
Great Lakes & Mississippi River Interbasin Study GLMRIS

Baseline Assessment of Cargo Traffic on the Chicago Area Waterway System

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Product of the GLMRIS Team

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EXECUTIVE SUMMARY

For the purposes of commercial cargo navigation analysis, the Chicago Area Waterway System (CAWS) is defined to include all the commercially-navigable channels between Lockport Lock and Dam and Lake Michigan. This would include the Chicago Sanitary and Ship Canal upstream of mile 291.1 (Lockport Lock and Dam), the navigable portions of the North Branch of the Chicago River, the South Branch of the Chicago and the Chicago River itself. It would include, as well, the Cal-Sag Channel and commercially-navigable portions of the Little Calumet River, the Calumet River and Lake Calumet. Commercial navigation in these river reaches is supported by the Lockport, Thomas J. O'Brien and Chicago Harbor locks and dams. It should be noted that this definition of the CAWS may or may not coincide with definitions for other project purposes. The CAWS has a direct waterway linkage to the Great Lakes/St. Lawrence Seaway. It is also linked to the majority of the nation's inland navigation system through the Illinois Waterway.

The CAWS, in one configuration or another, has long served the transportation needs of Chicago-area manufacturers, particularly the iron and steel manufacturers, as well as the construction and electric utility industries. In 2008, commodity traffic, as reported in the Waterborne Commerce Statistics, reached a level of about 15.9 million tons, made up principally of coal (26 percent), aggregates (18 percent), iron and steel (17 percent), petroleum fuels (13 percent) and chemicals (10 percent). The year 2008 was chosen for display because it appears that waterborne traffic on the inland waterways, in general, was suppressed in 2009 owing to the effects of the national recession. The highest level of traffic on the CAWS in recent memory was attained in 1994, when traffic spiked at about 25 million tons. Disregarding this spike, which was likely associated with the dismantling of an area steel mill, CAWS traffic over the last 15 years could be characterized as flat to declining.

The traffic orientation on the CAWS in 2008 was mostly (73 percent) upbound, meaning that it moves toward Lake Michigan. The traffic can also be characterized as either inbound to the CAWS, outbound from the CAWS, internal to the CAWS or through the CAWS. Inbound traffic dominated at 41 percent of total traffic, followed by internal (28 percent), outbound (19 percent) and through (12 percent). Internal traffic on the CAWS is noteworthy for its volume and the fact that 87 percent of it passes through no lock whatsoever. Lakewise traffic by way of the CAWS has for many years served the needs of steel producers at Indiana Harbor, Gary and Burns Harbor, all in Indiana.

The shipments and receipts by Economic Area show that two thirds of 2008 CAWS commodity shipments originated and three quarters of receipts terminated at locations within the Chicago-Naperville-Michigan City Economic Area (referred to simply as the Chicago Economic Area), which includes portions of Illinois, Wisconsin and Indiana. The CAWS is contained entirely within this Economic Area. The 2008 traffic data, as well, show a strong linkage to the Lower Mississippi and Gulf Coast. The New Orleans, Lafayette and Baton Rouge economic areas collectively accounted for 23 percent of shipments via the CAWS and eight percent of the commodity receipts.

The vessel fleet and lock utilization on the CAWS is heavily influenced by the physical and regulatory constraints on the waterways and the fact that the Lockport, O'Brien and Chicago locks are three different sizes. Upbound tows typically re-fleet above Lockport and exchange towboats for other boats with retractable pilot houses. The retractable pilot houses are necessary to clear low-hanging bridges throughout the Chicago Area. Refleeting is necessary because of limited channel width, channel circuitry and other restrictions such as the limitation of two barges on the Chicago River and the north and south branches. Shippers are sometimes forced to light load because of shoaling in certain areas of the CAWS.

As would be expected, the highest tonnages, largest tows, and greatest numbers of tows and barges on the CAWS typically pass through the Lockport Lock. The smallest tows, least tonnage and the smallest numbers of tows and barges pass through Chicago Harbor Lock. In 2010, Lockport processed a total of 2,460 commercial tows and 9,644 barges, or an average of about 6.7 tows and 26.4 barges per day. The comparable daily values were 4.2 tows and 13.9 barges for O'Brien and 0.5 tows and 0.5 barges for Chicago. The average tow through Lockport in 2010 consisted of 3.9 barges carrying 4,006 tons, compared to 3.3 barges loaded with 3,309 tons at O'Brien and 1.1 barges loaded with 614 tons at Chicago.

PART 1. CHICAGO AREA WATERWAY SYSTEM COMMODITY TRAFFIC

1. INTRODUCTION

This report is prepared as part of the Great Lakes Mississippi River Interbasin Study (GLMRIS). The data presented in this section are from the Waterborne Commerce Statistics (WCS), as collected and maintained by the Corps of Engineers Waterborne Commerce Statistics Center (WCSC). Recompilations and additional analyses are prepared by the Navigation Planning Center of Expertise for Inland Navigation (PCXIN). The WCS are compiled from confidential monthly reports submitted by individual towing companies. Among other pieces of information, the WCS contain dock-to-dock commodity movement data by individual commodity group. The dock-to-dock movement data, in some form, are essential to navigation system modeling.

2. DEFINITION OF THE STUDY AREA

The focus of this data collection effort is the navigable portions of the Chicago Area Waterway System (CAWS). The CAWS is depicted in Figure 1. For the purposes of commercial navigation analysis the primary study area is defined to include the Chicago Sanitary and Ship Canal (CSSC) from the Lockport Lock (mile 291.1) to its confluence with the South Branch of the Chicago River; the South Branch of the Chicago River; the North Branch of the Chicago River to mile 331.5; and the Chicago River itself to Chicago Harbor. The CAWS study area also encompasses the Calumet-Saganashkee (Cal-Sag) channel from its confluence with the CSSC at mile 303.5 to the Little Calumet River; the Little Calumet River itself; the Calumet River to Calumet Harbor and the port facilities at Lake Calumet. The CAWS has about 154 active cargo-handling terminals along its banks.

Navigation on the CAWS is supported by three facilities: the Lockport Lock and Dam on the CSSC at mile 291.1; the Thomas J. O'Brien Lock and Dam on the Calumet River at mile 326.4; and the Chicago Harbor Lock and Dam on the Chicago River at mile 326, which is actually part of the Chicago Harbor. River miles are measured from the mouth of the Illinois River and are duplicated for reaches above the confluence of the CSSC and the Cal-Sag channel. The Thomas J. O'Brien Lock is referred to hereafter as the O'Brien Lock and the Chicago Harbor Lock is referred to hereafter as the Chicago Lock. Each of the projects has a single navigation lock and each of the locks is sized differently. The Lockport facility measures 600'x110', while O'Brien and Chicago measure 1000'x110' and 600x80, respectively.

The CAWS links the U.S. shallow draft navigation system to U.S. and Canadian ports on the Great Lakes and to import/export markets by way of the St. Lawrence Seaway. Additionally, the CAWS provides access to other parts of the inland waterway system by way of the Illinois waterway. On the inland waterway system, shippers can access points as distant as Pittsburgh on the Ohio River; Minneapolis-St. Paul on the Upper Mississippi; New Orleans on the Lower Mississippi; and locations on the Gulf Coast, including import/export terminals.

FIGURE 1. THE CHICAGO AREA WATERWAY SYSTEM



3. EXISTING TRAFFIC

Table 1 shows the 2008 commodity traffic through the CAWS locks relative to the CAWS and the overall Illinois Waterway. The year 2008 was chosen for display because it appears that waterborne commodity traffic in most parts of the inland navigation system, the CAWS included, was suppressed in 2009 owing to effects of the national recession. In 2008, about 15.9 million tons of commodity traffic moved on the CAWS, accounting for about 43 percent of traffic on the entire Illinois Waterway. About 71 percent of this traffic moved through the Lockport facility; 36 percent moved through O'Brien and only about 0.3 percent moved through Chicago Lock.

The commodity traffic distributions from Table 1 for the CAWS as well as the Chicago, O'Brien and Lockport locks are illustrated in Figures 2 - 5. The leading commodity group on the CAWS in 2008 was coal and coke, which comprised about 26 percent of total traffic. Aggregates was next in importance (18 percent), followed by iron and steel (17 percent), petroleum fuels (15 percent), chemicals (10 percent), ores and minerals (9 percent) and grains (2 percent). Collectively, these commodity groups

TABLE 1

CAWS and Illinois Waterway Commodity Traffic, 2008
(Thousand Tons)

Commodity	CAWS Locks			CAWS	Illinois Waterway
	Chicago	O'Brien	Lockport		
Coal & Coke	0	1,575	1,726	4,101	4,459
Petroleum Fuels	15	430	1,862	2,040	6,502
Crude Petroleum	0	0	0	0	1
Aggregates	0	91	1,097	2,873	3,000
Grains	0	224	258	258	11,311
Chemicals	28	286	1,399	1,542	4,448
Ores & Minerals	0	542	1,408	1,408	2,287
Iron & Steel	5	2,069	2,706	2,715	3,913
All Other	0	564	813	986	1,379
TOTAL	48	5,781	11,271	15,923	37,300

SOURCE: Waterborne Commerce Statistics

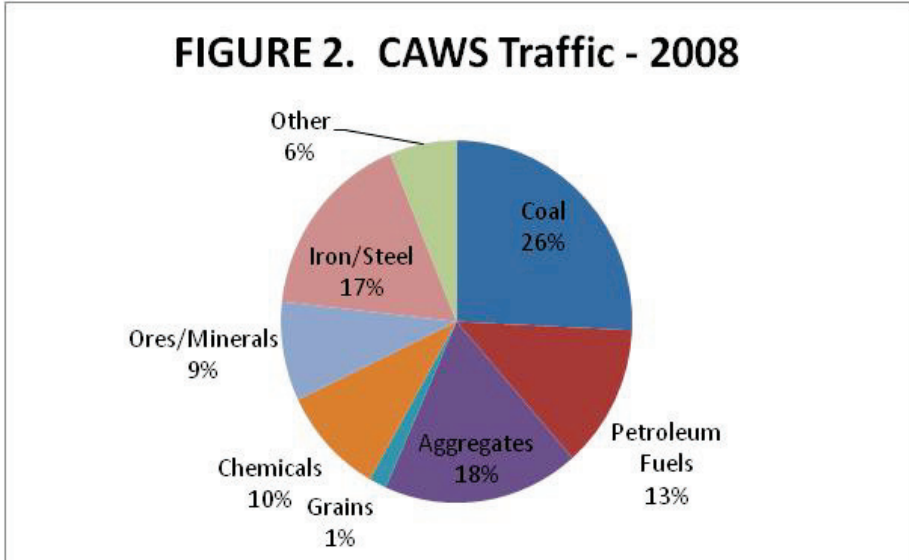


FIGURE 3. Lockport Traffic - 2008

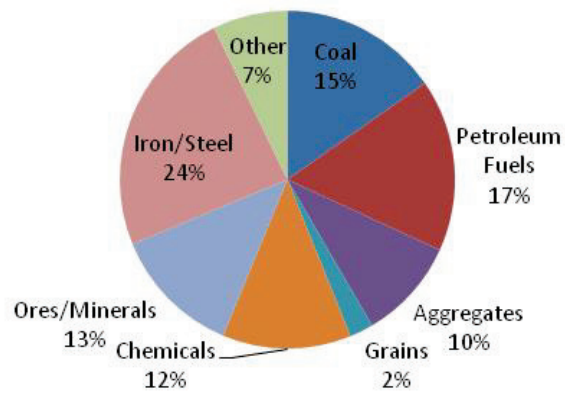


FIGURE 4. O'Brien Traffic - 2008

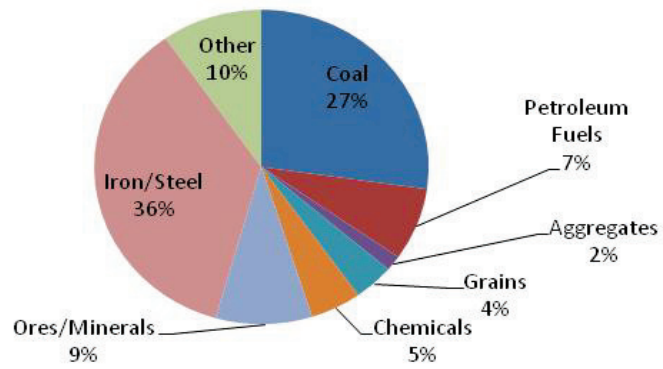
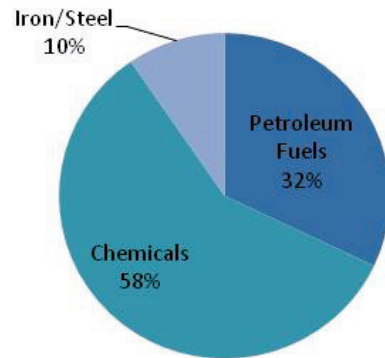


FIGURE 5. Chicago Traffic - 2008



made up 94 percent of total traffic on the system. The remaining tonnage, classified as all other, was made up largely of building cement, slag, wood chips, sugar, fabricated metal products and machinery.

Tonnage densities on the CAWS generally diminish toward Lake Michigan. The Lockport Lock is the lowermost and most heavily used of the CAWS locks, followed by O'Brien Lock and Chicago Lock. In 2008, Lockport processed about 11.3 million tons of commodity traffic, representing about 71 percent of traffic on the CAWS. O'Brien Lock processed about 5.8 million tons or about 36 percent of the total, and Chicago Lock processed about 48,000 tons or 0.3 percent. In 2008, the CAWS also handled about 3.9 million tons of internal traffic that never transited any lock whatsoever.

4. HISTORIC TRAFFIC TRENDS

a. Overall Trends. Commodity traffic for the CAWS, the individual locks and the overall Illinois Waterway for the period 1994-2009 is presented in Table 2. The highest level of commodity traffic on the CAWS over this time period was attained in 1994, when 24.6 million tons moved on the system. Lock Performance Monitoring System (LPMS) data for the CAWS locks suggest that 1994 was the peak traffic year for the CAWS locks for a period extending at least as far back as 1989. After 1994, CAWS traffic diminished and then leveled off in the 16-18 million ton range for several years. In 2005, traffic reached a level of about 21.0 million tons. After 2005, total traffic decreased every year, reaching a level of about 13.4 million tons by 2009. The steep drop off in traffic between 2008 and 2009 was likely an effect of the national recession. Overall, the decrease in traffic between 1994 and 2009, from 24.6 million tons to 13.4 million tons, represented an annual decline of about 4.0 percent. Over the same time period, traffic on the Illinois Waterway declined at a lower rate, about 2.2 percent.

Because of the configuration of the CAWS, there are few similarities among the locks in terms of traffic patterns or traffic volumes. The Lockport Lock is the most heavily used of the facilities, with traffic volumes ranging between 19.1 (1994) and 9.2 (2009) million tons. O'Brien Lock is the next most heavily used, with tonnages ranging between 11.7 (1994) and 4.1 (2009) million tons. Chicago Lock has the least commodity traffic of the three, with tonnages ranging between 812,000 (1994) and 24,000 (2009) tons. Although commodity traffic is quite low at Chicago Lock, the facility is heavily utilized, especially during the summer months for tour boat and recreational traffic.

Although a large majority of CAWS traffic typically transits the Lockport Lock, the data in Table 2 indicate that between 1994 and 2009, Lockport's share of CAWS traffic diminished from 78 to 69 percent. Similarly, O'Brien's share of total CAWS traffic diminished from 48 to 31 percent and Chicago's share diminished from 3 to 0.2 percent. Traffic at each of these locks diminished at a faster rate than traffic on the CAWS, pointing out the importance of internal traffic that doesn't transit any of the locks. Internal traffic increased as a share of total traffic from 18 percent in 1994 to 31 percent in 2009.

b. Commodity Group Trends. The changes in commodity traffic by major commodity group on the CAWS for selected years between 1994 and 2009 are shown in Table 3 and depicted graphically in Figure 6. Similar displays for the Lockport, O'Brien and Chicago locks are provided in Table 4 and Figures 7 - 9. Year-by-year WCSC commodity traffic data for the CAWS and each of the locks is displayed in Appendix A.

TABLE 2					
CAWS and Illinois Waterway Commodity Traffic, 1994-2009 (Thousand Tons)					
Year	CAWS Locks			CAWS	Illinois Waterway
	Lockport	O'Brien	Chicago		
1994	19,085	11,773	812	24,598	50,777
1995	14,152	11,106	308	19,704	47,287
1996	14,034	11,802	160	20,493	46,137
1997	14,587	9,348	163	18,900	42,933
1998	15,086	7,773	290	18,185	41,740
1999	14,539	6,805	174	17,500	43,646
2000	11,884	7,241	264	17,341	44,161
2001	13,820	5,483	253	16,905	43,418
2002	14,240	6,041	124	17,061	43,025
2003	13,959	5,927	128	19,465	45,000
2004	15,556	8,200	170	20,573	45,225
2005	15,424	8,173	106	21,047	44,018
2006	13,893	7,275	125	19,927	43,599
2007	11,455	6,053	149	16,929	41,122
2008	11,271	5,781	48	15,923	37,300
2009	9,242	4,118	24	13,376	36,410
Annual % Growth	-4.7%	-6.8%	-21.0%	-4.0%	-2.2%

SOURCE: Waterborne Commerce Statistics

Although traffic volumes have fluctuated over the 15-year period, the 2009 traffic level on the CAWS represented a decrease of 11.2 million tons from 1994, diminishing from 24.6 to 13.4 million tons. The 2009 traffic levels represented an increase relative to 1994 for only one commodity group, ores and minerals.

The coal and coke group, consisting of coal and a slightly larger amount of petroleum coke, has fluctuated between 10 (2002) and 37 (1996) percent of total commodity traffic on the CAWS over the 1994-2009 period. As of 2009, coal and coke comprised about 31 percent of the total. Overall, coal and coke traffic decreased at an annual rate of about 2.9 percent over the 15 year period. Coal and

TABLE 3

CAWS Traffic by Commodity Group, 1994-2009
(Thousand Tons)

Commodity	1994	2000	2005	2006	2007	2008	2009	Annual % Growth 94-09
Coal & Coke	6,512	2,675	5,873	5,308	4,582	4,101	4,181	-2.9
Petroleum Fuels	3,777	2,455	1,705	1,896	2,187	2,040	1,453	-6.2
Crude Petroleum	17	0	0	0	0	0	15	-0.7
Aggregates	3,532	3,616	4,148	4,375	3,340	2,873	2,142	-3.3
Grains	1,597	692	680	293	365	258	415	-8.6
Chemicals	1,965	2,001	1,317	1,559	1,587	1,542	1,335	-2.5
Ores & Minerals	1,329	750	957	930	645	1,408	1,577	1.1
Iron & Steel	4,173	3,295	4,123	3,754	2,734	2,715	1,491	-6.6
All Other	1,696	1,857	2,243	1,810	1,489	986	766	-5.2
Total	24,598	17,341	21,047	19,927	16,929	15,923	13,376	-4.0

SOURCE: Waterborne Commerce Statistics

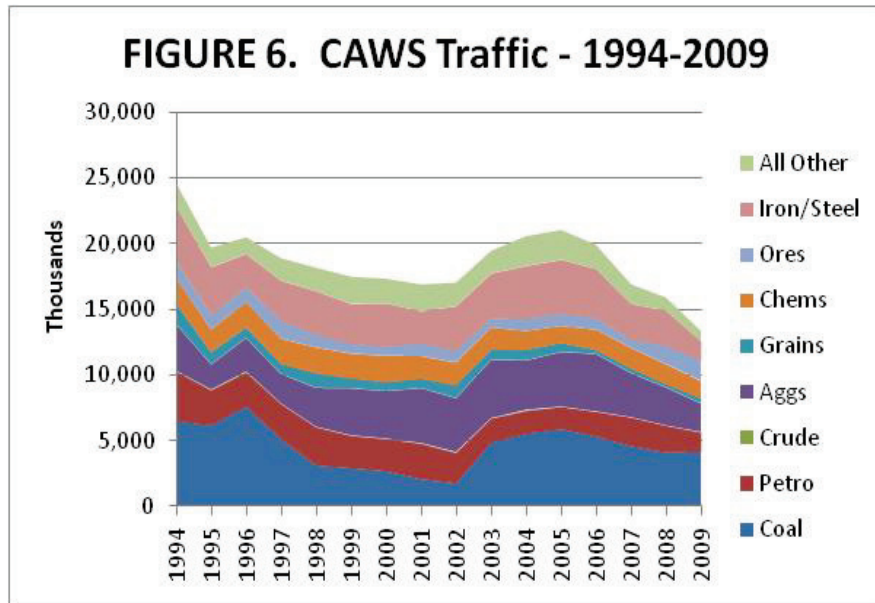


TABLE 4

CAWS Lock Traffic by Commodity, 1994-2008
(Thousand Tons)

Lock/ Commodity	1994	2000	2005	2006	2007	2008	2009	Annual % Growth 94-09
Lockport:								
Coal & Coke	3,631	1,886	2,667	2,038	1,459	1,726	1,405	-6.1
Petroleum Fuels	2,569	1,250	1,318	1,584	2,063	1,862	1,369	-4.1
Crude Petroleum	17	0	0	0	0	0	11	-2.4
Aggregates	2,399	1,960	2,309	2,155	1,513	1,097	1,004	-5.6
Grains	1,592	11	674	293	365	258	415	-8.6
Chemicals	1,739	1,603	1,183	1,413	1,417	1,399	1,283	-2.0
Ores & Minerals	1,329	744	957	930	645	1,408	1,577	1.1
Iron & Steel	4,164	2,757	4,093	3,718	2,717	2,706	1,490	-6.6
All Other	1,644	1,673	2,223	1,762	1,276	813	688	-5.6
Total	19,085	11,884	15,424	13,893	11,455	11,271	9,242	-4.7
O'Brien:								
Coal & Coke	4693	1942	2438	2019	1571	1575	1158	-8.9
Petroleum Fuels	843	463	291	308	551	431	183	-9.7
Crude Petroleum	0	0	0	0	0	0	0	--
Aggregates	404	249	241	323	124	91	19	-18.5
Grains	1,025	265	482	251	342	224	349	-6.9
Chemicals	613	322	131	211	273	286	216	-6.7
Ores & Minerals	413	357	340	308	269	542	716	3.7
Iron & Steel	3,100	2,910	3,276	2,970	1,993	2,069	993	-7.3
All Other	683	733	974	886	929	564	484	-2.3
Total	11,773	7,241	8,173	7,275	6,053	5,781	4,118	-6.8
Chicago:								
Coal & Coke	114	14	23	26	2	0	0	-100.0
Petroleum Fuels	376	57	7	12	14	15	0	-100.0
Crude Petroleum	0	0	0	0	0	0	0	
Aggregates	1	20	0	0	0	0	0	-100.0
Grains	65	0	5	0	0	0	18	-8.3
Chemicals	153	91	70	76	129	28	3	-22.7
Ores & Minerals	25	0	0	3	0	0	0	-100.0
Iron & Steel	76	55	1	8	3	5	3	-19.2
All Other	3	28	0	2	0	0	0	-100.0
Total	812	264	106	125	149	48	24	-21.0

SOURCE: Waterborne Commerce Statistics

FIGURE 7. Lockport Traffic 1994-2009

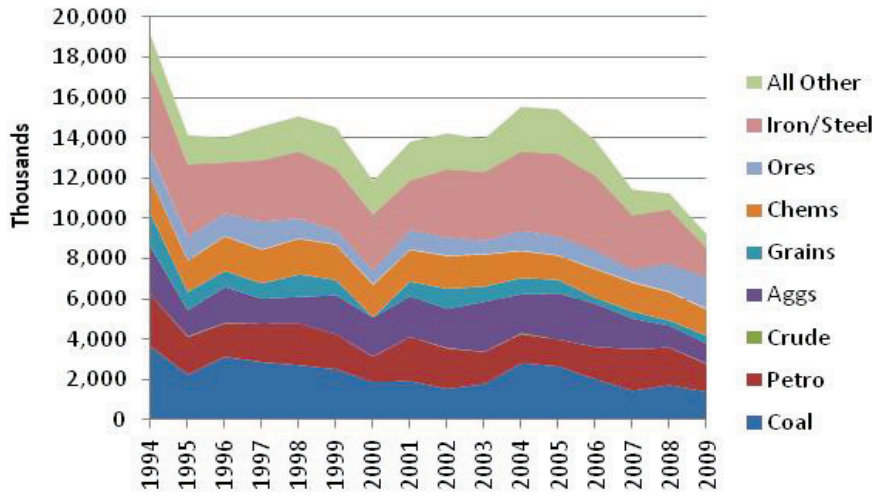
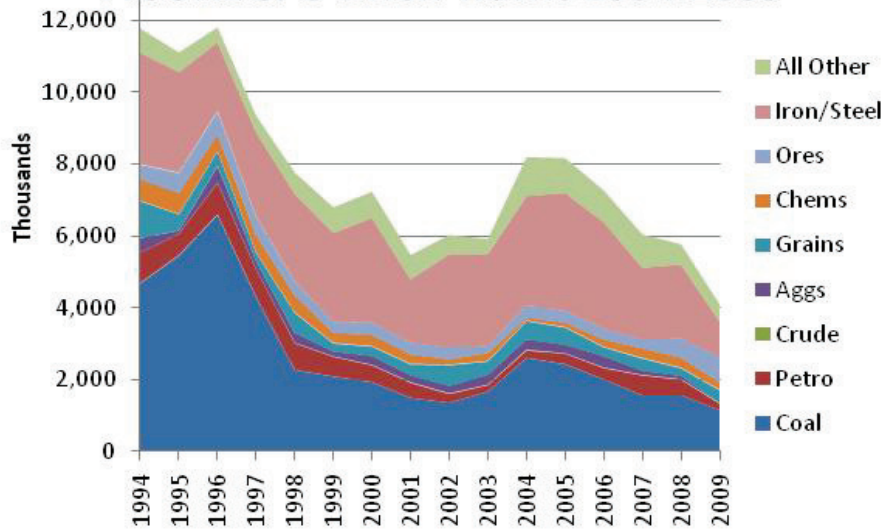
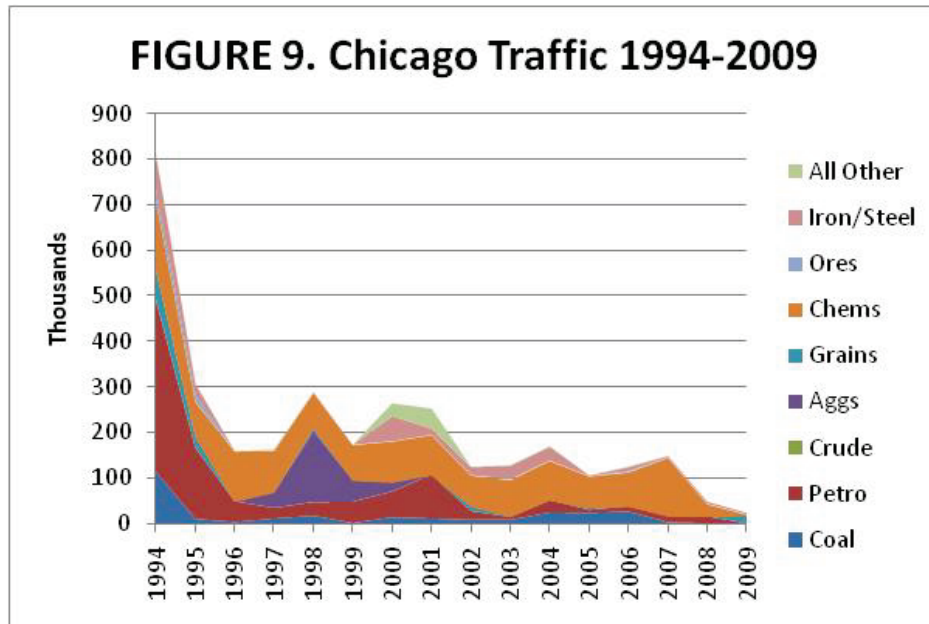


FIGURE 8. O'Brien Traffic 1994-2009





coke traffic moving on the CAWS serves the electric utility, iron and steel, lime, cement, and chemical industries, as well as other industrial consumers. Most of the petroleum coke traffic moving on the CAWS originates at refineries in the Chicago area, the upper Midwest and at refineries on the Lower Mississippi/Gulf Coast. Most of the coal traffic moving on the CAWS is actually Western coal that accesses the waterway on the CAWS itself. Central Appalachian coking coal frequently originates along the Middle Ohio River. The reduction in coal and coke traffic over the 1994-2009 period is accounted for by a shift to direct rail delivery for an area electric utility plant and the closure of Chicago-area coking facilities.

The petroleum products group, consisting primarily of distillate fuel oil, asphalt, residual fuel oil, gasoline and lubricating oils and greases accounted for between 8 (2005) and 16 (1998) percent of commodity traffic on the CAWS over the 1994 – 2009 period. In 2009, petroleum products was about 11 percent of total traffic. Petroleum products traffic diminished at a rate of 6.2 percent over the historic period. Petroleum products traffic moving on the CAWS typically serves the Chicago area transportation and construction sectors. Petroleum products traffic originates at Chicago area refineries and storage facilities, as well as other refineries in the Upper Midwest, the Lower Mississippi and the Gulf Coast. Typically, petroleum products are destined for storage facilities and eventual distribution in the Chicago area. Waterborne petroleum products traffic is generally weighted toward the heavier products, since the Chicago area is well served by petroleum products pipelines which typically handle light products.

Crude petroleum movements are rare and relatively small on the CAWS. When they occur, these movements typically originate in midwestern production areas or along the Lower Mississippi/Gulf Coast and are destined for Chicago area refineries.

Aggregates traffic on the CAWS is dominated by sand and gravel (98 percent), with much smaller quantities of gypsum, waterway improvement materials and limestone. Over the 1994-2009 period, aggregates traffic ranged between 10 (1995) and 25 (2001) percent of total traffic. The 2009 tonnage comprised 16 percent of the total. Aggregates traffic decreased at an annual rate of 3.3 percent over the historic period. Aggregates traffic typically supports construction activities in the Chicago area. Sand and gravel traffic ordinarily originates in quarries along the CAWS/Illinois Waterway and moves to area aggregates yards for distribution to construction sites.

Grains traffic on the CAWS comprises movements of wheat, soybeans, animal feed, corn, rice and oilseeds. Grains normally make up a very small percentage of total traffic on the CAWS, ranging between 1 and 6 percent. For 2009, grains was about 3 percent of the total. Between 1994 and 2009, grains traffic declined at an annual rate of about 8.6 percent. Grains traffic typically serves grain and food processors in the Chicago area, as well as the export grain market. Grains traffic typically originates at terminals on the CAWS itself and the broader Chicago area, the Tennessee River in Alabama, the Upper Mississippi and the lower Ohio River. Grains traffic using the CAWS moves to a wide range of grain processors on the CAWS and in the Chicago area and to export terminals on the Lower Mississippi/Gulf Coast.

Chemicals traffic on the CAWS is divided between industrial chemicals and chemical fertilizers. Industrial chemicals moving on the CAWS include alcohols, sodium hydroxide, basic chemicals, benzene and toluene and crude products from coal tar. Chemical fertilizers include nitrogenous chemical fertilizers, fertilizers and fertilizer materials not elsewhere classified and potassic chemical fertilizers. Chemicals traffic on the CAWS has ranged between 6 (2005) and 12 (2000) percent of total traffic over the 1994-2009 period. In 2009, chemicals comprised 10 percent of the total. Between 1994 and 2009, chemicals traffic decreased at an annual rate of 2.5 percent. Chemicals traffic serves the needs of downstream industrial chemical and fertilizer producers as well as the iron and steel industry and other manufacturers in the Chicago area. A large majority of the chemicals traffic originates on the Lower Mississippi and Gulf Coast, but a sizeable share also originates on the CAWS and in the broader Chicago area. Most of the chemicals traffic using the CAWS is destined for the Chicago area, but a portion also moves to the Lower Mississippi and Gulf Coast.

The ores and minerals group on the CAWS is dominated by salt (79 percent), but also includes clays, bauxite, manganese ore, nonferrous metal scrap, nonferrous metal ores and nonmetallic minerals. Between 1994 and 2009, ores and minerals traffic has ranged between 4 and 12 percent of total traffic. In 2009, ores and minerals traffic accounted for about 12 percent of total traffic. Over the historic period, ores and minerals traffic increased at an annual rate of 1.2 percent. The salt traffic is used primarily for roadway application during winter weather, while the remaining traffic serves the needs of Chicago area manufacturers. A large majority of the traffic in this category originates along the Lower Mississippi and Gulf Coast. The principal destination for this traffic is salt distributors as well as iron and steel and other metals manufacturers in the Chicago urban area.

Traffic in the iron and steel group consists of iron and steel scrap, pig iron, iron and steel plates, ferroalloys, iron ore, iron and steel bars and rods, primary iron and steel products, and iron and steel pipe and ingots. Over the 1994-2009 period, iron and steel ranged between 11 (2009) and 20 (2005) percent of total traffic on the CAWS. Over the same 15-year period, iron and steel traffic diminished at an annual rate of 6.6 percent. Iron and steel traffic on the CAWS serves the raw material input needs of steel mills in the Chicago area and elsewhere, as well as the intermediate iron and steel product needs of downstream steel manufacturers both in the Chicago area and other markets, especially along the

Lower Mississippi and Gulf Coast. Iron and steel traffic, including iron ore, scrap and intermediate iron and steel products, originates along the Gulf Coast and Lower Mississippi, some of it at import terminals; along the Ohio and Tennessee rivers; along the Upper Mississippi and at Chicago-area docks. Iron and steel traffic utilizing the CAWS is destined for Chicago-area terminals on the CAWS and elsewhere, the Lower Mississippi and Gulf Coast, the Ohio, the Tennessee and the Upper Mississippi.

CAWS traffic in the all others category is dominated by movements of cement, slag, wood chips, sugar, fabricated metal products and machinery. Over the 1994-2009 period, all others traffic ranged between 6 (2009) and 12 (2001) percent of total traffic. Also over the historic period, all others traffic decreased at an annual rate of 5.2 percent. Traffic in the all others category serves the raw material and intermediate input needs of a wide variety of distributors and manufacturers. Origins and destinations of this traffic are widespread, covering much of the inland waterway system in the eastern half of the country.

5. COMMODITY TRAFFIC BY DIRECTION OF MOVEMENT

Commodity traffic on the CAWS by commodity group and by direction of movement for 2008 is provided in Table 5. The traffic is identified, first of all, as being inbound to the CAWS, outbound from the CAWS, internal to the CAWS, thru the CAWS and total. Within those categories, the traffic is also identified as being upbound or downbound. Traffic by direction of movement for the Lockport, O'Brien and Chicago locks is presented in Table 6.

The overall orientation of traffic on the CAWS was about 73 percent upbound (toward the lake) in 2008. The upbound traffic was dominated by coal and coke, aggregates, iron and steel, and ores and minerals, which collectively accounted for about 76 percent of upbound traffic. Downbound traffic was mostly iron and steel, petroleum fuels, coal and coke, and all other. These four groups comprised about 81 percent of downbound traffic.

Among the inbound, outbound, internal and thru breakdowns, inbound traffic dominated, with about 41 percent of total traffic. Internal traffic comprised 28 percent of total traffic, followed by outbound (19 percent) and thru (12 percent). A large majority (98 percent) of the inbound traffic was upbound, made up mostly of ores and minerals, iron and steel, chemicals and petroleum fuels, together making up about 67 percent of inbound traffic. Internal traffic on the CAWS is noteworthy for its volume and the fact that 87 percent of it passes through no lock whatsoever. Upbound internal traffic predominated and was mostly (92 percent) made up of coal and coke and aggregates. Outbound traffic was largely (99 percent) downbound, with 83 percent of that traffic comprising iron and steel, petroleum fuels, coal and coke and chemicals. Thru traffic was close to evenly split between upbound and downbound traffic. Upbound thru traffic was largely (84 percent) coal and coke, iron and steel, petroleum fuels and ores and minerals. Downbound thru traffic was mostly iron and steel, petroleum fuels and all other, which together accounted for 96 percent of the total.

Similar to the CAWS overall, Table 6 shows that upbound traffic dominates the traffic pattern at all three lock projects. At Lockport, 66 percent of the traffic in 2008 was upbound, while at O'Brien and Chicago, upbound traffic was 67 and 100 percent respectively. Upbound traffic through Lockport was mostly iron and steel, ores and minerals, chemicals and coal and coke. Downbound traffic was made up largely of iron and steel, petroleum fuels and coal and coke. At O'Brien, the upbound traffic was mostly coal and coke, iron and steel and ores and minerals, while downbound traffic was principally iron and

TABLE 5

CAWS Traffic by Direction of Movement, 2008
(Thousand Tons)

Commodity	Total			Inbound			Outbound			Internal			Thru		
	Upbound	Downbound	Total	Upbound	Downbound	Total	Upbound	Downbound	Total	Upbound	Downbound	Total	Upbound	Downbound	Total
Coal & Coke	3454	647	4101	730	0	730	15	622	637	2339	22	2360	371	3	374
Petroleum Fuels	1035	1006	2040	836	26	862	30	669	699	48	74	123	121	236	357
Crude Petroleum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aggregates	2636	237	2873	831	0	831	0	224	224	1763	13	1776	43	0	43
Grains	109	149	258	97	0	97	0	123	123	0	0	0	11	26	37
Chemicals	1114	428	1542	1033	103	1136	0	287	287	1	38	39	79	0	79
Ores & Minerals	1395	13	1408	1285	0	1285	0	10	10	0	0	0	110	3	113
Iron & Steel	1399	1316	2715	1189	0	1189	0	892	892	0	9	9	210	415	625
All Other	474	512	986	451	0	451	0	149	149	2	171	173	21	192	214
Total	11615	4308	15923	6453	129	6581	44	2976	3020	4152	327	4479	967	875	1842

SOURCE: Waterborne Commerce Statistics

TABLE 6									
CAWS Lock Traffic By Direction, 2008 (Thousand Tons)									
Commodity	Chicago			O'Brien			Lockport		
	Upbound	Downbound	Total	Upbound	Downbound	Total	Upbound	Downbound	Total
Coal & Coke	0	0	0	1,401	174	1,575	1,101	625	1,726
Petroleum Fuels	15	0	15	156	274	431	957	906	1,862
Crude Petroleum	0	0	0	0	0	0	0	0	0
Aggregates	0	0	0	91	0	91	874	224	1,097
Grains	0	0	0	98	126	224	109	149	258
Chemicals	28	0	28	180	107	286	1,112	287	1,399
Ores & Minerals	0	0	0	528	13	542	1,395	13	1,408
Iron & Steel	5	0	5	1,316	753	2,069	1,399	1,307	2,706
All Other	0	0	0	79	484	564	472	341	813
Total	48	0	48	3,849	1,932	5,781	7,419	3,852	11,271

SOURCE: Waterborne Commerce Statistics

steel, all others and petroleum fuels. The traffic at Chicago was confined to upbound chemicals and petroleum fuels.

6. LAKEWISE TRAFFIC

Tables 7 and 8 show commodity shipments and receipts from and to locations on the Great Lakes that moved by way of the CAWS in 2008. These lakewise movements were very nearly evenly divided between shipments and receipts, around 1 million tons each. A large majority (884,618 tons) of lakewise shipments originated in the State of Indiana, specifically at Indiana Harbor (71 percent), Gary (17 percent) and Burns Harbor (12 percent). The Indiana traffic was made up largely of iron and steel (46 percent), petroleum fuels (28 percent), all others (22 percent) and grains (3 percent). Much smaller amounts of traffic originated in the states of Michigan (90,068 tons), Wisconsin (9,554 tons) and at foreign, especially Canadian, sources (20,047 tons).

Unlike shipments, all of the commodity receipts at Great Lakes locations moved to the Indiana ports in 2008. Indiana harbor dominated, with 74 percent of the total, while Burns Harbor and Gary received 20 and 6 percent of total receipts respectively. Commodity receipts were dominated by coal and coke (38 percent), iron and steel (21 percent), petroleum fuels (15 percent) and ores and minerals (11 percent).

7. LOCK COMMONALITY OF TRAFFIC

Table 9 shows the commonality of CAWS lock traffic with other selected locks, mostly on the Illinois Waterway, in 2008. The table shows the CAWS lock (Chicago, O'Brien or Lockport) tonnage moving

TABLE 7

Lakewise Shipments To/Thru CAWS - 2008
(Thousand Tons)

Commodity	Total Lakewise Shipments	Indiana			Total Indiana	Wisconsin	Michigan	Foreign
		Indiana Harbor	Gary	Burns Harbor				
Coal & Coke	3	0	3	0	3	0	0	0
Petroleum Fuels	262	246	0	0	246	0	0	15
Crude Petroleum	0	0	0	0	0	0	0	0
Aggregates	0	0	0	0	0	0	0	0
Grains	26	0	0	23	23	3	0	0
Chemicals	103	0	0	9	9	0	90	5
Ores & Minerals	3	0	0	3	3	0	0	0
Iron & Steel	415	241	118	49	408	6	0	0
All Other	192	137	33	22	192	0	0	0
Total	1,004	625	154	106	885	10	90	20

SOURCE: Waterborne Commerce Statistics

TABLE 8

Lakewise Receipts From/Thru CAWS - 2008
(Thousand Tons)

Commodity	Total Lakewise Receipts	Indiana			Total Indiana	Wisconsin	Michigan	Foreign
		Indiana Harbor	Gary	Burns Harbor				
Coal & Coke	385	376	7	2	385	0	0	0
Petroleum Fuels	150	144	0	7	150	0	0	0
Crude Petroleum	0	0	0	0	0	0	0	0
Aggregates	43	42	0	2	43	0	0	0
Grains	11	0	0	11	11	0	0	0
Chemicals	79	0	0	79	79	0	0	0
Ores & Minerals	110	29	36	45	110	0	0	0
Iron & Steel	210	143	14	53	210	0	0	0
All Other	21	20	0	1	21	0	0	0
Total	1,011	753	57	200	1,011	0	0	0

SOURCE: Waterborne Commerce Statistics

TABLE 9

Commonality of CAWS Lock Traffic with Other Selected Locks - 2008

(1) Lock	Chicago Tons thru (1)	% of Chicago Tons thru (1)	% of (1)'s Tons thru Chicago	O'Brien Tons thru (1)	% of O'Brien Tons thru (1)	% of (1)'s Tons thru O'Brien	Lockport Tons thru (1)	% of Lockport Tons thru (1)	% of (1)'s Tons thru Lockport
Chicago	48,093	100%	100.00%	0	0%	0%	4,610	0%	10%
O'Brien	0	0%	0.00%	5,781,313	100%	100%	5,049,105	45%	87%
Lockport	4,610	10%	0.04%	5,049,105	87%	45%	11,270,585	100%	100%
Brandon Road	4,610	10%	0.04%	5,049,105	87%	45%	11,267,909	100%	100%
Dresden	4,610	10%	0.03%	4,322,971	75%	32%	10,028,756	89%	75%
Marseilles	4,610	10%	0.03%	4,186,842	72%	30%	9,393,127	83%	68%
Starved Rock	4,610	10%	0.03%	4,185,392	72%	28%	9,391,677	83%	62%
Peoria	4,610	10%	0.02%	4,117,460	71%	19%	8,796,003	78%	41%
Lagrange	4,610	10%	0.02%	4,116,142	71%	16%	8,777,487	78%	34%
Miss. Lock 25	0	0%	0.00%	211,407	4%	1%	708,149	6%	3%
Melvin Price	4,610	10%	0.01%	3,904,735	68%	7%	8,069,338	72%	15%
Ohio Lock 52	0	0%	0.00%	509,670	9%	1%	894,811	8%	1%

SOURCE: Waterborne Commerce Statistics

through the lock in column 1, the percentage of the CAWS lock's tonnage moving through the lock in column 1 and the percentage of the column 1 lock's tonnage moving through the CAWS lock. In addition to the Illinois Waterway locks, column 1 shows Mississippi Lock 25, which is just upstream of the mouth of the Illinois Waterway; Melvin Price Lock, which is just downstream of the mouth of the Illinois Waterway; and Ohio River Lock 52. This illustrates upstream or downstream movement on the Mississippi, as well as movement onto the Ohio River System.

For the Chicago Lock, the table shows a very small amount of traffic (4,610 tons), amounting to 10 percent of the total, moving through each of the locks on the Illinois Waterway and downstream through Melvin Price on the Mississippi. The O'Brien lock shows diminishing tonnages moving through the Illinois Waterway locks. The O'Brien traffic shows a strong orientation toward the Lower Mississippi, with 3.9 million tons of traffic (68 percent of the total) moving through Melvin Price Lock. The lock has much weaker linkages with the Ohio River System and the Upper Mississippi, with 509,670 tons moving through Ohio Lock 52 (9 percent of total traffic) and 211,407 tons moving through Mississippi Lock 25 (4 percent of the total). Lockport traffic behaves in a manner similar to the O'Brien Lock. Lockport traffic diminishes at locks downstream on the Illinois Waterway. The traffic shows, again, a strong orientation toward the Lower Mississippi, with 8.1 million tons (72 percent of total traffic) moving through Melvin Price. Lockport has a much weaker linkage with the Ohio River System and the Upper Mississippi, with 894,811 tons (8 percent of total traffic) moving through Ohio River Lock 52 and 708,149 tons (6 percent of total traffic) moving through Mississippi Lock 25.

8. ORIGIN-DESTINATION PATTERNS

a. **State-to-State Flows.** CAWS traffic patterns were examined as well in terms of commodity movements between states. The 2008 shipping and receiving states for CAWS traffic are shown in Table 10 and illustrated in Figure 10.

Commodity traffic touching the CAWS is shipped/received from states as distant as Texas, Louisiana and Florida on the Gulf Intercoastal Waterway (GIWW) and Lower Mississippi; Minnesota on the Upper Mississippi; Pennsylvania and West Virginia on the Ohio; Tennessee and Alabama on the Tennessee/Cumberland; and Michigan, Wisconsin and the province of Ontario on the Great Lakes. Notwithstanding this geographic reach, about 60 percent of shipments and 74 percent of receipts originated in and/or were destined for the state of Illinois, largely in the Chicago area. Louisiana is another major shipping state, with 24 percent of the total, which includes imports. Other important shipping states include Indiana (6 percent), Texas (3 percent), Missouri (2 percent) and Alabama (1 percent). Important receiving states, in addition to Illinois include Louisiana (8 percent), Indiana (6 percent), Arkansas (3 percent) and Texas (3 percent).

b. **Economic Area-to-Economic Area Flows.** In addition to the state-to-state flows, the CAWS traffic was also examined in terms of shipments and receipts by Economic Area (EA). Economic areas, as defined by the Bureau of Economic Analysis, consist of a major city or Metropolitan Statistical Area that serves as a center of economic activity and outlying counties that are economically connected to the center. Economic areas frequently involve multi-state areas. The CAWS, for example, is contained within the Chicago-Naperville-Michigan City Economic Area which includes portions of Illinois, Wisconsin and Indiana, referred to hereafter simply as the Chicago EA.

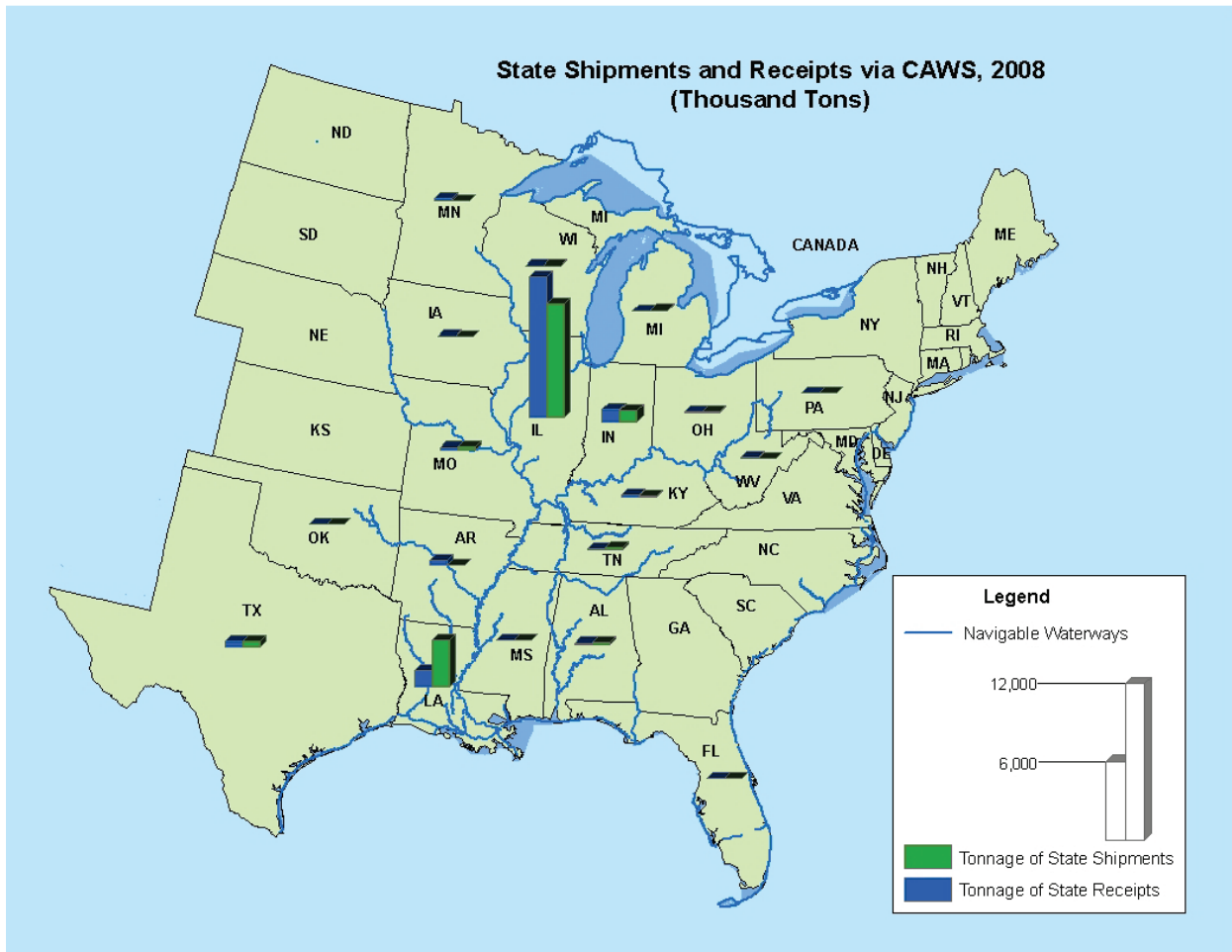
TABLE 10

State Shipments and Receipts via CAWS by State, 2008
(Thousand Tons)

State	Shipments	Receipts
Alabama	214	126
Arkansas	77	470
Florida	0	9
Iowa	2	32
Illinois	9,509	11,746
Indiana	892	1,014
Kentucky	131	164
Louisiana	3,901	1,304
Michigan	90	0
Minnesota	5	163
Missouri	310	233
Mississippi	38	25
Ohio	62	120
Oklahoma	11	25
Pennsylvania	26	3
Tennessee	137	35
Texas	476	415
Wisconsin	10	6
West Virginia	14	34
Foreign	20	0
TOTAL	15,923	15,923

SOURCE: Waterborne Commerce Statistics

FIGURE 10



Shipments and receipts, by EA, of commodity traffic moving by way of the CAWS are displayed in Table 11. In 2008, nearly two thirds of the shipments originated and a little over three quarters of the receipts terminated at locations within the Chicago EA. The 2008 traffic again shows a strong linkage to the Lower Mississippi and Gulf Coast. The New Orleans EA accounted for 14 percent of the shipments and 7 percent of the receipts. The Lafayette EA accounted for 5 percent of shipments and 0.3 percent of receipts and the Baton Rouge EA accounted for 4 percent of shipments and 0.7 percent of receipts. Other important shipping EAs included St Louis (3 percent), Peoria (2 percent), Houston (2 percent) and Lake Charles (1 percent). Other major receiving EAs included Houston (2 percent), Peoria (2 percent), St. Louis (2 percent) and Knoxville (1 percent).

TABLE 11

Economic Area Commodity Traffic via CAWS, 2008
(Thousand Tons)

No.	EA Designation	Shipments	Receipts
11	Atlanta-SandySprings-Gainesville,GA-AL	0	3
15	Baton Rouge-Pierre Part, LA	686	118
16	Beaumont-Port Arthur, TX	149	48
19	Birmingham-Hoover-Cullman, AL	21	2
25	Cape Girardeau-Jackson, MO-IL	32	2
29	Charleston, WV	61	16
32	Chicago-Naperville-Michigan City, IL-IN-WI	9,976	12,415
33	Cincinnati-Middletown-Wilmington, OH-KY-IN	42	147
40	Columbus-Marion-Chillicothe, OH	2	9
41	Corpus Christi-Kingsville, TX	58	0
43	Davenport-Moline-Rock Island, IA-IL	2	32
54	Evansville, IN-KY	5	17
75	Houston-Baytown-Huntsville, TX	264	340
76	Huntsville-Decatur, AL	125	113
80	Jackson-Yazoo City, MS	7	16
82	Jonesboro, AR	31	222
88	Knoxville-Sevierville-La Follette, TN	20	231
89	LaCrosse,WI-MN	0	6
90	Lafayette-Acadiana, LA	861	52
91	Lake Charles-Jennings, LA	168	28
96	Little Rock-North Little Rock-Pine Bluff, AR	53	19
98	Louisville-Elizabethtown-Scottsburg, KY-IN	64	79
104	McAllen-Edinburg-Pharr, TX	5	26
105	Memphis, TN-MS-AR	116	12
108	Milwaukee-Racine-Waukesha, WI	10	0
109	Minneapolis-St. Paul-St. Cloud, MN-WI	5	163
112	Mobile-Daphne-Fairhope, AL	58	12
116	Nashville-Davidson-Murfreesboro-Columbia,TN	0	21
117	New Orleans-Metairie-Bogalusa, LA	2,184	1,105
122	Paducah, KY-IL	32	52
123	PanamaCity-LynnHaven,FL	0	9
126	Peoria-Canton, IL	271	287
129	Pittsburgh-New Castle, PA	34	34
158	Springfield, IL	2	2
160	St. Louis-St. Charles-Farmington, MO-IL	422	253
168	Traverse City, MI	90	0
170	Tulsa-Bartlesville, OK	11	25
171	Tupelo, MS	36	9
0	Foreign	20	0
	TOTAL	15,923	15,923

SOURCE: Waterborne Commerce Statistics

9. COMPARISON OF WATERBORNE COMMERCE WITH LOCK PERFORMANCE MONITORING SYSTEM DATA

It should be noted that the data presented in this section are largely from the Corps of Engineers Waterborne Commerce Statistics (WCS). The WCS contain detailed vessel trip and cargo data, including dock-to-dock commodity movements, which are essential to most types of navigation system modeling. The WCS databases are compiled from detailed Vessel Operating Reports (VOR) that, by law, are submitted by towing companies to the Waterborne Commerce Statistics Center on a monthly basis. The WCS are used to analyze the feasibility of new projects and to set priorities for new investment and for the operation, rehabilitation and maintenance of existing projects.

In addition to the WCS, the Corps of Engineers maintains a second commodity data collection system as part of the Lock Performance Monitoring System (LPMS). The LPMS provides Corps operators, planners, and managers with information on the use and performance of the Corps' national system of locks. LPMS data is collected at most Corps-owned and/or Corps-operated locks. Data is collected at each lock by Corps personnel through visual inspection and direct communication with towboat operators. The information is then transmitted electronically to a central database which is managed and distributed by NDC. The data includes the number of vessels and barges locked; type and dates of lockages; barge type and size; commodity type; tons carried and direction of movement.

Although the WCS are reported as origin-destination movements, the movements are subsequently accumulated at the locks for comparison with LPMS and for other uses. Frequently, discrepancies are observed between the LPMS tonnage data and the WCS tonnages. In most such instances, the WCS tonnages at the locks exceed the LPMS tonnages. This typically occurs because the LPMS tonnages are estimates based on the observations of lock personnel, whereas the WCS tonnages represent the actual loadings as reported by the towing companies. The LPMS tonnage estimates are usually limited based on the technical specifications of the barges, when, in reality, shippers typically load barges beyond their technical specifications.

Table 12 compares the tonnages from the WCS with those from the LPMS for the Lockport, O'Brien and Chicago locks for the period 2005-2009. Table 13 does a similar comparison of barge counts at the locks. The data in Table 12 indicate that the LPMS tonnages are consistently higher than the WCS tonnages. At Lockport, the difference in 2009 amounts to about 11 percent, at O'Brien 13 percent and at Chicago 230 percent. Similar percentage discrepancies exist between the WCS and LPMS barge counts in Table 13. Since the barge counts are based on observation by Corps personnel, this would suggest that there is no underreporting occurring in the LPMS system. It would also point to a possible underreporting problem in the WCS system. Such underreporting is not uncommon on the inland waterway system, particularly in situations such as the CAWS where barges are routinely transferred between linehaul carriers and local towing companies.

TABLE 12

Comparison of Lock Tonnages From Waterborne Commerce and
the Lock Performance Monitoring System

Year	Lockport			O'Brien			Chicago		
	WCSC	LPMS	% Diff	WCSC	LPMS	% Diff	WCSC	LPMS	% Diff
2005	15,424	16,930	9.8%	8,173	9,048	10.7%	106	111	5.0%
2006	13,893	17,249	24.2%	7,275	9,480	30.3%	125	128	1.9%
2007	11,455	13,508	17.9%	6,053	7,295	20.5%	149	168	12.9%
2008	11,271	12,461	10.6%	5,781	6,822	18.0%	48	105	119.3%
2009	9,242	10,241	10.8%	4,118	4,641	12.7%	24	79	230.0%

SOURCE: Waterborne Commerce Statistics and Lock Performance Monitoring System

TABLE 13

Comparison of Loaded Barge Counts From Waterborne Commerce and
the Lock Performance Monitoring System

Year	Lockport			O'Brien			Chicago		
	WCSC	LPMS	% Diff	WCSC	LPMS	% Diff	WCSC	LPMS	% Diff
2005	9,774	10,637	8.8%	5,139	5,604	9.0%	24	36	50.0%
2006	8,884	10,672	20.1%	4,771	5,922	24.1%	27	52	92.6%
2007	6,892	8,124	17.9%	3,794	4,475	17.9%	26	50	92.3%
2008	6,690	7,440	11.2%	3,574	4,259	19.2%	6	39	550.0%
2009	5,528	6,204	12.2%	2,608	2,902	11.3%	13	50	284.6%

SOURCE: Waterborne Commerce Statistics and Lock Performance Monitoring System

PART 2. VESSEL FLEET AND LOCK UTILIZATION

1. INTRODUCTION

An important goal of towing companies operating on the inland navigation system is to select equipment and to configure tows to operate as efficiently as possible along each waterway, balanced against efficiencies for the entire waterway movement. A variety of factors enters into equipment selection and tow configuration, including length of haul, lock size constraints, backhaul opportunities, and channel configuration and constraints. This section examines navigation conditions and constraints on the CAWS as well as tow, equipment and lockage characteristics for the waterway segment. The data presented in this section is drawn from the Lock Performance Monitoring System. Compilations and analyses are prepared by the Planning Center for Expertise for Inland Navigation (PCXIN).

2. NAVIGATION OPERATIONS AND CONSTRAINTS

It is important to note that the CAWS locks are three different sizes, which can influence tow configurations and lock operations. The Lockport Lock measures 600'x110', which is consistent with downstream Illinois Waterway locks. Lockport is the only lock that has a tow haulage unit and also the only one of the three that regularly has up to two-cut lockages. The O'Brien Lock measures 1000'x110' and the Chicago Lock is 600'x80'. The difference in lock sizes has not been problematic because the locks operate below capacity and because tow sizes and configurations are constrained by channel and other restrictions at various points in the CAWS.

Tows navigating on the CAWS frequently re-fleet and exchange towboats in the vicinity of Lemont, above the Lockport facility at around mile 299.5. Tows destined for locations above Lemont re-fleet to negotiate channel conditions along the route to the destination terminal. Tows destined for locations below Lemont re-fleet for linehaul movement on the Illinois Waterway and beyond. For tows that are sufficiently large, the re-fleeting process takes place farther downstream, between mile 292 and mile 293. This is necessary for the larger tows because above mile 293 the tows must be 70 feet wide or less to enable tows to pass in the reaches where passing is feasible.

Tows moving upstream from the re-fleeting areas normally switch towboats from boats with fixed pilot houses to those with retractable pilot houses. Tows moving downstream normally do the reverse. Towboats with retractable pilot houses are necessary upstream of the re-fleeting areas because the CAWS has approximately 120 bridges crossing the waterway, many of which have low-hanging structures. The retractable feature is necessary for the towboats to clear the low-hanging bridge structures and for pilots to be able to see over barges when moving empties. Tows that enter Lake Michigan from the CAWS will sometimes switch towboats to navigate the lake. If this happens, it is frequently because the pilot is not licensed to operate on the lake. Sometimes towboats are switched out for tugboats, which, in contrast to the towboats, have pointed bows which give the boats greater stability when navigating on the lake.

The navigation channels on the CAWS have numerous constraints that influence the size, configuration and loading of tows, as well as tow speeds. In some areas, notably the Calumet River, channel circuitry is limiting on tow size and tow configuration. In other areas, like the North Branch of the Chicago

River, tows have to be light-loaded to navigate because of reduced channel depth due to shoaling. Abandoned bridge piers are a problem in certain areas. Narrow channels and circuitry in some areas result in one-way traffic. An electric fish barrier, located above Lockport at about mile 296.5, restricts navigation to one-way traffic with no passing. In addition, no mooring is allowed in the area, no one can be on deck and the barges must be tethered together with steel cables. Additionally, the City of Chicago limits tow sizes on the North Branch, South Branch and the Chicago River itself to two barges. Because of navigation channel restrictions, many areas of the CAWS are speed restricted, i.e. no wake zones.

The numerous bridges on the CAWS pose some special restrictions to navigation, in addition to the low steel under fixed bridges that was previously mentioned. Navigation channels narrow at bridges. Drawbridges frequently don't open upon request, requiring tows to wait while holding position. Clear height under opening bridges is sometimes a problem when the bridge does not open completely. Some bridges have restrictions on their hours of operation and some bridges occasionally break down and can't open. Each bridge is unique.

As a matter of policy, the locks on the CAWS are open for commercial navigation 24 hours a day year – round. As practical matter, weather conditions can be limiting. High water and current conditions can halt navigation on the CAWS. The Chicago and O'Brien Locks sometimes close during high water events to help limit polluted water entering Lake Michigan. Icing conditions at the any of the locks can prevent the complete opening of the lock gates which can necessitate a restriction on tow widths for tows using the chambers.

3. VESSEL TRAFFIC

a. **Existing Vessel Traffic and Trends.** Table 14 summarizes vessel traffic for the CAWS projects for selected years between 2000 and 2010. The highest tonnages, largest tows, and greatest numbers of tows and barges on the CAWS pass through the Lockport Lock. The smallest tows, least tonnage and the smallest numbers of tows and barges pass through Chicago Harbor Lock. In 2010, Lockport processed a total of 2,460 commercial tows and 9,644 barges, or an average of about 6.7 tows and 26.4 barges per day. The comparable daily values were 4.2 tows and 13.9 barges for O'Brien and 0.5 tows and 0.5 barges for Chicago. The average tow through Lockport in 2010 consisted of 3.9 barges carrying 4,006 tons, compared to 3.3 barges loaded with 3,309 tons at O'Brien and 1.1 barges loaded with 614 tons at Chicago.

Tow sizes and barge loadings at the CAWS locks are frequently influenced by factors other than simple lock capacity. Barges transiting the CAWS locks sometimes originate at or are destined for terminals on channels with depth restrictions, for example on the North Branch and South Branch of the Chicago River. In order to access these areas, shippers are sometimes compelled to light-load barges. Tows transiting the CAWS locks (particularly the Chicago Lock) are influenced by a City of Chicago regulation limiting tow sizes on the Chicago River and the North and South branches to two barges. Tow sizes at the O'Brien Lock are influenced by channel restrictions on the Calumet River.

Within recent memory, the highest levels of barge traffic at the CAWS locks actually occurred in the mid-1990s. The more recent data depicted in Table 14 indicate that, owing to decreased tonnage levels, the number of barges transiting each of the CAWS locks, with the exception of Chicago Lock, has been diminishing since 2006. The Chicago Lock handles small tonnages and has somewhat irregular

TABLE 14								
Tonnage, Barges and Tows Transitting Lockport, O'Brien and Chicago Locks Selected Years, 2000-2010								
Project/Item	2000	2005	2006	2007	2008	2009	2010	% Change 2000-10
Lockport:								
Tons (000)	16,789	16,930	17,249	13,508	12,461	10,241	9,854	-41.3
Barges	17,224	17,024	17,430	13,411	11,906	10,414	9,644	-44.0
Tows	2,865	2,735	2,979	2,647	2,459	2,345	2,460	-14.1
Barges per Tow	6.0	6.2	5.9	5.1	4.8	4.4	3.9	-34.8
Tons per Tow	5,860	6,190	5,790	5,103	5,067	4,367	4,006	-31.6
O'Brien:								
Tons (000)	8,436	9,048	9,480	7,295	6,822	4,641	5,132	-39.2
Barges	8,800	9,101	9,681	7,573	7,063	4,946	5,065	-42.4
Tows	2,281	2,207	2,362	2,082	1,921	1,388	1,551	-32.0
Barges per Tow	3.9	4.1	4.1	3.6	3.7	3.6	3.3	-15.4
Tons per Tow	3,698	4,100	4,013	3,504	3,551	3,344	3,309	-10.5
Chicago:								
Tons (000)	146	111	128	168	105	79	102	-30.3
Barges	162	45	69	78	53	60	175	8.0
Tows	110	44	62	71	48	59	166	50.9
Barges per Tow	1.5	1.0	1.1	1.1	1.1	1.0	1.1	-28.4
Tons per Tow	1,331	2,530	2,061	2,363	2,198	1,335	614	-53.8
SOURCE: Lock Performance Monitoring System								

commercial traffic patterns. Between 2006 and 2010, the numbers of barges processed at Lockport and O'Brien have diminished by 45 and 26 percent, respectively. The number of barges transiting Chicago, on the other hand, increased by 154 percent.

Table 15 shows tow size distributions at the CAWS locks for selected years between 2000 and 2010. Although the average tow on the CAWS falls into the 3-4 barge range, a fairly wide range of tow sizes is encountered. In 2010, the Lockport Lock had an average tow size of 3.9 barges, but tow sizes ranged to more than 10 barges. The largest concentration of tows was in the 1-2 barge range, with sizeable concentrations occurring in the 3-4 and 5-6 barge ranges. At the O'Brien facility, the most frequently occurring tow sizes were in the 1-2 barge range, but large concentrations also occurred in the 3-4 and 5-6 barge ranges. Tow sizes at the Chicago lock were exclusively in the 1-2 barge range.

TABLE 15

Tow Size Distributions
Lockport, O'Brien and Chicago Locks
Selected Years, 2000 - 2010

Barges/ Tow	Lockport				O'Brien				Chicago			
	2000	2005	2008	2010	2000	2005	2008	2010	2000	2005	2008	2010
1-2	23%	18%	29%	37%	37%	30%	39%	45%	100%	100%	100%	100%
3-4	18%	21%	26%	29%	22%	23%	26%	32%	0%	0%	0%	0%
5-6	21%	22%	21%	22%	38%	45%	35%	23%	0%	0%	0%	0%
7-10	26%	24%	17%	10%	4%	3%	0%	0%	0%	0%	0%	0%
>10	13%	15%	6%	2%	0%	0%	0%	0%	0%	0%	0%	0%
TOTAL	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%

SOURCE: Lock Performance Monitoring System

The percentage of empty barges that move on a given waterway segment indicates the level of backhaul opportunities available. Fifty percent empty generally indicates the total absence of backhauls, with barges moving loaded in one direction and empty in the other direction. In 2010, 38 percent of the barges transiting Lockport, 37 percent at O'Brien and 29 percent at Chicago were empty. This implies that 12 percent (.50 minus .38) of the barges at Lockport, 13 percent (.50 minus .37) at O'Brien and 21 percent (.50 minus .29) at Chicago were loaded both upbound and downbound through the locks. In general, backhaul opportunities on the CAWS appear to be limited.

b. Vessel Characteristics. The CAWS locks are unusual from the standpoint that they are three different sizes, although they are relatively close in proximity. The Lockport lock measures 600'x110', which makes it compatible with downstream locks on the Illinois Waterway. The O'Brien lock measures 1000'x110', although traffic levels are typically half those of the Lockport facility. The Chicago lock measures 600'x80'. The diversity of shippers in the Chicago area accounts for a variety of barge types and sizes at the locks.

The towboats utilized on the CAWS are typically divided into two types: linehaul vessels that generally navigate the Illinois Waterway downstream of the CAWS and other parts of the inland navigation system and towboats specifically geared toward navigation on the CAWS. The CAWS towboats are equipped with retractable pilot houses which enable them to clear low steel at numerous bridges in the Chicago area.

Linehaul vessels normally handle tows up to and shortly beyond the Lockport facility. Once tows enter the Lockport pool the barges are normally handed off to a towboat with a retractable pilot house, typically at Lemont. The most common towboat transiting the Lockport Lock in 2010 was a 1200-horsepower vessel (76.5'x24.0'), although the towboats ranged between 500 and 6,140 horsepower.

At the O'Brien facility, the most commonly seen towboat in 2010 was a 2000-horsepower vessel (80.8'x30.0'). The range in the towboats was between 500 and 4,200 horsepower. The most commonly seen towboat at the Chicago facility was a 1,000-horsepower vessel (79.8'x21.1'), although the range in towboats was between 800 and 2,600 horsepower.

Table 16 shows the major barge types transiting the CAWS locks in 2010. The barge counts by type account for about 91 percent of the barges at Lockport, 97 percent of the barges at O'Brien and 78 percent of the barges at Chicago. Among these barge types, covered hopper barges of various sizes

Barge Type	Length	Width	Lockport	O'Brien	Chicago
Covered Hopper Barge	195-199 ft	28-36 ft	1,092	650	0
Covered Hopper Barge	200-259 ft	28-36 ft	2,285	1,550	0
Flat/Deck Barge	Under 100 ft	Under 28 ft	0	16	0
Flat/Deck Barge	100-174 ft	28-36 ft	0	0	10
Flat/Deck Barge	100-174 ft	37-41 ft	0	0	3
Flat/Deck Barge	100-174 ft	42-49 ft	0	0	7
Flat/Deck Barge	100-174 ft	50-54 ft	0	0	5
Flat/Deck Barge	195-199 ft	28-36 ft	377	0	6
Flat/Deck Barge	195-199 ft	37-41 ft	0	14	0
Flat/Deck Barge	200-259 ft	28-36 ft	260	0	72
Flat/Deck Barge	200-259 ft	37-41 ft	0	15	0
Flat/Deck Barge	200-259 ft	50-54 ft	0	0	5
Liquid Hopper Barge	195-199 ft	28-36 ft	591	80	0
Liquid Hopper Barge	200-259 ft	28-36 ft	296	35	0
Liquid Hopper Barge	290-300 ft	50-54 ft	656	221	0
Liquid Hopper Barge	290-300 ft	Over 54 ft	0	0	9
Liquid/Cargo (Tank) Barge	290-300 ft	50-54 ft	268	0	0
Open Hopper Barge	195-199 ft	28-36 ft	1,583	1,262	0
Open Hopper Barge	200-259 ft	28-36 ft	1,337	1,074	14
Open Hopper Barge	260-289 ft	28-36 ft	0	0	5
Other			899	148	39
TOTAL			9,644	5,065	175

SOURCE: Lock Performance Monitoring System

accounted for 39 percent of the barge traffic at Lockport and 45 percent of the traffic at O'Brien. Covered hoppers were absent at Chicago Lock. Open hopper barges, again of various sizes, accounted for about 33 percent of the barge traffic at Lockport, 48 percent of the traffic at O'Brien and 14 percent of the traffic at Chicago. Liquid hopper barges comprised 18 percent of the barge traffic at Lockport, 7 percent of traffic at O'Brien and 7 percent of traffic at Chicago.

4. LOCK UTILIZATION AND PERFORMANCE

a. Operating Hours. All three of the CAWS projects operate year-round on a 24-hour basis except during intermittent periods where the locks are closed for inspection or maintenance and repair type work. In recent years, one or more of the locks have been temporarily closed because of activities associated with ANS control. The locks do not normally close because of adverse weather conditions. An exception to this, as an example, would be the occasional closures of the Chicago Lock that occur because of flooding on the Chicago River. The lock has been closed in the past to prevent combined storm and sanitary discharge into the lake. On occasion, adverse weather conditions (e.g. fog, high water) prevent tows from navigating on the CAWS, and as a result, lockages at the CAWS locks cease.

b. Lockage Policy and Procedures. Lockages through the CAWS facilities are generally carried out on a first-come, first-served basis, with certain caveats. First priority in lockages is given to vessels belonging to federal, state and local entities, especially those deployed for public safety and emergencies. Second priority is given to commercial passenger vessels. Third priority is given to commercial cargo tows and last priority is given to recreational vessels. In order to fully utilize the capacity of the locks, recreational craft may share the lock chamber with commercial cargo tows, under certain conditions intended to maintain safety in the lockage process.

Lockages at the CAWS locks are typically single-cut lockages. Multiple-cut lockages occur only at the Lockport facility, which is the only one of the CAWS locks equipped with tow haulage units. The tow haulage units are used to extract unpowered cuts from the chamber and align them along the guide wall to await lockage of the towboat. Lockages at the O'Brien facility are restricted to single cuts because channel restrictions elsewhere on the Calumet River limit tow sizes. Lockages through the Chicago Lock are limited to single cuts largely because of a City of Chicago regulation limiting tow sizes to 2 barges on the Chicago River and the North and South branches.

c. Lockage Characteristics. Table 17 shows lockages (cuts) at the CAWS projects by type of lockage for 2000, 2008 and 2010. It is important to note that the LPMS definition of commercial lockages includes both commercial cargo-type lockages and other commercial lockages, which includes tourboat and commercial fishing boat lockages. In other words, the LPMS definition includes all lockages by craft that have a profit-making purpose. Commercial cargo lockages made up about 76 percent of total lockages at Lockport in 2010, but only about about 27 percent at O'Brien and 1 percent at Chicago. Other commercial lockages, on the other hand, were only 5 percent of the total at Lockport, 0.3 percent at O'Brien and 70 percent at Chicago. At Chicago, the bulk of lockages are other commercial lockages, meaning largely tourboats.

Recreational lockages are lockages by pleasure craft or recreational fishing vessels. It should be noted that recreational traffic and tourboat-type commercial traffic is more important on the CAWS than on most other parts of the inland navigation system. These types of traffic become more prevalent as

TABLE 17

Lockages by Type at CAWS Locks

Project/Item	2000	%	2008	%	2010	%	% Change 2000-10
Lockport:							
Commercial Cargo	2,877	66.8	2,465	71.6	2,465	75.9	-14.3
Other Commercial	776	18.0	333	9.7	149	4.6	-80.8
Recreational	481	11.2	411	11.9	378	11.6	-21.4
Other	172	4.0	232	6.7	255	7.9	48.3
TOTAL	4,306	100.0	3,441	100.0	3,247	100.0	-24.6
O'Brien:							
Commercial Cargo	2,282	24.9	1,921	30.3	1,552	26.7	-32.0
Other Commercial	10	0.1	20	0.3	20	0.3	100.0
Recreational	6,514	71.1	4,024	63.5	3,987	68.6	-38.8
Other	360	3.9	371	5.9	251	4.3	-30.3
TOTAL	9,166	100.0	6,336	100.0	5,810	100.0	-36.6
Chicago:							
Commercial Cargo	155	0.9	50	0.3	170	1.1	9.7
Other Commercial	12,015	68.0	10,193	65.2	11,302	70.4	-5.9
Recreational	3,588	20.3	3,255	20.8	3,015	18.8	-16.0
Other	1,912	10.8	2,127	13.6	1,578	9.8	-17.5
TOTAL	17,670	100.0	15,625	100.0	16,065	100.0	-9.1
SOURCE: Lock Performance Monitoring System							

one approaches Lake Michigan. Recreational craft typically move to and from marinas on the CAWS. Recreational lockages comprised about 12 percent of the lockages at Lockport and about 69 percent of the lockages at O'Brien in 2010. At Chicago, recreational lockages comprised only 26 percent of total lockages.

Other lockages at the CAWS facilities are primarily lockages by craft belonging to local, state or federal government entities. Other lockages were about 8 percent of the total at Lockport, 4 percent at O'Brien and 10 percent of those at the Chicago Lock in 2010.

The data for Lockport in Table 17 show that a total of 3,247 lockages occurred at the facility in 2010. The total number of lockages at Lockport diminished by about 25 percent relative to 2000, while the number of commercial cargo lockages decreased by about 14 percent. Other commercial lockages and recreational lockages diminished by about 81 percent and 21 percent respectively, while lockages in the other category increased by about 48 percent. Data for the O'Brien facility show total lockages and commercial cargo lockages decreasing by about 37 percent and 32 percent, respectively, between 2000 and 2010. Other commercial lockages, although quite small, increased by 100 percent relative to 2000, while recreational and other lockages diminished by 39 and 30 percent respectively. Table 17 shows total lockages at Chicago decreasing by about 9 percent relative to 2000. Commercial cargo lockages at Chicago Lock actually increased by nearly 10 percent. Other commercial lockages decreased by about 6 percent, recreational lockages by 16 percent and other lockages by nearly 18 percent.

Table 18 shows pertinent data for commercial cargo lockages for selected years between 2000 and 2010. These data show that commercial cargo cuts (one or more cuts make up a lockage) have diminished at Lockport and O'Brien between 2000 and 2010, but increased at Chicago, where commercial cargo tonnage is the smallest. Cuts per tow at Lockport decreased from 1.3 to 1.1, while cuts per tow remained at 1 cut throughout for O'Brien and Chicago. The share of single-cut lockages at Lockport increased from 73 to 94 percent, while the share of double-cut lockages diminished from 27 to 6 percent.

d. Lock Transit Times. The time required for a tow to transit a lock comprises two basic components - processing or lockage time and delay time. Processing time is the amount of time a lock is obligated to serve a particular vessel. Delay time is the amount of time a vessel may have to wait to be served. The processing time for each tow can be further subdivided into four separate activities - approach time, entry time, chambering time and exit time. The processing time would also include turnback times and any time between cuts for multiple-cut lockages.

Table 19 provides a display of average processing times for the three CAWS projects. In 2010, the average processing times for the CAWS locks were 1.3 hours at Lockport, 0.7 hours at O'Brien and 0.2 hours at Chicago. The longer processing times at Lockport result from the larger average tow sizes that transit Lockport and the much higher lift at that project. Between 2000 and 2010, average processing times diminished at Lockport, increased slightly at O'Brien, and remained constant at Chicago. The delay data in Table 19 shows average 2010 delay times of 0.6 hours at Lockport, 0.1 hours at O'Brien and 0.1 hours at Chicago. Average delay at Lockport dropped substantially relative to 2000 while average delays remained unchanged for O'Brien and Chicago. The reduction in processing and delay times results from a reduction in average tow size in 2010 relative to 2000. This could be an impact of the national recession.

TABLE 18

Commercial Cargo Lockage Characteristics at CAWS Locks
Selected Years, 2000-2010

Project/Item	2000	2005	2008	2010
Lockport:				
Commercial Cargo Cuts	3,660	3,541	2,804	2,614
Cuts per Tow	1.3	1.3	1.1	1.1
% Single Lockages	73%	71%	86%	94%
% Double Lockages	27%	29%	14%	6%
% > 2 Lockages	0%	0%	0%	0%
O'Brien:				
Commercial Cargo Cuts	2,282	2,207	1,921	1,552
Cuts per Tow	1.0	1.0	1.0	1.0
% Single Lockages	100%	100%	100%	100%
% Double Lockages	0%	0%	0%	0%
% > 2 Lockages	0%	0%	0%	0%
Chicago:				
Commercial Cargo Cuts	155	44	50	170
Cuts per Tow	1.0	1.0	1.0	1.0
% Single Lockages	100%	100%	100%	100%
% Double Lockages	0%	0%	0%	0%
% > 2 Lockages	0%	0%	0%	0%
SOURCE: Lock Performance Monitoring System				

TABLE 19

Average Processing, Delay and Transit Times for Tows at CAWS Locks
Selected Years, 2000-2010

Project/Item	Hours Per Tow			
	2000	2005	2008	2010
Lockport:				
Processing Time	1.7	1.7	1.4	1.3
Delay Time	2.0	1.4	0.8	0.6
Total Transit Time	3.6	3.1	2.2	1.8
O'Brien:				
Processing Time	0.6	0.7	0.7	0.7
Delay Time	0.1	0.1	0.1	0.1
Total Transit Time	0.7	0.8	0.8	0.8
Chicago:				
Processing Time	0.2	0.2	0.2	0.2
Delay Time	0.1	0.1	0.1	0.1
Total Transit Time	0.2	0.3	0.3	0.3

SOURCE: Lock Performance Monitoring System

APPENDIX A

WATERBORNE COMMERCE COMMODITY TRAFFIC ON THE CHICAGO AREA WATERWAY SYSTEM

TABLE A-1

Waterborne Commerce Commodity Traffic on the Chicago Area Waterway System, 1994-2009
(Thousands of Tons)

Commodity	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Coal & Coke	6,512	6,157	7,592	5,126	3,120	2,915	2,675	2,073	1,747	4,842	5,526	5,873	5,308	4,582	4,101	4,181
Petroleum Fuels	3,777	2,689	2,618	2,682	2,916	2,471	2,455	2,709	2,342	1,854	1,759	1,705	1,896	2,187	2,040	1,453
Crude Petroleum	17	35	45	10	2	0	0	7	27	0	45	0	0	0	0	15
Aggregates	3,532	1,896	2,544	2,235	2,948	3,565	3,616	4,173	4,084	4,433	3,751	4,148	4,375	3,340	2,873	2,142
Grains	1,597	918	794	767	1,124	775	692	738	1,004	763	800	680	293	365	258	415
Chemicals	1,965	1,748	1,943	1,928	1,974	1,896	2,001	1,727	1,745	1,720	1,448	1,317	1,559	1,587	1,542	1,335
Ores & Minerals	1,329	1,174	1,162	1,401	992	752	750	993	919	687	999	957	930	645	1,408	1,577
Iron & Steel	4,173	3,622	2,543	3,058	3,343	3,068	3,295	2,469	3,391	3,463	3,992	4,123	3,754	2,734	2,715	1,491
All Other	1,696	1,467	1,250	1,693	1,766	2,058	1,857	2,016	1,802	1,702	2,253	2,243	1,810	1,489	986	766
TOTAL	24,598	19,704	20,493	18,900	18,185	17,500	17,341	16,905	17,061	19,465	20,573	21,047	19,927	16,929	15,923	13,376

SOURCE: Waterborne Commerce Statistics

TABLE A-2

Waterborne Commerce Commodity Traffic by Direction of Movement at CAWS Locks
Selected Years, 1994-2009
(Thousands of Tons)

Lock/ Commodity	1994			2000			2005			2008			2009		
	Up	Down	Total	Up	Down	Total	Up	Down	Total	Up	Down	Total	Up	Down	Total
Lockport:															
Coal & Coke	2,882	750	3,631	1,819	67	1,886	1,848	819	2,667	1,101	625	1,726	579	826	1,405
Petroleum Fuels	1,198	1,372	2,569	1,175	75	1,250	876	442	1,318	957	906	1,862	691	678	1,369
Crude Petroleum	0	17	17	0	0	0	0	0	0	0	0	0	11	0	11
Aggregates	1,790	608	2,399	1,444	516	1,960	1,994	315	2,309	874	224	1,097	617	387	1,004
Grains	69	1,524	1,592	8	3	11	68	606	674	109	149	258	35	381	415
Chemicals	1,450	289	1,739	1,555	48	1,603	1,048	135	1,183	1,112	287	1,399	987	297	1,283
Ores & Minerals	1,321	8	1,329	744	0	744	952	5	957	1,395	13	1,408	1,541	36	1,577
Iron & Steel	3,056	1,108	4,164	2,651	106	2,757	2,511	1,582	4,093	1,399	1,307	2,706	582	908	1,490
All Other	1,279	365	1,644	1,673	0	1,673	1,630	593	2,223	472	341	813	396	293	688
TOTAL	13,044	6,041	19,085	11,069	815	11,884	10,926	4,498	15,424	7,419	3,852	11,271	5,437	3,806	9,242
O'Brien:															
Coal & Coke	1,928	2,765	4,693	1,799	144	1,942	2,124	314	2,438	1,401	174	1,575	777	380	1,158
Petroleum Fuels	96	747	843	206	258	463	140	151	291	157	274	431	44	140	183
Crude Petroleum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aggregates	358	46	404	211	37	249	241	0	241	91	0	91	19	0	19
Grains	69	956	1,025	3	262	265	75	407	482	98	126	224	31	318	349
Chemicals	381	232	613	191	131	322	89	42	131	180	107	286	162	54	216
Ores & Minerals	410	3	413	351	6	357	335	5	340	528	13	542	679	36	716
Iron & Steel	2,499	601	3,100	2,219	690	2,910	2,259	1,017	3,276	1,316	753	2,069	538	454	993
All Other	332	351	683	422	312	733	436	538	974	79	484	564	165	319	484
TOTAL	6,072	5,701	11,773	5,402	1,839	7,241	5,700	2,474	8,173	3,849	1,932	5,781	2,416	1,702	4,118
Chicago:															
Coal & Coke	82	32	114	11	2	14	23	0	23	0	0	0	0	0	0
Petroleum Fuels	310	66	376	27	29	57	2	5	7	15	0	15	0	0	0
Crude Petroleum	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Aggregates	1	0	1	0	20	20	0	0	0	0	0	0	0	0	0
Grains	65	0	65	0	0	0	5	0	5	0	0	0	18	0	18
Chemicals	119	34	153	88	3	91	70	0	70	28	0	28	3	0	3
Ores & Minerals	0	25	25	0	0	0	0	0	0	0	0	0	0	0	0
Iron & Steel	13	62	76	0	55	55	1	0	1	5	0	5	3	0	3
All Other	2	1.4	3	0	28	28	0	0	0	0	0	0	0	0	0
TOTAL	592	220	812	127	137	264	101	5	106	48	0	48	24	0	24

SOURCE: Waterborne Commerce Statistics

APPENDIX B

LOCK PERFORMANCE MONITORING SYSTEM DATA FOR THE CHICAGO AREA WATERWAY SYSTEM

TABLE B-1

Lock Performance Monitoring System Traffic at CAWS Locks, 1993-2010
(Thousands of Tons)

Lock/Commodity	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010
Lockport:																		
Coal, Lignite, and Coal Coke	4,527	3,393	2,033	2,617	2,643	2,553	2,419	2,457	2,049	2,030	1,734	3,020	2,558	2,425	1,366	1,699	1,550	1,591
Petroleum and Petroleum Products	2,223	2,587	1,925	2,033	2,016	2,142	1,964	2,271	2,476	2,487	1,845	1,620	1,503	1,791	2,073	1,946	1,359	1,388
Chemicals and Related Products	2,133	2,377	1,964	2,203	2,080	2,161	1,990	2,164	2,013	2,131	1,843	1,963	1,807	1,855	1,754	1,628	1,391	1,442
Crude Materials, Inedible, Except Fuels	4,187	5,495	4,017	4,340	4,423	4,369	4,626	4,514	4,954	4,993	5,338	5,516	5,855	5,922	4,742	4,969	4,289	3,428
Primary Manufactured Goods	2,126	3,961	3,520	2,489	3,027	4,232	3,715	3,620	2,983	3,438	3,384	4,063	4,203	4,560	2,910	1,697	980	1,280
Food and Farm Products	1,761	1,758	1,096	925	872	1,202	796	889	1,031	1,295	1,078	941	850	552	495	406	583	540
Manufactured Equipment & Machinery	49	50	99	100	70	67	115	331	304	118	56	74	68	94	114	86	77	157
Waste Material	3	0	0	1	0	0	2	2	1	0	0	107	3	6	22	3	6	19
Unknown or Not Elsewhere Classified	34	78	333	157	278	375	414	541	159	380	31	38	83	44	32	26	6	8
TOTAL	17,042	19,701	14,987	14,865	15,411	17,103	16,040	16,789	15,970	16,872	15,310	17,341	16,930	17,249	13,508	12,461	10,241	9,854
O'Brien:																		
Coal, Lignite, and Coal Coke	3,055	5,221	5,377	6,958	4,918	2,435	2,230	2,379	1,909	2,040	1,639	2,951	2,336	2,542	1,689	2,426	1,488	1,409
Petroleum and Petroleum Products	1,015	1,305	1,066	1,254	960	980	764	664	731	460	457	450	532	442	550	411	169	357
Chemicals and Related Products	815	741	795	646	543	578	405	404	341	315	200	188	185	263	227	213	233	228
Crude Materials, Inedible, Except Fuels	1,112	1,537	1,235	1,529	1,316	1,199	997	1,201	1,043	1,064	1,240	1,988	1,799	1,743	1,645	1,645	1,232	1,306
Primary Manufactured Goods	1,304	3,052	2,746	1,961	2,355	2,986	2,654	3,240	2,105	2,836	2,765	3,374	3,575	4,051	2,654	1,754	999	1,219
Food and Farm Products	1,332	1,384	721	430	327	603	282	431	539	798	635	571	530	342	417	315	451	453
Manufactured Equipment & Machinery	35	19	24	41	15	34	17	29	64	18	27	35	29	42	74	44	58	138
Waste Material	0	2	0	0	0	0	0	0	0	3	0	94	26	9	10	4	4	0
Unknown or Not Elsewhere Classified	23	31	31	29	37	40	22	88	46	84	11	23	36	46	28	12	7	21
TOTAL	8,690	13,291	11,997	12,849	10,470	8,854	7,372	8,436	6,778	7,619	6,975	9,675	9,048	9,480	7,295	6,822	4,641	5,132
Chicago:																		
Coal, Lignite, and Coal Coke	7	124	3	4	0	0	0	0	0	2	0	0	0	0	3	0	0	0
Petroleum and Petroleum Products	358	442	164	60	31	167	45	22	79	27	10	24	44	23	42	15	14	0
Chemicals and Related Products	139	255	95	88	30	50	27	25	9	6	0	1	5	0	0	0	2	0
Crude Materials, Inedible, Except Fuels	15	63	5	25	26	39	169	53	57	57	51	32	11	24	20	20	21	37
Primary Manufactured Goods	20	29	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	2
Food and Farm Products	71	386	23	10	0	0	0	0	0	4	0	0	0	0	0	0	0	3
Manufactured Equipment & Machinery	0	23	3	1	7	33	56	43	13	44	13	3	0	0	4	1	0	9
Waste Material	0	1	0	0	1	0	0	0	0	0	0	3	0	0	0	0	0	0
Unknown or Not Elsewhere Classified	16	19	3	12	4	3	19	3	15	7	0	24	51	80	99	69	41	51
TOTAL	626	1,342	296	200	98	293	316	146	181	147	75	87	111	128	168	105	79	102

SOURCE: Lock Performance Monitoring System

TABLE B-2

Lock Performance Monitoring System Traffic at CAWS Locks by Direction of Movement
Selected Years, 2000-2010
(Thousands of Tons)

Lock/Commodity	2000			2005			2008			2009			2010		
	Up	Down	Total	Up	Down	Total	Up	Down	Total	Up	Down	Total	Up	Down	Total
Lockport:															
Coal, Lignite, and Coal Coke	2,009	448	2,457	1,807	751	2,558	1,068	631	1,699	622	928	1,550	801	790	1,591
Petroleum and Petroleum Products	1,252	1,020	2,271	1,044	459	1,503	959	987	1,946	664	695	1,359	650	739	1,388
Chemicals and Related Products	1,822	342	2,164	1,494	313	1,807	1,310	318	1,628	992	399	1,391	1,027	415	1,442
Crude Materials, Inedible, Except Fuels	3,484	1,030	4,514	4,224	1,631	5,855	3,456	1,513	4,969	2,929	1,359	4,289	2,048	1,380	3,428
Primary Manufactured Goods	3,063	557	3,620	3,102	1,100	4,203	1,181	517	1,697	576	404	980	927	353	1,280
Food and Farm Products	154	735	889	263	587	850	238	168	406	177	406	583	157	384	540
Manufactured Equipment & Machinery	125	205	331	17	51	68	22	63	86	69	8	77	129	28	157
Waste Material	0	2	2	3	0	3	0	3	3	6	0	6	19	0	19
Unknown or Not Elsewhere Classified	413	128	541	65	18	83	22	5	26	5	2	6	5	3	8
TOTAL	12,322	4,467	16,789	12,019	4,910	16,930	8,257	4,204	12,461	6,039	4,202	10,241	5,763	4,091	9,854
O'Brien:															
Coal, Lignite, and Coal Coke	2,250	130	2,379	2,081	255	2,336	1,469	957	2,426	944	544	1,488	1,032	378	1,409
Petroleum and Petroleum Products	281	383	664	218	314	532	127	284	411	19	150	169	32	324	357
Chemicals and Related Products	206	198	404	143	42	185	169	43	213	128	105	233	142	86	228
Crude Materials, Inedible, Except Fuels	840	362	1,201	1,049	750	1,799	992	653	1,645	785	447	1,232	528	778	1,306
Primary Manufactured Goods	2,561	679	3,240	2,348	1,227	3,575	1,087	667	1,754	485	514	999	746	473	1,219
Food and Farm Products	71	360	431	156	374	530	165	150	315	80	371	451	93	361	453
Manufactured Equipment & Machinery	15	15	29	11	18	29	21	23	44	56	2	58	118	21	138
Waste Material	0	0	0	14	12	26	2	2	4	0	4	4	0	0	0
Unknown or Not Elsewhere Classified	56	32	88	19	17	36	8	4	12	0	7	7	14	7	21
TOTAL	6,279	2,158	8,436	6,039	3,009	9,048	4,039	2,783	6,822	2,496	2,145	4,641	2,704	2,428	5,132
Chicago:															
Coal, Lignite, and Coal Coke	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Petroleum and Petroleum Products	7	15	22	14	30	44	0	15	15	14	0	14	0	0	0
Chemicals and Related Products	0	25	25	5	0	5	0	0	0	2	0	2	0.06	0.01	0.07
Crude Materials, Inedible, Except Fuels	1	53	53	0	11	11	0	20	20	0	21	21	24	13	37
Primary Manufactured Goods	0	0	0	0	0	0	0	0	0	0	0	0	2	0	2
Food and Farm Products	0	0.04	0.04	0	0	0	0	0	0	0	0	0	0	3.2	3.2
Manufactured Equipment & Machinery	18	25	43	0.05	0.10	0.15	1	0.1	1	0.1	0.2	0.3	3	5	9
Waste Material	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Unknown or Not Elsewhere Classified	0	3	3	0	51	51	1	69	69	0.1	41	41	3	48	51
TOTAL	26	121	146	19	92	111	2	104	105	16	63	79	33	70	102

SOURCE: Lock Performance Monitoring System