

# *Analysis of Great Lakes Pilotage Costs on Great Lakes Shipping and the Potential Impact of Increases in U.S. Pilotage Charges*



*Prepared for:*  
**United States Coast Guard**  
2703 Martin Luther King Jr Ave SE  
Washington, DC 20593-7828



*Prepared by:*  
**John C. Martin Associates, LLC DBA Martin  
Associates**  
941 Wheatland Avenue, Suite 203  
Lancaster, PA 17603  
(717) 295-2428  
[www.martinassoc.net](http://www.martinassoc.net)

June 28, 2017

# Table of Contents

<b>INTRODUCTION AND EXECUTIVE SUMMARY .....</b>	<b>1</b>
<b>I. ECONOMIC IMPORTANCE OF THE GREAT LAKES SHIPPING .....</b>	<b>6</b>
1. SYSTEM-WIDE ECONOMIC IMPACTS .....	6
2. ECONOMIC IMPACT OF FOREIGN FLAG VESSEL OPERATIONS .....	10
3. ECONOMIC IMPACT OF INVESTMENTS ON THE GREAT LAKES-ST. LAWRENCE SEAWAY SYSTEM .....	13
<b>II. DEVELOPMENT OF BASELINE ANALYSIS .....</b>	<b>16</b>
1. DEVELOPMENT OF BASELINE VOYAGE COST ROUTINGS .....	16
2. DEVELOPMENT OF VOYAGE COST MODEL.....	18
3. DEVELOPMENT OF PILOTAGE CHARGES.....	20
4. DEVELOPMENT OF TOTAL VOYAGE COSTS INCLUDING PILOT CHARGES .....	23
<b>III. THE IMPACT OF U.S. PILOTAGE CHARGES ON THE COMPETITIVE POSITION OF THE GREAT LAKES/ST. LAWRENCE SEAWAY TRANSPORTATION SYSTEM.....</b>	<b>35</b>
1. IDENTIFICATION OF IMPORT STEEL DESTINATIONS AND GRAIN ORIGINS AND COMPETING ROUTES.....	35
2. DETERMINE THE COMPETITIVE POSITION OF THE GREAT LAKES/ST. LAWRENCE SEAWAY SYSTEM UNDER CURRENT U.S. PILOTAGE CHARGES .....	36
2.1 <i>Competitive Position of the Great Lakes/St. Lawrence Seaway System for Steel Imports</i> .....	36
2.2 <i>Competitive Position of the Great Lakes/St. Lawrence Seaway System for Grain Exports</i> .....	40
2.2.1 Competitive Position of the Great Lakes/St. Lawrence Seaway System for Grain Exports via Thunder Bay .....	41
2.2.2 Competitive Position of the Great Lakes/St. Lawrence Seaway System for Grain Exports via Duluth/Superior .....	43
2.2.3 Competitive Position of the Great Lakes/St. Lawrence Seaway System for Grain Exports via Toledo ...	46
<b>IV. IMPACT OF INCREASES IN PILOT CHARGES ON THE COMPETITIVE POSITION OF THE GREAT LAKES/ST. LAWRENCE SEAWAY SYSTEM AND RESULTING ECONOMIC IMPACTS.....</b>	<b>50</b>

## Introduction and Executive Summary

The deep draft navigation system of the Great Lakes/St. Lawrence Seaway System is the longest in the world, extending 3,700 kilometers (2,300 miles) into the North American heartland. This waterway complements the region's rail and highway network and offers customers a cost-effective, safe, and environmentally smart means of moving raw materials, agricultural commodities and manufactured products. Every year more than 160 million metric tons of cargo is moved on the Great Lakes/St. Lawrence Seaway System. Dominant cargoes include iron ore for steel production, coal for power generation, limestone and cement for construction, and grain for both domestic consumption and export.

Three distinct vessel-operator communities service the waterway. These include U.S. domestic carriers ("U.S. Lakers") transporting cargo between ports on the system, Canadian domestic carriers ("Canadian Lakers") operating between ports on the system, and ocean-going vessel operators ("Salties"), which operate between system ports and overseas destinations. These carriers serve more than 110 system ports located in each of the eight Great Lakes U.S. states and the Canadian provinces of Ontario and Quebec. These eight states include Minnesota, Wisconsin, Illinois, Michigan, Indiana, Ohio, Pennsylvania and New York. Exhibit E-1 shows a map of the Great Lakes St./ Lawrence Seaway System

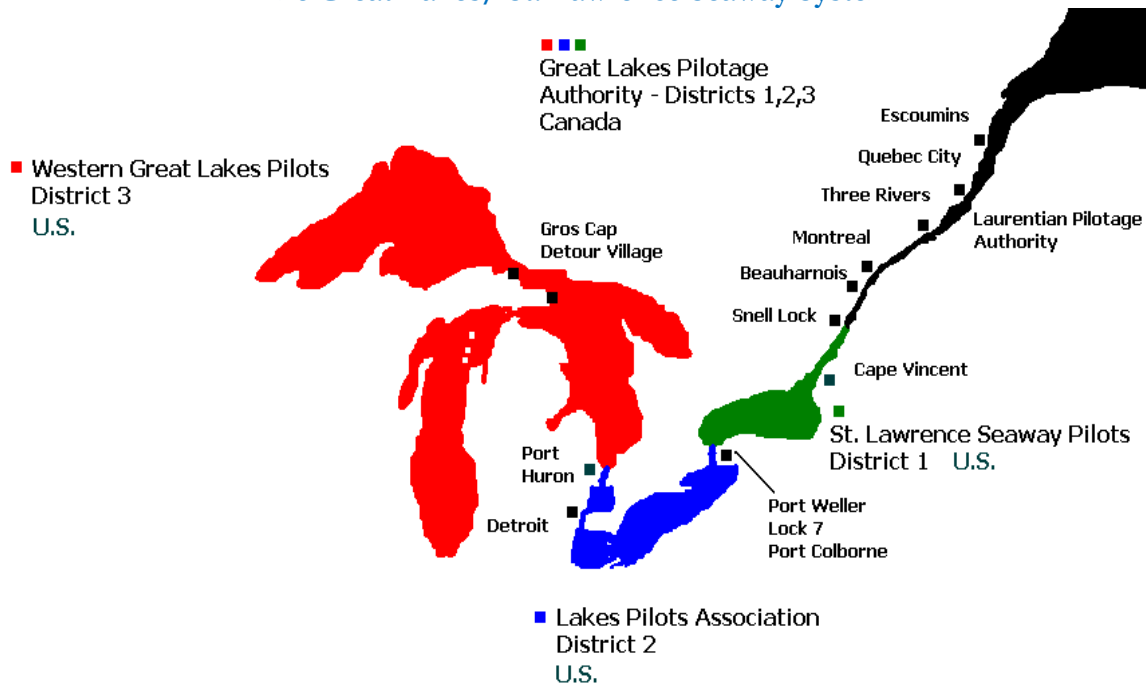
In addition to locks, ships and ports, a host of maritime service providers work to ensure the safe and efficient transport of cargo. These include stevedores, warehousemen, freight forwarders, dockworkers, crane operators, marine pilots, truck drivers, tugboat operators, and shipyard workers. In addition, steel mills, limestone quarries, and iron ore mines are located at these ports and provide significant levels of employment.

The economies of U.S. Midwestern and Mid-Atlantic industrial states located in the Great Lakes region benefit from the cost-effective mode that is provided by the waterborne transportation of goods shipped and received at their ports. Great Lakes shipping through ports in the eight-state region contribute to the economy of the region and changes in the Great Lakes shipping markets affect the region's economy. The cargo market is sensitive to voyage costs and a loss of cargo moving through U.S. Great Lakes ports could have a negative impact on the region's economy. To better understand this synergy, the United States Coast Guard retained the services of Martin Associates to conduct an assessment of the U.S. Great Lakes pilotage charges on Great Lakes shipping and the potential impact of pilotage charges increases and decreases.

Pilotage is required for all foreign flag vessels operating on the Great Lakes/St. Lawrence Seaway System that are involved in foreign commerce. The pilotage system on the Great Lakes/St. Lawrence Seaway System consists of three pilot organizations – the Office of Great Lakes Pilotage, which regulates three U.S. Great Lakes pilot associations that provide service on all U.S. and shared waters of the Great Lakes; the Great Lakes Pilotage Authority administers pilotage on all Canadian and shared waters of the Great Lakes; and the Laurentian Pilotage Association, which administers pilotage on the St. Lawrence River and the Gulf of the St. Lawrence River. The focus of this study is to evaluate the current impact of changes in U.S. pilotage charges on the cost effective competitive position of the Great

Lakes/St. Lawrence Seaway System and to assess the potential impact of increased U.S. Pilotage charges on the cost effective on the position of the Great/Lakes St. Lawrence Seaway System. The U.S. Pilotage System consists of three pilotage districts: District 1 consists of areas of the St. Lawrence River and Lake Ontario; District 2 covers international flag operations on Lake Erie, the Detroit River, Lake St. Clair, and the St. Clair River; District 3 covers foreign flag operations on the St. Marys River, Sault Ste. Marie Locks, and Lakes Huron, Michigan and Superior. Exhibit E-1 is a map of the Great Lakes/St. Lawrence Seaway System and the U.S. Pilot Districts

**Exhibit E-1**  
**The Great Lakes/ St. Lawrence Seaway System**



The assignment of a U.S. vs. Canadian pilot for a particular transit of a foreign flag vessel is outlined in a Memorandum of Understanding between the U.S. Coast Guard and Canadian Great Lakes Pilotage Authority. The assignment of the U.S. vs. Canadian pilot is based on the order in which a vessel arrives on the system, with the exception that a foreign trade flag vessel transiting between Canadian ports without an intermediate U.S. port call will likely use a Canadian pilot, and foreign trade flag vessels transiting between two U.S. ports will likely use a U.S. pilot. In addition, the Canadian pilots handle all transits through the Welland Canal, as well as between the St. Lambert Lock and the Snell Lock. For purposes of this analysis to isolate the potential cost competitive impacts of the U.S. pilotage charges, it is assumed that a U.S. pilot is assigned to the vessel for all portions of the voyage on which a U.S. pilot can be assigned. The key findings of the study follow.

U.S. pilotage charges increased significantly between 2015 and 2016. It is to be emphasized that the U.S. pilotage charges used in the analysis are based on the actual

invoiced amounts as reported by each U.S. Pilotage District, and supplied to Martin Associates by the Great Lakes Pilotage Office, U.S. Coast Guard. The percentage increases in pilotage charges for grain and steel moving on a Class 4 vessel (defined as a vessel of about 30,000 to 35,000 deadweight tons) on each of the three voyage scenarios analyzed in this study are presented in E-2.

**Exhibit E-2**  
**Increases in U.S. Pilotage Charges between 2015 and 2016 for Steel and Grain, by Voyage Scenario**

Voyage Scenario	Steel			Grain		
	2015	2016	Change	2015	2016	Change
<b>Voyage 1</b>	\$44,431.22	\$63,325.12	<b>42.52%</b>	\$53,154.85	\$95,620.66	<b>79.89%</b>
<b>Voyage 2</b>	\$40,830.81	\$60,996.61	<b>49.39%</b>	\$54,839.93	\$104,699.96	<b>90.92%</b>
<b>Voyage 3</b>	\$39,667.78	\$61,624.55	<b>55.35%</b>	\$42,461.83	\$65,208.78	<b>53.57%</b>

To assess the potential impact of the U.S. pilotage charges on the competitive cost position of the Great Lakes/St. Lawrence Seaway System and the associated impact on tonnage moving via the Great Lakes ports, the actual increases in pilotage charges between 2015 and 2016 were entered into the logistics cost model developed as part of the study to estimate the impact on tonnage, should similar increases in U.S. pilotage charges occur over the next year. It is important to underscore the fact that many factors drive the tonnage levels of foreign cargo on the Great Lakes/St. Lawrence Seaway, including demand for steel in auto and appliance production, construction levels in the region, tariff levels on imported steel, relative prices of foreign steel, exchange rates, weather conditions impacting grain production, domestic demand vs. foreign demand for export grain, rail pricing, etc. Furthermore, the limited nine-month shipping season on the Great Lakes/St. Lawrence Seaway impacts the logistics supply chain needs of many beneficial cargo owners, and renders the Great Lakes ports less attractive to coastal ports, where the shipping season length is not limited. It is to be emphasized that the purpose of this study is to isolate the impacts of the U.S. pilotage charges on the cost-effective routing of the Great Lakes/St. Lawrence Seaway System, with these other factors driving tonnage levels of foreign commerce held constant.

Exhibit E-2 shows the estimated tonnage for grain and steel for which a Great Lakes port routing no longer offers the lowest cost routing over an alternative coastal port routing under various scenarios regarding increases in U.S. pilotage charges. All other costs are held constant, including Canadian pilotage charges, tolls, stevedoring, port charges, etc. In addition, demand for the steel and grain tonnage is not included, nor are changes in exchange rates, and weather conditions. It is also assumed that adequate capacity exists for alternative modes and at Coastal ports. The purpose is to isolate only the potential impact on the cost-effective routing of the steel and grain under the various pilotage charges increases. The actual increases in U.S. pilotage charges between 2015 and 2016 for steel and grain under the three voyage scenarios were entered into the total logistics cost models to assess the impact on tonnage under each pilotage charge percentage increase. A sensitivity was also evaluated for a doubling of U.S. pilotage charges on both grain exports and steel imports.

It is important to note that export grain is much more price sensitive than imported steel since the primary hinterland of steel is typically in the immediate hinterland of the importing port. Conversely, grain exported from the Great Lakes' ports draws from a large hinterland, particularly for Thunder Bay and Duluth/Superior, and as a result is more elastic with respect to changes in pilotage charges since grain exports have more competitive alternative routings. Under these estimated tonnage losses, the economic impact to the Great Lakes region was estimated using the Martin Associates' Economic Impact Model of the Great Lakes/St. Lawrence Seaway System. These impacts on the U.S. and Canada are estimated for 585,890 tons of grain that could no longer move cost effectively through the Great Lakes ports, and thus be at risk for diversion to coastal ports with a 53.75% to 90.92% increase in U.S. pilotage charge. Under a doubling of U.S. pilotage charges, other factors held constant, 596,291 tons of grain and 10,401 tons of steel are no longer cost effectively served via a Great Lakes, and could be diverted to coastal ports that provide a more cost-effective routing to serve the inland origins of grain and destinations of steel imports.

**Exhibit E-3**  
**Impact of Changes in Pilotage Charges**

<b>Change in U.S. Pilot Charge for Steel Imports</b>	<b>42.50%</b>	<b>49.39%</b>	<b>55.35%</b>	<b>100%</b>
Non-Cost Competitive Steel Tonnage	0	0	0	10,401
<b>Change in U.S. Pilotage Charge for Grain Exports</b>	<b>53.57%</b>	<b>79.89%</b>	<b>90.92%</b>	<b>100%</b>
Non-Cost Competitive Grain Tonnage	585,850	585,850	585,890	596,291

If U.S. pilotage charges were to increase by 100% across the board, about 379 direct, induced and indirect jobs in the regional economy are at risk. Also, businesses could lose about \$36.2 million annually, while total regional income could be reduced by about \$27.2 million annually.

It is important to note that these economic impacts are only a small portion of the impacts that could occur due to the increases in U.S. pilotage charges. The potential loss of nearly 586,000 tons of grain represents a significant loss of backhaul tonnage for the foreign flag vessels moving imported steel products into the region. Assuming that 20,000 tons of grain exports per vessel is loaded at a Great Lakes port (after the steel imports are unloaded), the loss of 586,000 tons of grain equates to a loss of about 29 vessel backhauls. This reduction of backhaul potential for the foreign flag vessels moving steel products into the lakes would affect the financial incentive for the vessels to enter the Great Lakes trade, thereby possibly eliminating 29 vessel backhauls opportunities. This in turn could result in either a significant increase in rates charged for steel imports to cover a round trip voyage cost with only 20,000 tons of inbound steel (which could potentially divert cargo from the Great Lakes to alternative ports, other things held constant), or the reduction in foreign vessel calls at Great Lakes ports. Under either scenario, approximately 586,000 tons of steel imports would be at risk to be diverted to a coastal port, or charged a much higher rate. This loss of 586,000 tons of steel imports from the Great Lakes/St. Lawrence Seaway System could result in a significant economic loss to the regional economy, as estimated using the Martin Associates Great Lakes/St. Lawrence Seaway System Model. It is estimated that the potential impact of the loss of 586,000 tons of steel, or the loss of 29 steel vessel

backhauls, could potentially impact nearly 4,100 direct, induced and indirect jobs in the Great Lakes regional economy, and put in jeopardy about \$609 million of annual direct business revenue to businesses operating on the Great Lakes. This, combined with the loss of 300 direct, induced and indirect jobs associated with the loss of the grain exports from the Great Lakes, would increase the potential job impact loss to about 4,400 jobs annually. Greater increases in U.S. pilotage charges would further impact the economy of the Great Lakes region. Again, this assumes that all other factors are held constant that effect the level of foreign commerce on the Great Lakes/St. Lawrence Seaway System. It is to be further noted that these impacts to the Great Lakes regional economy are not necessarily net losses to the total U.S. and Canadian economies, as resulting increased impacts at the coastal ports to which the tonnage could be diverted are likely. However, the degree to which impacts would be transferred to the coastal ports depends on the ability to handle additional throughput with the existing capacity at the coastal ports, including terminal capacity, vessel capacity and surface modal capacity.

In summary, there are many factors driving the level of international marine cargo moving on foreign flag vessels into and out of the Great Lakes/St. Lawrence Seaway System. For example, factors affecting the level of steel imports into the Great Lakes include domestic and international economic conditions, import trade restrictions, value of the U.S. dollar, migration of steel consuming industries away from the Great Lakes region, restricted shipping season of the Great Lakes/St. Lawrence Seaway System, terminal/stevedoring charges, rail and truck availability and rates to competing ports, vessel size restrictions due to the dimensions of the locks on the System (hence impacting the economies of shipping on a per ton basis), insurance requirements, and Seaway System tolls. Additional factors that drive grain exports on the Great Lakes/St. Lawrence Seaway System include weather conditions and crop production, domestic vs. export prices, inland waterway river levels, barge and rail car capacity to serve coastal ports, vessel size restriction on the Great Lakes/St. Lawrence Seaway, world demand by region, tolls, and elevator capacity at Great Lakes and Coastal ports. These factors impacting steel and grain tonnage levels on the Great Lakes/St. Lawrence Seaway System are for the most part, exogenous to the system. However, the U.S. pilotage charge is a factor that could potentially impact the competitive position of the Great Lakes/St. Lawrence Seaway System ports, over which the U.S. Coast Guard, Great Lakes Pilotage Office, has direct control in setting rate levels. As demonstrated in this report, the U.S. pilotage charge has increased significantly between 2015 and 2016, and accounts for nearly 10% of the total voyage costs of foreign flag vessel operations into the Great Lakes/St. Lawrence Seaway System. Should charges increase at the same level as occurred between 2015 and 2016, other factors held constant, the tonnage that could no longer be cost effectively handled at the Great Lakes ports compared to coastal port alternatives supports about 4,400 direct, induced and indirect jobs annually in the region. This represents nearly 2% of the total economic impact of the Great Lakes/St. Lawrence Seaway System generated by both domestic and international cargo moved on foreign flag vessels, or about 25% of the regional economic impact supported by the international cargo moving on foreign flag vessels.



## I. Economic Importance of the Great Lakes Shipping

Martin Associates conducted the Economic Impacts of the Great Lakes-St. Lawrence Seaway, 2010, for a bi-national consortium of public and private stakeholders. These stakeholders included the St. Lawrence Seaway Management Corporation, the St. Lawrence Seaway Development Corporation, the Chamber of Marine Commerce, the American Great Lakes Ports Association, the Lake Carriers Association, the Great Lakes Maritime Task Force, Algoma Central Corporation, Canada Steamship Lines, and Fednav, Ltd. The study was based on a comprehensive telephone interview program of nearly 1,000 individual firms providing maritime services at 16 key U.S. ports and 16 key Canadian ports. To measure the impacts of marine cargo moving via individual ports and private terminals not included in the core group of 32 ports, Martin Associates developed prototype economic impact models. These models were used to expand the 32-port impacts to the state/provincial level, thus incorporating the Great Lakes-Seaway tonnage moving to and from all marine terminals located within a specific state or province.<sup>1</sup>

### 1. System-Wide Economic Impacts

In 2010, about 322 million metric tons of cargo were handled at the ports and marine terminals located on the system, the majority of which was cargo transported on U.S. and Canadian flag lakers, and this cargo typically moved between Canadian ports, between U.S. ports, and cross-lake traffic. This 322 million metric tons of cargo handled at U.S. and Canadian ports and marine terminals located on the Great Lakes/St. Lawrence Seaway System included domestic cargo shipped via the ports within the system, as well as that same cargo received by the port in the system. Therefore, this tonnage represents shipment and receipt of both domestic and trans-lake cargo, and is about double the actual volume of cargo moving on the system, which is about 164 million metric tons. Of that 164 million tons carried on all vessels transiting the Great Lakes/St. Lawrence Seaway System, about 7.6 million tons were carried on foreign flag vessels subject to the assignment of U.S. and Canadian pilots. This marine cargo activity created a range of economic impacts in the region, which is defined as the Canadian provinces of Ontario and Quebec, and the U.S. states of New York, Pennsylvania, Ohio, Indiana, Illinois, Wisconsin, Michigan, and Minnesota. The impacts measured are defined as:

- **Employment:** these impacts consist of three distinct job categories:
  - Direct Employment – jobs directly generated by maritime and port activity. These jobs include dockworkers, crane operators, ships' crew, steamship agents, freight forwarders, stevedores, etc. These jobs would experience dislocation if the activity at ports and marine terminals were to be discontinued.
  - Induced Employment – jobs created when individuals spend their wages

---

<sup>1</sup> The Economic Impacts of the Great Lakes/St. Lawrence Seaway System, October 18, 2011, by Martin Associates, for Consortium of Great Lakes Region Public and Private Stakeholders.



locally on goods and services such as food, housing and clothing.

- Indirect Employment – jobs created due to purchases of goods and services by businesses. These include jobs with office supply firms, maintenance and repair companies, parts and equipment suppliers, etc.
- **Personal Income:** these impacts are a measure of the employee wages and salaries (excluding benefits) received by individuals directly employed due to port activity. Direct wages and salaries are measured, as are the re-spending value of the direct income for local consumption and wages and salaries earned by the indirect job holders (indirect income)
- **Business Revenue:** these impacts represent the revenue generated by firms providing services at each port.
- **Local Purchases:** these impacts include the value of goods and services purchased by the firms providing services at each port. These purchases include office supplies, communications, utilities, fuel, maintenance and repair, goods/parts, contracted services, insurance, etc.
- **Taxes:** these impacts include payments to federal, state/provincial, and local governments by companies and individuals whose jobs are directly dependent on port activity.

Exhibit I-1 summarizes the economic impacts of all traffic moving via the ports on the Great Lakes/St. Lawrence Seaway System by country.

**Exhibit I-1**  
**Economic Impacts of the Total Great Lakes System – 2010**

	<b>United States</b>	<b>Canada</b>	<b>Total</b>
<b>JOBS</b>			
<b>Direct Jobs</b>	44,634	48,288	92,923
<b>Induced</b>	44,057	21,947	66,005
<b>Indirect</b>	<u>39,585</u>	<u>28,320</u>	<u>67,905</u>
<b>Total</b>	128,277	98,556	226,833
<b>PERSONAL INCOME (1,000)</b>			
<b>Direct</b>	\$2,052,776	\$2,310,209	\$4,362,985
<b>Re-Spending/Local Purchases</b>	\$5,974,194	\$878,987	\$6,853,182
<b>Indirect</b>	<u>\$1,623,988</u>	<u>\$1,274,072</u>	<u>\$2,898,060</u>
<b>Total</b>	\$9,650,959	\$4,463,268	\$14,114,227
<b>BUSINESS REVENUE (1,000)</b>	\$18,135,715	\$15,425,317	\$33,561,032
<b>LOCAL PURCHASES (1,000)</b>	\$3,040,143	\$3,373,601	\$6,413,744
<b>STATE AND LOCAL TAXES (1,000)</b>	\$945,668	\$584,966	\$1,530,634
<b>FEDERAL TAXES (1,000)</b>	\$1,737,173	\$1,315,681	\$3,052,853

The 322 million metric tons of cargo *handled* at U.S. and Canadian ports and marine terminals located on the Great Lakes/St. Lawrence Seaway System generated the following economic impacts in the United States and Canada during 2010:

226,833 jobs in Canada and the United States were supported by the cargo handled at the marine terminals located on the Great Lakes/St. Lawrence Seaway System.

- Of the 226,833 jobs, 92,923 direct jobs were generated by the marine cargo and vessel activity at the marine terminals on the Great Lakes/St. Lawrence Seaway System with 48,288 created in Canada and 44,634 created in the U.S.
- As a result of the local and regional purchases by those 92,923 individuals holding direct jobs, an additional 66,005 induced jobs were supported in the regional economy.
- 67,905 indirect jobs were supported by the U.S.\$6.4 billion in regional purchases by businesses supplying services at the marine terminals and ports.<sup>2</sup>

---

<sup>2</sup> Direct jobs generated by the cargo and vessel activity on the Great Lakes-Seaway system were nearly equally distributed between the U.S. and Canada. However, the majority of the induced and indirect jobs were created in the U.S. The difference in induced jobs reflects the fact that the savings rate in Canada was more than three times the level in the United States in 2007 – the most recent year at the time of the analysis in which the income multipliers were developed by the U.S. Bureau of Economic Analysis and by Statistics Canada, Industry Accounts Division. As a result of the lower savings rate in the U.S., the income multipliers are more than triple the multipliers for Canada. Therefore, the re-spending impact is significantly lower in Canadian than in the U.S., which results in fewer induced jobs. In addition, two different input/output models were used in the analysis – Statistics Canada, Industry Accounts Division model for Canada, and the U.S. Bureau of Economic

In 2010, the marine cargo and vessel activity at the marine terminals on the Great Lakes/Seaway system generated a total of \$47.7 billion in total economic activity in the United States and Canada.

- Marine activity supported \$33.6 billion in total personal wage and salary income, and local consumption expenditures for regional residents of the U.S. and Canada. This includes \$14.1 billion direct, indirect, induced and local consumption expenditures. The 92,923 direct job holders received \$4.4 billion in direct wage and salary income. This equates to an average salary of nearly \$47,000.

A total of \$4.6 billion in direct, induced and indirect federal, state/provincial and local tax revenue was generated by maritime activity at the marine terminals located on the Great Lakes-Seaway system.

- Of the \$4.6 billion, \$1.5 billion was paid to local and state/provincial governments, while nearly \$3.1 billion was paid in federal taxes.

The direct job impacts created by the tonnage handled on the Great Lakes/St. Lawrence Seaway System on a commodity basis are shown in Exhibit I-2. Iron ore and dry bulk cargo generated the largest job impacts, followed by petroleum products and coal. The majority of the direct jobs generated by iron ore shipments and receipts are with directly dependent shippers/consignees (steel mills) located at the ports that are directly dependent on the receipt of iron ore by vessels, as well as with the mines supplying the iron ore. The impacts generated by dry bulk cargo are concentrated with the operations of tenants located at the individual ports, as well as private terminals located on the Great Lakes handling and processing dry bulk cargoes such as alumina and other ores, fertilizers and potash. Non-allocated jobs are jobs generated that could not be isolated to a specific commodity such as jobs with the U.S. Army Corps of Engineers, U.S. Coast Guard, U.S. Customs and Border Protection, U.S. Department of Agriculture, jobs with marine construction firms, etc.

---

Analysis, RIMS II model for the United States. The differences in these two models may also explain some portion of the differences between the re-spending/induced job impact for Canada and the United States. However, it appears that the differences in the savings rate are the major underlying explanatory factor. Indirect jobs generated per dollar of local purchases are lower in Canada than in the U.S. reflecting the fact that in Canada, there are greater leakages of purchases out of the region. As a result, the jobs-to-sales multipliers used in estimating the indirect jobs ratios are lower in Canada than in the United States.

---

**Exhibit I-2**  
**Direct Job Impacts by Commodity (2010)**

	<b>1,000Tons</b>	<b>Direct Jobs</b>
<b>Steel</b>	3,165	5,080
<b>General Cargo</b>	2,390	681
<b>Iron Ore</b>	120,866	37,210
<b>Grain</b>	21,287	3,150
<b>Stone/Aggregate</b>	40,590	4,234
<b>Cement</b>	12,497	3,085
<b>Salt</b>	17,267	3,065
<b>Other Dry Bulk</b>	26,289	12,831
<b>Other Liquid Bulk</b>	1,234	520
<b>Coal</b>	59,612	5,591
<b>Petroleum Products</b>	16,372	5,920
<b>Wind Energy</b>	560	290
<b>Not Allocated</b>		<u>11,265</u>
<b>Total</b>	<b>322,129</b>	<b>92,923</b>

## 2. Economic Impact of Foreign Flag Vessel Operations

In 2010, 7.6 million metric tons of cargo moved into and out of the Great Lakes ports on foreign flag vessels, and represent the majority of traffic moving through the St. Lawrence Seaway. It is these vessels that are subject to the assignment of pilots. Increases in Great Lakes pilotage charges, both U.S. and Canadian, have the potential to impact the level of international cargo originating at or destined for Great Lakes ports. This international cargo is carried on foreign flag vessels or Canadian and U.S. vessels not on register to operate on the Great Lakes.

Exhibit I-3 shows the historical port tonnages transiting the St. Lawrence Seaway. Between 2006 and 2015<sup>3</sup>, grain and steel account for the largest share of this tonnage, accounting for about 73 % of total foreign tonnage. The majority of the other foreign cargo consists of liquid bulk and ores. Steel and grain movements are complimentary on the Great Lakes/St. Lawrence Seaway System, since steel products are predominately imported from Europe and discharged at ports such as Cleveland, Burns Harbor, Hamilton, and Chicago. The empty vessels then sail in ballast to grain export ports such as Toledo, Duluth/Superior and Thunder Bay where the grain is exported to ports throughout the world. As a result of this trade pattern, grain is a backhaul for the inbound steel products, and provides the backhaul tonnage that results in a cost-effective routing for both grain and steel to compete

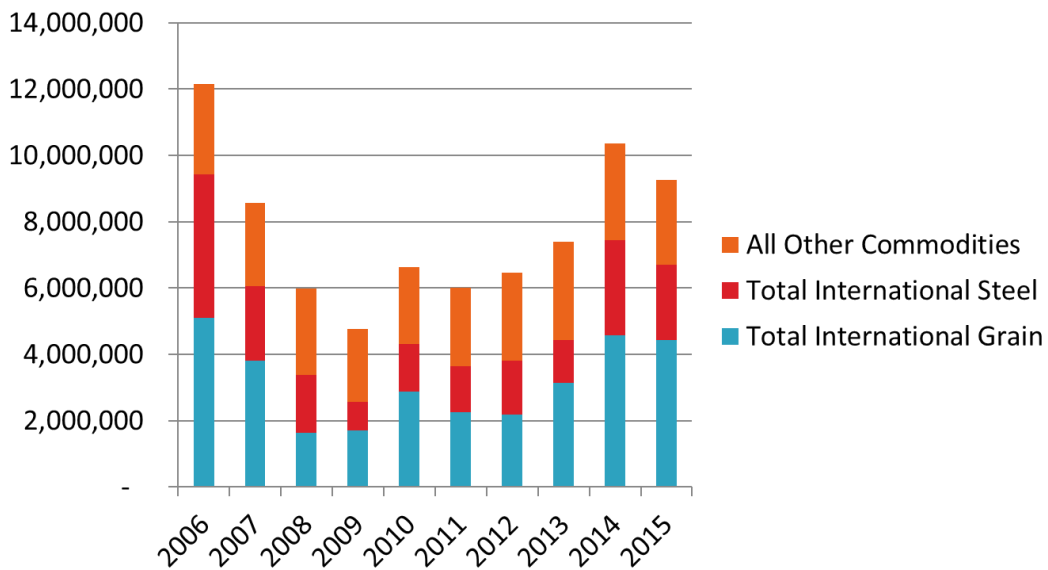
---

<sup>3</sup> St. Lawrence Seaway Traffic Report, Saint Lawrence Seaway Development Corporation. A portion of the cargo traffic moving through the St. Lawrence Seaway reported by the St. Lawrence Seaway Traffic Report is domestic cargo moving between Great Lakes ports as well as to or from deep-water ports on the St. Lawrence River and is not affected by Great Lakes pilotage charges. However, the majority of the traffic is international cargo traveling on foreign flag vessels.

with the Atlantic, Gulf and Pacific coastal ports. Should either the steel head haul or the grain backhaul be reduced, the cost-effective routings for these cargoes via the Great Lakes ports would be in jeopardy. Mills, automotive and appliance manufacturers, and grain farmers that depend on the use of the Great Lakes for international imports and exports would also be at risk, impacting the overall economic situation on the Great Lakes

As Exhibit I-3 illustrates, the cargo moving through the St. Lawrence Seaway, the majority of which is carried on foreign flag vessels, fell sharply through the 2009 recession, and then began a steady rebound through 2014. Although the volume did slip in 2015. This is the latest data available at the time of the study.

**Exhibit I-3**  
**Historical International Seaway Traffic by Major Commodities**  
**(Metric Tons)**



Source: St. Lawrence Seaway Management Corporation, Seaway Traffic Statistics

As part of the economic impacts of the Great Lakes/St. Lawrence Seaway System, 2010, Martin Associates conducted a specific analysis of the economic impacts of the foreign flag cargo moving on the System. Using 2010 data, it was estimated that 17,653 jobs were generated by the 7.6 million tons of cargo moving on foreign flag ships that require pilotage. Of these jobs, 7,043 were directly generated by this cargo activity with railroads, trucking companies, terminal operators and dependent shippers and consignees, longshoremen, lakers, vessel agents, pilots, forwarders and brokers, etc. These jobs are directly dependent on shipping through the Seaway and are at risk should there be a change in this cargo activity. The spending of personal income by these job holders created another 6,044 induced jobs in the Great Lakes economy. These jobs include persons employed in retail and wholesale trades, service industries and other sectors of the economy supported by personal spending. Businesses employing the direct job holders also spend money in the Great Lakes economy purchasing goods and services to support their activities. This

business spending created an additional 4,566 indirect jobs in companies supporting these business expenditures.

The 17,653 direct, induced and indirect jobs generated nearly \$1.4 billion in personal income. The directly dependent businesses generated \$2.3 billion in business revenue (this does not include the value of goods). Approximately \$263.5 million in federal state and local taxes were also generated by this activity. Exhibit I-4 summarizes the economic impacts of foreign flag traffic on the Great Lakes regional economy. As this Exhibit further demonstrates, of the 17,653 jobs, the majority of the impacts are generated in the U.S., primarily the result of the impact of steel products and intermediate raw materials for the steel industry are handled at U.S. Great Lakes ports.

**Exhibit I-4**  
**Economic Impact of Foreign Flag Traffic, 2010**

	Canada	United States	Total
<b>JOBS</b>			
<b>Direct Jobs</b>	2,114	4,928	7,043
<b>Induced</b>	1,069	4,976	6,044
<b>Indirect</b>	<u>729</u>	<u>3,837</u>	<u>4,566</u>
<b>Total</b>	3,912	13,741	17,653
<b>PERSONAL INCOME (1,000)</b>			
<b>Direct</b>	\$127,751	\$250,232	\$377,983
<b>Re-Spending/Local Consumption</b>	\$44,791	\$748,233	\$793,025
<b>Indirect</b>	<u>\$33,642</u>	<u>\$159,065</u>	<u>\$192,707</u>
<b>Total</b>	\$206,185	\$1,157,530	\$1,363,714
<b>BUSINESS REVENUE (1,000)</b>	\$577,690	\$1,767,284	\$2,344,974
<b>LOCAL PURCHASES (1,000)</b>	\$94,673	\$310,319	\$404,992
<b>STATE/PROVINCIAL AND LOCAL TAXES (1,000)</b>	\$34,560	\$115,217	\$149,777
<b>FEDERAL TAXES (1,000)</b>	\$55,115	\$208,355	\$263,470

Of those 13,741 jobs supported in the United States by cargo moving on foreign flag vessels, Exhibit I-5 illustrates the impacts by state. Of these eight states, the largest job impacts occur in Indiana, followed by Ohio, Wisconsin and New York. Indiana's 7,678 generated jobs represent 56% of the total 13,741 jobs, while Ohio's 1,553 jobs represent 11% followed by Wisconsin and New York that both generate 1,168 jobs and represent 9% of the total jobs.

**Exhibit I-5**  
**Economic Impacts of Cargo Moving on Foreign Flag Vessels by State: 2010**

	Indiana	Ohio	Michigan	Minnesota	Illinois	Wisconsin	New York	Pennsylvania	Total US
<b>JOBS</b>									
Direct Jobs	2,598	538	291	146	364	466	524	1	4,928
Induced	3,018	208	251	152	358	513	474	1	4,976
Indirect	<u>2,062</u>	<u>806</u>	<u>316</u>	<u>68</u>	<u>225</u>	<u>189</u>	<u>169</u>	<u>1</u>	<u>3,837</u>
Total	7,678	1,553	859	367	946	1,168	1,168	2	13,741
<b>PERSONAL INCOME (1,000)</b>									
Direct	\$122,955	\$26,374	\$15,507	\$8,017	\$17,660	\$27,851	\$31,832	\$34	\$250,232
Re-Spending/Local Consumption	\$417,973	\$88,995	\$33,953	\$18,312	\$55,724	\$63,085	\$70,076	\$117	\$748,233
Indirect	<u>\$80,968</u>	<u>\$34,961</u>	<u>\$13,149</u>	<u>\$2,762</u>	<u>\$10,662</u>	<u>\$7,666</u>	<u>\$8,867</u>	<u>\$30</u>	<u>\$159,055</u>
Total	\$621,896	\$150,330	\$62,609	\$29,091	\$84,046	\$98,602	\$110,775	\$182	\$1,157,530
<b>BUSINESS REVENUE (1,000)</b>	\$1,147,955	\$177,934	\$96,751	\$60,392	\$53,362	\$134,614	\$96,124	\$153	\$1,767,284
<b>LOCAL PURCHASES (1,000)</b>	\$156,190	\$70,588	\$24,546	\$5,234	\$18,607	\$14,689	\$20,409	\$55	\$310,319
<b>STATE AND LOCAL TAXES (1,000)</b>	\$59,080	\$14,582	\$6,073	\$3,098	\$8,405	\$10,557	\$13,404	\$18	\$115,217
<b>FEDERAL TAXES (1,000)</b>	\$111,941	\$27,059	\$11,270	\$5,236	\$15,128	\$17,748	\$19,940	\$33	\$208,355

### 3. Economic Impact of Investments on the Great Lakes-St. Lawrence Seaway System

Martin Associates conducted a survey of public and private stakeholders of the Great Lakes/St. Lawrence Seaway System to evaluate the level of public and private investment that has occurred on the System between 2009 and 2013, as well as the level of committed investment between 2013 and 2018. This study was conducted for a steering committee that included representatives from the St. Lawrence Seaway Management Corporation, the St. Lawrence Seaway Development Corporation, the Chamber of Marine Commerce, the American Great Lakes Ports Association, the Canadian Shipowners Association, the Lake Carriers' Association, the Port of Cleveland, the Port of Windsor, and Fednav Limited.

Martin Associates contacted 628 stakeholders of which 454 participated in the survey and provided investment data. All data is reported in both U.S. and Canadian dollars. The results of the survey can be seen in Exhibit I-6 and underscore the importance of the Great Lakes/St. Lawrence Seaway System to the regional economies, and further the level of commitment that has been made by both the public and private sectors in this System.

The key findings of the study are:

- Between 2009-2013 more than U.S.\$4.6 billion was invested in the Great Lakes/St. Lawrence Seaway navigation system by both the public and private sector, with 71% of the total invested by the private sector and 29% invested by the public sector.
- US\$2.2 billion of additional funds are committed for future investments in the system by companies and governments. Of the \$2.2 billion, 57% of future investments will come from the private sector and 43% from the public sector.
- Great Lakes/Seaway vessel operators invested nearly U.S.\$2.9 billion in new ships and vessel upgrades between 2009-2013, while an additional U.S. \$1.1 billion has been committed for future vessel investments.
- Great Lakes ports and terminals invested nearly U.S. \$1.3 billion in facilities and equipment between 2009-2013, and U.S. \$445.7 million has been committed for future investments.

When totaled, \$6.8 billion of historical and committed investment has occurred since 2009 on the Great Lakes/St. Lawrence Seaway System.



**Exhibit I-6**  
**Historical and Committed Investment in the Great Lakes/St. Lawrence Seaway System**

<b>Combined Private and Public Sector Capital Investments</b>		
	<b>CDN\$</b>	<b>US\$</b>
<b>Actual 2009-2013</b>		
Vessel	\$ 2,936,016,385	\$ 2,850,501,345
Ports & Terminals	\$ 1,295,277,071	\$ 1,257,550,554
Waterway Infrastructure	\$ 574,181,347	\$ 557,457,618
<b>Total 2009-2013</b>	<b>\$ 4,805,474,803</b>	<b>\$ 4,665,509,518</b>
<b>Committed post-2013</b>		
Vessel	\$ 1,161,363,168	\$ 1,127,537,056
Ports & Terminals	\$ 459,046,527	\$ 445,676,240
Waterway Infrastructure	\$ 667,844,692	\$ 648,392,905
<b>Total Committed post-2013</b>	<b>\$ 2,288,254,387</b>	<b>\$ 2,221,606,201</b>
<b>2009-2013 and Committed</b>		
Vessel	\$ 4,097,379,553	\$ 3,978,038,401
Ports & Terminals	\$ 1,754,323,598	\$ 1,703,226,794
Waterway Infrastructure	\$ 1,242,026,038	\$ 1,205,850,523
<b>Total</b>	<b>\$ 7,093,729,190</b>	<b>\$ 6,887,115,718</b>

\*All figures in 2013 dollars

Exhibit I-7 presents the investments by type of investment. As noted, the largest investment is in new vessel fleet additions, and these investments are in foreign flag vessels designed for transiting the Great Lakes/St. Lawrence Seaway System with its limited sailing depth.

**Exhibit I-7**  
**Capital Investments by Type of Investment**

<b>Capital Investments by Type for Public and Private Sectors, Actual 2009-13 and Committed Post-2013*</b>		
	<b>CDN\$</b>	<b>US\$</b>
<b>Vessel</b>		
Major Engine/Propulsion Rehab	\$ 126,430,502	\$ 122,748,060
New Vessel/Fleet Addition	\$ 3,177,616,963	\$ 3,085,065,013
Not Specified	\$ 270,160,403	\$ 262,291,653
Other Upgrade to Existing Fleet	\$ 463,501,498	\$ 450,001,454
R&D, including Environmental	\$ 59,670,188	\$ 57,932,221
<b>TOTAL VESSEL</b>	<b>\$ 4,097,379,553</b>	<b>\$ 3,978,038,401</b>
<b>Ports &amp; Terminals</b>		
Crane/Conveyor/Loading Equipment	\$ 37,448,083	\$ 36,357,362
Dock wall/wharf	\$ 526,262,725	\$ 510,934,684
Infrastructure - Rail	\$ 106,071,500	\$ 102,982,039
Infrastructure - Road	\$ 25,502,538	\$ 24,759,745
Lighting/Fencing/Paving/Utilities	\$ 14,812,398	\$ 14,380,969
Not Specified	\$ 761,698,115	\$ 739,512,733
Other	\$ 38,902,803	\$ 37,769,712
R&D, including Environmental	\$ 9,313,465	\$ 9,042,199
Security	\$ 7,919,952	\$ 7,689,274
Buildings (Warehouse/Admin)	\$ 170,505,679	\$ 165,539,494
Yard Equipment	\$ 55,886,340	\$ 54,258,583
<b>TOTAL PORTS &amp; TERMINALS</b>	<b>\$ 1,754,323,598</b>	<b>\$ 1,703,226,794</b>
<b>Waterway Infrastructure</b>		
Breakwater/Navigation/Other Structures	\$ 41,870,390	\$ 40,650,865
Dredging	\$ 639,188	\$ 620,570
Lock/Dockwall/Wharf Rehab	\$ 700,313,657	\$ 679,916,171
Other	\$ 434,017,460	\$ 421,376,174
Spoils Disposal Site	\$ 65,185,344	\$ 63,286,742
<b>TOTAL WATERWAY INFRASTRUCTURE</b>	<b>\$ 1,242,026,038</b>	<b>\$ 1,205,850,523</b>
<b>GRAND TOTAL</b>	<b>\$ 7,093,729,190</b>	<b>\$ 6,887,115,718</b>

\*All figures in 2013 dollars

The economic impact measures discussed in this report provide the baseline metrics that will be used to quantify the economic impact of increases in the U.S. pilotage charges on the transport of international cargo by foreign flag carriers.

## II. Development of Baseline Analysis

The current competitive position of the Great Lakes/St. Lawrence Seaway System to cost effectively handle international cargo moving on foreign flag vessels to and from the Great Lakes region is analyzed in this chapter. As demonstrated in the previous chapter, the competitive position of the Great Lakes/St. Lawrence Seaway System is based on the two key commodities moving on foreign flag vessels: imported steel and exported grain. The first step in the competitive analysis is to identify the typical routings and costs of steel imported into the Great Lakes region and grain exported from the region via foreign flag vessels that require pilotage. Once these routings are developed, the next step in the analysis is to identify the inland origins and destinations of imported steel and exported grain, followed by identifying the alternative coastal port routings that could be used to serve the steel and grain that is now moving via the Great Lakes/St. Lawrence Seaway System. The results of the baseline analysis will then be used to assess the impact of the U.S. pilotage charges on the competitive routings and the resulting economic impacts on the Great Lakes region under scenarios regarding pilotage charges.

### 1. Development of Baseline Voyage Cost Routings

Martin Associates developed representative voyage itineraries for imported steel and exported grain. These itineraries were developed based on interviews with current foreign flag vessel operators, with major steel importers and producers, with grain export trading companies, and Great Lakes ports handling imported steel and export grain. Martin Associates has an internal data base of steel and grain origin destination flows by U.S. and Canadian ports on the Great Lakes/St. Lawrence Seaway System that we have developed from specific port studies conducted on the Great Lakes, as well as from the data base that Martin Associates developed as part of the Economic Impact of the Great Lakes/St. Lawrence Seaway System, 2010 and our previous analysis of the Analysis of Great Lakes Pilotage charges on Great Lakes Shipping and the Analysis of Great Lakes Pilotage Costs on Great Lakes Shipping and the Potential Impact of Pilotage Rate Increases.<sup>4</sup> In addition, Martin Associates evaluated actual vessel itineraries of several Class 2 and Class 4 carriers from invoice records, and also reviewed the voyage itineraries reported in the District 1, District 2 and District 3 invoice records. Pilotage rates and hence charges vary by class of vessel. The class 2 vessel category consists of vessels with 12,000-17,000 DWT, averaging about 15,000 DWT. The Class 4 vessel category consists of vessels ranging from 30,000-35,000 DWT.

Three Class 4 vessel voyage scenarios were developed, each beginning with the vessel sailing directly from Antwerp, the major steel origin, and ending with the vessel transporting export grain from a Great Lakes grain export port to one of the seven major grain export destinations: Algiers, Alexandria, Felixstowe, Hamburg, Livorno, Xiamen, and Cartagena. The identification of these grain export destinations is based on a review of export statistics

---

<sup>4</sup> Analysis of Great Lakes Pilotage Costs on Great Lakes Shipping and the Potential Impact of Pilotage Rate Increases, October 1, 2004, prepared by Martin Associates, for the United States Coast Guard, Office of Great Lakes Pilotage

developed by port from USA Trade OnLine (U.S. Bureau of the Census) as well as interviews with grain trading companies and the Port of Thunder Bay. In addition to the grain export destination, the voyages also differ by steel discharge port itinerary (such as Hamilton, Cleveland, Toledo, Burns Harbor, Chicago, etc.) and grain export port (Thunder Bay, Duluth/Superior, and Toledo). Therefore, 21 different vessel itineraries were developed for a Class 4 vessel.

The three voyage scenarios for a Class 4 foreign flag vessel, with the seven grain export destinations for each voyage are shown in Exhibits II-1, II-2, and II-3

### Exhibit II-1

#### Voyage 1 Routing for a Class 4 Vessel with Thunder Bay as Grain Export Port

Voyage 1, Class 4, Grain 1	Voyage 1, Class 4, Grain 2	Voyage 1, Class 4, Grain 3	Voyage 1, Class 4, Grain 4	Voyage 1, Class 4, Grain 5	Voyage 1, Class 4, Grain 6	Voyage 1, Class 4, Grain 7
Antwerp	Antwerp	Antwerp	Antwerp	Antwerp	Antwerp	Antwerp
Montreal	Montreal	Montreal	Montreal	Montreal	Montreal	Montreal
Valleyfield	Valleyfield	Valleyfield	Valleyfield	Valleyfield	Valleyfield	Valleyfield
Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent
Hamilton	Hamilton	Hamilton	Hamilton	Hamilton	Hamilton	Hamilton
Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller
Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne
Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal
Detroit	Detroit	Detroit	Detroit	Detroit	Detroit	Detroit
Burns Harbor	Burns Harbor	Burns Harbor	Burns Harbor	Burns Harbor	Burns Harbor	Burns Harbor
Chicago	Chicago	Chicago	Chicago	Chicago	Chicago	Chicago
Thunder Bay	Thunder Bay	Thunder Bay	Thunder Bay	Thunder Bay	Thunder Bay	Thunder Bay
Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne
Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller
Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent
Alexandria	Algiers	Felixstowe	Hamburg	Livorno	Xiamen	Cartegna

### Exhibit II-2

#### Voyage 2 Routing for a Class 4 Vessel with Duluth-Superior as Grain Export Port

Voyage 2, Class 4, Grain 1	Voyage 2, Class 4, Grain 2	Voyage 2, Class 4, Grain 3	Voyage 2, Class 4, Grain 4	Voyage 2, Class 4, Grain 5	Voyage 2, Class 4, Grain 6	Voyage 2, Class 4, Grain 7
Antwerp	Antwerp	Antwerp	Antwerp	Antwerp	Antwerp	Antwerp
Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent
Hamilton	Hamilton	Hamilton	Hamilton	Hamilton	Hamilton	Hamilton
Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller
Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne
Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal
Detroit	Detroit	Detroit	Detroit	Detroit	Detroit	Detroit
Burnsharbor	Burnsharbor	Burnsharbor	Burnsharbor	Burnsharbor	Burnsharbor	Burnsharbor
Duluth Superior	Duluth Superior	Duluth Superior	Duluth Superior	Duluth Superior	Duluth Superior	Duluth Superior
Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne
Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller
Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent
Alexandria	Algiers	Felixstowe	Hamburg	Livorno	Xiamen	Cartagena

**Exhibit II-3**  
**Voyage 3 Routing for a Class 4 Vessel with Toledo as Grain Export Port**

Voyage 3, Class 4, Grain 1	Voyage 3, Class 4, Grain 2	Voyage 3, Class 4, Grain 3	Voyage 3, Class 4, Grain 4	Voyage 3, Class 4, Grain 5	Voyage 3, Class 4, Grain 6	Voyage 3, Class 4, Grain 7
Antwerp	Antwerp	Antwerp	Antwerp	Antwerp	Antwerp	Antwerp
Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent
Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller
Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne
Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal	Southeast Shoal
Milwaukee	Milwaukee	Milwaukee	Milwaukee	Milwaukee	Milwaukee	Milwaukee
Chicago	Chicago	Chicago	Chicago	Chicago	Chicago	Chicago
Burns harbor	Burns harbor	Burns harbor	Burns harbor	Burns harbor	Burns harbor	Burns harbor
Toledo	Toledo	Toledo	Toledo	Toledo	Toledo	Toledo
Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne	Port Colbourne
Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller	Port Weller
Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent	Cape Vincent
Alexandria	Algiers	Felixstowe	Hamburg	Livorno	Xiamen	Cartegna

A similar voyage scenario was developed for a Class 2 foreign flag vessel carrying steel, project cargo, and containers on the Great Lakes/St. Lawrence Seaway System. These costs were based on actual itinerary records of Class 2 vessel deployments (from past studies by Martin Associates for specific Great Lakes Ports, well as a review of the pilotage invoice records provided to Martin Associates from U.S. Pilotage District 1, District 2, and District 3. A sample of this routing can be seen in Exhibit II-4.

**Exhibit II-4**  
**Voyage 4 Routing for a Class 2 Foreign Flag General Cargo Vessel**

<b>Class 2: General Cargo Voyage Itinerary</b>
Antwerp
Cleveland
Toledo
Milwaukee
Detroit
Cleveland
Valleyfield
Antwerp

**2. Development of Voyage Cost Model**

The Martin Associates’ voyage cost model was calibrated for both vessel classes, Class 2 and Class 4, and then used to estimate the voyage cost for the Class 2 vessel itinerary as well as for each of the 21 Class 4 vessel itineraries. The Martin Associates’ voyage cost model consists of the following cost parameters:

- Capital repayment costs (source: U.S. Army Corps of Engineers’ Voyage Operating Costs, vessel operators)

- Operating expenses: (source: U.S. Army Corps of Engineers' Voyage Operating Costs, vessel operators)
  - Crew
  - Supplies/Lubricants
  - Insurance
  - Maintenance repair
- Fuel consumption:
  - 17.4 tons per day at sea (source: U.S. Army Corps of Engineers' Voyage Operating Costs, actual proprietary voyage records)
  - 3.0 tons per day at port (U.S. Army Corps of Engineers' Voyage Operating Costs (source: U.S. Army Corps of Engineers' Voyage Operating Costs, confirmed with vessel operators, actual proprietary voyage records)
  - IFO price = \$292/ton (source: Bunkerworld)
  - MDO \$425/ton (source: Bunkerworld)
- Speed:
  - 13.6 knots open sea Source: (U.S. Army Corps of Engineers' Voyage Operating Costs. Proprietary voyage records)
  - 8 knots in Seaway/Great Lakes (source: U.S. Army Corps of Engineers' Voyage Operating Costs, proprietary voyage records)
- Port costs (tugs, wharfage, dockage, harbor fees, etc.) were supplied to Martin Associates by actual vessel operators on the Great Lakes/St. Lawrence Seaway and from our terminal operating models developed as part of the 2011 Economic Impact Study of the Great Lakes/St. Lawrence Seaway System.
- Stevedoring rates were supplied by terminal operators and carriers for each key steel and grain port on the Great Lakes/St. Lawrence Seaway System included in the analysis. Stevedoring charges are the cost of loading and discharging cargo to and from the ship and the marine terminal, elevation fees for the grain, and also include terminal charges imposed by the terminal operator including cargo storage, truck and rail loading and off-loading, chassis repairs, etc. These charges are paid by the vessel operator from the voyage revenue.
- Typical steel discharges by Great Lakes Port were provided by the various terminal operators interviewed, Martin Associates' internal data base developed as part of the 2010 Economic Impact Study of the Great Lakes/St. Lawrence Seaway System, and interviews with carriers involved in the steel trade. Typical load factors for grain exports were developed from interviews with the Port of Thunder Bay, Port of Duluth/Superior, the Port of Toledo, grain brokers, and foreign flag vessel operators.
- Tolls were provided by operators for the MLO and Welland Canal sections of the voyage itineraries.
- For voyages with a Panama Canal or Suez Canal routing, specific canal toll calculators were developed based on the commodity and load factor for the vessel.

The model is based on daily operating costs, which are then translated into voyage costs based on mileage between port calls. The distances between ports were calculated using IHS World Shipping Encyclopedia.

The baseline operating costs and parameters were developed from inputs Martin Associates developed from the U.S. Army Corps of Engineers' Voyage Operating Costs for various sizes (measured in terms of deadweight tonnage corresponding to Class 2 and Class 4 vessels) and types of vessel (foreign flag general cargo vessels). In addition, the operating cost data was reviewed and validated by key foreign flag operators, and compared with internal operating cost data maintained by Martin Associates for Class 2 and Class 4 foreign flag vessels. These operators and associated voyage cost records also provided inputs as to port charges (excluding pilotage), stevedoring and typical load and discharge factors.

### **3. Development of Pilotage charges**

Pilotage charges for each voyage itinerary were calculated as a next step after the development of the voyage operating cost data and the representative voyage itineraries. To calculate the U.S. pilotage charges, U.S. Coast Guard, Great Lakes Pilotage Office, provided Martin Associates with the actual invoice logs from the 2015 and 2016 shipping seasons for each pilotage district as reported in the KLEINPILOT System. It is important to note that in 2016, the method by which pilotage charges are calculated changed significantly to reflect more accurately the operating costs incurred by the U.S. pilot operating on the Great Lakes. Therefore, the pilotage charge sensitivity analysis is based on the methodology developed and applied in 2016 going forward in the analysis. However, comparisons can be made between the U.S. pilotage charges and methodology used in 2015, with the new rates and methodology adapted in 2016.

Class 4 vessels are the work horses of the foreign flag vessels calling the Great Lakes ports, accounting for about 44% of total vessels assigned U.S. pilots in District I, 53% in District 2 and 52% in District III. Therefore, the focus of the analysis is on the impact of pilotage charges on the Class 4 foreign flag vessels.

For each leg of the Class 2 voyage scenario and the three Class 4 voyage scenarios, the actual U.S. pilot charges were obtained from the invoice and billing data supplied by the Great Lakes Pilotage Office. For each relevant leg, Martin Associates calculated the average U.S. pilotage charge, including pilot boat charges and applicable surcharges as reported on the invoicing records. Exhibit II-5 presents an example of the pilotage charges reported to the Coast Guard by the individual pilotage districts, by leg of a voyage.



**Exhibit II-5**  
**Example of U.S. KELINPILOT System Report from District 2**

Vessel	On Time	Off Time	Agency	From Name	To Name	Rate Charge	Pilot Boat Surcharge	Surcharge	Invoice Amount
Albanyborg	4/1/2016 16:40	4/1/2016 22:15	Lower St. Lawrence Ocean Agencies Ltd	DPB - Detroit Pilot Boat Change Point	B12 - Buoy No 12	3087.75	250	333.78	\$3,672
Albanyborg	4/1/2016 16:40	4/1/2016 22:15	Lower St. Lawrence Ocean Agencies Ltd	DPB - Detroit Pilot Boat Change Point	B12 - Buoy No 12	3087.75	250	333.78	\$3,672
Amstelborg	4/6/2016 17:55	4/6/2016 22:45	Lower St. Lawrence Ocean Agencies Ltd	DPB - Detroit Pilot Boat Change Point	SES - Southeast Shoal	3933	250	209.15	\$4,392
Albanyborg	4/10/2016 16:15	4/10/2016 21:40	Lower St. Lawrence Ocean Agencies Ltd	DPB - Detroit Pilot Boat Change Point	SES - Southeast Shoal	4326.3	250	228.82	\$4,805
Minervagracht	4/11/2016 19:20	4/12/2016 2:15	McLean Kennedy Inc.	DPB - Detroit Pilot Boat Change Point	SES - Southeast Shoal	5506.2	250	287.81	\$6,044
Fairlift	4/12/2016 9:30	4/12/2016 16:10	Montship Inc.	DPB - Detroit Pilot Boat Change Point	B12 - Buoy No 12	5309.55	250	555.96	\$6,116
Vancouverborg	4/16/2016 8:30	4/16/2016 16:40	Lower St. Lawrence Ocean Agencies Ltd	DPB - Detroit Pilot Boat Change Point	B12 - Buoy No 12	6489.45	250	336.97	\$7,076
Fairlift	4/20/2016 6:45	4/20/2016 11:45	Montship Inc.	DPB - Detroit Pilot Boat Change Point	SES - Southeast Shoal	3933	250	209.15	\$4,392
Eeborg	4/24/2016 17:05	4/25/2016 0:45	Lower St. Lawrence Ocean Agencies Ltd	DPB - Detroit Pilot Boat Change Point	B12 - Buoy No 12	6096.15	250	317.31	\$6,663
Happy Ranger	5/5/2016 12:35	5/5/2016 18:15	McLean Kennedy Inc.	DPB - Detroit Pilot Boat Change Point	B12 - Buoy No 12	4522.95	250	238.65	\$5,012
Happy Ranger	5/8/2016 14:00	5/8/2016 19:00	McLean Kennedy Inc.	DPB - Detroit Pilot Boat Change Point	SES - Southeast Shoal	3933	250	209.15	\$4,392
Floretgracht	5/8/2016 21:15	5/9/2016 3:05	McLean Kennedy Inc.	DPB - Detroit Pilot Boat Change Point	B12 - Buoy No 12	4719.6	250	248.48	\$5,218
Floretgracht	5/13/2016 12:20	5/13/2016 17:05	McLean Kennedy Inc.	DPB - Detroit Pilot Boat Change Point	SES - Southeast Shoal	3736.35	250	199.32	\$4,186

The average U.S. pilotage charge for 2015 and 2016 was calculated for each relevant leg of each of the vessel voyage scenarios for both a Class 2 and Class 4 vessel. The pilotage charges for the Laurentian Pilots applied to transit along the St. Lawrence River were provided directly by the Laurentian Pilots as well as foreign flag vessel operators. The actual Canadian pilot charges were used for transits through the St. Lambert Lock to the Snell Lock and for all transits via the Welland Canal. The Canadian pilotage charges for the St. Lambert Lock /Snell Lock Transit and the Welland Canal transit were provided to Martin Associates by the Great Lakes Pilots Association. For all other legs of the vessel voyage, the average of actual charges for that leg for the U.S. pilots were applied.

The average pilot charges calculated from the reported pilotage invoices reported in KLEINPILOT for each leg of the vessel voyages are presented in Exhibit II-6. The actual average U.S. pilotage charges for each segment of the three Class 4 voyages were calculated for 2015 and 2016. As this exhibit shows, for nearly every voyage segment, for each of the three Class 4 voyage itineraries, the U.S. pilotage charges increased significantly between 2015 and 2016. The shaded areas of each of the voyage tables indicate for which segment of the voyage the largest increase in pilotage charges occurred. Canadian pilots only are used on the Welland Canal (Port Colborne to Port Weller) and the St. Lambert to Snell Lock.

**Exhibit II-6**  
**U.S. Pilotage Charge Increase Between 2015 and 2016, by Voyage Segment for**  
**Example Voyage Itineraries**

<b>Voyage 1 Class 4</b>	<b>2015 U.S. Pilot Cost</b>	<b>2016 U.S. Pilot Cost</b>	<b>Change from 2015 to 2016</b>
Antwerp to Cape Vincent (Snell to Cape Vincent)	\$7,750.00	\$10,350.11	34%
Cape Vincent to Hamilton	\$5,944.64	\$8,709.35	47%
Hamilton to Port Weller	\$3,115.04	\$2,366.47	-24%
Port Weller to Port Colborne (Welland Canal) Canadian Pilotage	\$6,901.95	\$7,076.00	3%
Port Colborne to Detroit	\$8,584.03	\$14,322.06	67%
Detroit to Burns Harbor	\$15,437.11	\$25,248.62	64%
Burns Harbor to Chicago	\$3,600.41	\$2,328.49	-35%
Chicago to Thunder Bay	\$15,295.40	\$29,670.49	94%
Thunder Bay to Port Colborne	\$25,524.43	\$49,405.06	94%
Port Colborne to Port Weller Canadian Pilotage	\$6,901.95	\$7,075.72	3%
Port Weller to Cape Vincent	\$4,585.02	\$6,195.00	35%
Cape Vincent to Antwerp (Snell to Cape Vincent)	\$7,750.00	\$10,350.11	34%
<b>Voyage 2 Class 4</b>	<b>2015 Pilot Cost</b>	<b>2016 Pilot Cost</b>	<b>Change from 2015 to 2016</b>
Antwerp to Cape Vincent (Snell to Cape Vincent)	\$7,750.00	\$10,350.11	34%
Cape Vincent to Hamilton	\$5,944.64	\$8,709.35	47%
Hamilton to Port Weller	\$3,115.04	\$2,366.47	-24%
Port Weller to Port Colborne (Welland Canal) Canadian Pilotage	\$6,901.95	\$7,076.00	3%
Port Colborne to Detroit	\$8,584.03	\$14,322.06	67%
Detroit to Burns Harbor	\$15,437.11	\$25,248.62	64%
Burns Harbor to Duluth	\$16,345.93	\$34,875.89	113%
Duluth to Port Colborne	\$26,158.98	\$53,278.95	104%
Port Colborne to Port Weller Canadian Pilotage	\$6,901.95	\$7,075.72	3%
Port Weller to Cape Vincent	\$4,585.02	\$6,195.00	35%
Cape Vincent to Antwerp (Snell to Cape Vincent)	\$7,750.00	\$10,350.11	34%
<b>Voyage 3 Class 4</b>	<b>2015 Pilot Cost</b>	<b>2016 Pilot Cost</b>	<b>Change from 2015 to 2016</b>
Antwerp to Cape Vincent (Snell to Cape Vincent)	\$7,750.00	\$10,350.11	34%
Cape Vincent to Port Weller	\$3,604.32	\$6,195.14	72%
Port Weller to Port Colborne (Welland Canal) Canadian Pilotage	\$6,901.95	\$7,076.00	3%
Port Colborne to Milwaukee	\$21,451.69	\$38,300.77	79%
Milwaukee to Chicago	\$3,425.79	\$4,695.67	37%
Chicago to Burns Harbor	\$3,435.99	\$2,082.85	-39%
Burns Harbor to Toledo	\$21,359.54	\$32,121.48	50%
Toledo to Port Colborne	\$8,767.27	\$16,542.19	89%
Port Colborne to Port Weller Canadian Pilotage	\$6,901.95	\$7,075.72	3%
Port Weller to Cape Vincent	\$4,585.02	\$6,195.00	35%
Cape Vincent to Antwerp (Snell to Cape Vincent)	\$7,750.00	\$10,350.11	34%

Source: KLEINPILOT, U.S. Coast Guard, Great Lakes Pilotage

Exhibit II-7 provides a comparison of the average actual U.S. pilotage charges for each segment of the Class 2 (1.15 factor) vessel voyage itinerary. As with the Class 4 vessels, the actual U.S. pilotage charges increased significantly between 2015 and 2016.

**Exhibit II-7**  
**U.S. Pilotage Charges by Voyage Segment for Class 2 Vessel Voyage Itinerary**

<b>Vessel Class 2</b>	<b>2015 Pilot Cost</b>	<b>2016 Pilot Cost</b>	<b>Change from 2015 to 2016</b>
Valleyfield to Cape Vincent (Snell to Cape Vincent)	\$5,863.00	\$7,612.17	30%
Cape Vincent to Port Weller	\$2,564.90	\$5,744.70	124%
Port Weller to Port Colborne (Welland Canal) Canadian Pilotage	\$5,499.82	\$5,637.64	3%
Port Colborne to Cleveland	\$4,198.42	\$7,228.87	72%
Cleveland to Toledo	\$6,678.12	\$6,703.68	0%
Toledo to Milwaukee	\$20,413.77	\$22,021.99	8%
Milwaukee to Detroit	\$12,535.62	\$18,116.68	45%
Detroit to Cleveland	\$5,558.58	\$8,840.66	59%
Cleveland to Port Colborne	\$2,722.28	\$6,631.34	144%
Port Colborne to Port Weller Canadian Pilotage	\$5,499.82	\$5,637.64	3%
Port Weller to Cape Vincent	\$3,941.96	\$5,996.72	52%
Cape Vincent to Valleyfield (Cape Vincent to Snell)	\$5,863.00	\$7,699.69	31%

Source: KLEINPILOT, U.S. Coast Guard, Great Lakes Pilotage

District 3 Pilotage Association conducts the invoicing for both U.S. and Canadian pilots operating in District 3. Therefore, it is possible to compare the U.S. pilot charges with the Canadian pilot charges for a specific leg of a vessel voyage while in District 3 waters. Exhibit II-8 provides a direct comparison of pilot charges for the U.S. and Canadian pilots. As demonstrated by this exhibit, the U.S. pilotage charge for a Class 4 vessel is significantly greater than the Canadian pilot charge for the same voyage leg. This suggests vessels using Canadian pilots in District 3 will have a lower pilotage charge than if U.S. pilots were used in District 3. The same comparison cannot be made for the data provide by District 1 and 2, since these districts do not invoice for the Canadian pilots operating in those waters.

**Exhibit II-8**  
**Comparison of Actual Pilotage Charges for U.S. and Canadian Pilots in District 3, by Voyage Leg**

VOYAGE LEG	U.S. PILOTAGE	CANADIAN PILOTAGE	DIFFERENCE U.S. VS CANADIAN
BUOY 33 / THUNDER BAY	\$9,767.52	\$4,815.89	103%
THUNDER BAY / BUOY 33	\$9,976.16	\$5,171.46	93%
ST. MARY'S (DETOUR)/ BUOY 33	\$7,817.31	\$5,423.27	44%
BUOY 33 / ST. MARY'S (DETOUR)	\$7,875.94	\$5,410.59	46%
BUOY 33/ DULUTH	\$13,391.29	\$6,558.00	104%

Source: District 3 Pilots Association reported pilotage charges for 2016 season

**4. Development of Total Voyage Costs Including Pilot Charges**

The voyage costs for each of the Class 4 voyages were calculated using the average operating costs and metrics described previously in the chapter combined with the appropriate U.S. pilotage charges (and Canadian pilot charges for the transits through the St. Lambert to the Snell and the Welland Canal) for each segment of the Class 4 voyage scenarios. For each of the seven grain export destinations within each of the three Class 4 voyage scenarios, the average voyage costs for a steel routing and a grain routing were estimated using both 2015 and 2016 pilotage charges for the U.S. and Canada. The steel voyage includes the sail from Antwerp through the last steel discharge port (i.e. Chicago, Burns Harbor, etc.). The grain voyage cost begins with the sail of the vessel (in ballast) from the last steel discharge port in each of the three voyage scenarios to the grain export port, Thunder Bay, Duluth/Superior, or Toledo. At the grain export port, 20,000 tons of grain are loaded on the vessel for it to sail to one of the seven grain destinations within each of the three voyage scenarios for a Class 4 vessel.

Exhibits II-9, II-10, and II-11 show the voyage cost per ton for a steel service under the port rotations for each Class 4 voyage, as well as for a grain export service to each of the grain destinations. The voyage costs are estimated using the 2015 and 2016 pilotage charges, so direct comparisons can be made between the years. The total voyage costs are presented, as are the costs for the import steel itinerary and the export grain itinerary. For the steel voyage and the grain voyage, each table indicates the various cost components of the voyage, including the total voyage cost, total pilotage cost, stevedoring, toll (including Panama Canal and Suez Canal tolls where relevant), and U.S. pilotage charge. Also, each table shows the average voyage cost per ton and the U.S. pilotage charge per ton. The share of the U.S. pilotage charge as a percent of the voyage cost per ton is also estimated. Each of the seven

tables within each of the three voyage scenarios shows the voyage cost particulars for the beginning and end of the voyage, i.e. Thunder Bay to Alexandria, Thunder Bay to Livorno, Duluth/Superior to Felixstowe, etc.).

Exhibit II-9

Voyage Costs for Voyage I, Class 4 Vessel Itinerary, using U.S. Pilotage Charges for 2015 and 2016 (Thunder Bay Grain Export Port)

Voyage 1 Thunder Bay to Alexandria		2016		Per Ton	Share
Total Voyage cost	\$1,597,763			\$39.94	
Pilotage cost	\$210,135				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$158,946			\$3.97	9.95%
Steel		2016		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$799,375	Steel rate		\$39.97	
Pilotage cost	\$88,920				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$63,325	US Pilotage		\$3.17	7.92%
Grain		2016		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$798,387	Grain rate		\$39.92	
Pilotage cost	\$121,215				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$95,621	US Pilotage		\$4.78	11.98%

Voyage 1 Thunder Bay to Alexandria		2015		Per Ton	Share
Total Voyage cost	\$1,532,333			\$38.31	
Pilotage cost	\$148,128				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$97,586			\$2.44	6.37%
Steel		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$777,194	Steel rate		\$38.86	
Pilotage cost	\$69,702				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$44,431	US Pilotage		\$2.22	5.72%
Grain		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$755,139	Grain rate		\$37.76	
Pilotage cost	\$78,426				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$53,155	US Pilotage		\$2.66	7.04%

Voyage 1 Thunder Bay to Algiers		2016		Per Ton	Share
Total Voyage cost	\$1,528,045			\$38.20	
Pilotage cost	\$210,135				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$158,946			\$3.97	10.40%
Steel		2016		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$799,375	Steel rate		\$39.97	
Pilotage cost	\$88,920				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$63,325	US Pilotage		\$3.17	7.92%
Grain		2016		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$728,670	Grain rate		\$36.43	
Pilotage cost	\$121,215				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$95,621	US Pilotage		\$4.78	13.12%

Voyage 1 Thunder Bay to Algiers		2015		Per Ton	Share
Total Voyage cost	\$1,462,615			\$36.57	
Pilotage cost	\$148,128				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$97,586			\$2.44	6.67%
Steel		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$777,194	Steel rate		\$38.86	
Pilotage cost	\$69,702				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$44,431	US Pilotage		\$2.22	5.72%
Grain		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$685,421	Grain rate		\$34.27	
Pilotage cost	\$78,426				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$53,155	US Pilotage		\$2.66	7.76%

Voyage 1 Thunder Bay to Felixstowe		2016		Per Ton	Share
Total Voyage cost	\$1,508,321			\$37.71	
Pilotage cost	\$210,135				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$158,946			\$3.97	10.54%
Steel		2016		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$799,375	Steel rate		\$39.97	
Pilotage cost	\$88,920				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$63,325	US Pilotage		\$3.17	7.92%
Grain		2016		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$708,945	Grain rate		\$35.45	
Pilotage cost	\$121,215				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$95,621	US Pilotage		\$4.78	13.49%

Voyage 1 Thunder Bay to Felixstowe		2015		Per Ton	Share
Total Voyage cost	\$1,442,890			\$36.07	
Pilotage cost	\$148,128				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$97,586			\$2.44	6.76%
Steel		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$777,194	Steel rate		\$38.86	
Pilotage cost	\$69,702				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$44,431	US Pilotage		\$2.22	5.72%
Grain		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$665,696	Grain rate		\$33.28	
Pilotage cost	\$78,426				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$53,155	US Pilotage		\$2.66	7.98%

Voyage 1 Thunder Bay to Hamburg		2016	Per Ton	Share
Total Voyage cost	\$1,518,763		\$37.97	
Pilotage cost	\$210,135			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$158,946		\$3.97	10.47%
Steel				
Voyage 1: Class 4		2,016	Per Ton	Share
Total Voyage cost	\$799,375		Steel rate	\$39.97
Pilotage cost	\$88,920			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$63,325		US Pilotage	\$3.17 7.92%
Grain				
Voyage 1: Class 4		2,016	Per Ton	Share
Total Voyage cost	\$719,388		Grain rate	\$35.97
Pilotage cost	\$121,215			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$95,621		US Pilotage	\$4.78 13.29%

Voyage 1 Thunder Bay to Hamburg		2015	Per Ton	Share
Total Voyage cost	\$1,453,333		\$36.33	
Pilotage cost	\$148,128			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$97,586		\$2.44	6.71%
Steel				
Voyage 1: Class 4		2015	Per Ton	Share
Total Voyage cost	\$777,194		Steel rate	\$38.86
Pilotage cost	\$69,702			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$44,431		US Pilotage	\$2.22 5.72%
Grain				
Voyage 1: Class 4		2015	Per Ton	Share
Total Voyage cost	\$676,139		Grain rate	\$33.81
Pilotage cost	\$78,426			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$53,155		US Pilotage	\$2.66 7.86%

Voyage 1 Thunder Bay to Livorno		2016	Per Ton	Share
Total Voyage cost	\$1,551,100		\$38.78	
Pilotage cost	\$210,135			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$158,946		\$3.97	10.25%
Steel				
Voyage 1: Class 4		2016	Per Ton	Share
Total Voyage cost	\$799,375		Steel rate	\$39.97
Pilotage cost	\$88,920			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$63,325		US Pilotage	\$3.17 7.92%
Grain				
Voyage 1: Class 4		2016	Per Ton	Share
Total Voyage cost	\$751,724		Grain rate	\$37.59
Pilotage cost	\$121,215			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$95,621		US Pilotage	\$4.78 12.72%

Voyage 1 Thunder Bay to Livorno		2015	Per Ton	Share
Total Voyage cost	\$1,485,669		\$37.14	
Pilotage cost	\$148,128			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$97,586		\$2.44	6.57%
Steel				
Voyage 1: Class 4		2015	Per Ton	Share
Total Voyage cost	\$777,194.05		Steel rate	\$38.86
Pilotage cost	\$69,701.97			
Stevedoring	\$180,000.00			
Tolls	\$60,875.00			
US Pilotage	\$44,431		US Pilotage	\$2.22 5.72%
Grain				
Voyage 1: Class 4		2015	Per Ton	Share
Total Voyage cost	\$708,475		Grain rate	\$35.42
Pilotage cost	\$78,426			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$53,155		US Pilotage	\$2.66 7.50%

Voyage 1 Thunder Bay to Xiamen		2016	Per Ton	Share
Total Voyage cost	\$1,691,979		\$42.30	
Pilotage cost	\$210,135			
Stevedoring	\$300,000			
Tolls	\$284,036			
US Pilotage	\$158,946		\$3.97	9.39%
Steel				
Voyage 1: Class 4		2016	Per Ton	Share
Total Voyage cost	\$799,375		Steel rate	\$39.97
Pilotage cost	\$88,920			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$63,325		US Pilotage	\$3.17 7.92%
Grain				
Voyage 1: Class 4		2016	Per Ton	Share
Total Voyage cost	\$892,603		Grain rate	\$44.63
Pilotage cost	\$121,215			
Stevedoring	\$120,000			
Tolls	\$223,161			
US Pilotage	\$95,621		US Pilotage	\$4.78 10.71%

Voyage 1 Thunder Bay to Xiamen		2015	Per Ton	Share
Total Voyage cost	\$1,626,549		\$40.66	
Pilotage cost	\$148,128			
Stevedoring	\$300,000			
Tolls	\$284,036			
US Pilotage	\$97,586		\$2.44	6.00%
Steel				
Voyage 1: Class 4		2015	Per Ton	Share
Total Voyage cost	\$777,194		Steel rate	\$38.86
Pilotage cost	\$69,702			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$44,431		US Pilotage	\$2.22 5.72%
Grain				
Voyage 1: Class 4		2015	Per Ton	Share
Total Voyage cost	\$849,355		Grain rate	\$42.47
Pilotage cost	\$78,426			
Stevedoring	\$120,000			
Tolls	\$223,161			
US Pilotage	\$53,155		US Pilotage	\$2.66 6.26%

Voyage 1 Thunder Bay to Cartagena		2016		Per Ton	Share
Total Voyage cost	\$1,691,979			\$42.30	
Pilotage cost	\$210,135				
Stevedoring	\$300,000				
Tolls	\$284,036				
US Pilotage	\$158,946			\$3.97	9.39%
Steel		2016		Per Ton	Share
Voyage 1 class 4					
Total Voyage cost	\$799,375	Steel rate		\$39.97	
Pilotage cost	\$88,920				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$63,325	US Pilotage		\$3.17	7.92%
Grain		2016		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$892,603	Grain rate		\$44.63	
Pilotage cost	\$121,215				
Stevedoring	\$120,000				
Tolls	\$223,161				
US Pilotage	\$95,621	US Pilotage		\$4.78	10.71%

Voyage 1 Thunder Bay to Cartagena		2015		Per Ton	Share
Total Voyage cost	\$1,626,549			\$40.66	
Pilotage cost	\$148,128				
Stevedoring	\$300,000				
Tolls	\$284,036				
US Pilotage	\$97,586			\$2.44	6.00%
Steel		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$777,194	Steel rate		\$38.86	
Pilotage cost	\$69,702				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$44,431	US Pilotage		\$2.22	5.72%
Grain		2015		Per Ton	Share
Voyage 1: Class 4					
Total Voyage cost	\$849,355	Grain rate		\$42.47	
Pilotage cost	\$78,426				
Stevedoring	\$120,000				
Tolls	\$223,161				
US Pilotage	\$53,155	US Pilotage		\$2.66	6.26%



**Exhibit II-10**  
**Voyage Costs for Voyage 2, Class 4 Vessel Itinerary, using U.S. Pilotage Charges for 2015 and 2016 (Duluth-Superior Grain Export Port)**

Voyage 2 Duluth/Superior Alexandria		2016		Per Ton	Share
Total Voyage cost	\$1,574,235			\$39.36	
Pilotage cost	\$216,886				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$165,697	\$4.14	10.53%		
<b>Steel</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$714,394	Steel rate	\$35.72		
Pilotage cost	\$86,591				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$60,997	US Pilotage	\$3.05	8.54%	
<b>Grain</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$859,841	Grain rate	\$42.99		
Pilotage cost	\$130,294				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$104,700	US Pilotage	\$5.23	12.18%	

Voyage 2 Duluth/Superior Alexandria		2016		Per Ton	Share
Total Voyage cost	\$1,503,562			\$37.59	
Pilotage cost	\$146,212				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$95,671	\$2.39	6.36%		
<b>Steel</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$693,904	Steel rate	\$34.70		
Pilotage cost	\$66,102				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$40,831	US Pilotage	\$2.04	5.88%	
<b>Grain</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$809,658	Grain rate	\$40.48		
Pilotage cost	\$80,111				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$54,840	US Pilotage	\$2.74	6.77%	

Voyage 2 Duluth/Superior Algiers		2016		Per Ton	Share
Total Voyage cost	\$1,504,518			\$37.61	
Pilotage cost	\$216,886				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$165,697	\$4.14	11.01%		
<b>Steel</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$714,394	Steel rate	\$35.72		
Pilotage cost	\$86,591				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$60,997	US Pilotage	\$3.05	8.54%	
<b>Grain</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$790,124	Grain rate	\$39.51		
Pilotage cost	\$130,294				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$104,700	US Pilotage	\$5.23	13.25%	

Voyage 2 Duluth/Superior Algiers		2105		Per Ton	Share
Total Voyage cost	\$1,433,844			\$35.85	
Pilotage cost	\$146,212				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$95,671	\$2.39	6.67%		
<b>Steel</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$693,904	Steel rate	\$34.70		
Pilotage cost	\$66,102				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$40,831	US Pilotage	\$2.04	5.88%	
<b>Grain</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$739,940	Grain rate	\$37.00		
Pilotage cost	\$80,111				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$54,840	US Pilotage	\$2.74	7.41%	

Voyage 2 Duluth/Superior to Felixstowe		2016		Per Ton	Share
Total Voyage cost	\$1,484,793			\$37.12	
Pilotage cost	\$216,886				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$165,697	\$4.14	11.16%		
<b>Steel</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$714,394	Steel rate	\$35.72		
Pilotage cost	\$86,591				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$60,997	US Pilotage	\$3.05	8.54%	
<b>Grain</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$770,399	Grain rate	\$38.52		
Pilotage cost	\$130,294				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$104,700	US Pilotage	\$5.23	13.59%	

Voyage 2 Duluth/Superior to Felixstowe		2015		Per Ton	Share
Total Voyage cost	\$1,414,120			\$35.35	
Pilotage cost	\$146,212				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$95,671	\$2.39	6.77%		
<b>Steel</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$693,904	Steel rate	\$34.70		
Pilotage cost	\$66,102				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$40,831	US Pilotage	\$2.04	5.88%	
<b>Grain</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$720,215	Grain rate	\$36.01		
Pilotage cost	\$80,111				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$54,840	US Pilotage	\$2.74	7.61%	

Voyage 2 Duluth/Superior to Hamburg		2016		Per Ton	Share
Total Voyage cost	\$1,495,236			\$37.38	
Pilotage cost	\$216,886				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$165,697			\$4.14	11.08%
Steel		2016		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$714,394	Steel rate		\$35.72	
Pilotage cost	\$86,591				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$60,997	US Pilotage		\$3.05	8.54%
Grain		2016		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$780,842	Grain rate		\$39.04	
Pilotage cost	\$130,294				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$104,700	US Pilotage		\$5.23	13.41%

Voyage 2 Duluth/Superior to Hamburg		2015		Per Ton	Share
Total Voyage cost	\$1,424,562			\$35.61	
Pilotage cost	\$146,212				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$95,671			\$2.39	6.72%
Steel		2015		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$693,904	Steel rate		\$34.70	
Pilotage cost	\$66,102				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$40,831	US Pilotage		\$2.04	5.88%
Grain		2015		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$730,658	Grain rate		\$36.53	
Pilotage cost	\$80,111				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$54,840	US Pilotage		\$2.74	7.51%

Voyage 2 Duluth/Superior to Livorno		2016		Per Ton	Share
Total Voyage cost	\$1,527,572			\$38.19	
Pilotage cost	\$216,886				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$165,697			\$4.14	10.85%
Steel		2016		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$714,394	Steel rate		\$35.72	
Pilotage cost	\$86,591				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$60,997	US Pilotage		\$3.05	8.54%
Grain		2016		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$813,178	Grain rate		\$40.66	
Pilotage cost	\$130,294				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$104,700	US Pilotage		\$5.23	12.88%

Voyage 2 Duluth/Superior to Livorno		2015		Per Ton	Share
Total Voyage cost	\$1,456,899			\$36.42	
Pilotage cost	\$146,212				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$95,671			\$2.39	6.57%
Steel		2015		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$693,904	Steel rate		\$34.70	
Pilotage cost	\$66,102				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$40,831	US Pilotage		\$2.04	5.88%
Grain		2015		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$762,994	Grain rate		\$38.15	
Pilotage cost	\$80,111				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$54,840	US Pilotage		\$2.74	7.19%

Voyage 2 Duluth/Superior to Xiamen		2016		Per Ton	Share
Total Voyage cost	\$1,681,910			\$42.05	
Pilotage cost	\$216,886				
Stevedoring	\$300,000				
Tolls	\$284,036				
US Pilotage	\$165,697			\$4.14	9.85%
Steel		2016		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$714,394	Steel rate		\$35.72	
Pilotage cost	\$86,591				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$60,997	US Pilotage		\$3.05	8.54%
Grain		2016		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$967,516	Grain rate		\$48.38	
Pilotage cost	\$130,294				
Stevedoring	\$120,000				
Tolls	\$223,161				
US Pilotage	\$104,700	US Pilotage		\$5.23	10.82%

Voyage 2 Duluth/Superior to Xiamen		2015		Per Ton	Share
Total Voyage cost	\$1,611,236			\$40.28	
Pilotage cost	\$146,212				
Stevedoring	\$300,000				
Tolls	\$284,036				
US Pilotage	\$95,671			\$2.39	5.94%
Steel		2015		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$693,904	Steel rate		\$34.70	
Pilotage cost	\$66,102				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$40,831	US Pilotage		\$2.04	5.88%
Grain		2015		Per Ton	Share
Voyage 3: Class 4					
Total Voyage cost	\$917,332	Grain rate		\$45.87	
Pilotage cost	\$80,111				
Stevedoring	\$120,000				
Tolls	\$223,161				
US Pilotage	\$54,840	US Pilotage		\$2.74	5.98%

Voyage 2 Duluth/Superior to Cartagena		2016		Per Ton	Share
Total Voyage cost	\$1,681,910			\$42.05	
Pilotage cost	\$216,886				
Stevedoring	\$300,000				
Tolls	\$284,036				
US Pilotage	\$165,697			\$4.14	9.85%
<b>Steel</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$714,394	Steel rate	\$35.72		
Pilotage cost	\$86,591				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$60,997	US Pilotage	\$3.05	8.54%	
<b>Grain</b>					
Voyage 3: Class 4		2016		Per Ton	Share
Total Voyage cost	\$967,516	Grain rate	\$48.38		
Pilotage cost	\$130,294				
Stevedoring	\$120,000				
Tolls	\$223,161				
US Pilotage	\$104,700	US Pilotage	\$5.23	10.82%	

Voyage 2 Duluth/Superior to Cartagena		2015		Per Ton	Share
Total Voyage cost	\$1,611,236			\$40.28	
Pilotage cost	\$146,212				
Stevedoring	\$300,000				
Tolls	\$284,036				
US Pilotage	\$95,671			\$2.39	5.94%
<b>Steel</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$693,904	Steel rate	\$34.70		
Pilotage cost	\$66,102				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$40,831	US Pilotage	\$2.04	5.88%	
<b>Grain</b>					
Voyage 3: Class 4		2015		Per Ton	Share
Total Voyage cost	\$917,332	Grain rate	\$45.87		
Pilotage cost	\$80,111				
Stevedoring	\$120,000				
Tolls	\$223,161				
US Pilotage	\$54,840	US Pilotage	\$2.74	5.98%	

Exhibit II-11

Voyage Costs for Voyage 3, Class 4 Vessel Itinerary, using U.S. Pilotage Charges for 2015 and 2016 (Toledo Grain Export Port)

Voyage 3 Toledo to Alexandria		2016		Per Ton	Share
Total Voyage cost	\$1,504,637			\$37.62	
Pilotage cost	\$178,022				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$126,833			\$3.17	8.43%
Steel		2016		Per Ton	Share
Voyage 2: Class 4				Steel rate	\$36.46
Total Voyage cost	\$729,290				
Pilotage cost	\$87,219				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$61,625	US Pilotage	\$3.08		8.45%
Grain		2016		Per Ton	Share
Voyage 2: Class 4				Grain rate	\$38.77
Total Voyage cost	\$775,347				
Pilotage cost	\$90,803				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$65,209	US Pilotage	\$3.26		8.41%

Voyage 3 Toledo to Alexandria		2015		Per Ton	Share
Total Voyage cost	\$1,459,286			\$36.48	
Pilotage cost	\$132,671				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$82,130			\$2.05	5.63%
Steel		2015		Per Ton	Share
Voyage 2: Class 4				Steel rate	\$35.35
Total Voyage cost	\$707,010				
Pilotage cost	\$64,939				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$39,668	US Pilotage	\$1.98		5.61%
Grain		2015		Per Ton	Share
Voyage 2: Class 4				Grain rate	\$37.61
Total Voyage cost	\$752,276				
Pilotage cost	\$67,733				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$42,462	US Pilotage	\$2.12		5.64%

Voyage 3 Toledo to Algiers		2016		Per Ton	Share
Total Voyage cost	\$1,409,192			\$35.23	
Pilotage cost	\$178,022				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$126,833			\$3.17	9.00%
Steel		2016		Per Ton	Share
Voyage 2: Class 4				Steel rate	\$36.46
Total Voyage cost	\$729,290				
Pilotage cost	\$87,219				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$61,625	US Pilotage	\$3.08		8.45%
Grain		2016		Per Ton	Share
Voyage 2: Class 4				Grain rate	\$34.00
Total Voyage cost	\$679,901				
Pilotage cost	\$90,803				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$65,209	US Pilotage	\$3.26		9.59%

Voyage 3 Toledo to Algiers		2015		Per Ton	Share
Total Voyage cost	\$1,389,569			\$34.74	
Pilotage cost	\$132,671				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$82,130			\$2.05	5.91%
Steel		2015		Per Ton	Share
Voyage 2: Class 4				Steel rate	\$35.35
Total Voyage cost	\$707,010				
Pilotage cost	\$64,939				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$39,668	US Pilotage	\$1.98		5.61%
Grain		2015		Per Ton	Share
Voyage 2: Class 4				Grain rate	\$34.13
Total Voyage cost	\$682,559				
Pilotage cost	\$67,733				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$42,462	US Pilotage	\$2.12		6.22%

Voyage 3 Toledo to Felixstowe		2016		Per Ton	Share
Total Voyage cost	\$1,415,195			\$35.38	
Pilotage cost	\$178,022				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$126,833			\$3.17	8.96%
Steel		2016		Per Ton	Share
Voyage 2: Class 4				Steel rate	\$36.46
Total Voyage cost	\$729,290				
Pilotage cost	\$87,219				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$61,625	US Pilotage	\$3.08		8.45%
Grain		2016		Per Ton	Share
Voyage 2: Class 4				Grain rate	\$34.30
Total Voyage cost	\$685,905				
Pilotage cost	\$90,803				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$65,209	US Pilotage	\$3.26		9.51%

Voyage 3 Toledo to Felixstowe		2015		Per Ton	Share
Total Voyage cost	\$1,369,844			\$34.25	
Pilotage cost	\$132,671				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$82,130			\$2.05	6.00%
Steel		2015		Per Ton	Share
Voyage 2: Class 4				Steel rate	\$35.35
Total Voyage cost	\$707,010				
Pilotage cost	\$64,939				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$39,668	US Pilotage	\$1.98		5.61%
Grain		2015		Per Ton	Share
Voyage 2: Class 4				Grain rate	\$33.14
Total Voyage cost	\$662,834				
Pilotage cost	\$67,733				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$42,462	US Pilotage	\$2.12		6.41%

Voyage 3 Toledo to Hamburg		2016	Per Ton	Share
Total Voyage cost	\$1,425,637		\$35.64	
Pilotage cost	\$178,022			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$126,833		\$3.17	8.90%
Steel		2016	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$729,290	Steel rate	\$36.46	
Pilotage cost	\$87,219			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$61,625	US Pilotage	\$3.08	8.45%
Grain		2016	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$696,347	Grain rate	\$34.82	
Pilotage cost	\$90,803			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$65,209	US Pilotage	\$3.26	9.36%

Voyage 3 Toledo to Hamburg		2015	Per Ton	Share
Total Voyage cost	\$1,380,286		\$34.51	
Pilotage cost	\$132,671			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$82,130		\$2.05	5.95%
Steel		2015	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$707,010	Steel rate	\$35.35	
Pilotage cost	\$64,939			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$39,668	US Pilotage	\$1.98	5.61%
Grain		2015	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$673,277	Grain rate	\$33.66	
Pilotage cost	\$67,733			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$42,462	US Pilotage	\$2.12	6.31%

Voyage 3 Toledo to Livorno		2016	Per Ton	Share
Total Voyage cost	\$1,457,974		\$36.45	
Pilotage cost	\$178,022			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$126,833		\$3.17	8.70%
Steel		2016	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$729,290	Steel rate	\$36.46	
Pilotage cost	\$87,219			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$61,625	US Pilotage	\$3.08	8.45%
Grain		2016	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$728,684	Grain rate	\$36.43	
Pilotage cost	\$90,803			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$65,209	US Pilotage	\$3.26	8.95%

Voyage 3 Toledo to Livorno		2015	Per Ton	Share
Total Voyage cost	\$1,412,623		\$35.32	
Pilotage cost	\$132,671			
Stevedoring	\$300,000			
Tolls	\$94,375			
US Pilotage	\$82,130		\$2.05	5.81%
Steel		2015	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$707,010	Steel rate	\$35.35	
Pilotage cost	\$64,939			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$39,668	US Pilotage	\$1.98	5.61%
Grain		2015	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$705,613	Grain rate	\$35.28	
Pilotage cost	\$67,733			
Stevedoring	\$120,000			
Tolls	\$33,500			
US Pilotage	\$42,462	US Pilotage	\$2.12	6.02%

Voyage 3 Toledo to Xiamen		2016	Per Ton	Share
Total Voyage cost	\$2,050,341		\$51.26	
Pilotage cost	\$178,022			
Stevedoring	\$300,000			
Tolls	\$284,036			
US Pilotage	\$126,833		\$3.17	6.19%
Steel		2016	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$729,290	Steel rate	\$36.46	
Pilotage cost	\$87,219			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$61,625	US Pilotage	\$3.08	8.45%
Grain		2016	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$1,321,051	Grain rate	\$66.05	
Pilotage cost	\$90,803			
Stevedoring	\$120,000			
Tolls	\$223,161			
US Pilotage	\$65,209	US Pilotage	\$3.26	4.94%

Voyage 3 Toledo to Xiamen		2015	Per Ton	Share
Total Voyage cost	\$2,004,990		\$50.12	
Pilotage cost	\$132,671			
Stevedoring	\$300,000			
Tolls	\$284,036			
US Pilotage	\$82,130		\$2.05	4.10%
Steel		2015	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$707,010	Steel rate	\$35.35	
Pilotage cost	\$64,939			
Stevedoring	\$180,000			
Tolls	\$60,875			
US Pilotage	\$39,668	US Pilotage	\$1.98	5.61%
Grain		2015	Per Ton	Share
Voyage 2: Class 4				
Total Voyage cost	\$1,297,980	Grain rate	\$64.90	
Pilotage cost	\$67,733			
Stevedoring	\$120,000			
Tolls	\$223,161			
US Pilotage	\$42,462	US Pilotage	\$2.12	3.27%

Voyage 3 Toledo to Cartagena		2016		Per Ton	Share
Total Voyage cost	\$1,409,192			\$35.23	
Pilotage cost	\$178,022				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$126,833			\$3.17	9.00%
Steel		2016		Per Ton	Share
Voyage 2: Class 4					
Total Voyage cost	\$729,290	Steel rate	\$36.46		
Pilotage cost	\$87,219				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$61,625	US Pilotage	\$3.08		8.45%
Grain		2016		Per Ton	Share
Voyage 2: Class 4					
Total Voyage cost	\$679,901	Grain rate	\$34.00		
Pilotage cost	\$90,803				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$65,209	US Pilotage	\$3.26		9.59%

Voyage 3 Toledo to Cartagena		2015		Per Ton	Share
Total Voyage cost	\$1,389,569			\$34.74	
Pilotage cost	\$132,671				
Stevedoring	\$300,000				
Tolls	\$94,375				
US Pilotage	\$82,130			\$2.05	5.91%
Steel		2015		Per Ton	Share
Voyage 2: Class 4					
Total Voyage cost	\$707,010	Steel rate	\$35.35		
Pilotage cost	\$64,939				
Stevedoring	\$180,000				
Tolls	\$60,875				
US Pilotage	\$39,668	US Pilotage	\$1.98		5.61%
Grain		2015		Per Ton	Share
Voyage 2: Class 4					
Total Voyage cost	\$682,559	Grain rate	\$34.13		
Pilotage cost	\$67,733				
Stevedoring	\$120,000				
Tolls	\$33,500				
US Pilotage	\$42,462	US Pilotage	\$2.12		6.22%

As can be seen from each of the voyage scenarios and seven grain routings within each scenario, the U.S. pilotage charge has a greater impact on the grain export routing than on the steel import routing. If the U.S. pilotage could render the grain export routing cost non-competitive compared to an alternative coastal port routing, then the grain backhaul availability would be reduced. This in turn would increase the cost of the steel inbound vessel routing as the total voyage cost to the ship operator would only be spread across steel import tonnage and no longer grain export tonnage. As a result, the steel rates charged by the vessel operator would need to dramatically increase in order to cover costs and therefore reduce the competitive position of the Great Lakes/St. Lawrence Seaway System to serve the regional steel import market.

Another implication ascertained from this review of baseline voyage costs is that the U.S. pilotage charges increased significantly from 2015 to 2016. These rates represent nearly 10% of the total grain voyage costs under each voyage scenario and between 8 and 9% of the steel voyage costs. The distribution of the total voyage costs by cost category is shown in Exhibit II-12. This exhibit shows the composition of the voyage costs for the voyage 3 routing with a Felixstowe destination for the grain movement from Toledo. The cost components will change slightly by voyage itinerary, but the relative cost composition will not likely change significantly except on longer Asian voyages for a grain export destination.

**Exhibit II-12**  
**Composition of Voyage Costs by Cost Category, Class 4 Vessel, Voyage Scenario 3,  
 With Grain Export Destination Felixstowe**

<b>Cost Category</b>	<b>Voyage Cost Percentage</b>	
Capital/Charter	\$244,951	17.31%
Crew Wages	\$119,116	8.42%
Maintenance & Repair	\$64,609	4.57%
Insurance	\$52,821	3.73%
Stores/Supplies	\$34,858	2.46%
Miscellaneous	\$23,636	1.67%
Fuel Cost	\$155,806	11.01%
Stevedoring	\$300,000	21.20%
Pilotage	\$178,022	12.58%
Port costs	\$147,000	10.39%
Tolls	\$94,375	6.67%
<b>Total</b>	<b>\$1,415,195</b>	<b>100.00%</b>

The total voyage cost of the Class 2 vessel voyage itinerary was also estimated using a similar approach that was used for the Class 4 vessel voyage cost. Exhibit II-13 provides a summary of the total voyage costs for the Class 2 vessel itinerary, and identifies the voyage costs under the use of the 2015 and 2016 U.S. pilotage charges. As this Exhibit shows, the U.S. pilotage component of the total voyage cost increased by 37.6% between 2015 and 2016. The U.S. pilotage share of total voyage costs grew from about 6% in 2015 to about 8% in 2016.

**Exhibit II-13**  
**Class 2 Voyage Cost Summary and U.S. Pilotage Charges, 2015 and 2016**

<b>Class 2 2016</b>		<b>Class 2 2015</b>	
Total Voyage cost	\$1,233,546	Total Voyage cost	\$1,198,461
Pilotage cost	\$137,825	Pilotage cost	\$110,836
Stevedoring	\$116,526	Stevedoring	\$116,526
Seaway tolls	\$81,519	Seaway tolls	\$81,519
US Pilots	\$96,597	US Pilots	\$70,180

The voyage cost analysis developed in this chapter, inclusive of the U.S. pilotage charges in 2015 and 2016, are used in the following chapter to assess the impact of U.S. pilotage charges on the competitive position of the Great Lakes/St. Lawrence Seaway System.



### III. The Impact of U.S. Pilotage Charges on the Competitive Position of the Great Lakes/St. Lawrence Seaway Transportation System

In this chapter, the impact of the U.S. pilotage charges on the competitive position of the Great Lakes/St. Lawrence Seaway System is evaluated. The focus of the analysis is to identify at what level of U.S. pilotage charge increases would the competitive advantage of the Great Lakes/St. Lawrence Seaway System be impacted. To evaluate the potential impacts of increases in U.S. pilotage charges, the first step in the analysis was to identify the destinations of steel ports served by the Great Lakes ports, and the grain origins served by the Great Lakes grain export ports of Thunder Bay, Duluth/Superior and Toledo. Next, the competitive position of the Great Lakes ports to serve the inland destinations for the steel imports and inland origins for the grain exports with respect to coastal ports was evaluated. A least cost logistics model was then developed to assess changes in U.S. pilotage charges and the potential impacts on the competitive position of the Great Lakes ports, and ultimately, the impact on regional economic activity.

#### 1. Identification of Import Steel Destinations and Grain Origins and Competing Routes

Martin Associates conducted interviews with several steel importers, grain trading companies and specific Great Lakes port authorities including Thunder Bay, Duluth/Superior, Toledo and Cleveland to develop the inland destinations for imported steel and origins of export grain using the Great Lakes ports. Interviews were conducted with:

- Port of Thunder Bay
- Port of Toledo
- Port of Cleveland
- Port of Duluth/Superior
- Arcelor Mittal
- TaTa Steel
- CHS, Inc.

The key steel import destinations are:

- Milwaukee, WI
- Cleveland, OH
- Owatonna, MN
- Weirton, WV
- Warren, OH
- South Bend, IN
- Bethlehem, PA
- Roseville, MI
- New Boston, MI
- Warren, MI
- Rochelle, IL
- Detroit, MI
- East Chicago, IL
- Canton, MI
- Jeffersonville, IN
- Plover, WI
- Dover, OH
- Aurora, IL
- Woodhaven, MI
- Toledo, OH
- Rock Island, IL
- Bowling Green, OH
- Oak Creek, WI
- Gary, IN
- Taylor, MI
- Middletown, OH
- Chicago, IL

With respect to coastal ports competing for steel imports into the Midwestern destinations, Camden, NJ was identified as the key competitor to serve these steel destinations. Further interviews identified the percentage of steel imports destined for each inland destination by Great Lakes and coastal ports. This actual distribution of steel imports by destination were then used to calibrate the U.S. steel tonnage imported in 2016 by Camden, Cleveland, Detroit, Burns Harbor, Chicago and Milwaukee. The steel tonnages imported at each port was then allocated to specific inland destinations based on the proprietary data provided to Martin Associates by the steel importers interviewed.

For grain exports, specific origins of grain exported via Duluth/Superior, Thunder Bay, and Toledo were identified. For Duluth/Superior, the key inland origins for grain were Ulen, MN, Bisbee, ND and Parshall, ND. For Thunder Bay, the key inland origins for grain exports are Saskatoon, Manitoba and Alberta. Finally, interviews with the Port of Toledo and the Illinois Soybean Association identified a local region from which soybeans are exported via the Port of Toledo. The competing coastal ports for grain exports vary by Great Lakes port. For Duluth/Superior grain exports, the competing ports are Portland, OR (including Longview, Vancouver (WA), and Kalama, WA), New Orleans (Lower Mississippi River ports), and Quebec City. The competing ports for grain exported via Thunder Bay are Vancouver, BC and Quebec City. Lastly, the ports of Wilmington, NC and New Orleans (Lower Mississippi River ports) are the competing ports for Toledo grain exports.

## **2. Determine the Competitive Position of the Great Lakes/St. Lawrence Seaway System Under Current U.S. Pilotage Charges**

Based on the alternative ports and inland origins and destinations described in the previous section, Martin Associates developed total logistics cost models to assess the current competitive position of the Great Lakes/St. Lawrence Seaway System (under the 2016 U.S. pilotage charges) vis-a-vis the competing coastal ports to serve the steel destinations and grain origins.

### **2.1 Competitive Position of the Great Lakes/St. Lawrence Seaway System for Steel Imports**

To assess the competitive position of the Great Lakes ports to handle steel imports, total logistics costs were developed to move steel between Antwerp and the identified inland destinations via the various Great Lakes ports served on each of the three Class 4 voyage scenarios. Similarly, the total logistics cost of moving steel imports into these inland destinations using the Port of Camden, NJ (South Jersey Port Corporation) was calculated. The total logistics cost to handle steel consists of the voyage cost from Antwerp to each of the various steel import ports served on the port rotations specific to each of the three Class 4 voyage scenarios. The second part of the total logistics costs analysis for the Great Lakes steel import routings consists of the inland costs from the individual Great Lakes steel ports called in the scenarios and are estimated using the Martin Associates' truck cost model.

The total logistics cost to serve the inland destinations via the alternative coastal port of Camden, NJ, consists of the voyage cost on a 40,000 DWT vessel carrying 35,000 tons of steel imports. This compares to a typical Class 4 foreign flag vessel carrying about 20,000

tons on the Great Lakes due to lock size and depth restrictions. At Camden, the stevedoring cost per ton of steel imports was obtained from data supplied by terminal operators in Camden. Tug and pilot costs in Camden are also included in the cost of the voyage operation in Camden based on data that Martin Associates has developed for transiting the Delaware River. Rail costs from Camden to key inland destinations were supplied to Martin Associates from interviews with the steel importers, as well as data supplied by private beneficial cargo owners and a review of the Surface Transportation Waybill Sample. The truck costs were also calculated between Camden and the inland steel import destinations using Martin Associates truck cost model. The lower of the inland cost (truck or rail costs) to each inland destination was then used in the logistics cost analysis for steel imports.

The voyage cost for using the Great Lakes/St. Lawrence Seaway System is based on the average voyage cost per ton for the three steel service vessel itineraries included in the Class 4 voyage cost analysis, since the steel ports on the Great Lakes are served by a combination of the three vessel itineraries represented in the voyage scenarios. Similarly, an average U.S. pilotage cost per ton was also calculated.

Exhibit III-1 shows the voyage cost, voyage cost per ton, and U.S. pilotage charge for the Great Lakes ports of Cleveland, Detroit, Burns Harbor, Chicago, and Milwaukee. Again, the voyage cost is an average of the various voyage costs associated with the itineraries in each of the Class 4 Voyage scenarios for steel imports. (See Exhibits II-9, II-10, II-11 for the individual steel voyage costs and cost per ton and terminal/stevedoring, toll and total and U.S. pilotage charges). As shown in Exhibit III-1, the average voyage cost on the Great Lakes is about \$37.38 per ton including stevedoring, port charges, Seaway Tolls, U.S. Great Lakes pilotage charges applied on all legs of the itinerary except the Welland and the St. Lambert to Snell transits (where Canadian pilot charges are assigned), and Laurentian pilot charges. Terminal charges in Antwerp are also included. The average U.S. pilotage charge is about \$61,982, or about 8.3% of the total voyage cost allocated to the steel import service. The direct voyage cost to Camden is \$22.51 per ton, inclusive of stevedoring, pilots, tugs, port charges (wharfage and dockage).

**Exhibit III-1**  
**Voyage Costs for Steel Imports**

	Coastal Port	GL Ports:					
	Camden	Cleveland	Detroit	Burns Harbor	Chicago	Milwaukee	
Steel From Antwerp							
Total Voyage Cost (average of 3 Class 4 scenarios including positioning to Duluth/Superior, Toledo and Thunder Bay)	\$341,983	\$747,686	\$747,686	\$747,686	\$747,686	\$747,686	
Tons moves	35000	20000	20000	20000	20000	20000	
Cost Voyage Per Ton For Great Lakes		\$37.38	\$37.38	\$37.38	\$37.38	\$37.38	
Total Coastal Voyage Cost Per Ton	\$22.51						
Total Tons of Steel for GL Routing		20,000	20,000	20,000	20,000	20,000	
U.S. Pilot Cost		\$61,982.09	\$61,982.09	\$61,982.09	\$61,982.09	\$61,982.09	
US Pilot Cost per ton (Total US Pilot Cost/20,000 tons)		\$3.10	\$3.10	\$3.10	\$3.10	\$3.10	

The inland costs were combined with the voyage costs to calculate the total logistic cost to each inland steel import destination via the Great Lakes/St. Lawrence Seaway System and the Camden routing. Exhibit III-2 shows which destinations are more cost effectively served via the Great Lakes vs. the Camden routing (indicated by a 1 in the “least cost 2016” column) as well as the Great Lakes tonnage that is assigned to the inland location via each Great Lakes port.

## Exhibit III-2 Total Logistics Cost Analysis, Great Lakes/St. Lawrence Seaway System vs. Camden, 2016

DESTINATION	TONNAGE SHARE Least Cost 2016			TONNAGE SHARE Least Cost 2016			TONNAGE SHARE Least Cost 2016			TONNAGE SHARE Least Cost 2016			TONNAGE SHARE Least Cost 2016								
	Camden	Tonnage	Cost Per Ton	Cleveland	E SHARE	Tonnage	Detroit	Tonnage	Cost Per Ton	Burns Harbor	Tonnage	Cost Per Ton	Chicago	Tonnage	Cost Per Ton	Milwaukee	Tonnage	Cost Per Ton			
<b>2016 TONNAGE BY PORT</b>																					
	Cost Per Ton			Cost/Ton		407,851	Cost/Ton		419,434	Cost/Ton		805,480	Cost/Ton		844,879	Cost/Ton		192,024			
MILWAUKEE (WISCONSIN)	\$103.15	5.50%	0	\$79.95	0.94%	3,835	0	\$75.14	0.00%	0	0	\$53.38	0.34%	2,730	0	\$50.03	0	\$45.34	58.11%	111,576.1	1
CLEVELAND (OHIO)	\$65.16	1.06%	0	\$45.34	38.97%	158,925	1	\$56.01	0.00%	0	0	\$68.62	0.00%	0	0	\$70.61	0	\$79.95	0.00%	0.0	0
DWATONNA, MN	\$91.81	9.80%	0	\$107.60	0.00%	0	0	\$101.98	0.00%	0	0	\$80.13	0.00%	0	0	\$76.96	0	\$69.52	36.57%	70,218.3	1
WEIRTON, WV	\$57.00	9.10%	0	\$52.02	20.04%	81,725	0	\$65.90	0.00%	0	0	\$78.50	0.00%	0	0	\$80.49	0	\$89.83	0.00%	0.0	0
WARREN (OHIO)	\$60.54	5.18%	0	\$45.69	23.74%	96,842	1	\$60.00	0.00%	0	0	\$72.61	0.00%	0	0	\$74.60	0	\$83.94	0.00%	0.0	0
SOUTH BEND (INDIANA)	\$86.92	0.04%	0	\$63.72	0.00%	0	0	\$60.27	0.00%	0	0	\$47.61	35.80%	288,327	1	\$47.95	0	\$57.28	0.00%	0.0	0
BATAVIA, IL	\$87.21	6.56%	0	\$75.33	0.02%	62	0	\$69.61	0.00%	0	0	\$47.84	24.29%	195,637	0	\$47.61	50.00%	\$50.85	0.00%	0.0	0
FINDLAY, OH	\$74.77	5.21%	0	\$51.57	9.11%	37,136	0	\$50.30	0.00%	0	1	\$62.54	0.00%	0	0	\$64.45	0	\$73.78	0.00%	0.0	0
PORTAGE (INDIANA)	\$87.21	0.19%	0	\$68.34	0.33%	1,330	0	\$62.72	0.00%	0	0	\$45.34	19.83%	159,763	1	\$47.61	0	\$52.39	0.00%	0.0	0
BETHLEHEM, PA	\$32.73	10.82%	1	\$77.59	0.02%	71	0	\$91.46	0.00%	0	0	\$104.16	0.00%	0	0	\$106.06	0	\$115.40	0.00%	0.0	0
ROSEVILLE, MI	\$80.48	0.05%	0	\$57.28	0.19%	784	0	\$45.34	38.67%	162,200	1	\$63.63	0.00%	0	0	\$65.99	0	\$76.05	0.00%	0.0	0
NEW BOSTON (MICHIGAN)	\$77.49	0.65%	0	\$54.29	0.27%	1,097	0	\$45.34	26.16%	109,732	1	\$61.09	0.00%	0	0	\$63.45	0	\$73.51	0.00%	0.0	0
WARREN (MICHIGAN)	\$80.57	0.01%	0	\$57.37	0.54%	2,201	0	\$45.34	23.55%	98,766	1	\$63.36	0.00%	0	0	\$65.71	0	\$75.87	0.00%	0.0	0
ROCHELLE (ILLINOIS)	\$87.21	0.00%	0	\$78.68	0.00%	0	0	\$73.06	0.00%	0	0	\$51.21	4.82%	38,835	0	\$49.01	0	\$51.21	0.00%	0.0	0
DETROIT (MICHIGAN)	\$79.03	0.05%	0	\$55.83	1.27%	5,178	0	\$45.34	3.26%	13,667	1	\$62.54	0.00%	0	0	\$64.90	0	\$75.05	0.00%	0.0	0
EAST CHICAGO	\$94.90	0.01%	0	\$71.70	0.00%	0	0	\$66.08	0.00%	0	0	\$47.61	2.46%	19,823	0	\$45.34	0	\$48.82	0.00%	0.0	0
CANTON (MICHIGAN)	\$78.67	0.03%	0	\$55.47	0.01%	31	0	\$45.34	6.33%	26,549	1	\$60.27	0.10%	791	0	\$62.54	0	\$72.70	0.00%	0.0	0
JEFFERSONVILLE, IN	\$67.10	0.00%	0	\$72.06	0.26%	1,057	0	\$73.33	0.00%	0	0	\$64.90	1.29%	10,401	1	\$66.08	50.00%	\$75.96	0.00%	0.0	0
PLOVER (WISCONSIN)	\$117.57	0.00%	0	\$94.37	0.00%	0	0	\$88.65	0.00%	0	0	\$66.89	0.00%	0	0	\$63.63	0	\$54.56	1.62%	3,119.8	1
DOVER (OHIO)	\$64.98	0.00%	0	\$47.97	0.68%	2,789	1	\$61.91	0.00%	0	0	\$74.60	0.00%	0	0	\$76.50	0	\$85.84	0.00%	0.0	0
AURORA, IL	\$98.34	0.00%	0	\$75.23	0.00%	0	0	\$69.52	0.00%	0	0	\$47.71	1.12%	9,003	0	\$47.61	0	\$50.66	0.00%	0.0	0
WOODHAVEN (MICHIGAN)	\$77.58	0.00%	0	\$54.38	0.20%	820	0	\$45.34	1.81%	7,595	1	\$61.91	0.00%	0	0	\$64.26	0	\$74.87	0.00%	0.0	0
TOLEDO (OHIO)	\$74.23	0.00%	0	\$51.03	0.39%	1,599	0	\$45.97	0.00%	0	1	\$59.64	0.00%	0	0	\$61.54	0	\$70.88	0.00%	0.0	0
ROCK ISLAND (ILLINOIS)	\$108.77	0.01%	0	\$85.57	0.00%	0	0	\$79.95	0.00%	0	0	\$58.10	0.48%	3,883	0	\$56.92	0	\$59.46	0.00%	0.0	0
BOWLING GREEN (OHIO)	\$74.05	0.06%	0	\$50.85	0.10%	398	0	\$48.18	0.00%	0	1	\$60.37	0.00%	0	0	\$62.27	0	\$71.61	0.00%	0.0	0
DAK CREEK (WISCONSIN)	\$102.42	0.02%	0	\$79.22	0.00%	0	0	\$74.42	0.00%	0	0	\$52.66	0.00%	0	0	\$49.34	0	\$45.34	0.22%	420.9	1
GARY, INDIANA	\$92.36	0.00%	0	\$69.16	0.00%	0	0	\$63.54	0.00%	0	0	\$45.34	0.11%	921	0	\$45.34	0	\$51.48	0.00%	0.0	0
TAYLOR (MICHIGAN)	\$78.04	0.00%	0	\$54.83	0.01%	60	0	\$45.34	0.22%	924	1	\$61.36	0.00%	0	0	\$63.72	0	\$73.87	0.00%	0.0	0
MIDDLETOWN (OHIO)	\$77.22	0.03%	0	\$62.00	0.00%	0	0	\$61.82	0.00%	0	1	\$64.45	0.00%	0	0	\$65.53	0	\$75.42	0.00%	0.0	0
CHICAGO (ILLINOIS)	\$94.90	0.00%	0	\$71.70	0.00%	0	0	\$66.08	0.00%	0	0	\$47.61	0.04%	344	0	\$45.34	0	\$48.82	0.00%	0.0	0

In 2016, the U.S. Great Lakes ports cost effectively served about 1.8 million tons of imported steel, as shown in Exhibit III-3. This Exhibit also shows the distribution of this tonnage handled by Great Lakes ports to the key inland destinations.

**Exhibit III-3**  
**Distribution of Cost Effective Steel Markets Served by Great Lakes Ports in 2016 with Current U.S. Pilotage Charges**

Inland Destinations	2016 Base Tonnage
MILWAUKEE, WI	111,576
CLEVELAND, OH	158,925
OWATONNA, MN	70,218
WEIRTON, WV	81,725
WARREN, OH	96,842
SOUTH BEND, IN	288,327
BATAVIA, IL	422,440
FINDLAY, OH	0
PORTAGE, IN	159,763
BETHLEHEM, PA	0
ROSEVILLE, MI	162,200
NEW BOSTON, MI	109,732
WARREN, MI	98,766
ROCHELLE IL	0
DETROIT, MI	13,667
EAST CHICAGO, IL	0
CANTON, MI	26,549
JEFFERSONVILLE, IN	10,401
PLOVER, WI	3,120
DOVER, OH	2,789
AURORA, IL	0
WOODHAVEN, MI	7,595
TOLEDO, OH	0
ROCK ISLAND, IL	0
BOWLING GREE, OH	0
OAK CREEK, WI	421
GARY, IN	0
TAYLOR, MI	924
MIDDLETOWN, OH	0
CHICAGO, IL	0
	<b>2016 Base Tonnage</b>
	<b>1,825,981</b>

**2.2 Competitive Position of the Great Lakes/St. Lawrence Seaway System for Grain Exports**

For each of the grain export ports and the seven export international destination ports, Martin Associates developed the total logistics cost to move grain exports from each inland origin to each overseas destination. Similarly, the total logistics cost to move grain to the export destinations via the alternative coastal ports was also estimated. A vessel carrying

imported steel typically stops at several ports on its journey through the Great Lakes, then moves to one grain export port where the vessel is loaded with the maximum tonnage for its transit out of the Great Lakes/St. Lawrence Seaway System. Therefore, the competitive logistics cost analysis for grain exports must focus on the alternative routings for each of the three grain export ports considered in the analysis – Thunder Bay, Duluth/Superior and Toledo. Each of these grain export ports has a unique set of origins supplying grain to the export elevators at each port, as well as a unique set of competing coastal ports. In addition, the inland logistics mode to move the grain from the origins to the competing coastal ports differs. Therefore, the competitive logistics analysis of grain exports is addressed separately for each Great Lakes grain export port.

*2.2.1 Competitive Position of the Great Lakes/St. Lawrence Seaway System for Grain Exports via Thunder Bay*

As noted, the majority of grain exported from Thunder Bay originates in Saskatoon, Manitoba and Alberta. The two alternative coastal ports that compete with the Thunder Bay market are Vancouver, BC and Quebec City. To export grain from these alternative ports, the grain could be railed from inland origins to Vancouver for export; move directly by rail to Quebec City for export; or railed from the inland origins to Thunder Bay where it would be loaded onto Canadian lakers (not requiring pilots) for a shipment to an export elevator in Quebec City, and then reloaded onto a deep draft vessel calling the Port of Quebec for export to the overseas destination. With respect to export destinations, grain is primarily exported from Thunder Bay to the Middle East (Port of Alexandria), Africa (the Port of Algiers), the United Kingdom (the Port of Felixstowe), Northern Europe (the Port of Hamburg), the Mediterranean (the Port of Livorno) and Central and South America (the Port of Cartagena). Currently, Asia is not a major market of Thunder Bay

The inland logistics costs were developed to move the grain by rail to Thunder Bay for the export of the grain via a foreign flag vessel to each of the overseas destinations. The foreign flag voyage costs to these destinations were described previously in Chapter II, but are presented again in Exhibit III-4. This exhibit shows the total voyage cost from Thunder Bay direct to each overseas destination, the cost per ton, and the U.S. pilotage charge and the U.S. pilotage charge per ton.

**Exhibit III-4  
Foreign Flag Voyage Costs from Thunder Bay to Export Grain  
Destinations**

Direct Thunder Bay to:	Alexandria	Algiers	Felixstowe	Hamburg	Livorno	Cartegna
	\$798,387	\$728,670	\$708,945	\$719,388	\$751,724	\$892,603
Tons	20,000	20,000	20,000	20,000	20,000	20,000
Rate/Ton	\$39.92	\$36.43	\$35.45	\$35.97	\$37.59	\$44.63
Tons	20,000	20,000	20,000	20,000	20,000	20,000
US Pilots	\$95,621	\$95,621	\$95,621	\$95,621	\$95,621	\$95,621
US Pilots/Ton	\$4.78	\$4.78	\$4.78	\$4.78	\$4.78	\$4.78

As shown in the exhibit, the cost of the U.S. pilots is \$95,621, or about \$4.78 per ton compared to a voyage cost ranging between \$35.45 per ton to Felixstowe to about \$44.63 per ton to Cartagena. The difference in the voyage costs reflects the distance traveled after the vessel exits the St. Lawrence Seaway. The voyage costs include stevedoring, canal tolls, port charges, pilotage (U.S. Canadian pilots for the Welland Canal transit, the transit from the Snell Lock to the St. Lambert Lock, and the Laurentian pilots) and also include a bunkering charge along the St. Lawrence River. Also included are Suez Canal tolls and Panama Canal tolls where appropriate.

The voyage costs via the alternative coastal ports are based on the use of a 50,000 DWT vessel, and include terminal/stevedoring charges, and port costs (such as wharfage, dockage, tugs and pilots). The costs for the 50,000 DWT vessel are based on the Martin Associates' voyage costing model, as described in Chapter II, and include terminal charges and stevedoring charges based on interviews with terminal operators at each port. The voyage costs for the alternative coastal ports are shown in Exhibit III-5.

**Exhibit III-5**  
**Voyage Costs for Alternative Routings for Thunder Bay**

	Via Vancouver		Via Quebec	
<b>Voyage Cost to:</b>	<b>Total Voyage Cost</b>	<b>\$/ton</b>	<b>Total Voyage Cost</b>	<b>\$/ton</b>
<b>Alexandria</b>	\$1,634,706	\$32.69	\$1,210,326	\$24.21
<b>Algiers</b>	\$1,519,065	\$30.38	\$1,094,686	\$21.89
<b>Felixstowe</b>	\$1,519,735	\$30.39	\$1,061,968	\$21.24
<b>Hamburg</b>	\$1,545,925	\$30.92	\$1,079,289	\$21.59
<b>Livorno</b>	\$1,590,860	\$31.82	\$1,132,926	\$22.66
<b>Xiamen</b>	\$922,668	\$18.45	\$2,088,713	\$41.77
<b>Cartegna</b>	\$1,145,868	\$22.92	\$1,052,094	\$21.04

Inland costs to and from each grain export origin to Thunder Bay and the alternative ports were developed based on rail rates provided to Martin Associates by grain traders, as well as transshipment rates for Canadian lakers as provided to Martin Associates by these grain trading houses as well as from data collected during the Martin Associates' Economic Impact Analysis of the Great lakes/St. Lawrence Seaway System. The inland rates are shown in Exhibit III-6.

**Exhibit III-6**  
**Inland Cost Assumptions for Thunder Bay**

<b>Inland Cost</b>	IN US \$						
	Rail to Vancouver		Rail Direct Quebec		Laker Transship	Rail Cost to Thunder Bay	
Origin:	Car Rate	Cost/ton	Car Rate	Cost/ton	Cost/ton	Car Cost	Cost/ton
Saskatoon	\$2,552.31	\$25.52	\$5,051.54	\$50.52	\$25.00	\$2,339.23	\$23.39
Manitoba	\$4,099.23	\$40.99	\$3,985.00	\$39.85	\$25.00	\$1,484.62	\$14.85
Alberta	\$2,079.23	\$20.79	\$5,804.62	\$58.05	\$25.00	\$3,949.23	\$39.49

The inland costs were then combined with the voyage costs for a foreign flag voyage from Thunder Bay to each overseas grain destination, as well as to each alternative routing



port. Exhibit III-7 identifies the routings that are competitive for the foreign flag service via Thunder Bay for each overseas grain destination.

### Exhibit III-7 Total Logistics Cost Analysis for Thunder Bay, 2016 U.S. Pilotage Charges

Total Logistics Costs to Alexandria		Vancouver	Least Cost	Transshipmen t Quebec	Least Cost	Rail Quebec	Least Cost	Salty Direct	Least Cost	2016 Tonnage
Tonnage from Thunder Bay to Middle East		71,900								
From:	Tonnage From:									
Saskatoon	46,735	\$58.22	1	\$72.60	0	\$74.72	0	\$63.31	0	0
Manitoba	21,570	\$73.69	0	\$64.05	0	\$64.06	0	\$54.77	1	21,570
Alberta	3,595	\$53.49	1	\$88.70	0	\$82.25	0	\$79.41	0	0
Total Logistics Costs to Algiers		285,800								
From:	Tonnage From:									
Saskatoon	185,770	\$55.90	1	\$70.29	0	\$72.41	0	\$59.83	0	0
Manitoba	85,740	\$71.37	0	\$61.74	0	\$61.74	0	\$51.28	1	85,740
Alberta	14,290	\$51.17	1	\$86.39	0	\$79.94	0	\$75.93	0	0
Total Logistics Costs to Felixtowe		62,800								
From:	Tonnage From:									
Saskatoon	40,820	\$55.92	1	\$69.63	0	\$71.75	0	\$58.84	0	0
Manitoba	18,840	\$71.39	0	\$61.09	0	\$61.09	0	\$50.29	1	18,840
Alberta	3,140	\$51.19	1	\$85.73	0	\$79.29	0	\$74.94	0	0
Total Logistics Costs to Hamburg		435,900								
From:	Tonnage From:									
Saskatoon	283,335	\$56.44	1	\$69.98	0	\$72.10	0	\$59.36	0	0
Manitoba	130,770	\$71.91	0	\$61.43	0	\$61.44	0	\$50.82	1	130,770
Alberta	21,795	\$51.71	1	\$86.08	0	\$79.63	0	\$75.46	0	0
Total Logistics Costs to Livorno		403,300								
From:	Tonnage From:									
Saskatoon	262,145	\$57.34	1	\$71.05	0	\$73.17	0	\$60.98	0	0
Manitoba	120,990	\$72.81	0	\$62.50	0	\$62.51	0	\$52.43	1	120,990
Alberta	20,165	\$52.61	1	\$87.15	0	\$80.70	0	\$77.08	0	0
Total Logistics Costs to Caribbean Central America and South America		568,000								
From:	Tonnage From:									
Saskatoon	369,200	\$48.44	1	\$69.43	0	\$71.56	0	\$68.02	0	0
Manitoba	170,400	\$63.91	0	\$60.89	0	\$60.89	0	\$59.48	1	170,400
Alberta	28,400	\$43.71	1	\$85.53	0	\$79.09	1	\$84.12	0	0
										<b>Base 2016</b>
										<b>548,310</b>

As this exhibit shows, under the use of U.S. pilots on all segments except the transits through the Welland Canal and the Snell to St. Lambert locks, a foreign flag (salty) routing via Thunder Bay provides a cost-effective routing for 548,310 tons of grain.

#### 2.2.2 Competitive Position of the Great Lakes/St. Lawrence Seaway System for Grain Exports via Duluth/Superior

The majority of grain exported from Duluth/Superior originates in Ulen, MN, Bisbee, ND and Parshall, ND. There are three alternative coastal ports that compete with the grain exported via Duluth/Superior. These are the ports of Portland OR, Quebec City, and the Port of New Orleans. The grain could be railed to Portland (or neighboring ports of Kalama, Longview, and Vancouver (WA)), could move to Quebec City from the inland origins directly by rail to Quebec export elevators, or first to Duluth/Superior, where it would be loaded onto a laker (not requiring pilots) for a shipment to an export elevator, and then reloaded onto a deep draft vessel calling Quebec for transit to the overseas destination. To move the grain from the origins serving Duluth/Superior to New Orleans (or other Lower Mississippi River ports), the grain would be railed to St. Louis, then put on a barge

for transport to a Lower Mississippi River export grain elevator. With respect to export destinations, grain is exported from Duluth/Superior primarily to Africa (the Port of Algiers), the United Kingdom (the Port of Felixstowe), Northern Europe (the Port of Hamburg), the Mediterranean (the Port of Livorno) and Central and South America (the Port of Cartagena). Currently, the Middle East and Asia are not major markets for grain exported from Duluth/Superior.

The inland logistics costs were developed to move the grain by rail to Duluth/Superior for the export of the grain via a foreign flag vessel to each of the overseas destinations. The foreign flag voyage costs to these destinations was described previously in Chapter II, but presented again in Exhibit III-8. This exhibit shows the total voyage cost from Duluth/Superior direct to each overseas destination, the cost per ton, and the U.S. pilotage charge and the U.S. pilotage charge per ton.

**Exhibit III-8**  
**Foreign Flag Voyage Costs from Duluth/Superior to Export Grain**  
**Destinations**

Duluth to:	Alexandria	Algiers	Felixstowe	Hamburg	Livorno	Cartegna
	\$859,841	\$790,124	\$770,399	\$780,842	\$813,178	\$967,516
Tons	20,000	20,000	20,000	20,000	20,000	20,000
Rate/Ton	\$42.99	\$39.51	\$38.52	\$39.04	\$40.66	\$48.38
Tons	20,000	20,000	20,000	20,000	20,000	20,000
US Pilots	\$104,700	\$104,700	\$104,700	\$104,700	\$104,700	\$104,700
US Pilots/Ton	\$5.23	\$5.23	\$5.23	\$5.23	\$5.23	\$5.23

As shown in this exhibit, the U.S. pilotage charge is \$104,700, or about \$5.23 per ton compared to a voyage cost of between \$38.52 per ton to Felixstowe or about \$48.38 per ton to Cartagena. The difference in the voyage costs reflects the distance traveled after the vessel exits the St. Lawrence Seaway. The voyage costs include stevedoring, canal tolls, port charges, pilotage (U.S. Canadian pilots for the Welland Transit and the transit from the Snell Lock to the St. Lambert Lock, and the Laurentian pilots) as well as a bunkering charge along the St. Lawrence River. Also included are Suez Canal tolls and Panama Canal tolls where appropriate.

The voyage costs via the alternative coastal ports are based on the use of a 50,000 DWT vessel, and include terminal/stevedoring charges, and port costs (such as wharfage, dockage, tugs and pilots). The costs for the 50,000 DWT vessel are based on the Martin Associates' voyage costing model, as described in Chapter II, and include terminal charges and stevedoring charges based on interviews with terminal operators at each port. The voyage costs for the alternative coastal ports are shown in Exhibit III-9.

**Exhibit III-9**  
**Voyage Costs for Alternative Routings for Duluth/Superior**

	Via Quebec		Via Portland		Via Nola	
<b>Voyage Cost:</b>	<b>Total Voyage Cost</b>	<b>\$/ton</b>	<b>Total Voyage Cost</b>	<b>\$/ton</b>	<b>Total Voyage Cost</b>	<b>\$/ton</b>
<b>Alexandria</b>	\$1,210,326	\$24.21	\$1,603,744	\$32.07	\$676,164	\$13.52
<b>Algiers</b>	\$1,094,686	\$21.89	\$1,488,103	\$29.76	\$885,523	\$17.71
<b>Felixstowe</b>	\$1,061,968	\$21.24	\$1,488,773	\$29.78	\$868,369	\$17.37
<b>Hamburg</b>	\$1,079,289	\$21.59	\$1,514,963	\$30.30	\$886,945	\$17.74
<b>Livorno</b>	\$1,132,926	\$22.66	\$1,559,898	\$31.20	\$923,763	\$18.48
<b>Xiamen</b>	\$2,088,713	\$41.77	\$917,981	\$18.36	\$1,494,661	\$29.89
<b>Cartegna</b>	\$1,052,094	\$21.04	\$1,114,404	\$22.29	\$592,572	\$11.85

Inland costs from each grain export origin to Duluth/Superior and the alternative ports were developed based on rail rates provided to Martin Associates by grain traders, as well as transshipment rates for Canadian Lakers as provided to Martin Associates by grain trading houses, as well as from data collected during the Martin Associates' Economic Impact Analysis of the Great Lakes/St. Lawrence Seaway System. Barge rates are developed from the Grain Transportation Report<sup>5</sup> and the inland rates are shown in Exhibit III-10.

**Exhibit III-10**  
**Inland Cost Assumptions for Duluth/Superior**

<b>Inland Cost</b>	US \$						
	Rail to Portland		Rail Rate to St. Louis		Barge Rate	Laker Transship	Rail Cost to Duluth/Superior
	Car Rate	Cost/ton	Car Rate	Cost/ton	Cost/Ton	Cost/ton	Cost/ton
Origin							
Ulen	\$5,173.00	\$51.73	\$3,581.00	\$35.81	\$8.50	\$25.00	\$22.62
Bisbee	\$5,076.00	\$50.76	\$4,345.00	\$43.45	\$8.50	\$25.00	\$29.53
Parshall	\$4,871.76	\$48.72	\$4,580.21	\$45.80	\$8.50	\$25.00	\$30.85

The inland costs were then combined with the voyage costs for a foreign flag voyage from Duluth/Superior to each overseas grain destination, as well as to each alternative routing port. Exhibit III-11 identifies the routings that are competitive for the foreign flag service via Duluth/Superior for each overseas grain destination.

<sup>5</sup> Grain Transportation Report, January 19, 2017, U.S. Department of Agriculture, Agricultural Marketing Service.

**Exhibit III-11**

**Total Logistics Cost Analysis for Duluth/Superior, 2016 U.S. Pilotage Charges**

		Portland	Least Cost	Transshipment Quebec	Least Cost	Rail To St. Louis then NOLA	Least Cost	Salty Direct	Least Cost	2016 Tonnage
<b>Total Logistics Costs to Algiers</b>										
Tonnage from Duuth/Superior to Africa	145,659									
From:										
Ulen		\$81.49	0	\$69.51	0	\$62.02	1	\$62.13	0	0
Bisbee		\$80.52	0	\$76.42	0	\$69.66	0	\$69.04	1	43,698
Parshall		\$78.48	0	\$77.74	0	\$72.01	0	\$70.36	1	7,283
<b>Total Logistics Costs to Felixstowe</b>										
Tonnage from Duluth/Superior to UK	152,088									
From:										
Ulen		\$81.51	0	\$68.86	0	\$61.68	0	\$61.14	1	98,857
Bisbee		\$80.54	0	\$75.77	0	\$69.32	0	\$68.05	1	45,626
Parshall		\$78.49	0	\$77.09	0	\$71.67	0	\$69.37	1	7,604
<b>Total Logistics Costs to Hamburg</b>										
Tonnage from Duluth/Superior to Northern Europe	34,740									
From:										
Ulen		\$82.03	0	\$69.21	0	\$62.05	0	\$61.66	1	22,581
Bisbee		\$81.06	0	\$76.12	0	\$69.69	0	\$68.57	1	10,422
Parshall		\$79.02	0	\$77.44	0	\$72.04	0	\$69.89	1	1,737
<b>Total Logistics Costs to Iivorno</b>										
Tonnage from Duluth/Superior to Mediterranean	507,661									
From:										
Ulen		\$82.93	0	\$70.28	0	\$62.79	1	\$63.28	0	0
Bisbee		\$81.96	0	\$77.19	0	\$70.43	0	\$70.19	1	152,298
Parshall		\$79.92	0	\$78.51	0	\$72.78	0	\$71.51	1	25,383
<b>Total Logistics Costs to Cartagena</b>										
Tonnage from Duluth/Superior to South America	41,409									
From:										
Ulen		\$74.02	0	\$68.66	0	\$56.16	1	\$71.00	0	0
Bisbee		\$73.05	0	\$75.57	0	\$63.80	1	\$77.91	0	0
Parshall		\$71.01	0	\$76.89	0	\$66.15	1	\$79.23	0	0
<b>Base 2016</b>										<b>415,490</b>

As this exhibit shows, under the use of U.S. pilots on all segments except the transits through the Welland Canal and the Snell to St. Lambert Locks, a foreign flag (salty) routing via Duluth/Superior provides a cost-effective routing for 415,490 tons of grain.

*2.2.3 Competitive Position of the Great Lakes/ St. Lawrence Seaway System for Grain Exports via Toledo*

The majority of grain exported from Toledo originates locally. There are two alternative coastal ports that compete with the grain exported via Toledo, the ports of Wilmington, NC and the Port of New Orleans. The grain could be railed to Wilmington from the Toledo area or trucked to Cincinnati and loaded onto a barge for transport to New Orleans (or other Lower Mississippi River ports). With respect to export destinations, grain is exported from Toledo to the Middle East (Port of Alexandria), Africa (the Port of Algiers), the United Kingdom (the Port of Felixstowe), Northern Europe (the Port of Hamburg), Asia (the Port of Xiamen) and Central and South America (the Port of Cartagena). Currently, the Mediterranean is not a major market for grain exported from Toledo.

The inland logistics costs were developed to move the grain by truck to Toledo for the export of the grain via a foreign flag vessel to each of the overseas destinations. The foreign flag voyage costs to these destinations was described previously in Chapter II, but presented again in Exhibit III-12. This Exhibit shows the total voyage cost from Toledo direct to each overseas destination, the cost per ton, and the U.S. pilotage charge and the U.S. pilotage charge per ton.

**Exhibit III-12**  
**Foreign Flag Voyage Costs from Toledo to Export Grain Destinations**

Toledo to:	Alexandria	Algiers	Felixstowe	Hamburg	Livorno	Xiamen	Cartegna
	\$775,347	\$679,901	\$685,905	\$696,347	\$728,684	\$1,321,051	\$679,901
Tons	20,000	20,000	20,000	20,000	20,000	20,000	20,000
Rate/Ton	\$38.77	\$34.00	\$34.30	\$34.82	\$36.43	\$62.79	\$34.00
Tons	20,000	20,000	20,000	20,000	20,000	20,000	20,000
US Pilots	\$65,209	\$65,209	\$65,209	\$65,209	\$65,209	\$65,209	\$65,209
US Pilots/Ton	\$3.26	\$3.26	\$3.26	\$3.26	\$3.26	\$3.26	\$3.26

As shown in the exhibit, the cost of the U.S. pilots is \$65,209, or about \$3.26 per ton compared to a voyage cost ranging between \$34.30 per ton to Felixstowe to about \$62.79 per ton to Xiamen. The difference in the voyage costs reflects the distance traveled after the vessel exits the St. Lawrence Seaway. The voyage costs include stevedoring, canal tolls, port charges, pilotage (U.S. Canadian pilots for the Welland transit and the transit from the Snell Lock to the St. Lambert Lock, and the Laurentian pilots) and also include a bunkering charge along the St. Lawrence River. Also included are Suez Canal tolls and Panama Canal tolls where appropriate.

The voyage costs via the alternative coastal ports are based on the use of a 50,000 DWT vessel, and include terminal/stevedoring charges, and port costs (such as wharfage, dockage, tugs and pilots). The costs for the 50,000 DWT vessel are based on the Martin Associates voyage costing model, as described in Chapter II, and include terminal charges and stevedoring charges based on interviews with terminal operators at each port. The voyage costs for the alternative coastal ports are shown in Exhibit III-13.

**Exhibit III-13**  
**Voyage Costs for Alternative Routings for Toledo**

	Via Wilmington		Via Nola	
Voyage Cost:	Total Voyage Cost	\$/ton	Total Voyage Cost	\$/ton
<b>Alexandria</b>	\$593,158	\$11.86	\$676,164	\$13.52
<b>Algiers</b>	\$798,918	\$15.98	\$885,523	\$17.71
<b>Felixstowe</b>	\$774,903	\$15.50	\$868,369	\$17.37
<b>Hamburg</b>	\$792,307	\$15.85	\$886,945	\$17.74
<b>Livorno</b>	\$837,242	\$16.74	\$923,763	\$18.48
<b>Xiamen</b>	\$1,514,074	\$30.28	\$1,494,661	\$29.89
<b>Cartegna</b>	\$593,158	\$11.86	\$592,572	\$11.85

Inland costs to from the local grain export origins to Toledo and the alternative ports were developed based on rail rates provided to Martin Associates by grain traders and the Illinois Soybean Association for the Wilmington, NC routing. The Martin Associates' truck costing model was used to estimate truck costs to Cincinnati, and barge rates from

Cincinnati to New Orleans (Lower Mississippi River ports) were developed from the Grain Transportation Report<sup>6</sup>. The inland rates are shown in Exhibit III-14.

**Exhibit III-14**  
**Inland Cost Assumptions for Toledo**

Inland Cost Origin:	Rail to Wilmington NC		Truck to Cincinnati		Barge Rate	Truck Cost to Toledo	
	Car Rate	Cost/ton	Daily Cost	Cost/ton	Cost/Ton	Daily Cost	Cost/ton
Local	\$4,226.00	\$42.26	\$900.00	\$27.27	\$11.02	\$900.00	\$13.64

The inland costs were then combined with the voyage costs for a foreign flag voyage from Toledo to each overseas grain destination, as well as to each alternative routing port. Exhibit III-15 identifies the routings that are competitive for the foreign flag service via Toledo for each overseas grain destination.

---

<sup>6</sup> Grain Transportation Report, January 19, 2017, U.S. Department of Agriculture, Agricultural Marketing Service.

**Exhibit III-15**  
**Total Logistics Cost Analysis for Toledo, 2016 U.S. Pilotage Charges**

			Wilmington	Least Cost	Truck to Cincinnati then barge to NOLA	Least Cost	Salty Direct	Least Cost	2016 Tonnage
Total Logistics Costs to Alexandria									
Tonnage from Toledo to Middle East									47,979
From:	Share of Tonnage	Tonnage From							
Local	1	47,979	\$54.12	0	\$51.82	1	\$52.40	0	0
	0	0							
	0	0							
Total Logistics Costs to Algiers									
Tonnage from Toledo to Africa									178,974
From:	Share of Tonnage	Tonnage From							
Local	1	178,974	\$58.24	0	\$56.00	0	\$47.63	1	178,974
	0	0							
	0	0							
Total Logistics Costs to Felixtowe									
Tonnage from Toledo to UK									127,782
From:	Share of Tonnage	Tonnage From							
Local	1	127,782	\$57.76	0	\$55.66	0	\$47.93	1	127,782
	0	0							
	0	0							
Total Logistics Costs to Hamburg									
Tonnage from Toledo to Northern Europe									71,288
From:	Share of Tonnage	Tonnage From							
Local	1	71,288	\$58.11	0	\$56.03	0	\$48.45	1	71,288
	0	0							
	0	0							
Total Logistics Costs to Livorno									
Tonnage from Toledo to Mediterranean									0
From:	Share of Tonnage	Tonnage From							
Local	1	0	\$59.00	0	\$56.77	0	\$50.07	1	0
	0	0							
	0	0							
Total Logistics Costs to Asia China and Japan									
Tonnage from Toledo to Xiamen									63,422
From:	Share of Tonnage	Tonnage From							
Local	1	63,422	\$72.54	0	\$68.19	1	\$76.43	0	0
	0	0						0	
	0	0						0	
Total Logistics Costs to South America/Caribbean									
Tonnage from Toledo to Cartagena									58,507
From:	Share of Tonnage	Tonnage From							
Local	1	58,507	\$54.12	0	\$50.14	0	\$47.63	1	58,507
	0	0						0	
	0	0						0	
									<b>Base 2016</b>
									<b>436,551</b>

As this exhibit shows, under the use of U.S. pilots on all segments except the transits through the Welland Canal and the Snell to St. Lambert Locks, a foreign flag (salty) routing via Toledo provides a cost-effective routing for 436,551 tons of grain.

## IV. Impact of Increases in Pilot Charges on the Competitive Position of the Great Lakes/St. Lawrence Seaway System and Resulting Economic Impacts

The baseline cost analysis developed in the previous chapter provides a framework by which the impact of pilotage cost increases on the cost-effective position of the Great Lakes/St. Lawrence Seaway can be evaluated. Similarly, using the Martin Associates Economic Impact Model of the Great Lakes/St. Lawrence Seaway System, changes in tonnage levels that can be cost effectively served via the Great Lakes/St. Lawrence Seaway can be used to estimate changes in economic impacts to the Great Lakes regional economy.<sup>7</sup>

As presented in Chapters II and III, the U.S. pilotage charges increased significantly between 2015 and 2016. It is to be emphasized that the U.S. pilotage charges used in the analysis are based on the actual invoiced amounts as reported by each U.S. Pilotage District, and supplied to Martin Associates by the Great Lakes Pilotage Office, U.S. Coast Guard. The percentage increase in pilotage charges for grain and steel moving on a Class 4 vessel on each of the three voyage scenarios is presented in Exhibit IV-1. To assess the potential impact on the competitive position of the Great Lakes/St. Lawrence Seaway System and the impact on tonnage moving via the Great Lakes ports, the actual increases in pilotage charges between 2015 and 2016 were entered into the logistics cost model to estimate the impact on tonnage should similar U.S. pilotage cost increases occur over the next year. The tonnage that would no longer be cost effectively routed via a Great Lakes port under each pilotage charge increase (other factors held constant) was then used with the metrics developed from the economic model developed by Martin Associates to measure the economic impacts of the Great Lakes/St. Lawrence Seaway System, as described in Chapter I of this report.

### Exhibit IV-1

#### Pilotage Charges Changes Between 2015 and 2016 for Steel and Grain, by Voyage Scenario

Voyage Scenario	Steel			Grain		
	2015	2016	Change	2015	2016	Change
<b>Voyage 1</b>	\$44,431.22	\$63,325.12	<b>42.52%</b>	\$53,154.85	\$95,620.66	<b>79.89%</b>
<b>Voyage 2</b>	\$40,830.81	\$60,996.61	<b>49.39%</b>	\$54,839.93	\$104,699.96	<b>90.92%</b>
<b>Voyage 3</b>	\$39,667.78	\$61,624.55	<b>55.35%</b>	\$42,461.83	\$65,208.78	<b>53.57%</b>

Exhibit IV-2 shows the estimated tonnage for grain and steel that can no longer be handled more cost effectively via the Great Lakes/St. Lawrence Seaway System under the various U.S. pilotage cost increases. All other costs are held constant, including Canadian pilotage charges, tolls, stevedoring, port charges, etc. The actual increases in U.S. pilotage

---

<sup>7</sup> The development of a point elasticity curve relating changes in foreign flag tonnage to changes in U.S. Pilot rates is not possible due to the limited size of time series data of actual pilotage charges, and the large number of independent variable impacting foreign flag international tonnage levels moving on the Great Lakes/St. Lawrence Seaway. Furthermore, the methodology used on U.S. pilot rate making has changed in 2016, and an elasticity curve based on an out-of-date pricing methodology could not be used in the development of a time series regression model structure to project future changes in tonnage levels, other factors held constant.



charges between 2015 and 2016 for steel and grain under the three voyage scenarios were entered into the total logistics cost models to assess the impact on tonnage under each pilotage charge percentage increase. A sensitivity was also evaluated for a doubling of U.S. pilotage charges on both grain exports and steel imports.

**Exhibit IV-2**  
**Impact of Changes in Pilotage Charges**

<b>Change in U.S. Pilot Charge for Steel Imports</b>	<b>42.50%</b>	<b>49.39%</b>	<b>55.35%</b>	<b>100%</b>
Non-Cost Competitive Steel Tonnage	0	0	0	10,401
<b>Change in U.S. Pilotage Charge for Grain Exports</b>	<b>53.57%</b>	<b>79.89%</b>	<b>90.92%</b>	<b>100%</b>
Non-Cost Competitive Grain Tonnage	585,850	585,850	585,890	596,291

Using the estimated tonnage that would no longer have a least cost routing via the Great Lakes ports under the various U.S. pilotage charge increases, the economic impact to the Great Lakes region was estimated using the Martin Associates' Economic Impact Model of the Great Lakes/St. Lawrence Seaway System. These impacts on the U.S. and Canada are estimated for 585,890 tons of grain that could no longer move cost effectively via the system with a 53.75% to 90.92% increase in U.S. pilotage charge. Similarly, under a 100% increase in the U.S. pilotage charges, 585,890 tons of grain and 10,401 tons of steel could no longer move cost effectively under a doubling of U.S. pilotage charges, other factors held constant. The regional economic impacts associated with these tonnages at risk were also estimated.

Exhibit IV-3 presents the projected economic impacts of the 585,890 tons of grain that would no longer move more cost effectively via the Great Lakes ports if U.S. pilotage charges were to increase by the same percentage that actually occurred between 2015 and 2016, all other factors held constant. This tonnage at risk supports 307 direct, induced and indirect jobs per year in the Great Lakes Regional economy and about \$25.4 million of direct business revenue annually. Finally, the increased level of these U.S. pilotage charges could impact about \$21.7 million annually of direct and indirect income, as well as the re-spending impact and local purchases supported by the 113 direct jobs at risk due to loss of the cost-effective routing of the tonnage.

**Exhibit IV-3**  
**Economic Impact of Loss of the Competitive Routing of Grain Tonnage Due to Increases in U.S. Pilotage Charges Similar to the Same Level of Increases in U.S.**

### Pilotage Charges that Occurred Between 2015 and 2016

	UNITED STATES	CANADA	TOTAL REGION
<b>JOBS</b>			
Direct Jobs	-91	-22	-113
Induced	-90	-10	-100
Indirect	<u>-81</u>	<u>-13</u>	<u>-94</u>
Total	-262	-44	-307
<b>PERSONAL INCOME (1,000)</b>			
Direct	-\$4,196	-\$1,039	-\$5,234
Re-Spending/Local Purchases	-\$12,211	-\$395	-\$12,606
Indirect	<u>-\$3,319</u>	<u>-\$573</u>	<u>-\$3,892</u>
Total	-\$19,726	-\$2,007	-\$21,733
<b>BUSINESS REVENUE (1,000)</b>	-\$19,194	-\$6,181	-\$25,374
<b>LOCAL PURCHASES (1,000)</b>	-\$6,214	-\$1,517	-\$7,731
<b>STATE, PROVINCIAL AND LOCAL TAXES (1,000)</b>	-\$1,933	-\$263	-\$2,196
<b>FEDERAL TAXES (1,000)</b>	-\$3,551	-\$592	-\$4,142

Exhibit IV-4 shows that if U.S. pilotage charges were to increase by 100% across the board, the tonnage that could no longer move cost effectively via the Grata Lakes ports, other factors held constant, support 379 direct, induced and indirect jobs. Also, businesses providing services to handling the impacted tonnage receive about \$36.2 million annually, while total \$27.2 million of regional income is supported by the tonnage at risk.

### Exhibit IV-4

### Economic Impact of the Loss of the Competitive Routing of Steel and Grain Tonnage due to 100% Increases in U.S. Pilotage Charges

	UNITED STATES	CANADA	TOTAL REGIONAL
<b>JOBS</b>			
Direct Jobs	-116	-22	-138
Induced	-115	-10	-125
Indirect	<u>-103</u>	<u>-13</u>	<u>-116</u>
Total	-335	-44	-379
<b>PERSONAL INCOME (1,000)</b>			
Direct	-\$5,358	-\$1,039	-\$6,396
Re-Spending/Local Purchases	-\$15,593	-\$395	-\$15,988
Indirect	<u>-\$4,239</u>	<u>-\$573</u>	<u>-\$4,811</u>
Total	-\$25,189	-\$2,007	-\$27,196
<b>BUSINESS REVENUE (1,000)</b>	-\$30,003	-\$6,181	-\$36,184
<b>LOCAL PURCHASES (1,000)</b>	-\$7,935	-\$1,517	-\$9,452
<b>STATE, PROVINCIAL AND LOCAL TAXES (1,000)</b>	-\$2,468	-\$263	-\$2,731
<b>FEDERAL TAXES (1,000)</b>	-\$4,534	-\$592	-\$5,126

It is important to note that these economic impacts are only a small portion of the impacts that could potentially occur due to the increases in U.S. pilotage charges. The projected impact of nearly 586,000 tons of grain that could no longer be cost effectively served via the Great Lakes ports represents a significant loss of backhaul tonnage for the foreign flag vessels moving imported steel products into the region. Assuming that 20,000 tons of grain exports per vessel is loaded at a Great Lakes port (after the steel imports are

unloaded), the loss of 586,000 tons of grain equates to a loss of about 29 vessel backhauls. This reduction of backhaul potential for the foreign flag vessels moving steel products into the lakes would affect the financial incentive for the vessels to enter the Great Lakes trade, thereby eliminating 29 vessel backhauls. This in turn could result in either a significant increase in rates charged for steel imports (which would divert cargo from the Great Lakes to alternative ports), or the reduction in foreign vessel calls at Great Lakes ports. Under either scenario, approximately 586,000 tons of steel imports are then at risk to be diverted to a coastal port, or charged a much higher rate to move via the Great Lakes ports. This potential diversion to coastal ports of 586,000 tons of steel imports from the Great Lakes/St. Lawrence Seaway System could result in a significant economic impact to the Great Lakes regional economy, as estimated using the Martin Associates Great Lakes/St. Lawrence Seaway System Model, all other factors impacting the level of steel and grain tonnage moving on the Great Lakes held constant. Exhibit IV-5 shows that the potential impact of the diversion of 586,000 tons of steel to coastal ports, or the loss of 29 steel vessel backhauls on the Great Lakes, could potentially impact nearly 4,100 direct, induced and indirect jobs in the Great Lakes Regional economy, and put in jeopardy about \$609 million of annual direct business revenue. This, combined with the potential loss of 300 direct, induced and indirect jobs associated with the grain exports that could no longer move cost effectively via the Great Lakes, would increase the potential job impacts at risk to about, 4,400 jobs annually in the Great Lakes region. Greater increases in U.S. pilotage charges could further impact the economy of the Great Lakes region, other factors held constant. It is important to note that these impacts to the Great Lakes regional economy are not necessarily net losses to the total U.S. and Canadian economies, as resulting increased impacts at the coastal ports to which the tonnage could be diverted are likely. However, the degree that to which impacts would be transferred to the coastal ports depends on the ability to handle additional throughput with the existing capacity at the coastal ports, including terminal capacity, vessel capacity and surface modal capacity.

**Exhibit IV-5**  
**Potential Economic Impact of the Loss of Backhauls for 586,000 Tons of Steel due to**  
**U. S. Pilotage Charges Increases of the same Magnitude that Occurred**  
**Between 2015 and 2016**

	<b>TOTAL REGIONAL</b>
<b>JOBS</b>	
<b>Direct Jobs</b>	-1,423
<b>Induced</b>	-1,405
<b>Indirect</b>	<u>-1,262</u>
<b>Total</b>	-4,091
<b>PERSONAL INCOME (1,000)</b>	
<b>Direct</b>	-\$65,464
<b>Re-Spending/Local Purchases</b>	-\$190,521
<b>Indirect</b>	<u>-\$51,790</u>
<b>Total</b>	-\$307,775
<b>BUSINESS REVENUE (1,000)</b>	-\$609,010
<b>LOCAL PURCHASES (1,000)</b>	-\$96,952
<b>STATE, PROVINCIAL AND LOCAL TAXES (1,000)</b>	-\$30,158
<b>FEDERAL TAXES (1,000)</b>	-\$55,400

Finally, the logistics cost model can also be used to estimate the potential economic impacts developed of a reduction in U.S. pilot charges. For example, if U.S. pilotage charges were reduced by 50% (in contrast to doubling as would be the case with a 100% increase), the Great Lakes/St. Lawrence Seaway System could provide a cost-effective routing for an additional 425,000 tons of grain, other factors held constant. The economic impact of the additional 425,000 tons of grain are presented in Exhibit IV-6. Such a reduction in U.S. pilotage charges could result in the potential creation of nearly 270 direct, induced and indirect jobs in the regional economy, other factors held constant. The additional 425,000 tons of grain that could be more cost effectively served via the Great Lakes/St. Lawrence Seaway System under the U.S. Pilotage charges reduction would also provide more backhaul capacity for the imported steel markets, thereby potentially reducing steel rates as more capacity is added onto the system.

**Exhibit IV-6**  
**Potential Economic Impact of a 50% Reduction in U.S. Pilotage Charges on**  
**Grain Markets**

<b>TOTAL REGIONAL</b>	
<b>JOBS</b>	
<b>Direct Jobs</b>	93
<b>Induced</b>	92
<b>Indirect</b>	<u>83</u>
<b>Total</b>	268
<b>PERSONAL INCOME (1,000)</b>	
<b>Direct</b>	\$4,288
<b>Re-Spending/Local Purchases</b>	\$12,480
<b>Indirect</b>	<u>\$3,393</u>
<b>Total</b>	\$20,161
<b>BUSINESS REVENUE (1,000)</b>	\$19,617
<b>LOCAL PURCHASES (1,000)</b>	\$6,351
<b>STATE, PROVINCIAL AND LOCAL TAXES (1</b>	\$1,976
<b>FEDERAL TAXES (1,000)</b>	\$3,629

In summary, there are many factors driving the level of international marine cargo moving on foreign flag vessels into and out of the Great Lakes/St. Lawrence Seaway System. For example, factors affecting the level of steel imports into the Great Lakes include domestic and international economic conditions, import trade restrictions, value of the U.S. dollar, migration of steel consuming industries away from the Great Lakes region, restricted shipping season of the Great Lakes/St. Lawrence Seaway System, terminal/stevedoring charges, rail and truck availability and rates to competing ports, vessel size restrictions due to the dimensions of the locks on the System (hence impacting the economies of shipping on a per ton basis), insurance requirements, and Seaway System tolls. Additional factors that drive grain exports on the Great Lakes/St. Lawrence Seaway System, include weather conditions and crop production, domestic vs. export prices, inland waterway river levels, barge and rail car capacity to serve coastal ports, vessel size restriction on the Great Lakes/St. Lawrence Seaway, world demand by region, tolls, and elevator capacity at Great Lakes and Coastal ports. These factors impacting steel and grain tonnage levels on the Great Lakes/St. Lawrence Seaway System are for the most part, exogenous to the system. However, the U.S. pilotage charge is a factor I that could potentially impact the competitive position of the Great Lakes/St. Lawrence Seaway System ports, over which the U.S. Coast Guard, Great Lakes Pilotage Office, has direct control in setting rate levels. As demonstrated in this report, the U.S. pilotage charge has increased significantly between 2015 and 2016, and accounts for nearly 10% of the total voyage costs of foreign flag vessel operations into the Great Lakes/St. Lawrence Seaway System. Should charges increase at the same level as

occurred between 2015 and 2016, other factors held constant, the tonnage that could no longer be cost effectively handled at the Great Lakes ports compared to coastal port alternatives supports about 4,400 direct, induced and indirect jobs in the region annually. This represents nearly 2% of the total economic impact of the Great Lakes/St. Lawrence Seaway System generated by both domestic and international cargo moved on foreign flag vessels, or about 25% of the regional economic impact supported by the international cargo moving on foreign flag vessels.