

*Safety Profile
of the
Great Lakes-
St. Lawrence
Seaway System
Executive Summary*



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Prepared by the
RESEARCH AND TRAFFIC GROUP

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About the Study Authors

For more than two decades, Research and Traffic Group has provided advice and assistance to clients, and undertaken important studies, particularly in transportation. Brief resumes of the qualifications and experience of the Partners and Associates involved in this safety profile are provided below:

Gordon English (B.Sc., M.B.A., P.Eng.)

Gordon English has been a partner at Research and Traffic Group since 1999, and an active associate since 1994, leading projects focused on energy, safety and techno-economic feasibility evaluations, including five climate change evaluations, four energy/emissions modal comparison projects, several transportation safety impact assessments and a discussion paper on internalizing social costs in the transportation sector. English has more than 37 years' experience conducting transportation-related research. He is also currently the President of TranSys Research Ltd, which has focused on safety and techno-economic analyses for projects such as the economic viability of railway operations in an asset devolution assessment for the St. Lawrence Seaway and recommendations to the Republic of China on proposals for high-speed rail passenger service between Taipei and Kaohsiung. He also previously worked as the Director of Research for the Canadian Transportation Safety Board Act Review Commission and in various positions at the Canadian Institute of Guided Ground Transport at Queen's University.

David C. Hackston (B.Comm., B.Arts, FCILT)

David Hackston has been a partner at Research and Traffic Group since 1988, assisting clients with analyses related to rail transportation, intermodal and Great Lakes-Seaway issues. He has more than 40 years' experience in the transportation sector, including providing the Canada Transportation Act Review with expert advice on rail freight and passenger (intercity and urban) issues. From 1974 to 1987, he served with the Canadian Transport Commission as Executive Director, Traffic and Tariffs, advising on rates and public interest issues for rail, motor vehicle and marine (Great Lakes and Northern Resupply). As chairman of the Ad Hoc Rates Committee and of the Sub Committee on Data, he advised on the drafting of the Western Grain Transportation Act and represented the CTC on the Steering Committee overseeing Transport Canada's review of the Atlantic Region Freight Assistance program. He also managed and conducted studies into various aspects of Canadian transportation flowing from initiatives agreed upon at the Western Economic Opportunities Conference, as well as the relationship between transportation and various Canadian industries. This followed a nine-year career in the marketing and sales department of CP Rail.

Captain Randolph Helland, USCG (ret.)

Captain Helland held senior executive positions over a 32-year U.S. Coast Guard career at the national, regional and local levels in the areas of marine/port safety, security, environmental protection and waterways management. Specific positions he held during his Coast Guard career included Chief, Marine Safety, Security and Environmental Protection for the Ninth Coast Guard District (Great Lakes), Captain of the Port, Detroit, MI, Co-Chair Regional Response Team for Region V (Great Lakes), and Co-Chair of the U.S./Canadian Joint Response Team. After his Coast Guard career, he has consulted for companies conducting Port Vulnerability Assessments, Trade Resumption/Business Continuity plans, and marine safety and navigation projects around the U.S.

Captain John Greenway

Captain Greenway attained his Master's certification and command experience on Great Lakes and East Coast Canadian ships. After a 12-year sailing career, he held various marine management positions with Upper Lakes Shipping (Hull – Superintendent, Fleet Superintendent – Operations, and General Manager- Operations). From 2004 to 2010, he served as Vice President – Operations with Seaway Marine Transport and retired in 2011. His involvement in marine regulatory matters has included industry representation with Transport Canada Marine Safety, the Canadian Coast Guard, the Great Lakes Pilotage Authority, the Laurentian Pilotage Authority and the Atlantic Pilotage Authority. Captain Greenway is a recipient of the Transport Canada "Marine Safety Award" which recognized his contribution to marine safety in Canada as well as a recipient of Georgian College's Governors Award for his contribution to marine training in Ontario and to the Canadian marine industry.

Acknowledgments

The study, *Safety Profile of the Great Lakes-St. Lawrence Seaway System*, was commissioned and produced in collaboration with the Chamber of Marine Commerce.

To our knowledge, this is the first time that the safety framework and safety performance has been documented and reported across the entire bi-national Great Lakes-St. Lawrence Seaway System. This report provides a comprehensive account of the key elements of the safety framework currently in place throughout the bi-national navigation system — from regulations and the role of government, vessel construction and inspection, and mariner training — to shipowner and workplace safety programs, advanced navigation technology and emergency response capabilities.

The report also provides the navigation community, transportation planners, government policy makers and the general public with a statistical assessment of the safety performance and spills record of vessels operating in these waters.

The authors would like to thank the Chamber of Marine Commerce, the St. Lawrence Seaway Corporations and the marine carriers for providing valuable input and operating data in the preparation of this report.

We commend the Great Lakes-Seaway marine industry for their efforts to provide this safety profile that builds on prior works to benchmark the marine industry's environmental performance and quantify its economic impacts.

Gordon English

Partner, Research and Traffic Group

David C. Hackston

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Executive Summary

The Great Lakes and St. Lawrence River together form a critical path for the flow of commerce and essential raw materials for North America’s manufacturing and agriculture centers. Ships have been transporting goods along the Lakes and their connecting tributaries for more than two centuries and the maritime industry has played an integral role in the economic and social development of the region.

Over the years, the waterway has evolved. The Welland Canal connected Lake Ontario and Lake Erie, enabling vessels to bypass Niagara Falls. The Soo Locks connected Lake Superior with Lake Huron and the St. Lawrence Seaway allowed vessels to sail from Lake Ontario to the Atlantic Ocean.

Figure ES1. Great Lakes-St. Lawrence Seaway System



The resulting navigation system — the longest inland, deep-draft marine highway in the world — supports the activities of more than 100 ports and commercial docks. American and Canadian domestic ships and international ocean-going vessels carry more than 160 million tons of cargo via the waterway each year. This activity generates \$35 billion in business revenues and supports 227,000 jobs in Canada and the U.S.¹

While this economic contribution is vital to the prosperity of the region, the marine shipping industry recognizes that it must be balanced against the protection of people, property and the environment. This waterway is a precious resource that is shared among many. It is the largest freshwater body in the world; a source of drinking water for 40 million people, and a recreational playground for nature and fishing enthusiasts, boaters, tourists and cottage owners alike. It is also uniquely shared by two nations, and regulated and protected by international treaties (such as the *Boundary Waters Treaty* of 1909), U.S.-Canadian binational commissions (such as the International Joint Commission, which regulates water uses and environmental issues), and two federal, two provincial and eight state governments.

Against this backdrop, it is not surprising that an innovative and multi-layered safety regime for the Great Lakes-St. Lawrence Seaway System (**Great Lakes-Seaway**) has developed that builds on the standards in place for international waters.

This report, for the first time, measures safety performance across the entire bi-national Great Lakes-Seaway. It provides a comprehensive account of the bi-national safety framework currently in place throughout the navigation system — from regulations and the role of government, vessel construction and inspection, and mariner training — to shipowner and workplace safety programs, advanced navigation technology and emergency response capabilities.

It also provides the navigation community, transportation planners, government policy makers and the general public with a statistical assessment of the safety and environmental performance and spills record of vessels operating in these waters.

¹ Source: The Economic Impacts of the Great Lakes-St. Lawrence Seaway System, Martin Associates, October 2011

Key Elements of the Marine Safety Framework

1. Government regulation is extensive

- Due to its bi-national nature, the Great Lakes-Seaway is unlike any other waterway system in the world. The safety regime is anchored by a comprehensive structure of regulations that begins with a well-established international framework for the governance of vessel design and operations led by the International Maritime Organization (IMO). Canadian and U.S. agencies monitor and enforce these standards for any vessel entering their territorial waters and adopt or adapt these regulations for their own domestic fleets. Transport Canada and the U.S. Coast Guard (USCG) are the principal agencies in each country charged with this task.
- While Transport Canada and the USCG are the core safety agencies, there are an additional 18 federal agencies as well as state/provincial and local governments in the two nations involved in various aspects of marine safety.

Figure ES2. Governmental Participation by Functional Area

Agencies	Functional Areas of Safety Responsibility/Participation									
	Ship Safety	Port/Facility	Emergency Response	Aids to Navigation	Ice Breaking	Dredging/Water Levels	Environment	Mariner Safety/Health	Licensing/Pilotage	Other
Canadian Agencies										
Transport Canada	X	X	X			X	X		X	
Canadian Coast Guard			X	X	X	X	X			X
Canadian Border Services Agency										X
Canadian Hydrographic Services										X
Department of National Defence										X
Environment Canada			X				X			X
Human Resources and Skills Development								X		
Labour Canada		X						X		
St. Lawrence Seaway Management Corp.	X	X	X				X			
Transportation Safety Board	X							X		
Provincial Governments		X	X				X			
Local Governments		X	X				X			
U.S. Agencies										
U.S. Coast Guard	X	X	X	X	X		X	X	X	
Army Corps of Engineers		X				X	X			
Centers for Disease Control and Prevention								X		
Customs and Border Protection	X									
Department of Agriculture										X
Department of Labor								X		
Environmental Protection Agency			X				X			
Federal Communications Commission										X
National Oceanic and Atmospheric Administration						X				X
Saint Lawrence Seaway Development Corp	X	X	X				X			
State Governments		X	X				X			
Local Governments		X	X				X			

- The administration of the St. Lawrence Seaway’s infrastructure is shared by two entities: the Saint Lawrence Seaway Development Corporation (SLSDC) in the U.S. — a federal agency within the U.S. Department of Transportation — and the St. Lawrence Seaway Management Corporation (SLSMC) in Canada — a not-for-profit corporation. The two Seaway Corporations provide the regulatory framework for the inland navigation waterway under their respective jurisdictions, coordinate operational activities, particularly with respect to rules and regulations, and day-to-day operations of 15 locks between Montreal and Lake Erie, provide traffic management to ensure safe vessel transit, manage draft and water navigation conditions, navigation aids, safety, environmental programs, operating dates and trade development programs and provide management of certain land parcels adjoining the Seaway, owned by the U.S. and Canadian federal governments.

2. *Ship regulations are enforced prior to entry into the Great Lakes-Seaway*

- Before a foreign-flag ship even enters North American waters, it submits a “notice-of-arrival” to the Marine Communications and Traffic Service in Halifax, Nova Scotia. The notice-of-arrival provides critical information that includes prior ports of call, destination port, cargo, and crew nationality. This information is then forwarded to the Canadian Coast Guard’s (CCG’s) Marine Security Operations Centre in Halifax, and further, to a joint Canadian-U.S. inspection team in Montreal and to the Seaway Corporations. If there is anything related to law enforcement or national security, the Royal Canadian Mounted Police and/or Canada’s Department of National Defence will decide the appropriate steps to take, including whether to board the vessel.
- Foreign ships that are permitted in Canadian waters and enter the Great Lakes-Seaway are then subject to a series of inspections to ensure compliance with domestic and international laws, and Seaway-specific regulations. Based in Montreal, a joint Canadian and U.S. team, including Transport Canada, the USCG and the Canadian and U.S. Seaway Corporations, inspect vessels to verify safety, security and pollution prevention requirements, as well as ballast water compliance.
- Possible enforcement actions against non-compliant vessels include preventing transit or the delay of cargo operations until the deficiency is corrected; a monetary fine; or depending on the violation, pursuing criminal charges against the vessel owner, captain of the ship or another person in charge.

3. *Ships are tracked by advanced traffic control systems*

- The Great Lakes shipping industry has been proactive in the development and adoption of satellite-navigation technology to improve safety, with the Seaway being the one of the first inland navigation systems to adopt an integrated vessel Automatic Identification System (AIS). Prior to the introduction of mandatory carriage of this modern equipment, Great Lakes operators were utilizing electronic charting, satellite positioning, and ship information-transmission technology. Significant testing in its infancy and advancement of this navigation technology are credited to the pioneering efforts of Great Lakes shipping companies.
- All vessels entering the Great Lakes-Seaway are monitored by vessel traffic control centers stationed throughout the system. Each vessel is required to have AIS technology as part of its navigation equipment. This technology sends out a signal to each of the vessel traffic centers and also shares important “real-time” navigational information with nearby vessels, including the exact location, speed and course of each vessel. Every commercial vessel that transits the Great Lakes-Seaway can then be tracked electronically (through the AIS) when in the specified traffic control zones, and shore stations can communicate with the vessel by voice using Very High Frequency (VHF) radio. In the Seaway, ongoing real-time navigation information is used by vessels, providing key data that increases navigational safety by enabling mariners to proactively make decisions before a vessel reaches a dangerous point in its transit path.

4. *Vessel integrity and equipment are inspected during construction and throughout its lifespan*

- Throughout its lifespan, a Great Lakes ship is subject to rigorous inspections and certification oversight — in the original design and construction stage, through mandatory annual inspections, and through the “out of water” dry-docking inspections undertaken on a five-year basis for domestic vessels and twice in every five-year period for international vessels. Regular inspection of vessels is performed by Transport Canada or the USCG or delegated to an approved classification society. These classification societies are subject to audit and verification by government authorities to ensure compliance with all standards.

5. *Waterway depths and hazards are continuously monitored and managed*

- The U.S. Army Corps of Engineers (USACE) ensures the safe passage of vessels in American waters by constructing and maintaining navigation channels and harbors through dredging and regulation of water levels on inland waterways — including 47 deep-draft U.S. ports and 55 shallow-draft harbors. In addition, the USACE surveys the lakes; builds and maintains 104 miles of breakwater; and operates and maintains 20 lock chambers and 20 confined disposal facilities for dredge materials.
- In the Seaway, both Corporations (SLSMC and SLSDC) ensure the safe passage of vessels in their jurisdictional waters by implementing effective maximum vessel draft and speed management.
- The Canadian Hydrographic Service performs surveys of lakes, rivers and channel bottoms in Canadian waters to ensure the accuracy of depths on navigation charts for safe navigation. The CCG has responsibility for dredging and maintaining safe depths in specific identified navigational channels and Canadian ports are responsible for the dredging of their harbors and navigation channels.
- Water levels are monitored in real time by water-level gauges owned and operated in U.S. waters by the National Oceanic and Atmospheric Administration and USACE — and in Canadian waters, by the SLSMC, CCG and the Canadian Hydrographic Service. Water-depth information is made available to the mariner via Internet, telephone and AIS services — to ensure up-to-date and accurate water-level readings that support safe navigation and route planning.

6. *The Great Lakes-Seaway is a compulsory pilotage zone*

- Under Canadian and U.S. law, any ship entering the navigation system from overseas is required to hire a Canadian or American pilot. Pilots are expert navigators who are familiar with local geography, weather, currents and sailing conditions. The pilot’s expertise supplements the captain’s expertise to ensure safe navigation.
- U.S. and Canadian domestic ships meet this requirement through demanding USCG licensing programs for U.S. deck officers. Canadian deck officers follow a similar system through the Great Lakes Pilotage Authority’s Pilotage Certification Program. Extensive training, examination and assessment of skills, mandatory trips, valid marine officer credentials and rigorous physical examinations all support the knowledge, skills and capabilities of domestic mariners to conduct their pilotage responsibilities.

7. *Mariners receive specialized training and are licensed by government authorities*

- Commercial vessels operating on the Great Lakes-Seaway are under the control of professional mariners that have not only received specialized training, but have also been licensed by government authorities. A ship’s captain, for example, will have graduated from an accredited maritime academy or university program, and will have accumulated years of experience and passed a series of written and oral examinations before obtaining a Master’s (Captain’s) ticket. In the United States, licensing of merchant mariners is the responsibility of the USCG. In Canada, licensing is the responsibility of Transport Canada.

- In Canada and the U.S., becoming certified as a Master takes a minimum of between six and eight years and, given the need for gaining necessary experience, often longer. Following certification, companies will often require Masters to serve on different ship types; conduct a period of sailing with “Training Masters”; complete additional training on simulators for ship handling, pilotage and bridge resource management; and complete other management courses before taking on command of a ship. A “Master-in-Training” often undergoes 6 to 12 months of additional onboard training under Training Masters, with formal assessments documented.

8. *Stringent tanker safety requirements are in place*

- Liquid bulk cargo is transported on the Great Lakes-Seaway by Canadian, American and international vessel operators. Specially designed tank ships (self-propelled tankers) typically transport petroleum products and liquid chemicals. Tank barges (non-powered vessels pulled or pushed by a tug) are typically used to transport asphalt and heavy oil.
- The U.S. and Canadian governments have adopted environmental safety standards for new and existing petroleum-product tankers operating in Canadian or U.S. waters. These standards require that tankers be built to specific double-hulled standards, resulting in a safety separation between the inner cargo compartments and the ship’s outer hull of between 1 and 2 metres (3.3 to 6.6 ft.) depending on the deadweight tonnage (DWT) capacity of the tanker.²
- All Canadian, American and international tanker ships operating on the Great Lakes-Seaway must be double hulled by January 1, 2015.

9. *Emergency preparedness and response measures are continuously tested and evaluated*

- The Great Lakes-Seaway marine industry works in partnership with federal, state/provincial and local governments to develop contingency plans to be prepared in the event of marine emergencies. These plans are tested through regular emergency preparedness exercises involving vessels, Coast Guards, ports and the St. Lawrence Seaway Corporations.
- All vessels must have on board a detailed emergency plan, containment booms and other equipment to deal with possible spills, as well as agreements with government-approved emergency response contractors to aid in clean-up, if required.
- In the event of a marine oil spill/emergency in Canada or the U.S., the Coast Guard (Canadian or U.S., depending on jurisdiction) is the first in line-of-command for oversight and response at a spill site. The Seaway Corporations, port and infrastructure management agencies (e.g. for spills in harbors or in Seaway locks/channels) notify all relevant responders and offer assistance in whatever way they can provide, including containment if they have local resources. Oil-response organizations are usually the first responders for spills and address containment and recovery activity. They operate under the direction of the responsible party and fall under the jurisdiction of the Coast Guard, which may intervene if necessary.
- The responsible entity (usually a vessel owner) is liable for the costs incurred and generally has indemnity insurance in excess of the minimum required to cover the costs of a major spill. If required, publicly administered Oil Pollution Funds are available in both countries for payment to those incurring damage or containment costs. Recovery of the funds is sought from the responsible entity and/or insurance company after the clean-up operations are completed.
- The Canada-United States Joint Marine Pollution Contingency Plan provides a coordinated system for planning, preparedness and response to harmful-substance incidents in the contiguous waters. The Joint Marine Pollution Contingency Plan and its Geographic Annexes (Area specific plans) augment the national response systems of Canada and the United States by providing a “bridge” between the two systems — ensuring that coordinated planning is accomplished at the local level.

² The formula for the width of the space is W (in metres) = $0.5 + DWT/20,000$ with a minimum space of 1.0 metres and a maximum of 2.0 metres.

Safety Performance of the Great Lakes-Seaway Fleet

1. Statistical Analysis

The Great Lakes-Seaway fleet (Canadian, U.S. and international vessels) operates in Canadian and U.S. waters and the combined activity of these vessels can be isolated from that of other regions of the two countries. Marine safety data specific to the Great Lakes-Seaway was, therefore, collected from Canadian and U.S. government sources for the years 2002 to 2011.

Data on marine accidents in Canada are reported to the Canadian Transportation Safety Board (TSB) and in the U.S., to the U.S. Coast Guard (USCG). Marine safety data for Canada was obtained from the TSB Marine Occurrences Database and for the U.S., from the Marine Casualty and Pollution Database held by the National Technical Information Service. The Canadian TSB data were segmented to include only those vessels that were making a trip into the Seaway. Thus, accidents occurring in the lower St. Lawrence River were included only if the vessel had an origin or destination west of Montreal.

The marine reporting requirements include both transportation-related accidents and employee health- and safety-related accidents when occurring aboard vessels. Marine transportation-related accidents include vessel events such as strikings, groundings and collisions. Therefore, the data can be segmented into transportation-related casualties and workplace-related casualties.

Spills in U.S. waters are reported to the USCG and the data are included in the same Marine Casualty and Pollution Database cited above. Spills in Canadian waters are reported to the CCG and a 10-year (2002-2011) history of data was obtained for analysis in this study. Spills were included if they occurred in the Great Lakes-Seaway — which covers the Seaway within Montreal and all Great Lakes-Seaway waters west of Montreal. Much of the activity on the tributary rivers/canal systems involves barges that operate strictly on the rivers and canals. Spills occurring on the tributary rivers, canals and harbors were only included if they involved a Great Lakes bulk cargo vessel or a barge of 2,000 gross registered tonnage (GRT) or higher.

2. Public Safety Record

Great Lakes-Seaway ships operating in Canada and the U.S. carried more than 1.5 billion metric tonnes of cargo over the 10-year period (2002 to 2011) without any accidents negatively impacting public safety.

There were a total of 801 reported vessel accidents and safety occurrences throughout the entire system in Canada and the U.S. over the period of 2002 to 2011. Most of the marine accidents were minor in nature with 59% of the accidents reported in U.S. waters resulting in no damage to the vessel and 97.5% of accidents reported in Canadian waters classified at the minimum severity ranking.

Vessel collisions/strikings or groundings (transportation-related accidents) resulted in zero fatalities and injuries to members of the public. Shipping accidents did result in two injuries to marine employees. Based on the total number of vessels trips made over the 10-year data interval, 100% of trips were fatality-free and 99.997% were injury free in relation to shipping accidents.

The analysis shows that the rate of transportation-related injuries per 100-billion tonne-km for marine vessels in this region is 17 times lower than the national rate for Canadian freight railways and 70 times lower than U.S. Class 1 freight railways. The rail statistics include casualties due to train derailments/collisions, highway grade crossing collisions and trespass collisions.

Table ES1. Comparison of Marine and Rail Injury and Fatality Rates for Transportation-related Accidents (2002-2011)

Mode	Injuries	Fatalities
Rate per 100-billion tonne-km		
Marine – Great Lakes-Seaway Vessels	0.10	0
Rail – Cdn Freight Railways	1.78	0.64
Rail – U.S. Class 1 Freight Railways	7.0	0.65
Rate per 100-billion ton-miles		
Marine – Great Lakes-Seaway Vessels	0.15	0
Rail – Cdn Freight Railways	2.59	0.94
Rail – U.S. Class 1 Freight Railways	10.2	0.95

Source: RTG analysis of Canadian TSB accident data and Federal Railway Administration casualty database and ton-mile data from the U.S. Department of Transport, Bureau of Transportation Statistics, Appendix D: Rail Profile.

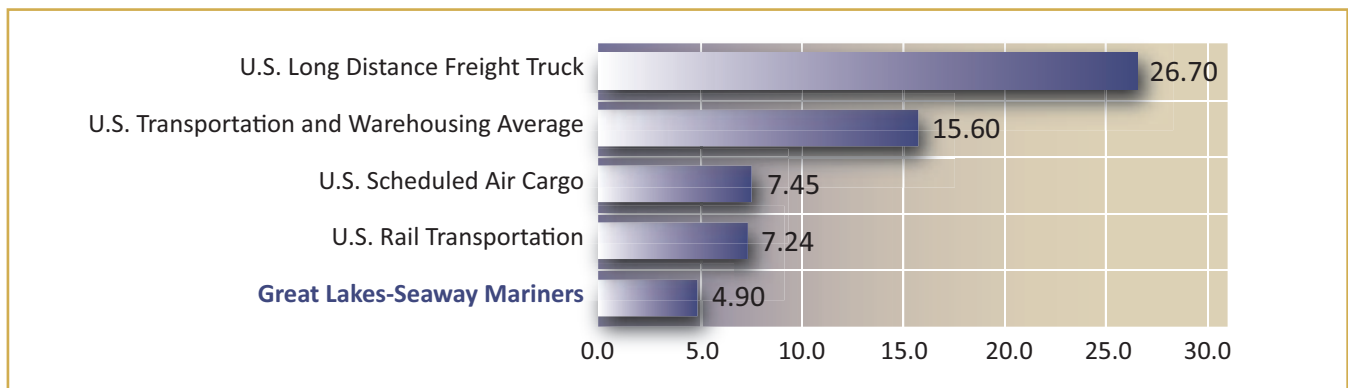
3. Workplace Safety Record

For the 10-year period of 2002 to 2011, a total of 5 employee fatalities occurred while onboard vessels - 2 aboard Canadian-flagged vessels and 3 aboard U.S.-flagged vessels.

Analysis of Canadian and U.S. government records shows that Great Lakes-Seaway mariners have significantly lower employee fatality rates than other U.S. transportation and material-moving occupations, including rail, trucking and air cargo sectors. Over the 10-year period 2002-2011, employee fatality rates were about 50% higher for rail transportation and 5.5 times higher for long-distance trucking compared to Great Lakes-Seaway mariners.

A similar workplace safety comparison against other Canadian freight modes was not possible due to a lack of consistent and comparable government information.

Figure ES3. Freight Transport Mode Employee Fatality Rates Per 100,000 workers (2002-2011)



Source: Fatality rates based on census data published by the U.S. Department of Labor, Bureau of Labor Statistics, Census of Fatal Occupational Injuries (2002-2011)

Note 1: Marine casualties are those of the combined U.S. and Canadian waters of the Great Lakes-Seaway based on USCG and TSB data.

Note 2: Employee workplace fatalities exclude 3 fatalities resulting from previously existing medical conditions that are reported in the marine data but are not included in the chart as they are not “workplace casualties” as defined in normal labor statistics.

4. Spills in Canadian and U.S. Waters

Spills of dangerous goods in Canada and hazardous materials in the U.S. are reported to the respective Coast Guards. Analysis of the data shows that there were 139 releases from vessels in the bi-national Great Lakes-Seaway, over the period of 2002 to 2011.

Spills were predominantly small product spills during loading/unloading, or minor releases of consumables such as hydraulic fluid, lubricating oil or fuel oils. The data include bulk and general cargo vessels, as well as tank ships and barges. None of the marine releases resulted in casualties.

Table ES2. Dangerous Goods/Hazardous Materials Spills Performance of Great Lakes-Seaway Fleet (2002-2011)

	Canada	U.S.	Total	Avg/Year
Spills Reported	73	66	139	14
Quantity – Litres	20,291	17,165	37,456	3,746
Quantity – U.S. gallons	5,361	4,534	9,895	990

Source: Derived from USCG Marine Casualty and Pollution Database and TSB Marine Occurrences Database

Based on an estimated 69,960 vessels trips made over the 10-year data interval, 99.8% of vessel trips were “incident-free” — in terms of releases of dangerous goods/hazardous materials.

The spill-free performance of all tank vessels and barges operating in the Great Lakes-Seaway was 99.99% for the 10-year period of 2002-2011.

For the period of 2002-2011, the quantity of spills occurring on tank vessels and barges (i.e. during loading or unloading operations, or minor releases of consumables) totaled 9,574 litres (2,522 U.S. gallons) in Canadian waters and 4,046 litres (1,071 U.S. gallons) in U.S. waters. The combined spill rate is equivalent to 157 millilitres (about 10.5 tablespoons) per million litres of product carried —or 2.5 cups for every million U.S. gallons carried.

On an annual basis, the quantity of spills occurring on tank vessels in Canadian and U.S. waters was 1,362 litres (360 U.S. gallons) per year. This annual amount is equivalent to 1.2% of the capacity of a single rail tank car (i.e. 113,000 litres/30,000 U.S. gallons).

Closing Comments from the Study Authors

It is clear from our analysis that the Great Lakes-Seaway marine system operates under a well-established safety framework, has coordinated bi-national response programs/procedures in place and over the past decade, its operators have demonstrated an exemplary safety record. Great Lakes-Seaway overseers and operators have shown initiative in developing safety training programs and leadership in testing/adopting new technology. In benchmarking with other modes, the Canadian, U.S. and international vessels operating on the Great Lakes-Seaway were found to exceed the safety performance of other freight transport modes, in both safe transportation and employee workplace safety. In every area that benchmarking data were available, Great Lakes-Seaway operators essentially set a safety-performance benchmark that other modes could strive to attain.


Gord English, Partner

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The full report of the Safety Profile of the Great Lakes-St. Lawrence Seaway System follows or is available on www.marinedelivers.com and provides a more detailed account of the safety framework in place, as well as a breakdown of safety performance data by country.





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