1,500	Visual external inspection can be completed in as little as one day. Time required for internal inspection depends on variables listed below.	$1,500 to $2,500
	Vessels 100 to 140 feet	$2,500		
B	Vessels of 400 GRT	$2,500	Two to three days for full internal inspection. External inspection can be performed in as little as a day but generally takes longer. Total time spent in port estimated to be between 3 and 5 days.	$2,500 to $5,000
	Vessels of 800 GRT	$5,000		
C	Cost quoted includes inspection and labor	$1,000 + $468 labor	At least half a day for both external (two hours) and internal (four hours) inspection.	$1,468
D	Direct price quote	$2,500	100 hours	$2,500
E	Direct price quote	$1,000	One day	$1,000
F	Direct price quote	$300 per day and $35 per day for electricity and $75 initial hookup fee	Visual external inspection can be completed in as little as one day. Time required for internal inspection depends on variables listed below.	$410
Overall Estimated Total Potential Inspection Costs				**$410 to $5,000**

Notes:
[1] Length approximations provided by Company A are based on the capacity of two separate drydocks intended to handle smaller and larger vessels.

General differences in the cost of drydock rental are due to the following three factors:

1. Configuration of vessel hull: A drydock company will custom-build blocks for each vessel that is suspended out of the water. Block configuration varies based on the size of the vessel and the underwater hull structure, and is different for ocean-going versus inland push boats due to the nature of the hulls. Further, blocks are built to accommodate each vessel and the unique structure of the hull such that it is not damaged when brought up to rest on the dock. A rail system is also constructed to haul the vessel out of the water. The cost of building blocks is based on time invested for each vessel and the company's specific hourly labor rate.

2. Length of the vessel: Some drydock companies maintain different docks that handle vessels of different lengths. Rental costs vary with length.

3. Duration of time since last inspection: A vessel may be docked longer if more time is required to appropriately clean it (for internal inspections). Longer periods between inspections are likely to increase time in port, because more time may be required to prepare and clean the vessel.

Labor Costs

Because drydock companies do not provide labor rates separately, the preliminary assessment relies on telephone interviews with five companies that perform drydocking inspections in order to estimate an average labor rate per hour. The interviews were conducted to capture a wide geographic range. Exhibit 11 summarizes these labor rates. The average labor rate for drydocking inspectors across five companies is $52 per hour. Applying this average labor rate to the average duration of inspection provided by one company – a duration ranging from three to four hours for small vessels to one day (eight hours) for large vessels – the assessment suggests a range of labor costs for inspections of $156 to $416 per inspection, depending on the size of the vessel.

Exhibit 11

Hourly Labor Rates for Towing Vessel Dry-Dock Inspections

Company	City, State	Rate Per Hour
A	Seward, AK	$59
B	St. Rose, LA	$50
C	Portland, OR	$50
D	San Francisco, CA	$56
E	Morgan City, LA	$45
Average hourly labor rate		**$52**

Frequency of Inspection

The TSAC RWG recognizes that many towing vessels currently operate in compliance with either the ISM or the AWO's RCP-recommended inspection intervals in the absence of federal regulation requiring drydocking, and contends that a majority of companies follow individual schedules for drydockings. However, the TSAC RWG recommends that specific drydocking interval times be included in any future rulemaking on UTV inspection.

The 2005 AWO RCP manual recommends that vessels in freshwater service drydock as needed with a maximum interval of 36 months.[23] For vessels in saltwater service, the manual recommends drydocking twice in five years with not more than 36 months between successive drydockings. For vessels operating exclusively in coastal harbor service (i.e., not beyond the

[23] According to the TSAC RWG, a vessel is deemed to be in freshwater service if it has operated in freshwater for at least six months in every twelve-month period since the last required drydocking.

boundary line), drydocking is recommended on an as-needed basis, with a minimum of once every five years, and with a mid-term underwater inspection recommended between the 24th and 36th month.

Industry input yielded two estimates of inspection frequency from two companies. One company reported drydocking towing vessels for inspection every two to three years, while the other reported intervals for the same vessel type of three to five years. Overall, inspection requirements are likely to vary according to the drydocking frequency requirements included in any proposed rulemaking and the area of operation of UTVs (fresh or saltwater).

4.2 Delay Costs

Potential delay costs under a regulation requiring a USCG or third party inspection will arise where UTVs must be drydocked for marginally longer periods of time than in the absence of regulation. Specifically, delay costs may result from 1) longer periods of time required to ready the vessel for inspection; 2) longer periods of time required to inspect a vessel in accordance with all regulatory requirements; 3) time required for inspection by the U.S. Coast Guard or a third party inspector; and 4) time required to implement corrections to issues raised by the inspection. Opportunity costs associated with these increased drydocking periods include such elements as lost profits and other foregone economic benefits of having the vessel on the water. The amount of lost profit will depend primarily on the day rate of the vessel.

The length of potential delay will depend on the size of the vessel and the interval time between successive drydockings, as well as on the availability of inspectors. Larger vessels require longer periods in port for inspection, simply because there are usually more components to inspect. This issue is of particular importance with respect to internal inspections. The interval time between inspections is relevant because longer intervals can necessitate more cleaning and inspection time. One company reported that the determining factor in the length of inspection time is the cleaning and preparing of sea valves, including the time required to disassemble parts of the vessel.

Estimates for overall time spent in port vary from “at least one day” to one business week (five days). The length of delay is not itemized based on the number or type of element inspected. Rather, estimates are provided for external and internal inspections in terms of the time required to complete an average inspection that would commonly include the elements listed in section 4.1.

Opportunity costs of delay consist of profits foregone as a result of regulations that may require a vessel to spend longer periods of time out of service, or drydocked, and less time performing operations that generate revenue. A company may also lose future business if it is not able to use time in service to conduct valuable client and person-to-person interactions. Opportunity cost will also vary to some degree based on the size of the company and the number of vessels run by the company (larger companies might be affected less by one vessel out of service for a short period of time than smaller companies), number of employees, and other revenue-generating activities that cannot be conducted because the vessel is drydocked.

External Inspections

Several interviewees indicated that an external inspection could be performed in a single day. However, interviewees indicated that a more thorough inspection would likely require at least two days. Other interviewees estimated that an external inspection requires between three and five days. The length of time is in part dependent on the items requested for inspection, which are currently unknown.

Internal Structural Inspections

Interviewees reported between one and three days required for proper full inspection. This time period allows for vessel preparation to allow safe entry into confined spaces. Time required depends in part on the condition of the vessel, including tank cleaning, which can vary by the type of material and buildup in the tanks. The internal inspection may be performed concurrently with the external inspection and may result in a total docking period of approximately one business week (five days). As stated previously, most drydock companies interviewed contract out this work and would not provide specific cost estimates.

5. SAFETY MANAGEMENT SYSTEM DEVELOPMENT, IMPLEMENTATION AND MANAGEMENT

The TSAC RWG recommends that the UTV industry be required to develop, implement, and maintain a safety management system (SMS) as part of any future proposed rule creating an inspection regime for the UTV industry. An SMS is a structured and documented system that enables company personnel to effectively implement the company's safety and environmental protection policy.[24] The AWO RCP and the International Maritime Organization's ISM Code provide guidelines that are currently used, on a voluntary basis, throughout the towing industry by those companies choosing to develop an SMS and become certified by these organizations. Based upon the AWO RCP and ISM Code standards, the TSAC RWG recommends the following:[25]

Any company that operates a towing vessel must have a Coast Guard-accepted safety management system. To be accepted by the Coast Guard, the safety management system must include, at a minimum, the following components:

1) *Safety, Security, and Environmental Protection Policies*
   a) *Company safety and security policy*
   b) *Company environmental policy*
   c) *Accountability and commitment at all organizational levels*

2) *Company responsibilities*
   a) *Explain or depict company organization and authority and responsibility of individuals at different levels*
   b) *Designated Person*
   c) *Vendor safety*

3) *Master (Captain) Authority & Responsibilities; Crew Responsibilities*
   a) *Master's authority and responsibilities*
   b) *Explain or depict responsibility of individuals at different levels*
      (i) *Authority of crewmembers not to perform task in the event of an unsafe situation*

4) *Personnel Procedures*
   a) *Hiring*
   b) *Physical exams and physical standards*
   c) *Drug, alcohol, and prescription medication*

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[24] This definition is from ISM Code 2002, section 1.1.4.

[25] However, the TSAC RWG states that while the working group "…recognizes that many towing vessels currently operate in compliance with either the International Safety Management (ISM) Code or the American Waterways Operators (AWO) Responsible Carrier Program (RCP)," they nevertheless believe that "…it is important that a towing company's safety management system include all of the SMS components proposed in section I of Attachment D." Attachment 1 to this report reproduces Section D of the TSAC RWG. Working Group on Towing Vessel Inspection, "Report of the Working Group on Towing Vessel Inspection." Memorandum submitted to the Towing Safety Advisory Committee, September 29, 2005, page 4.

d) New hire orientation and familiarization
e) Performance evaluations
f) Performance expectations and disciplinary procedures
g) Personnel development
h) Training program (initial and periodic refresher training by crew position)
i) Vessel manning
j) Crew Endurance Management

5) Vessel and Shoreside Operating Procedures
a) Procedures to ensure compliance with applicable federal laws and regulations concerning marine safety, security, and environmental protection
b) Bridge or pilothouse management
c) Operator incapacitation
d) Procedures for making horsepower-to-tow-size decisions
e) Minimum rigging or towing gear requirements according to vessel service
f) Navigation and watchstanding
g) Voyage or trip planning
h) Lightering
i) Procedures for identifying critical stores and supplies
j) Security

6) Safety and Health Procedures
a) Company safety and health rules
b) Personal protective equipment procedures appropriate for vessel operation
(i) Use, inspection, maintenance, and replacement
(ii) Respiratory protection
(iii) Fall arrest
c) Safety program – training, drills, and meetings
d) Safe use of equipment
(i) Deck machinery
(ii) Rigging
(iii) Welding and cutting
(iv) Hand tools
(v) Ladders
(vi) Abrasive wheel machinery
e) Slip, trip, and fall prevention
f) Fall overboard protection
g) Hazard communication and cargo knowledge
h) Confined space entry
i) Bloodborne pathogens
j) Lock-out/tag-out
k) Hearing conservation
l) Back safety
m) Personal hygiene
n) Sanitation and safe food handling

7) *Emergency Preparedness and Response*
   a) *Company emergency preparedness and response procedures, drills and training program*
   b) *Vessel specific emergency preparedness and response procedures, drills and training program*

8) *Maintenance of Vessel: Hull, Machinery, and Equipment*
   a) *Hull maintenance and inspection procedures*
   b) *Machinery maintenance and inspection procedures*
   c) *Equipment maintenance and inspection procedures*
   d) *Inspection and replacement program for rigging or towing gear*
   e) *Maintenance recordkeeping*

9) *Documentation*
   a) *Procedures to ensure proper and valid documentation carried aboard vessels*
   b) *Document control, updating, and distribution*

10) *Internal Audits, External Audits and Evaluation of the SMS*
   a) *Internal audit – schedule, topics, and scope*
   b) *External audit – schedule, topics, and scope*
   c) *Annual evaluation of SMS for effectiveness*

11) *Incident Investigation, Management of Non-conformities & Corrective Action*
   a) *Incident reporting and investigation procedures*
   b) *Communication procedures for disseminating lessons learned*
   c) *Procedures for identifying and reporting safety deficiencies and non-conformities*
   d) *Procedures for determining, implementing, and tracking corrective action*
   e) *Performance management procedures*

In order to estimate potential costs associated with TSAC's recommended requirements for SMSs, the preliminary cost assessment acquired cost information from entities that currently develop and implement SMSs, including towing vessel companies and professional SMS auditors. Based on information obtained from these sources, the assessment separates the costs of an SMS into five categories: 1) SMS development; 2) SMS initial implementation; 3) ongoing SMS maintenance and activities; 4) internal auditing programs; and 5) external auditing programs. Cost estimates for these categories are summarized in Exhibit 12. These components are discussed in greater detail in the sections that follow.

Exhibit 12 Summary of Cost Estimates for Potential Safety Management System Requirements	
Cost Element [1]	**Estimated Potential Costs [2]**
SMS development [3]	$750 to $70,000 (One-time cost)
SMS initial implementation	$311,000 overall for an average towing vessel company $1,680 per employee for an average towing vessel company (One-time cost)
Ongoing SMS maintenance and activities [4]	$2.5 million for an average towing vessel company $14,490 per employee for an average towing vessel company (Annual cost)
Internal auditing	$5,000 to $18,000 audit cost (Per audit) $1,700 training cost (Per employee trained as auditor)
External auditing	$750 to $6,000

Notes:
[1] Safety management cost elements included in this exhibit represent only a portion of the recommended standards included in TSAC's RWG. To the extent that certain recommended SMS components are not included in these cost estimates, the estimates will understate potential future costs of complying with RWG recommendations.
[2] Per employee costs for SMS initial implementation represent training costs only; per employee costs for ongoing SMS maintenance and activities represent personal protective equipment and maintenance, safety program drill performance, safety meetings, emergency drills and exercises, recordkeeping, and period refresher training programs for personnel policies; per employee costs for other activities were not estimable given the lack of data on the number of employees implementing those activities. To the extent that these activities are already conducted in the absence of a future Coast Guard SMS regulation, these costs will overstate potential future costs of complying with RWG recommendations.
[3] The range of potential costs for SMS development is estimated using cost information obtained from interviews with towing vessel companies, interviews with SMS development professionals, the response to the leave-behind questionnaire distributed to towing vessel companies during ABS Consulting port visits, and from personal communication with the company that completed the leave-behind questionnaire on August 25, 2006.
[4] The reported cost for ongoing SMS maintenance and activities represents the sum of the cost of company safety, health, and security policy; SMS updating; emergency preparedness and response procedures; personnel policies and procedures; documentation and recordkeeping; and incident reporting. These costs represent costs reported in the leave-behind questionnaire by a single average-sized towing vessel company with 24 vessels and between 100 and 200 employees, and may not be representative of towing vessel companies in the UTV industry.

Caveats to the Analysis

Actual costs incurred by UTV industry members may differ from the estimated potential costs summarized in Exhibit 12 for the following reasons:

- Because the current SMSs associated with the entities interviewed for this assessment differ in scope and content from TSAC's recommended requirements for SMSs and those requirements that may be finalized in a future UTV regulation, cost estimates obtained may overstate or understate the actual future costs to comply with a future UTV regulation.

- Costs of implementing SMSs are likely to vary according to company size and other company-specific characteristics that may differ from the average-sized towing vessel company used for many of the cost estimates. For this reason, cost estimates summarized in Exhibit 12 may overstate future costs for a smaller company.

- While employee training costs comprise a large percentage of initial SMS implementation costs as reported in the leave-behind questionnaire, training on such issues as safety and emergency response may already be conducted in the absence of regulation.[26] To the extent that this is true, all training costs presented may not be attributable to a future Coast Guard SMS regulation. Similarly, ongoing SMS maintenance and activities that may already be conducted in the absence of regulation such as safety program drill performance, safety meetings, and emergency drills and exercises, comprise a large percentage of ongoing SMS maintenance and activities. To the extent that these are already conducted in the absence of regulation, costs presented for ongoing SMS maintenance and activities may not be attributable to a future Coast Guard SMS regulation.

Data Sources

Data and information in this section are drawn from interviews with professional SMS auditors and towing vessel companies, from responses to surveys distributed to towing vessel companies, and from personal communication on August 25, 2006 with the towing vessel company that completed the leave-behind questionnaire. Eight professional SMS auditors employed by private consulting companies or major certification organizations were interviewed for this effort. Five of these individuals also develop SMSs for their clients. Data were also drawn from communication with three vessel companies, representing different areas of the United States: Houston, Seattle, and Tampa. Two of the three companies prepare their SMSs in-house. While specific citations for data sources are not included in this section, Attachment 3 to this report provides specific company names and contact information for these interviewees. Finally, a leave-behind questionnaire associated with specific costs related to SMS development and implementation was distributed to towing vessel companies during port visits conducted by ABS Consulting from January to March 2006. The assessment relies on one response to this questionnaire, as well as on an abbreviated version of this questionnaire that was also distributed to these companies, as other sources of data. Attachment 4 reproduces the original and abbreviated questionnaires.

5.1 Safety Management System Development & Initial Implementation

SMS Development: Costs Associated with Developing SMSs In-House and Outsourcing

SMS development involves laying out requirements and the collection and compilation of relevant company information (policies, procedures, processes, and other documentation as listed above) into a single, organized document system. Most companies already maintain many of the SMS components in some form, and require simply integrating these information resources, thereby incurring a relatively low cost for SMS development. Other companies that do not maintain much relevant documentation incur higher costs of SMS development, as the missing policies or procedures must be developed or written.

The assessment uses three sources of information to develop an overall range of potential costs for SMS development and initial implementation: interviews with towing vessel companies,

[26] For example, employee training costs represent 95% of total SMS initial implementation costs.

interviews with SMS development professionals, and the response to the leave-behind questionnaire distributed to towing vessel companies during ABS Consulting port visits. Exhibit 13 summarizes this cost information; the paragraphs that follow discuss the specific cost information provided by each source. As Exhibit 13 shows, overall estimated per company costs for SMS development may range from $750 to $70,000. As stated, actual costs will depend on the degree to which companies already engage in SMS-related development and/or implementation activities.

Exhibit 13 Estimated Per Company Costs for SMS Development			
Data Source	**Cost Variable**	**Estimated Range of Potential Costs**	**Notes**
Interviews with Towing Vessel Companies	SMS Development	$10,000 to $70,000 per company	Represents costs of SMS plan development only
Interviews with SMS Development Professionals	SMS Development	$750 to $30,000 per company	Represents costs of SMS preparation by an SMS development professional only
Leave-Behind Questionnaire	SMS Development	$50,000 for an average towing company [1]	Represents costs of SMS development for an average towing company
Overall Estimated Per Company Cost Range		**$750 to $70,000**	
[1] The towing company that completed the leave-behind questionnaire has 24 vessels and between 100 and 200 employees and may not be representative of all companies in the UTV industry.			

Of the towing vessel companies interviewed, two companies developed their SMSs in-house, while one company outsourced this activity. The vessel company that outsourced estimated a cost of $10,000 and a time frame of 1,000 hours. The two vessel companies that prepared their SMSs in-house were not able to estimate a cost for the development, but did report a time frame of 1,440 to 2,000 hours.[27] Applying an average labor rate in this industry of $35 per hour to these time frames yields a range of in-house SMS preparation costs of $50,400 to $70,000.[28] Overall, cost information from towing vessel companies suggests that costs for SMS preparation may range from $10,000 to $70,000 per company.

The SMS development professionals that were interviewed provided the rates that they charge their clients for preparation of an SMS. Rates for interviewees that charged by the hour range between $65 and $150 per hour, plus expenses (such as travel). The ultimate price, therefore, is based primarily on the amount of time required to prepare the SMS. Interviewees reported that the time required to develop the basic structure of an SMS varies from 100 hours to 200 hours. Applying the hourly rate range of $65 to $150 per hour to the time required to develop the basic structure of an SMS yields a range of $6,500 to $30,000 for this cost factor. The actual cost is dependent on several factors, including the size of the company, the complexity of operations, and, most importantly, the extent to which relevant information already exists. Some interviewees charge a flat fee instead of charging by the hour; these fees range from $750 to $5,000. Overall, cost information from SMS development professionals suggests that costs for SMS preparation may range from $750 to $30,000 per company.

In talking with towing vessel companies and SMS development professionals, interviewers initially tried to obtain separate cost and time estimates for each of the SMS components listed in

[27] The towing vessel companies reported that the most time-intensive component involved in developing an SMS is developing standard procedures. One vessel company estimated the cost of procedure development alone at $3,000 and 120 hours.

[28] The labor rate used in the analysis is based on an interview with the towing vessel company that completed the leave-behind questionnaire and quoted $35 per hour as an average rate for internal employees.

at the beginning of this section; however, all interviewees had a difficult time separating costs or hours spent on particular components. They stated that such differentiations are highly site-specific, and dependent upon the information available. Itemized costs were provided, however, in one response from a towing company to the leave-behind questionnaire distributed to vessel companies during port visits. For initial SMS development, this company reported a cost of $50,000 for the company, which includes $10,000 in external consultant fees and $40,000 in internal labor costs allocated to the SMS development process. This company is of average size, with 24 vessels and between 100 and 200 employees, and may not be representative of all companies in the UTV industry.

SMS Initial Implementation

Generally, SMS implementation involves establishing safety objectives and associated personnel support, training to ensure proper application of the SMS, and internal audits to ensure compliance. Interviewees indicated that initial SMS implementation generally takes 12 to 18 months but can take as little as one month. This depends, in part, on company motivation and management buy-in, and the stringency of its implementation. Reportedly, companies may shelve SMS plans because they do not have consistent vessel/shore-side communication, because they do not have the commitment of management, or because they have high rates of turnover or have not administered training, which can be expensive. SMS development professionals stated that the most time-intensive components of SMS development were collecting information and becoming familiar with unique company policy and procedures. They also indicated that documentation of various procedures was time-consuming. The vessel construction material, type of service, and length of the vessel do not reportedly affect the time required to develop an SMS. However, many respondents agreed that low rates of company participation and involvement in SMS development provided the largest obstacle to creating a comprehensive plan.

The towing vessel company that completed the leave-behind questionnaire was able to itemize costs for SMS implementation. Exhibit 14 presents these cost estimates for initial implementation activities for the entire company and also estimates the per person cost. As shown, per company costs for this company are estimated at $311,000, or $1,680 per employee for SMS implementation.[29] Costs incurred by UTV companies under a future Coast Guard regulation may differ from these costs for two primary reasons: 1) as stated, this company is of average size in the towing industry with 24 vessels and between 100 and 200 employees and may not be representative of companies in the UTV industry, which may be smaller; and 2) a future Coast Guard regulation incorporating SMSs may include more or less activities than those presented in Exhibit 14, leading these estimates to understate or overstate actual future costs.

[29] Total one-time costs per employee represent training costs only; per employee costs for other activities were not estimable given the lack of data on the number of employees implementing those activities. Training is generally oriented toward teaching personnel about the contents of the SMS, characteristics of the vessel, and personal safety. Training programs for vessel crews are usually company-specific and commonly include training in such topics as firefighting, and study of navigation charts, first aid, and engine room maintenance. Training for shore-side company personnel is typically less hands-on, and involves becoming familiar with SMS components and procedures.

Exhibit 14

Estimated Costs of Initial SMS Implementation by Activity For an Average Towing Vessel Company

SMS Component	Activity	Annual Number of Hours	$/hour	Number of Employees	Total One-Time Cost	Total One-Time Cost Per Employee [2]
SMS Initial Implementation [1]	Post Signs	N/P	N/P	N/P	$1,000	N/A
	Staff Training on Overall SMS	8 hours per person	$35	175	$49,000	$280
	Develop Emergency Response Procedures	120	N/P	N/P	$3,000	N/A
	Staff Training on Emergency Response Procedures	4 hours per person	$35	175	$24,500	$140
	Staff Training on Personnel Procedures	32 hours per person	$35	175	$196,000	$1,120
	Purchase of Personal Protective Equipment	N/P	N/P	N/P	$5,000	N/A
	Staff Training on Personal Protective Equipment	4 hours per person	$35	175	$24,500	$140
	Develop Safety Training Program	300	N/P	N/P	$8,000	N/A
Total					**$311,000**	**$1,680**

N/P indicates the response was not provided. **N/A** indicates an estimate is not applicable.
Notes:
[1] Cost data for initial SMS implementation are from a single response to the leave-behind questionnaire from a towing vessel company of average size, and from personal communication with this company on August 25, 2006. All other industry participants who were interviewed did not break down costs into these categories. Costs incurred by UTV companies under a future Coast Guard regulation may differ from these costs for two primary reasons: 1) as stated, this company is of average size in the towing industry with 24 vessels and between 100 and 200 employees and may not be representative of companies in the UTV industry, which may be smaller; and 2) a future Coast Guard regulation incorporating SMSs may include more or less activities than those presented here, leading these estimates to understate or overstate actual future costs.
[2] Total one-time costs per employee represent training costs only; per employee costs for other activities were not estimable given the lack of data on the number of employees implementing those activities. To the extent that these activities are already conducted in the absence of a future Coast Guard SMS regulation, these costs will overstate potential future costs of complying with RWG recommendations.

5.2 Ongoing SMS Maintenance & Activities

Ongoing SMS maintenance and activities include staff training, updates to the SMS documents, recordkeeping, and internal audits. Exhibit 15 summarizes ongoing SMS maintenance and activity costs as provided by the one survey response to the leave-behind questionnaire submitted by a towing vessel company of average size. As shown, this company estimates a cost of approximately $2.5 million for ongoing SMS maintenance and activities, or an equivalent of $15,000 per employee. Costs incurred by UTV companies under a future Coast Guard regulation may differ from these costs for two primary reasons: 1) as stated, this company is of average size

in the towing industry with 24 vessels and between 100 and 200 employees and may not be representative of companies in the UTV industry, which may be smaller; and 2) a future Coast Guard regulation incorporating SMSs may include more or less activities than those presented in Exhibit 15, leading these estimates to understate or overstate actual future costs.

Exhibit 15

Estimated Annual Costs of Ongoing SMS Activities

SMS Category [1]	Activity	Annual Number of Hours	$/hour	Number of Employees	Total Annual Cost	Total Annual Cost Per Employee [2]
Company Safety, Health, and Security Policy	Personal protective equipment inspection and maintenance	100 per person	$35	175	$612,500	$3,500
	Hazard communication and cargo knowledge	100	N/P	N/P	$2,500	N/A
	Safety program drill performance	200 per person	$35	175	$1,225,000	$7,000
	Safety meetings	100 per person	$35	175	$612,500	$3,500
SMS Update	Periodic SMS update	416	$35	N/P	$14,560	N/A
Emergency Preparedness and Response Procedures	Drills and exercises	4 per person	$35	175	$24,500	$140
	Recordkeeping	2 per person	$35	50	$3,500	$70
Personnel Policies and Procedures	Periodic refresher training programs	8 per person	$35	175	$49,000	$280
Documentation and Recordkeeping	Maintenance of vessel log, publications, costs	100	N/P	N/P	$2,500	N/A
Incident Reporting	Paperwork	12	N/P	N/P	$300	N/A
	Investigations	48	N/P	N/P	$1,200	N/A
	Corrective actions	48	N/P	N/P	$1,200	N/A
Total					**$2,549,260**	**$14,490**

N/P indicates the response was not provided. **N/A** indicates an estimate is not applicable.

Notes:

[1] Cost data for ongoing SMS activities are from a single response to the leave-behind questionnaire from a towing vessel company of average size, and from personal communication with this company on August 25, 2006. All other industry participants who were interviewed did not break down costs into these categories. Costs incurred by UTV companies under a future Coast Guard regulation may differ from these costs for two primary reasons: 1) as stated, this company is of average size in the towing industry with 24 vessels and between 100 and 200 employees and may not be representative of companies in the UTV industry, which may be smaller; and 2) a future Coast Guard regulation incorporating SMSs may include more or less activities than those presented in Exhibit 15, leading these estimates to understate or overstate actual future costs.

[2]Per employee costs for ongoing SMS maintenance and activities represent personal protective equipment and maintenance, safety program drill performance, safety meetings, emergency drills and exercises, recordkeeping, and period refresher training programs for personnel policies; per employee costs for other activities were not estimable given the lack of data on the number of employees implementing those activities. To the extent that these activities are already conducted in the absence of a future Coast Guard SMS regulation, these costs will overstate potential future costs of complying with RWG recommendations.

5.3 Internal Auditing Programs

An internal auditing program is the foundation of an oversight system, and serves to assess compliance with the requirements of the particular SMS program. The internal audit helps to maintain the SMS, including detecting and rectifying problems before an external audit, and provides information for SMS updates. Internal auditing procedures are generally company-specific. They can be conducted by trained company personnel, or outsourced to companies such as those who develop the SMS. All of the SMS preparers interviewed were able to provide information about internal auditing procedures.

Internal SMS audits are generally conducted by auditing a representative sample of vessels, speaking with crew on these vessels, and examining vessel documentation. One interviewee indicated that two or three company personnel from each company department are generally interviewed. Interviewees provided estimates for the duration of an internal audit, ranging from one to six days; this includes time for both reviewing paperwork and conducting interviews. Time required may vary based on the number of vessels, the company's level of compliance, and whether procedures, training and recordkeeping need to be updated. The frequency of internal audits is company-specific, and may be based on previous audit results and the desired outcome of the system.

Rather than hiring an outside contractor to complete internal audits, companies may train employees. For towing vessel companies seeking training programs instructed by external SMS experts, one SMS development professional described a three-day training courses available for $1,000 to $2,400 per employee, or $1,700 on average; another described a five- to six-day course for $1,500. Many larger companies reportedly train internal auditors, while smaller companies tend to hire contractors to perform internal audits.

Two vessel companies that perform in-house audits reported internal auditing costs ranging from $5,000 to $18,000 per year. Costs for training and conducting an internal audit are summarized in Exhibit 16.

Exhibit 16 Estimated Costs of Internal Audits		
SMS Category	**Activity**	**Total [1]**
Internal Audits	Training for internal audits by vessel company	$1,700 (per employee trained as auditor)
	Conducting in-house internal audits	$5,000 to $18,000 (per company) [2]

Notes:
[1] Total costs are not additive because training costs are estimated per employee while conducting an in-house internal audit is estimated per company.
[2] The upper-bound estimate of $18,000 includes labor costs of interviewees in the internal audit process.

5.4 External Auditing Programs

Once the SMS is prepared and implemented, a qualified external auditor must perform initial and periodic external audits in order for the company to obtain and maintain certification under a formal certification program. While the external audits discussed with interviewees are specifically associated with AWO's RCP or ISM Code compliance, cost estimates may be indicative of costs that could be incurred for companies to undergo an audit to demonstrate compliance with potential Coast Guard SMS requirements, such as those proposed by the TSAC RWG, if audits are required by personnel outside the company.

Interviewees consisted of auditors certified to audit under either the AWO's RCP or the ISM Code. They reported auditing both large and small companies, and each perform anywhere from two to 100 audits per year.

The ISM Code requires that a company undergo an initial audit for certification, annual internal audits thereafter, and a renewal external audit every five years. The AWO RCP standard requires a report of the initial audit by the auditor, including completion of an AWO RCP checklist. The AWO RCP will subsequently issue certification, which is valid for three years.

Interviewees reported that external audits consist of a review of company documentation, and interviews with company personnel, both at company headquarters and on the vessels. According to one interviewee, auditors typically review the SMS before arriving onsite, which requires approximately one day. The auditor will then visit the company headquarters and review documentation and files, and attempt to speak with employees at all levels of the company. This may take anywhere from four hours to two days, depending on the size of the company. The auditor will then visit the company's vessel(s) with the purpose of completing the AWO or ISM checklists and speaking with the vessel's crewmembers in order to ensure that SMS components are being appropriately implemented on the vessel. The time required for a vessel audit ranges from two hours for a small vessel to six to twelve hours for a large vessel.

Exhibit 17 summarizes costs interviewees reported charging for their auditing services. These costs generally do not include travel or other expenses.

Exhibit 17 Cost for External SMS Audits, Excluding Travel and Other Expenses	
Company [1]	**Cost**
I	$105 per hour (local audits), or $1,000 per day (nonlocal audits, includes travel)
II	$100 per hour
III	$95 per hour
IV	$60 to $65 per hour
V	$1,495 per day (office visit) $700 - $1,000 per vessel
VI	$750 flat fee
VII	Flat fee, calculated for each individual audit. Approx: $6,000 for medium sized company $4,000 for small company
Notes: [1] Companies interviewed for the SMS section of this report are different than companies interviewed for the dry docking section of this report.	

Exhibit 18 uses cost information provided by AWO and ISM auditors to calculate three estimates of annual external audit costs. It is important to note that these costs do not include company costs of providing time for employees to serve as interviewees. For this reason, total annual costs of external audits summarized in Exhibit 18 may underestimate costs to a towing vessel company of having an external audit.

Exhibit 18

Estimated Costs of External Audits

Cost Unit	$/hr	Duration of Audit	Frequency	Total Annual Cost [1]
Per hour	$60 to $105	2 to 12 hours for vessel inspection 2 to 4 days for company inspection	Annually	$120 to $1,260 per vessel $960 to $3,360 per company $1,080 to $4,620 for audit [2]
Flat rate	N/A	N/A	Annually	$750 to $6,000 per company
Total Estimated Range of Annual External Audit Costs				**$750 to $6,000 [3]**

N/A indicates response not applicable.
Notes:
[1] Data for external audits is based on interviews with AWO and ISM auditors as summarized in Exhibit 17. Costs presented do not include company costs of providing time for employees to serve as interviewees. For this reason, total annual costs of external audits summarized here may underestimate costs to a towing vessel company of having an external audit.
[2] The range of total external audit costs assumes that the per vessel costs represent the vessel inspection portion of the external audit, while the per company costs represent the company portion of the external audit. The estimate assumes one vessel per company.
[3] The range of total external audit costs uses the lowest figure ($750) and the highest figure ($6,000) estimated in this Exhibit. Because the lowest and highest cost estimates were obtained as flat rates, it is unclear whether both the company and the vessel portion of the external audit are included. However, because the total cost estimated using the per hour rates includes both the company and vessel portions of the external audit and falls within the range suggested by the flat rate estimates, it is reasonable to assume that the flat rates represent a comprehensive external SMS audit (company and vessel).

Interviewees described common non-conformities in an SMS that must be corrected. These include deficiencies in the training program, document control, missing procedures, delayed updates in the plan, staff unfamiliarity with the SMS, and deficiencies in radio and telephone logs and recordkeeping. Reportedly, discrepancies also often exist between the policies that are written in the SMS plan and those that are actually implemented. Furthermore, some interviewees stated that emergency response procedures and maintenance records contain too little detail. The time required to correct these non-conformities ranges from two hours to three months. Finally, several interviewees stated that vessel crews and management often do not buy in to the plan, and this renders an SMS inherently ineffective.

Attachment 1

TSAC Recommended Requirements for a UTV Inspection Regime

Subchapter M: Towing Vessels

I. **Safety Management System**: Any company that operates a towing vessel must have a Coast Guard-accepted safety management system. To be accepted by the Coast Guard, the safety management system must include, at a minimum, the following components:

1) Safety, Security and Environmental Protection Policies
   a) Company safety and security policy
   b) Company environmental policy
   c) Accountability and commitment at all organizational levels

2) Company Responsibilities
   a) Explain or depict company organization and authority and responsibility of individuals at different levels
   b) Designated Person
   c) Vendor safety

3) Master (Captain) Authority & Responsibilities; Crew Responsibilities
   a) Master's authority and responsibilities
   b) Explain or depict responsibility of individuals at different levels
      i) Authority of crewmembers not to perform a task in the event of an unsafe situation

4) Personnel Procedures
   a) Hiring
   b) Physical exams and physical standards
   c) Drug, alcohol, and prescription medication
   d) New hire orientation and familiarization
   e) Performance evaluations
   f) Performance expectations and disciplinary policies
   g) Personnel development
   h) Training program (initial and periodic refresher training by crew position)
   i) Vessel manning
   j) Crew Endurance Management

5) Vessel and Shoreside Operating Procedures
   a) Procedures to ensure compliance with applicable federal laws and regulations concerning marine safety, security, and environmental protection
   b) Bridge or pilothouse management
   c) Operator incapacitation
   d) Procedures for making horsepower-to-tow-size decisions
   e) Minimum rigging or towing gear requirements according to vessel service
   f) Navigation and watchstanding
   g) Voyage or trip planning

h) Lightering
i) Procedures for identifying critical stores and supplies
j) Security

6) Safety and Health Procedures
   a) Company safety and health rules
   b) Personal protective equipment procedures appropriate for vessel operation
      i) Use, inspection, maintenance, and replacement
      ii) Respiratory protection
      iii) Fall arrest
   c) Safety program -- training, drills, and meetings
   d) Safe use of equipment
      i) Deck machinery
      ii) Rigging
      iii) Welding and cutting
      iv) Hand tools
      v) Ladders
      vi) Abrasive wheel machinery
   e) Slip, trip, and fall prevention
   f) Fall overboard prevention
   g) Hazard communication and cargo knowledge
   h) Confined space entry
   i) Bloodborne pathogens
   j) Lock-out/tag-out
   k) Hearing conservation
   l) Back safety
   m) Personal hygiene
   n) Sanitation and safe food handling

7) Emergency Preparedness and Response
   a) Company emergency preparedness and response procedures, drills and training program
   b) Vessel specific emergency preparedness and response procedures, drills and training program

8) Maintenance of Vessel: Hull, Machinery, and Equipment
   a) Hull maintenance and inspection procedures
   b) Machinery maintenance and inspection procedures
   c) Equipment maintenance and inspection procedures
   d) Inspection and replacement program for rigging or towing gear
   e) Maintenance recordkeeping

9) Documentation
   a) Procedures to ensure proper and valid documentation carried aboard vessels
   b) Document control, updating, and distribution

10) Internal Audits, External Audits and Evaluation of the SMS
    a) Internal audit - schedule, topics, and scope
    b) External audit - schedule, topics, and scope
    c) Annual evaluation of SMS for effectiveness

11) Incident Investigation, Management of Non-conformities & Corrective Action
    a) Incident reporting and investigation procedures
    b) Communication procedures for disseminating lessons learned
    c) Procedures for identifying and reporting safety deficiencies and non-conformities
    d) Procedures for determining, implementing, and tracking corrective action
    e) Performance measurement procedures

II. **Standards**

1) Hull and Machinery

Note: For the items below, failure of a redundant auxiliary system does not make the vessel unseaworthy or require the vessel to be moored or anchored; however, the Master shall use all available means at his/her disposal to ensure the inoperative equipment is repaired and returned to service as soon as practicable. The Master shall consider the condition of the vessel and its machinery when making decisions affecting navigation and the safety of onboard personnel.

a) Design and Construction (new vessels)

Inland towing vessels built after the effective date of the regulations must be designed and constructed in accordance with ABS Rules for Building and Classing Steel Vessels for Service on Rivers and Intracoastal Waterways (version in effect as of the date the contract was signed), or other published, recognized standards. ***(Other acceptable standards TBD; may include comparable standards of other recognized classification societies, American Boat and Yacht Council, etc.)*** Classification by a recognized classification society is not required.

Coastal/ocean towing vessels built after the effective date of the regulations must be designed and constructed in accordance with ABS Rules for Building and Classing Steel Vessels Under 90 Meters (295 Feet) in Length (version in effect as of the date the contract was signed), or other published, recognized standards. ***(Other acceptable standards TBD; may include comparable standards of other recognized classification societies, American Boat and Yacht Council, etc.)*** Classification by a recognized classification society is not required.

Vessels constructed after the effective date of the regulations that are essentially sister vessels of a class or series of previously built vessels may be constructed to the same design as previously built vessels in the class or series, provided that 1) the class or series of vessels has a history of safe operation and 2) the new vessels meet all of the requirements outlined in items c) through r) below, including the provisions for vessels constructed after the effective date of the regulations.

New designs that deviate from applicable ABS Rules for Building and Classing Steel Vessels or other published, recognized standards may be permitted if approved by the Coast Guard or a recognized classification society.

Vessel plans must be reviewed and approved by a Professional Engineer with marine expertise. Builder must certify that vessel was built in accordance with approved plans. Vessel owner must retain a copy of the approved plans in the company office. Plan approvals and builder certifications must be available for review by Coast Guard or third-party auditor.

Existing vessels that undergo substantial modification may be rebuilt as original or to the standards above.

b) Drydocking

Intervals: Drydocking intervals should be based on time of service in salt water. The most restrictive schedule would require inspections twice in five years, with no more than three years between inspections. Five-year intervals shall be permitted for vessels in fresh water service. A vessel will be deemed to be in fresh water service if it has operated in fresh water for at least six months in every 12-month period since the last required drydocking.

Underwater inspections in lieu of drydocking may be permitted for alternating examinations if no obvious defects are present and the vessel has a satisfactory operating record.

A drydocking that meets the standards below, conducted within the specified intervals, will satisfy this requirement. Drydocking due dates will be based on the last drydocking conducted that meets the standards below.

Components/Standards:

Towing vessels required to have a loadline will be considered to meet the requirements below for hull and seachest examinations only. Towing vessels whose hull is classed by a recognized classification society will be considered to meet all the drydocking requirements specified below.

For other towing vessels, a drydocking for regulatory credit must satisfy the following requirements:

> The vessel owner or operator shall ensure that all components that affect the safe operation and hull integrity of the vessel are inspected.
>
> The vessel owner or operator must maintain documentation of: 1) the condition of the hull, underwater propulsion, and steering system as inspected; and 2) all repairs and alterations to the hull, underwater propulsion, and steering systems. Documentation must be retained for review by the Coast Guard or approved third-party auditor.
>
> At a minimum, the following inspections shall be performed and documented:

Hull: Inspect on drydock the hull bottom, sides, headlog and stern for indentations, fractures, holes, and other deficiencies that may affect the watertight integrity of the vessel. Assess by appropriate means the condition of the hull for watertight and structural integrity. Any steel replacement must be done to original construction or better. Hull fractures in any plating except an oil tank may be covered with an appropriately sized doubler plate, installed using good marine practice, if the hull thickness and condition is suitable.

Tailshafts: Inspect for bends, cracks, and damage from rope, wires or other foreign objects. Tailshaft need not be removed for inspection if these items can be properly evaluated without doing so. Repair or replace as necessary to ensure safe operation and avoid excessive vibration. Inspect the sleeve (or other bearing contact surface) on the tailshaft for wear. Repair or replace as necessary for safe operation.

Rudders: Inspect for skin or plate damage or fractures, upper and lower bearing wear, and bent rudder stock. Rudders need not be removed for inspection if these items can be properly evaluated without doing so. Repair or replace as necessary in accordance with good marine practice.

Propellers: Inspect for cracks and damage from foreign objects. Propellers need not be removed for inspection if these items can be properly evaluated without doing so. Repair or replace as necessary in accordance with good marine practice.

Coolers: Inspect the exterior components of the machinery cooling system for leaks or damage. Repair or replace as necessary to ensure proper operation of the system.

Seachest and Through-Hull Fitting: Inspect condition of seachest and through-hull fittings. Repair or replace as necessary in accordance with good marine practice. Ensure proper operation of associated valves.

c) Watertight integrity and watertight fixtures

For each towing vessel that has watertight bulkheads in the hull and/or watertight fixtures on the exterior deck and deckhouse, these watertight closures must be maintained in serviceable condition.

d) Miscellaneous exterior openings

For each towing vessel that has cabin or hull penetrations open to the exterior of the vessel that may allow water to enter the vessel in the expected area of operation, the closure devices for these exterior openings must be maintained in satisfactory weather-resistant condition.

e) Handrails and bulwarks

Rails or equivalent protection must be installed near the periphery of all decks accessible to crew. Equivalent protection may include lifelines, wire rope, chains, and bulwarks that provide strength and support equivalent to fixed rails. Where space limitations make deck rails impractical, such as at narrow catwalks in way of deckhouse sides, hand grabs may be substituted.

f) Emergency egress

A towing vessel constructed after the effective date of the regulations must have at least two means of egress from the engine room and the overall crew accommodations area. (This does not mean individual spaces, such as staterooms, within the overall accommodations area.) Doors and escape hatches must be operable from either side. The lower section of the engine room must be provided with at least two means of egress to the upper engine room or the exterior of the vessel.

g) Freeing ports and scuppers

For each towing vessel that is fitted with installed bulwarks around the exterior of the main deck, sufficient freeing ports and/or scuppers must be provided and maintained to allow water to run off the deck quickly without adversely affecting the stability of the vessel.

h) Piping systems and tanks

All vessel piping and tanks that have exposure to the outside of the hull must be made of metal and must be maintained in leak-free condition. Valves at the origination and termination of a pipe and tank vents must be marked by labeling or color-coding.

i) Guards for exposed hazards

An exposed hazard, such as gears or rotating machinery, must be properly protected by a cover, guard, or rail.

j) Alarms/monitoring

Each towing vessel must be equipped with an alarm system that includes main engine lubricating oil pressure, main engine cooling water temperature, auxiliary generator engine lubricating oil pressure, auxiliary generator engine cooling water temperature, hydraulic steering fluid levels, and bilge levels. Alarms must be audible and visible at the primary operating station.

k) Gauges

Each towing vessel must be equipped with gauges for the following: main engine lubricating oil pressure, main engine cooling water temperature, auxiliary generator engine lubricating oil pressure, auxiliary generator engine cooling water temperature, and hydraulic steering fluid pressure if equipped with hydraulic steering systems. Gauges must be accessible to crewmembers for monitoring.

l) Steering

A towing vessel constructed after the effective date of the regulations must be equipped with two independently operating sources of power (e.g., two steering pumps and two fluid reservoirs) for the steering system. Each source of power must be capable of operating the entire steering system.

An existing towing vessel that has only one source of power for the steering system must have an emergency backup system or process that will allow the vessel to be moved to a safe location in the event of a steering failure.

m) Electrical

A towing vessel constructed after the effective date of the regulations must have electrical equipment and wiring that meets the standards of 46 CFR Subchapter L or appropriate equivalent standard.

For existing towing vessels, all electrical equipment and wiring must be maintained in good operating condition such that no fire hazards or other hazards to personnel are present. All wiring terminations must be made in junction boxes or other electrical fixtures suitable for the purpose intended. All machinery switches, energizers, and circuit breakers must be labeled and maintained in good operating condition. When electrical equipment or wiring on an existing towing vessel is retrofitted or replaced, the new equipment or wiring must meet UL Marine standards or an appropriate equivalent standard.

n) Propulsion

All propulsion machinery, including main engines, reduction gears, shafting, and bearings, must be maintained in good operating condition.

o) Control systems

All control systems must be maintained in good operating condition.

p) Fuel systems

Vessels whose construction was contracted for after January 18, 2000, must comply with the requirements for fuel systems at 46 CFR 27.211.

For all towing vessels, fuel systems for the vessel and for main engine propulsion and auxiliary generator systems must be maintained in good operating condition. Each towing vessel must be able to supply clean fuel to the main engines and auxiliary generator engines via a filtering system that may include filters, a centrifuge, and/or a day tank. A towing vessel equipped with a day tank must be equipped with a low fuel level alarm.

q) Electrical generating systems

A towing vessel constructed after the effective date of the regulations must be equipped with two electrical generating systems. Each electrical generating system, regardless of type, must be capable of carrying the essential electrical load of the vessel under normal operating conditions.

Electrical generating systems on existing towing vessels must be maintained in good operating condition.

r) Lighting

A towing vessel must be equipped with appropriate illumination in crew work areas.

2) **Firefighting**

a) Fire detection system to detect engine room fires (46 CFR 27.203)
b) General alarm (46 CFR 27.201)
c) Internal communication system (46 CFR 27.205)
d) Hand-portable fire extinguishers (46 CFR 25.30, 27.303, 27.305)
e) Semi-portable fire extinguishing systems (as applicable) (46 CFR 27.303 and 27.305)
f) Fixed fire extinguishing systems (as applicable) (46 CFR 27.303 and 27.305)
g) Fixed fire pump and fire main, with hoses and nozzles (46 CFR 27.301)
h) Portable fire pump with hose and nozzle (46 CFR 27.301(e))
i) Remote engine fuel shutoff valve (46 CFR 27.207)
j) Remote starter for fire pump (46 CFR 27.301(a)(2))

k) Fire axe

Each towing vessel must be equipped with at least one fire axe that is readily accessible for use from the exterior of the vessel.

l) Smoke alarms to protect all sleeping spaces

Each towing vessel must be equipped with a means to detect smoke in the sleeping spaces and lounges that will alert individuals in those spaces. This can be accomplished via an installed detection system or by using individual battery operated detectors. Detection systems or individual detectors must be kept in operational condition at all times.

m) Heat or flame detector in galley

Each towing vessel constructed after the effective date of the regulations and equipped with a galley must have a heat or flame detector with an audible alarm at the primary operating station. (Galley=a space containing appliances with cooking surfaces that may exceed 250 degrees Fahrenheit).

n) Remote manual engine shutdown

Each towing vessel constructed after the effective date of the regulations must have a remote manual main engine shutdown for each main engine and auxiliary generator engine, which can be operated from a location outside the machinery space where the engines are located. The required fuel shutoff may serve as this shutdown if each engine is fitted independently.

o) Placarded storage area appropriate for flammable products

A towing vessel that has paints, coatings, or other flammable products on board must have a designated storage area for unopened containers of flammable products. Previously opened containers of flammable products must be kept in a steel storage locker that is marked as containing flammable products, located away from ignition sources, and protected by a nearby fire extinguisher.

3) Lifesaving

a) Coast Guard-approved life preservers (46 CFR 25.25-5(b) & (c))
b) Coast Guard-approved ring buoy (46 CFR 25.25-5(d))
c) Coast Guard-approved work vests (46 CFR 26.30)
d) Emergency Position Indicating Radio Beacon (EPIRB) (46 CFR 25.26)

e) Visual Distress Signals

Each towing vessel operating on oceans, near coastal, or Great Lakes routes must carry six red flares and six smoke distress signals. Each towing vessel operating on lakes, bays, and sounds must carry three red flares and three smoke distress signals.

f) First aid kit/trauma kit

Each towing vessel must be equipped with an industrial type first aid cabinet/kit appropriate to size of the crew. A vessel operating on oceans, near coastal, or Great Lakes routes must have a means to take blood pressure readings, splints for broken bones, and large bandages for serious wounds.

g) Emergency lighting

Each towing vessel must be equipped with sufficient lighting to illuminate escape routes in the event of a power loss. Emergency lighting may be automatic, battery-operated with a duration sufficient to allow the crew to escape, or non-electric, phosphorescent adhesive lighting strips that mark escape routes to the exits.

h) Immersion suits

Each towing vessel operating on oceans, near coastal, or Great Lakes routes whose voyage takes it above Latitude 32 degrees North must carry an appropriately sized immersion (survival) suit for each person onboard.

i) Inflatable life raft

Each towing vessel operating on oceans, near coastal, or Great Lakes routes more than one mile from shore must carry an inflatable life raft appropriate for the number of persons onboard.

4) Pollution Prevention

a) Fuel oil and bulk lubricating oil containment (33 CFR 155.320)
b) Oily Mixtures (Bilge slop) retention (33 CFR 155.330, 155.350, 155.360, 155.370)

c) Bilge pumps or other dewatering capability

All towing vessels must have either an installed bilge pump or another method for emergency dewatering, such as a portable pump with hoses.

d) Oil transfer hoses (33 CFR 154.500)
e) Oily water separator equipment (where applicable) (33 CFR 155.350, 155.360, 155.370, 155.380)
f) Placard prohibiting discharge of oil (33 CFR 155.450)
g) Garbage (MARPOL) placard (33 CFR 151.59)
h) Garbage disposal requirements/procedures/documentation (including Waste Management Plan where applicable) (33 CFR 151.57, 33 CFR 151.63; 151.66; 151.67; and 46 CFR 25.50-1)
i) Marine Sanitation Devices (MSD) (33 CFR Part 159)
j) Oil transfer procedures (33 CFR 155.720, 33CFR155.750)
k) Declaration of Inspection (33 CFR 156.150, 33 CFR 156.120)

l) Pumping systems for oily mixtures (33 CFR 155.410, and 155.420)

m) Spill kit

During fueling operations, each towing vessel must have ready for immediate use equipment and supplies to clean up and remove an on-deck oil spill of at least one barrel. The equipment and supplies must include sorbents; non-sparking hand scoops, shovels, and buckets; containers suitable for holding recovered waste; emulsifiers for deck cleaning; and protective clothing.

n) Closable scuppers or other containment method

Each towing vessel must be capable of preventing spills to the deck during oil or fuel transfers from reaching the water, either by 1) pre-closing off the scuppers/freeing ports, if the vessel is so equipped, or 2) pre-deploying absorbent booming/pads on the deck around vents and fills.

5) Navigation and Communication Equipment

a) VHF radio (33 CFR 164.72(a)(3), 33 CFR 26.03)
b) Second marine VHF radio (33 CFR 164.72(a)(3), 33 CFR 26.03(e) and (f))

c) Capability of connecting a VHF to battery backup

At least one VHF radio required under 33 CFR 164.72(a)(3) must be installed at the operating station in the pilothouse and connected to a properly operating battery backup.

d) Handheld VHF radio

Each towing vessel must have at least one properly operating handheld VHF radio.

e) Navigation lights (COLREGS, 33 CFR Part 84)

Each towing vessel must have navigation lights in accordance with the Navigation Rules for its area of operation, including compliance with Annex I, Positioning and Technical Details for lights and shapes (33 CFR 84).

f) Whistle and bell (COLREGS Rule 33) (33 CFR Part 86)

Each towing vessel must have a whistle and bell in accordance with the Navigation Rules for its area of operation, including compliance with Annex III, Technical Details of Sound Signal Appliances (33 CFR 86).

g) Radar (33 CFR 164.72(a)(1))

h) Second radar

Each towing vessel that operates on oceans, near coastal, or Great Lakes routes more than 12 miles from shore must be equipped with a second radar. The second radar must meet the requirements of the Federal Communications Commission (FCC) specified by 47 CFR part 80, and RTCM Standard for Marine Radar Equipment Installed on Ships of Less Than 300 Tons Gross Tonnage, RTCM Paper 71-95/SC112-STD, Version 1.1, display Category II and stabilization Category Bravo.

i) Fathometer (except Western Rivers) (33 CFR 164.72(a)(5))
j) Search light (33 CFR 164.72(a)(2))
k) GPS (satellite navigation receiver) or LORAN (33 CFR 164.72(a)(6))
l) Magnetic compass (33 CFR 164.72(a)(4))
m) Swing meter (Western Rivers only) (33 CFR 164.72(a)(4))
n) Alternative means of determining course and direction (33 CFR 164.72(a)(1)(ii)(B))
o) AIS (33 CFR 164.46)

p) Rudder angle indicator or means to visually indicate rudder position

Each towing vessel must be equipped with a rudder angle indicator if it is fitted with non-follow-up steering gear. Towing vessels fitted with follow-up type steering are not required to have a separate rudder angle indicator as long as the position of the towing vessel's rudders is appropriately indicated by the relative position of the steering levers.

q) Onboard crew communications

Each towing vessel must have an internal communication system or other means of communication that allows the vessel operator to communicate with crewmembers on watch.

r) Means of ensuring visibility through pilothouse windows

Each towing vessel must have a means of ensuring that the windows immediately forward of the steering station in the wheelhouse allow for adequate visibility to ensure safe navigation.

s) Emergency communications capability

Each towing vessel must maintain an emergency communications capability appropriate for the vessel's area of operation.

t) Maintenance and failure of navigation equipment

The requirements for maintenance and failure of navigation equipment at 33 CFR 164.82 shall apply to all of the navigation and communication equipment required under items a) through s) above.

6) Towing Gear/Rigging

a) Face wires, spring lines, and push gear used for towing vessels when pushing ahead or towing alongside (includes all rigging used to make up towing vessel to its tow and all rigging used to wire up the tow, itself) (33 CFR 164.76)
b) Towline for towing astern (wire or hawser) (33 CFR 164.74(a))
c) Terminal gear for towing astern (e.g., bridles, surge chain, shackles, flounder/fish plate, shock hawser, pennant) (33 CFR 164.74(b))

7) Documents and Publications

a) Certificate of Inspection (46 CFR Subchapter M)
b) Certificate of Documentation (46 CFR 67.313)

c) Vessel log or other record (paper or electronic)

Each towing vessel must employ a vessel log or other means, either paper or electronic, which documents daily operational events.

d) Copy of Navigation Rules (33 CFR 88.05)
e) Navigation charts/maps (33 CFR 164.72(b)(1))
f) Tide and Current Tables (33 CFR 164.72(b)(2)
g) Coast Pilot (33 CFR 164.72(b)(2))
h) Light List (33 CFR 164.72(b)(2))
i) Notice to Mariners (33 CFR 164.72(b)(2))
j) VTS Manual (33 CFR 161.4)
k) FCC radio station license posted in pilothouse (33 CFR 164.72(a)(3)(47 CFR 80.405)
l) Radiotelephone log (47 CFR 80.409)
m) Certificate of Financial Responsibility (33 CFR 138.12)
n) Copy of demise charter (33 CFR 138.100)

o) Station bill

The Master of each towing vessel must post a station bill in one or more conspicuous locations onboard the towing vessel. Locations of station bills must be such that all towing vessel crewmembers and other persons onboard the towing vessel are adequately informed of their emergency response stations and primary duties for emergency situations such as fire, man-overboard, collision/allisions, and sinkings. The towing vessel's station bill must be coordinated with the towing vessel's emergency response procedures contained in the Company's Safety Management System.

p) Employee Assistance Program – display of informational material, hotline telephone number and employer's drug and alcohol policy (46 CFR 16.401(a))
q) ITC tonnage certificate (46 CFR 69.69)

r) IMO documents, e.g., SOLAS, ISM, ISSC (Vessels over 500 GT on Int'l voyages (varies by build date), see NVIC 11-93 Change 3)

8) Manning and Watchstanding

a) Minimum watch complement

Each towing vessel engaged in towing operations shall have a licensed master. If operations exceed 12 hours, an additional licensed officer (master, mate, or pilot) must be added or an alternate relief crew provided. One licensed officer and one additional crewmember must be on duty at all times while the vessel is underway. These requirements shall be posted on the vessel's Certificate of Inspection.

Additional manning shall be provided as specified in the vessel's safety management system, taking into account the following factors: applicable law and regulation; number, size, and type of barges to be towed; towing route; safety of personnel, equipment, and environment; service in which the tow is engaged; functional duties required of crew in addition to standard navigation; configuration of vessel superstructure, deck, and engine room; extent of automation; size and power of equipment used; prevailing environmental/climatic conditions; and, experience of crew.

b) Working hours

Existing work hour requirements for persons operating towing vessels (46 USC 8104(h), or 46 USC 8104(c) for Great Lakes towing vessels) remain in effect.

Except as provided under 46 USC 8104(h) or 46 USC 8104(c), no crewmember on a towing vessel may work more than 15 hours in any 24-hour period or more than 42 hours in a 72-hour period, except in an emergency or drill.[1]

c) Watches (46 CFR 15.705)
d) Vessel operator(s) properly licensed and endorsed for vessel route (46 CFR 15.610)
e) Discharges and shipping articles (46 CFR Part 14)
f) Vessel crew properly documented (46 CFR 12.02-7)
g) Drug and alcohol testing (46 CFR Part 16)
h) Operating a vessel while intoxicated (33 CFR 95.015 and 95.020)
i) Navigation underway (33 CFR 164.78)
j) Tests, inspections, and voyage planning (33 CFR 164.80)

9) Training

a) Fire fighting (46 CFR 27.209)
b) PIC for oil transfers (33 CFR 155.710(e))

[1] The working group considered, but did not adopt, a recommendation that all crewmembers receive a minimum of six hours of uninterrupted rest in every 24-hour period. Ten working group members supported including such a recommendation in the working group report to TSAC.

c) Fire fighting certificate for oceans towing license (46 CFR 10.205(g)(3))
d) First Aid and CPR certificates for towing license (46 CFR 10.205(h))
e) Radar Observer (46 CFR 10.480)

10) Safety and Health

a) Posted safety notices/placards/warning signs
b) Cargo knowledge based on barge service (e.g., Subchapters N, D, O)
c) Benzene (where applicable based on barge service)

Attachment 2

The Towing Assistance Industry

The TSAC RWG recommends exempting vessels in the towing assistance industry from future Coast Guard regulations for the UTVs. In general, towing assistance vessels are generally small, open vessels. This attachment discusses the towing assistance industry and provides estimated costs of bringing towing assistance vessels into compliance with the Conference of Private Operators for Response Towing's (C-PORT) accreditation (ACAPT) program, which is a voluntary program requiring marine assistance vessels to meet certain service, training, and equipment standards.

Background

The towing assistance industry arose in 1983 with the privatization of the U.S. Coast Guard's non-emergency towing and salvage operations. In that year, Representative Gerry Studds (D-MA) passed a law prohibiting the Coast Guard from competing with private towing companies; the towing assistance industry has since grown from 10 to over 300 companies offering 24-hour towing assistance services throughout the year. The industry comprises numerous small operators, as well as a number of large operators that offer towing service memberships similar to the American Automobile Association (AAA) for automobiles, such as Boat/U.S. (www.boatus.com) and Sea Tow (www.seatow.com).

Conversations with Boat/U.S. indicate that they do not require training or certifications, beyond a captain's license with a towing endorsement, for boat operators in their association. Required equipment lists are available from the company when one requests a candidate package.[1] Information from Sea Tow's Web site indicates that Sea Tow boats are typically equipped with multiple Digital Selective Calling (DSC)-capable VHF radios, Global Positioning System (GPS) chart plotters, radar, VHF-based directional finders, depth sounders, and other electronics.

The Conference of Private Operators for Response Towing (C-PORT) is the national marine assistance and salvage industry association, and has a membership of over 230 independent and network-affiliated marine assistance operators across the country. C-PORT administers the ACAPT (Accredited for Commercial Assistance and Professional Towing) accreditation program, a voluntary program requiring marine assistance vessels to meet certain service, training, and equipment standards.

Accredited surveyors for the ACAPT program and C-PORT have agreed on a $65.00 per vessel survey fee for simple, streamlined surveys.[2] Equipment costs are expected to be minimal because most C-PORT members and ACAPT-certified companies already meet ACAPT standards. While ACAPT companies must pay for the first inspection of their vessels, C-PORT will pay for random vessel inspections of 10 percent of marine assistance vessels annually.

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[1] Personal communication with Anne Sooby, Boat U.S., on February 28, 2006.

[2] There is also an ACAPT fee of $35.00 per vessel for C-PORT members and $60.00 per vessel for non-members.

ACAPT recognizes three tiers of vessels: utility, coastal, and ocean.[3] ACAPT requires compliance with certain standards for all three tiers in addition to tier-specific standards. Exhibit 2-1 summarizes standards required for ACAPT certification, including U.S. Coast Guard safety equipment standards required of all vessels.

[3] Utility vessels are small, travel short distances, and carry minimum equipment. Coastal vessels are mid-size, are limited to a maximum response distance of 30 miles from the nearest safe harbor, and carry more equipment than utility vessels. Ocean vessels are larger, are not limited to maximum response distances, and carry the highest level of equipment. The ACAPT committee expects that the largest number of marine assistance vessels will fall into the "coastal" tier. Information from C-PORT Web site, accessed at http://www.c-port.org/acapt/three_tier.html on February 27, 2006.

Exhibit 2-1 ACAPT Accredited Applicant Company Standards	
U.S. Coast Guard Safety Equipment Requirements	Fuel tank installation Backfire flame arrester Engine compartment ventilation appropriate for engine type Navigation lights Sound producing device and/or bell Fire extinguishers required by regulations Distress signals (at least 3 day/night flares within expiration date) Garbage disposal placard Oil pollution placard
Additional ACAPT Requirements	Copy aboard of USCG Operators License with towing endorsement (masters>200t are exempt) Copy aboard of base station license Copy aboard of vessel CG documentation (if>26 feet unless exemption for vessel exists)
Company Service Standards **(Copies sent to C-PORT for verification)**	All operators/crew enrolled in random drug testing program Towing liability insurance ($300,000 minimum coverage) 24 hr response available during local boating season Service price list established and publicly available Backup vessel arrangement if firm only has one vessel Company has at least one year of experience in towing/salvage or search and rescue
Utility Tier Standards	Operational limit – does not travel farther than 10 miles from the nearest safe harbor Minimum crew – one Boat length – minimum 15 feet Power – minimum 35 hp outboard Crew PFD – Type 3 or better PFDs – Type 2 or better, two adult Lifesaving – throwable device Communications – one VHF Depth Sounder Tow line – minimum 100 feet of ½ inch Tow post or reinforced towing cleats or transom eyes that have been strength inspected De-watering capacity (any type) Appropriate COLREGS lights Tools onboard – knife to cut towline, boat hook, compass, fenders or equivalent Anchor
Coastal Tier Standards	Operational limit – does not travel farther than 30 miles from nearest safe harbor Minimum crew – one Boat length – minimum 21 feet Power – minimum 150 hp gas or 90 hp diesel Crew PFD – Type 3 or better PFDs – Type 2 or better, 2 adult and 4 children Lifesaving – one exposure suit recommended, but not required Communications – Two VHF and alternate communications device Depth sounder or lead line Tow line – minimum 300 feet of 5/8”, 600 feet recommended Tow post or reinforced towing cleats or transom eyes that have been strength inspected De-watering capacity – minimum 25 gpm from any power source Lighting – appropriate COLREGS lights, 50,000 candle power spotlight Tools onboard – knife to cult towline, boat hook, compass, fenders or equivalent, binoculars recommended, tools to change own plugs, belts, and filters, jump start system Anchor and chain sized to vessel and appropriate for area of response Radar if over 26 feet Loran or GPS

	Loud hailer (recommended) Charts (paper or electronic) Damage control – material for stuffing into and stopping leaks Spare belts and filters for vessel Red/yellow safety lights authorized to meet USCG requirements
Ocean Tier Standards	Operational limit – boat's endurance assuming proper crew Minimum crew – 2 when past 40 miles Boat length – minimum 26 feet Power – minimum 150 hp, twin outboards acceptable Crew PFD PFDs – Type 2 or better, 6 adult, 2 child Lifesaving – 2 exposure suits recommended or life raft Communications – 2 VHFs, alternate communications device & SSB recommended when out of local VHF range Depth sounder Radar & reflector Loran or GPS Loud hailer ADF EPIRB – 406 required Charts – paper required Tow line – minimum 600 feet of ¾" Tow post De-watering capacity – minimum 100 gpm from any power source Lighting – appropriate COLREGS lights, 50,000 candle power spotlight, deck lights & underwater flashlight Tools – knife to cut towline, boat hook, compass, binoculars, tools to change own plugs, belts, filters, jump start system, wrenches, pliers, screwdrivers and fenders or equivalent Anchor with chain sized to vessel (minimum 125 feet rode) Damage control – material for stuffing into and stopping leaks Spare belts and filters for vessel and 200 feet extra line Red/Yellow safety lights authorized to meet USCG requirements Drogue
ACAPT Professional and Ethical Standards	Applicant company and representatives Will conduct business practices in full compliance with all applicable federal and state laws and regulations Will not use deceptive or misleading statements relating to estimated time of arrival on scene Will not unlawfully transmit by radiotelephone for the purpose of disrupting or interfering with the radio telephone communications of others, key the mike or step on transmissions of boaters or other providers, or intervene in communication between boaters and another towing company specifically contacted by the boater Will endeavor to communicate rates and any grounding surcharges prior to commencing work, and obtain customer's signature on final invoice Will not post-date invoices for towing or salvage services Will not use advertising language and methods that are deceptive or misleading Will conduct all business dealings with members of the public in a fair, consistent, professional, and ethical manner Will apply all standards and business practices without regard to a customer's insurance practices Will use his or her best efforts to cooperate with all available resources to prevent damage or loss to life or property
Source: C-PORT, Year 2005 ACAPT Accreditation Application, accessed at http://www.c-port.org on February 27, 2006.	

Estimated Costs of Complying with C-PORT ACAPT

In 2005, C-PORT conducted a survey to determine the composition of member and non-member companies operating in the assistance towing industry. Nearly 120 companies nationwide completed and returned the survey, representing approximately one third of the industry. The survey asked participants to quantify the cases they handled in the 2005 calendar year, and to describe their operations and safety equipment. Overall, the survey found that respondents responded to more than 120,000 assistance-towing incidents in 2005. The survey also reported that the industry generated approximately $72 million in total revenue, and provided employment for more than 800 full-time captains and more than 1,000 part-time captains, as well as technicians needed to maintain an estimated fleet of over 1,000 towing vessels.[4] The survey also revealed that all respondents reported compliance with USCG requirements for safety equipment and, in most cases, exceeded those requirements.[5]

Exhibit 2-2 summarizes the findings of the survey with respect to the number of towing companies that require vessels to abide by C-PORT-selected criteria related to operations and safety equipment, and the average cost of achieving these criteria. The cost of wearing a personal flotation device (PFD) and the cost of a vessel/equipment daily checklist were not requested in the survey and are thus not included in the Exhibit 2-2.

Exhibit 2-2

Average Costs of Selected C-PORT Criteria

Operations and Safety Equipment Criteria	Criteria is Required by Towing Companies	Criteria is Not Required by Towing Companies	Average Reported Cost
Surveyed Vessels	101	12	$327
Wearing of PFD	74	45	NR
Ref/SOP Manual	39	80	$1,276
Daily Checklist	82	37	NR
Training Program	110	10	$1,002

NR = Not Reported

[4] From *C-PORT Assistance Towing Industry Survey Results, 2005*, Captain Terry Hill, Chairman of C-PORT.
[5] Ibid.

Attachment 3

Contact Information for Telephone Interviews and Surveys

Exhibit 3-1

Contact Information for Telephone Interviews and Surveys

Name of Company	Interviewee	Position	Location	Date	SMS Developer
Equipment Standards					
Robert Allen Ltd.			Vancouver, BC	23-Feb-06	
Timothy Graul Marine Design	Mark Pudlow		Sturgeon Bay, WI	23-Feb-06	
Jensen Marine Consultants			Seattle, WA	5-Apr-06	
Elliot Bay Design Group	Jim Cole		Seattle, WA	5-Apr-06	
Genoa Design International	Darren Liddle		Conception Bay South, Newfoundland	5-Apr-06	
Guido Perla & Associates	Alex Louden		Seattle, WA	5-Apr-06	
Moran Towing	Paul Swensen	Vice President General Manager	Baltimore, MD	6-Feb-06	
Potomac Marine	Mike Cahill		Woodbridge, VA	6-Feb-06	
Excom Marine	Paul Stroop		Flint, MI	Feb-06	
ComNav Marine Ltd.	Satish Narayn		Richmond, BC CANADA	Feb-06	
Paxton Marine	Bill Siddle	Marine Distributor	Norfolk, VA	Feb-06	
Bollinger Shipyards	Travis Aucoin	New Construction Estimator	St. Rose, LA	Feb-06	
Recovered Energy	Gary Chandler		Oak Brook, IL	Feb-06	
Coffin World Water Systems	Jeff Belotti		Irvine, CA	Feb-06	
Village Marine	Andy Kennett	Sales	Gardena, CA	Feb-06	
Sawyer and Whitten Marine Electronics	Sam Serappa	Sales	Protland, ME	Jun-06	
Englund Marine and Industrial Supply Co. Inc.		Sales	Astoria, OR	Jun-06	
Life Raft and Survival Equipment, Inc.	Dan O'Conner		Portsmouth, RI	10-Apr-06	
Atlantic Marine	Chuck Nugent	Estimator	Jacksonville, FL	6-Jul-06	

Lyon Shipyard	Danny Davis	Estimator	Norfolk, VA	6-Jul-06	
Drydocking					
A&B Industries			Morgan City, LA	17-Feb-06	
BAE Systems	Ira Maybaum	General Manager	San Francisco, CA	13-Feb-06	
Bay Ship and Yacht Company			Alameda, CA	21-Feb-06	
Diversified Marine, Inc.			Portland, OR	21-Feb-06	
Elmwood Drydock and Repair	Wayne Thibodeaux	Sales/New Construction Manager	St. Rose, LA	16-Feb-06	
Seward Ship's Drydock, Inc.			Seward, AK	21-Feb-06	
Safety Management System					
Auditors					
American Bureau of Shipping	Pat Farwell	ABS Auditor	Houston, TX	16-Feb-06	
American Bureau of Shipping	Martin Hruska	Manager	Houston, TX	16-Feb-06	
Teicheira Maritime Surveyors	Dana Teicheira	Company founder	Petaluma, CA	22-Feb-06	
Maritime Compliance International LLC	Kevin Gilheany	President	New Orleans, LA	22-Feb-06	x
Rushing Marine Service, LLC	Mike Rushing	Marine Consultant and Safety Program Manager	Jackson, MO	22-Feb-06	x
M&P Enterprises	Mike Bowen	Auditor	The Woodlands, TX	17-Feb-06	x
MRR Management Consultants	Michael Reynolds	Auditor	Springfield, MA	26-Feb-06	x
SQE Marine Consultants	Ron Borison	President	St. Bernard, LA	23-Feb-06	x
WH Padie Associates Inc.	W.H. Padie	Auditor	Mercer Island, WA	22-Feb-06	
Vessel Companies					
Kirby	John Baker	Corp Quality Manager	Houston, TX	10-Mar-06	x
Seabulk Towing	Doug Carlson	Safety and QA Manager	Tampa, FL	3-Mar-06	
Tidewater Barge Lines Inc	John Pigott	General Manager	Vancouver, WA	10-Mar-06	x

Attachment 4

Copy of the Leave-Behind Questionnaire (Full and Abbreviated Versions)

Questionnaire for Collection of Burden and Expense Information From Towing Companies and Vessels

Note: Responding to any portion of this questionnaire is completely voluntary. You are not required to respond to any collection of information unless it displays a currently valid OMB control number.

INSTRUCTIONS

Please provide estimates for each of the four categories below, as they apply to a towing vessel at your company.

- For categories that relate to capital expenses, please estimate an average annual amount spent in US $. (An estimate for calendar year 2005 or your most recent fiscal year should be sufficient.)
- For categories that relate to hours or time spent, please provide burden estimates in total person-hours. This refers to the number of hours of paid staff time expended for each activity.
- For categories that include periodic or repeating events/expenses, please estimate the frequency (e.g., annual, monthly, etc.).

BASIC INFORMATION

Company Name/Affiliation: _____

Job Title: _____

Phone Number: _____

E-mail Address: _____

City and State: _____, _____

1. SAFETY MANAGEMENT SYSTEM (SMS)

An SMS may consist of multiple components including operating procedures, personnel policies and procedures, emergency preparedness and response procedures, and training. Please provide an estimate of the number of hours or dollars associated with each SMS component that you currently implement and/or maintain.

If you do not maintain a formal safety management system, please check the box below, but still *provide responses for each type of procedures/policies below that you may implement and/or maintain independently of an SMS*.

❑ I do not maintain an SMS.

SAFETY MANAGEMENT SYSTEM COMPONENTS	COST	HOURS	FREQU -ENCY
1. DEVELOPING AND IMPLEMENTING THE SMS			
A. Hours required for initial development of the entire SMS?			
B. Hours required for periodic update of the SMS?			
C. Hours required for staff training on overall SMS?			
D. Hours required for internal audits of SMS?			
E. Do you outsource SMS development? ❑ YES ❑ NO What is the cost of outsourcing? What is the cost of developing an SMS internally?	$ $		
F. Does each vessel at your company have an individual SMS or is a company-wide SMS in place?	❑ Individual ❑ Company		
G. Has there been an improvement in your overall safety record due to implementation of an SMS? ❑ NO ❑ N/A ❑ YES If yes, please explain:			

2. EMERGENCY PREPAREDNESS AND RESPONSE PROCEDURES			
A. Hours required to develop procedures to identify, describe and respond to potential emergency shipboard situations?			
B. Hours required to training staff on emergency preparedness and response procedures?			
C. Hours required to conduct drills and exercises to prepare for emergency actions?			
D. Hours required for recordkeeping related to emergency preparedness and response?			

SAFETY MANAGEMENT SYSTEM COMPONENTS	COST	HOURS	FREQU -ENCY
E. Has your average incident response time decreased due to implementation of emergency preparedness and response procedures? ❑ NO ❑ N/A ❑ YES If yes, please explain:			

3. INCIDENT REPORTING			
A. What is the job title of the person responsible for incident reporting?			
B. Hours associated with reporting an incident (e.g., non-conformities, accidents and hazardous situations) including completing paperwork?			
C. Hours required to investigate incidents?			
D. Hours required to undertake corrective actions?			

4. VESSEL OPERATING AND MAINTENANCE PROCEDURES			
A. What is the job title of the person responsible for carrying out operating and maintenance procedures?			
B. Hours required for inspection and maintenance/repair of superstructure?			
C. Hours required for inspection and maintenance/repair of hull?			
D. Hours required for inspection and maintenance/repair of equipment, appliances, and propulsion machinery?			
E. Hours required for inspection and maintenance/repair of auxiliary machinery?			
F. Hours required for inspection and maintenance/repair of piping?			
G. Hours required for inspection and maintenance/repair of rigging or towing gear?			
H. Hours required for recordkeeping for inspection and maintenance/repair?			
I. Have there been fewer equipment failures and related incidents due to implementation of operating and maintenance procedures? ❑ NO ❑ N/A ❑ YES If yes, please explain:			

5. PERSONNEL POLICIES, PROCEDURES AND RESPONSIBILITIES			
A. What is the job title of the person responsible for overseeing personnel policies and procedures?			
B. How many hours are required for *initial* training programs such that workers are given proper familiarization with their duties and have an adequate understanding of relevant rules, regulations, codes, and guidelines.			
C. How many hours are required *periodic refreshers* training programs such that workers are given proper familiarization with their duties and have an adequate understanding of relevant rules, regulations, codes, and guidelines.			

SAFETY MANAGEMENT SYSTEM COMPONENTS	COST	HOURS	FREQU -ENCY
6. SAFETY AND HEALTH POLICIES/PROCEDURES			
A. Cost of personal protective equipment: initial purchase?	$		
B. Hours of training required for personal protective equipment use?			
C. Hours required for personal protective equipment inspection and maintenance?			
D. Hours required for hazard communication and cargo knowledge?			
E. Cost of posting safety notices/placard/warning signs?	$		
F. Hours required to develop safety training program?			
G. Hours required to perform safety program drills?			
H. Hours required for safety meetings?			
I. On average, how many work days per year are lost due to safety and health policy and procedure-related issues?			
K. Have there been fewer accidents/injuries and/or safety and health-related worker absences due to implementation of safety and health policies and procedures? ❑ NO ❑ N/A ❑ YES If yes, please explain:			

7. OTHER DOCUMENTATION/ RECORDKEEPING			
A. Hours required to maintain vessel log, documents, or publications including but not limited to Certification Documentation, Navigation charts/maps, or Radiotelephone log? Total cost may be reported in hours or broken down by documentation.			

SAFETY MANAGEMENT SYSTEM COMPONENTS	COST	HOURS	FREQU -ENCY

ADDITIONAL NOTES

2. Drydocking and Underwater Inspections

Below is a list of costs associated with drydocking and underwater inspections. To the extent possible, please provide an estimate for each cost in hours and or dollars.

Drydocking and Underwater Inspections Components	Cost	Hours Per Year	Frequ-ency
1. Time in port and associated lost productivity, delay costs, and lost profits			
A. How many hours are associated with arriving at port for inspection?			
B. What is the cost of productivity lost to time required for inspections? [Example: Delay costs can be estimated by multiplying average hourly or daily productivity by time in port.]	$		
C. How often do you conduct a drydock inspection?			
2. Inspection of items such as hull; tail shafts; rudders; propellers; coolers; sea chests and through-hull fittings			
A. On average, how many hours are required for inspection?			
B. What is the cost of training inspectors for drydock inspection?	**$**		
3. Internal Structure Exams: Costs associated with accessing confined spaces for exam			
A. What is the cost and time required to remove hazardous wastes (e.g. oil), clean the tanks, and certify/maintain a gas free atmosphere?	**$**		
4. Documentation of inspections [for review by Coast Guard or approved third-party auditor]			
A. How is paperwork maintained? Is there a cost of storing documentation?			
5. Underwater Inspections			
A. How many hours are required to prepare for the inspection – including time associated with positioning vessel for proper inspection, or linking up with inspector?			

3. AUDITING PROGRAMS

Below is a list of costs associated with auditing programs. To the extent possible, please provide an estimate for each cost in hours and or dollars.

AUDITING PROGRAMS	COST	HOURS PER YEAR	FREQU-ENCY
1. COST OF AUDITING PROGRAMS AND COMPONENTS			
A. How many hours are required to develop an internal auditing program?			
B. What is the cost of third-party five-year audits (hours of work lost to allow audit)?	$		
C. What is the cost of *external* auditor(s)?	$		
D. How many productive hours are lost as a result of external audits?			

ADDITIONAL NOTES

Questionnaire for Collection of Burden and Expense Information From Towing Companies and Vessels

Note: Responding to any portion of this questionnaire is completely voluntary. You are not required to respond to any collection of information unless it displays a currently valid OMB control number.

INSTRUCTIONS

Please provide estimates for each of the four categories below, as they apply to a towing vessel at your company.

- For categories that relate to capital expenses, please estimate an average annual amount spent in US $. (An estimate for calendar year 2005 or your most recent fiscal year should be sufficient.)

BASIC INFORMATION

Company Name/Affiliation: _____

Job Title: _____

Phone Number: _____

E-mail Address: _____

City and State: _____, _____

1. SAFETY MANAGEMENT SYSTEM (SMS)

An SMS may consist of multiple components including operating procedures, personnel policies and procedures, emergency preparedness and response procedures, and training. Please provide an estimate of the number of hours or dollars associated with each SMS component that you currently implement and/or maintain.

If you do not maintain a formal safety management system, please check the box below, but still *provide responses for each type of procedures/policies below that you may implement and/or maintain independently of an SMS*.

❑ I do not maintain an SMS.

SAFETY MANAGEMENT SYSTEM COMPONENTS	COST	TIME	FREQU-ENCY
1. DEVELOPING AND IMPLEMENTING THE SMS			
A. Time required for development of the SMS?			
B. Time required for periodic update of the SMS? (Best guess or ignore)			

SAFETY MANAGEMENT SYSTEM COMPONENTS	COST	TIME	FREQU -ENCY
C. Time and cost required for staff training on overall SMS?			
E. Do you outsource SMS development? ❑ YES ❑ NO What is the cost of outsourcing?	$		
F. Does each vessel at your company have an individual SMS or is a company-wide SMS in place?	❑ Individual ❑ Company		
G. What is the most time intensive component of developing an SMS?			
H. Has there been an improvement in your overall safety record due to implementation of an SMS? ❑ NO ❑ N/A ❑ YES			

3. INCIDENT REPORTING			
B. Time associated with reporting an incident (e.g., non-conformities, accidents and hazardous situations) including completing paperwork?			
D. Time required to undertake corrective actions?			

7. OTHER DOCUMENTATION/ RECORDKEEPING			
A. Time required to maintain vessel log, documents, or publications including but not limited to Certification Documentation, Navigation charts/maps, or Radiotelephone log? You may report this as one total cost.			

ADDITIONAL NOTES

2. DRYDOCKING AND UNDERWATER INSPECTIONS

Below is a list of costs associated with drydocking and underwater inspections. To the extent possible, please provide an estimate for each cost in hours and or dollars.

DRYDOCKING AND UNDERWATER INSPECTIONS COMPONENTS	COST	TIME	FREQU -ENCY

1. TIME IN PORT AND ASSOCIATED LOST PRODUCTIVITY, DELAY COSTS, AND LOST PROFITS			
A. How long does it take to arrive at port for inspection?			
B. What is the cost of renting space for a drydock?	$		

DRYDOCKING AND UNDERWATER INSPECTIONS COMPONENTS	COST	TIME	FREQU-ENCY
C. How often do you conduct a drydock inspection?			

2. INSPECTION OF ITEMS SUCH AS HULL; TAIL SHAFTS; RUDDERS; PROPELLERS; COOLERS; SEA CHESTS AND THROUGH-HULL FITTINGS			
A. On average, how many hours are required for inspection?			
B. What is the cost of training inspectors for drydock inspection?	$		

3. INTERNAL STRUCTURE EXAMS: COSTS ASSOCIATED WITH ACCESSING CONFINED SPACES FOR EXAM			
A. How long does it take to conduct internal inspections?			

4. DOCUMENTATION OF INSPECTIONS [FOR REVIEW BY COAST GUARD OR APPROVED THIRD-PARTY AUDITOR]	
A. How is paperwork maintained? Is there a cost of storing documentation?	

5. UNDERWATER INSPECTIONS			
A. How many hours are required to prepare for the inspection – including time associated with positioning vessel for proper inspection, or linking up with inspector?			

3. AUDITING PROGRAMS

Below is a list of costs associated with auditing programs. To the extent possible, please provide an estimate for each cost in hours and or dollars.

AUDITING PROGRAMS	COST	HOURS PER YEAR	FREQU-ENCY
1. COST OF AUDITING PROGRAMS AND COMPONENTS			
A. How many hours are required to develop an internal auditing program?			
B. What is the cost of an internal audit	$		
C. What is the cost of a third-party audit?	$		

AUDITING PROGRAMS	COST	HOURS PER YEAR	FREQU-ENCY
D. How long is a third party audit?			

ADDITIONAL NOTES