

The Chicago Area Waterway System:
Analysis of Corps of Engineers
Expenditures for Fiscal Years 2001-
2011 and Forecast of Expenditures
through Fiscal Year 2035

Prepared for the Prairie Rivers Network

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1. Background

The Chicago Area Waterway System (CAWS) is a network comprised of approximately 130 miles of rivers, canals and associated controlling structures. It is managed for the purposes of sanitation, navigation, flood control, ecosystem restoration and recreation.

Of particular interest, the construction of the Chicago Sanitary & Ship Canal together with the reversal of the flow of the Chicago River connected the Great Lakes to the Illinois Waterway and the Mississippi River watershed. While providing many benefits, this action also created the potential for the migration of invasive species between the two watersheds.

Controlling the spread of these invasive species, especially the potential contamination of the Great Lakes by Asian Carp has motivated the US Army Corps of Engineers (COE) and other entities to evaluate the potential for restoring a physical divide between these two watersheds. To assist in the evaluation of potential separation measures, this analysis examines recent COE expenditures (compiled from Federal Fiscal Year 2001 through Fiscal Year 2011 data) related to the CAWS that may no longer be required if the Great Lakes and the Illinois Waterway and Mississippi River watershed are separated. These expenditures are identified by waterway segment and authorized project purpose, forecast through Fiscal Year (FY) 2035 and presented as average annual cost savings if the two watersheds are physically separated.

2. Caveats

The COE is not the only entity that provides funding for construction, operation, maintenance and management of the CAWS. Other expenditures may be made periodically by local authorities, port districts, or private parties. For example, water treatment facilities and pumping stations are operated and maintained at significant cost by the Metropolitan Water Reclamation District (MWRD) of Greater Chicago. The analysis presented here includes only those expenditures of the COE and local and in-kind contributions of other entities to COE projects as identified by COE data. Other local, but related, expenditures are excluded and may form another source of cost savings realizable by a physical separation of the two watersheds.

Presented below are historic COE expenditures compiled from FY2001 through FY2011 data supplied by the COE. These expenditures can be considered as a baseline representation of COE costs associated with constructing, operating, maintaining and managing the CAWS. The year by year expenditures are escalated to 2011 price levels using guidance from COE Engineer Manual 110-2-1304, the COE Civil Works Construction Cost Index System (attachment 1) to identify the real resource costs in a consistent and comparable metric. Consequently, unless otherwise noted, all expenditures presented below, are reported in FY 2011 prices. Depending on the exact course of action implemented to separate the

watersheds, some (or all) of these COE costs for the CAWS may be eliminated or reduced. These reduced expenditures represent real resource savings in the national economy that should be accounted for when evaluating the other economic impacts of separating the two watersheds.

3. Methodology

The COE Rock Island District and COE Chicago District both have operation, maintenance, construction, and management responsibilities in the CAWS. Freedom of Information Act (FOIA) requests were delivered to each of the respective districts requesting data on expenditures related to the CAWS from FY01 – FY11 (attachments 2 & 3). The responses to the FOIA requests were analyzed to identify the expenditures relevant to this analysis, and the historic COE costs were escalated to FY11 dollars as previously noted. An excel file summarizing the information provided by the COE is provided in attachment 4.

To facilitate the application of these expenditures to alternative physical separation alternatives, the waterways comprising the CAWS are partitioned into 10 segments, termed reaches, so that costs can be assigned to and evaluated by waterway segment. A description of the 10 reaches is provided in Table 1 and a graphical depiction in Figure 1 below. Beyond identifying and assigning the costs, anticipated expenditures associated with future lock rehabilitation projects are also forecast from data in the FOIA responses.

Reach	Description
Reach 1	Chicago Sanitary & Ship Canal: Lockport Lock to Confluence with the CAL-SAG Channel
Reach 2	Chicago Sanitary & Ship Canal: Confluence with the CAL-SAG to Bubbly Creek
Reach 3	Chicago River: Chicago River, CR South Branch, CR North Branch, North Shore Channel
Reach 4	Cal-Sag Channel (from Chicago Sanitary & Ship Canal to Confluence with Little Calumet)
Reach 5	Little Calumet River (from Cal-Sag to Hart Ditch)
Reach 6	Little Calumet River & Burns Waterway (east of Hart Ditch through Burns Harbor to Lake)
Reach 7	Cal-Sag Channel (from Confluence with the Little Calumet to Confluence with the Calumet River)
Reach 8	Calumet River
Reach 9	Grand Calumet River (From Confluence with the Calumet River to the Indiana Harbor Canal)
Reach 10	Indiana Harbor Canal and Grand Calumet east of the Indiana Harbor Canal

Table 1 – Description of CAWS Reaches

4. COE Expenditures by Reach

During the 11 year period the COE spent over \$600,000,000 dollars (measured in FY 2011 prices) on the CAWS. These expenditures are displayed by reach in Table 2. Note that there were no reported COE expenditures in Reaches 2, 4, 7 & 9. Further, other than the dredging associated with Port maintenance (which does extend inland), there were generally no reported dredging costs. There could be a number of explanations for this including: dredging these channels is not required; dredging costs are not reported by waterway segment; or that some entity other than the COE provides channel dredging.

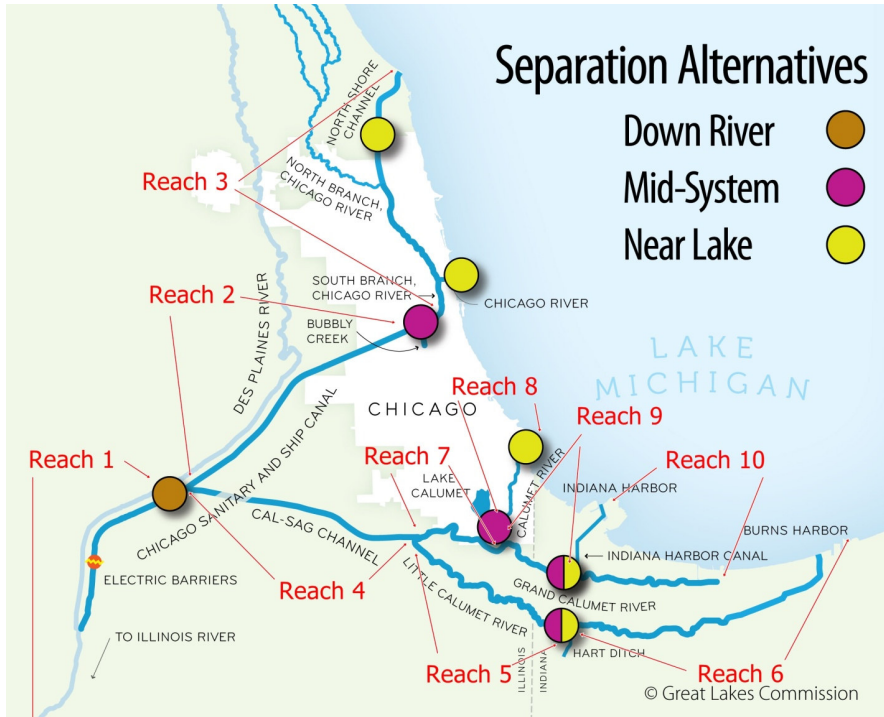


Figure 1 – Analytical Reaches

Chicago Area Waterway Corps of Engineers Expenditures ¹		
CAWS Segment	Total COE Expenditures 2001-2011 ²	Average Yearly Expenditure 2001-2011 ²
Reach 1	\$158,615,577	\$14,419,598
Reach 2	\$0	\$0
Reach 3	\$51,248,154	\$4,658,923
Reach 4	\$0	\$0
Reach 5	\$145,395,306	\$13,217,755
Reach 6	\$39,844,822	\$3,622,257
Reach 7	\$0	\$0
Reach 8	\$62,512,981	\$5,682,998
Reach 9	\$0	\$0
Reach 10	\$133,487,526	\$12,135,230
Non-Reach Specific	\$9,482,324	\$862,029
Total	\$600,586,692	\$54,598,790

¹Expenditures are expressed in 2011 dollars

²Expenditures include local and/or in-kind contributions

Table 2 – Expenditures by Reach

5. Expenditures by Feature and Purpose

Table 3 below provides a more detailed account by project purpose and funding source of the COE expenditures identified in this analysis.

CAWS Segment				Total COE Expenditures 2001-2011
Reach	Feature	Purpose	Funding	
Reach 1	Lockport Lock	Navigation	O&M	\$22,312,545
	Lockport Lock	Navigation	Major Maintenance	\$5,355,870
	Lockport Lock	Navigation	Rehabilitation	\$87,997,206
	Dispersal Barriers I & II	Erosion Control	Construction General	\$42,949,956
Total Reach 1				\$158,615,577
Reach 3	Chicago Harbor	Navigation	O&M	\$40,554,352
	Chicago River	Navigation	O&M	\$4,672,336
	Chicago River North Branch	Flood Control	O&M	\$373,865
	North Branch Chicago River	Flood Control	Construction General	\$5,647,601
Total Reach 3				\$51,248,154
Reach 5	Little Calumet River, IN	Flood Control	Construction General	\$145,395,306
			Total Reach 5	\$145,395,306
Reach 6	Burns Harbor	Navigation	O&M	\$37,053,254
	Burns Waterway Small Boat Harbor	Navigation	O&M	\$2,791,507
	Burns Harbor Rehab	Navigation	O&M	\$60
Total Reach 6				\$39,844,822
Reach 8	O'Brien Lock and Dam	Navigation	O&M	\$20,603,859
	Calumet Harbor	Navigation	O&M	\$41,909,123
Total Reach 8				\$62,512,981
Reach 10	Indiana Harbor	Navigation	O&M	\$10,223,495
	Indiana Harbor, Disposal Facility	Navigation	Construction General	\$123,264,031
Total Reach 10				\$133,487,526
Non-Reach Specific	Lake Michigan Diversion	Navigation	O&M	\$8,881,243
			O&M	\$601,081
Total non-Reach				\$9,482,324
Grand Total				\$600,586,692

Table 3 – Expenditures by Feature and Funding Account.

Note in particular the two non-reach specific expenditures. These are the Lake Michigan Diversion project, an accounting of the volume of water diverted from Lake Michigan to the Inland Waterways, and an annual hydrographic survey conducted by the Rock Island District.

6. Federal vs. Local Expenditures

As mentioned previously the COE expenditures include both federal contribution and the local or any in-kind contribution. The distribution of federal and local expenditures is displayed in Table 4 below. Note that the overwhelming majority of the expenditures are federal dollars.

Federal vs. Local Expenditures				
	Federal	Local	Total	% Local
Reach 1	\$156,012,849	\$2,602,729	\$158,615,577	1.64%
Reach 3	\$49,278,333	\$1,969,821	\$51,248,154	3.84%
Reach 5	\$128,784,447	\$16,610,860	\$145,395,306	11.42%
Reach 6	\$39,844,822	\$0	\$39,844,822	0.00%
Reach 8	\$62,512,981	\$0	\$62,512,981	0.00%
Reach 10	\$115,548,936	\$17,938,590	\$133,487,526	13.44%
non-Reach Specific	\$9,482,324	\$0	\$9,482,324	0.00%
Total	\$561,464,693	\$39,121,999	\$600,586,692	6.51%

Table 4 – Federal vs. Local expenditures

7. Expenditures by Project Purpose

Table 5 below displays the expenditures by stated project purpose. Curiously, the electrical dispersal barriers located in the Chicago Sanitary & Ship Canal are classified by the Chicago District as “Beach Erosion Control”. Note also that the majority of expenditures are directly related to navigation.

Expenditures by Project Purpose			
	Total COE Expenditures 2001-2011	Average Yearly Expenditure 2001-2011	% of Total Expenditures
Navigation	\$406,219,963	\$36,929,088	67.64%
Flood Control	\$151,416,773	\$13,765,161	25.21%
Other¹	\$42,949,956	\$3,904,541	7.15%
Total	\$600,586,692	\$54,598,790	100.00%

¹This reflects the cost of Dispersal Barriers I & II

Table 5 – Expenditures by Purpose

While this disaggregation by project purpose is useful, it does not provide the complete picture. The electrical barriers (“Other”) are certainly related to navigation in that they are necessitated by the connection between the Great Lakes and Mississippi River watersheds. Further, some of the flood

control projects can be related directly or indirectly to navigation. For example, the Chicago River (North Branch) project provides for clearing debris from the channel. While this is characterized as a flood control project, channel clearing could also pertain to the navigation purpose. Further still, the North Branch Chicago River project provides for the excavation of flood control reservoirs. While clearly a flood control project, this channel clearing may have been necessitated by the reversed flow of the Chicago River, so, indirectly, it is also navigation related. If the Chicago River is returned to its natural flow, these flood control measures may not be needed.

8. Expenditures by Funding Type

Table 6 below describes the expenditures by funding type. The majority of expenditures are for construction.

CAWS Expenditures by Funding Type				
	Total COE Expenditures 2001-2011	Mean Yearly Expenditure 2001-2011	% of Total Expenditures	
O&M	\$189,976,721	\$17,270,611	31.63%	
Major Maintenance	\$5,355,870	\$486,897	0.89%	
Rehabilitation	\$87,997,206	\$7,999,746	14.65%	
Construction General	\$317,256,895	\$28,841,536	52.82%	
TOTAL	\$600,586,692	\$54,598,790	100.00%	

Table 6 – Expenditures by Funding Type

Generally, the Operation and Maintenance (O&M) expenditures can be considered ongoing expenses. The Major Maintenance and Rehabilitation Expenses are periodic and the Construction General (CG) expenses are onetime costs. However, as with the project purpose, further analysis is needed. The projects being completed with CG funds will require maintenance and likely future rehabilitation costs. Further, as ongoing construction projects are completed, new construction projects currently waiting funding may enter the CG pipeline and increase future CAWS operating, maintenance and rehabilitation costs.

There are additional aspects to CG funding worth noting. For example, consider the Indiana Harbor Confined Disposal Facility. The expenditures for this project from FY2001 – FY2011 were over \$123,000,000 (in FY11 \$), making it the second most costly project considered in this analysis. While this is clearly a construction project, the project purpose is to dispose of contaminated dredge material which is a maintenance activity. So, indirectly, this can be considered a maintenance expenditure.

Another example worth noting is the Chicago Sanitary & Ship Canal Dispersal Barriers. In FY 2011 the expenditure for utilities was \$804,518 and the expenditure for eDNA testing was \$464,981. These are clearly operating expenses which together accounted for more than 10% of the FY11 expenditures on this project.

The maintenance expenses also deserve further examination. The expenses for the Chicago Harbor are classified as maintenance expenses but Chicago District's expense report indicates that much of the expenses include items which would normally be considered Major Maintenance or rehabilitation.

9. Port (Harbor) Expenditures

Expenditures for four harbors are included in this cost analysis of COE CAWS expenditures. These are: Chicago Harbor, Burns Harbor, Calumet Harbor, and Indiana Harbor. Each of these harbors has both a Great Lakes component and an Inland Navigation component. It is clear in the data that much of the expense of the Chicago Harbor is related to the operation, maintenance and improvement of the Chicago Lock, and any watershed separation alternative which would obviate the need for this lock could result in savings of these costs. Beyond that, it is not possible, with the data provided in the FOIA responses, to further separate harbor costs between shallow and deep draft navigation. In any event, this is probably only an issue at the Calumet Harbor, and only if the near-lake cutoff is being considered.

10. Lock Related Expenditures

Of particular interest are the COE expenditures related to lock operation, maintenance and rehabilitation.

A. Lockport Lock

The average annual O&M expenses related to Lockport Lock over the period being evaluated were \$2,028,413 (FY11 \$s). Additionally Lockport is had Major Maintenance expenses and is undergoing a rehabilitation expected to be completed in 2015. During the period evaluated (FY01-FY11), \$93,353,076 (FY11 \$) were spent on major maintenance and rehabilitation at Lockport. The COE has estimated another \$43,209,381 (FY11 \$) to complete the rehabilitation by 2015.

B. O'Brien Lock

The average annual O&M expenses related to O'Brien Lock over the period being evaluated were \$1,873,078 (FY11 \$s). The requirement for the rehabilitation for O'Brien has been identified and approved, but not funded. The costs associated with this project are approximately \$43,000,000 in major maintenance and rehabilitation expenditures. For details see attachment 5.

C. Chicago Lock

As previously mentioned the expenditures related to the Chicago Lock are embedded in the costs of the Chicago Harbor and include some Major Maintenance/Rehabilitation expenditures. Chicago Lock is operated by contract. Over the evaluated period the average annual operations expenditure (not maintenance) was \$1,133,246 (FY11 \$s). Substantial maintenance costs were also identified, but the data is not sufficient to separate routine maintenance elements from Major

Maintenance/Rehabilitation expenditures. It is also difficult to separate the lock expenditures from the other harbor expenses.

11. Forecasts of COE Expenditures

Future COE expenditures are forecast by reach through FY 2035 and details of the forecast methodology are provided in Appendix 1. Because the historic expenditure stream has been very uneven forecasting expenditures from the historic data is difficult. The following methodology is applied.

Maintenance expenditures (in FY 2011 price levels) are forecast by reach to remain at the mean expenditure level evidenced in the period FY2001 through FY2011 as the historic trend in maintenance expenditures evidences flat to slightly declining real expenditures. Therefore, no increase in these costs is forecast although newly completed or anticipated construction projects may require increased maintenance expenditures.

Construction expenditures are forecast on a project by project basis. If work has been substantially completed no additional expenditures are forecast. For projects with substantial work the remaining costs to complete the project are forecast to continue at the FY11 expenditure level until the project construction is complete.

Costs for the Lockport lock rehabilitation are forecast per the information provided by the Rock Island District to complete the rehabilitation work by FY2015.

Costs for the potential O'Brien lock rehabilitation are not included in the forecast. If this project is ultimately funded it will add substantially to the future costs on reach 8.

The forecasted average annual costs are summarized by reach in table 7 below. Details of the forecasts are presented in attachment 6. The average annual computations employ a FY12 real discount rate of 4% used by the COE to evaluate new projects benefits and costs (Economic Guidance Memorandum, 12-01, Federal Interest Rates for Corps of Engineers Projects for Fiscal Year 2012, 21 October 2011).

Forecast Average Annual Costs through 2035 (FY11 \$)			
	Maintenance	non-Maintenance	TOTAL
Reach 1	\$2,028,413	\$13,740,851	\$15,769,264
Reach 3	\$4,145,505	\$0	\$4,145,505
Reach 5	\$0	\$13,217,755	\$13,217,755
Reach 6	\$3,622,257	\$0	\$3,622,257
Reach 8	\$5,682,998	\$0	\$5,682,998
Reach 10	\$929,409	\$11,205,821	\$12,135,230
Non-Reach Specific	\$862,029	\$0	\$862,029
TOTAL	\$17,270,611	\$38,164,427	\$55,435,038

Table 7 – Average Annual Expenditure Forecast

12. Conclusion

COE expenditures to construct, operate, maintain and manage the Chicago Area Waterway System are substantial and should be considered in the economic evaluation of alternatives to physically separate the Great Lakes and the Inland Waterway System as these expenditures may no longer be required if the Great Lakes and the Illinois Waterway and Mississippi River watershed are permanently separated. Foregoing the commitment of these scarce resources to the CAWS enables their use for other productive purposes in the regional and national economies. Of course, these resource cost savings should be viewed as but a single component of all the other economic effects associated with the physical separation of the two watersheds.