



FEASIBILITY CONSIDERATIONS OF SHORESIDE BALLAST WATER MANAGEMENT FOR LAKERS

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BACKGROUND

- ▶ **US COAST GUARD (USCG) FINAL RULE JUNE 21, 2012 ESTABLISHED BALLAST WATER DISCHARGE STANDARDS (BWDS)**

- ▶ Existing Lakers (pre 2009) exempt, however USCG “fully intends to expand the BWDS Rule to all vessels”

- ▶ **USEPA VESSEL GENERAL PERMITS (VGP)**

- ▶ US Second Circuit Court of Appeals: USEPA did not

- ▶ Fully analyze shoreside treatment
 - ▶ Conduct adequate cost-benefit analysis



SCOPE OF STUDY

▶ EVALUATE FEASIBILITY OF SHORE-SIDE TREATMENT

- ▶ Dedicated Treatment Facility
- ▶ Existing Publicly Owned Treatment Works (POTW)
- ▶ Mobile Shoreside Treatment

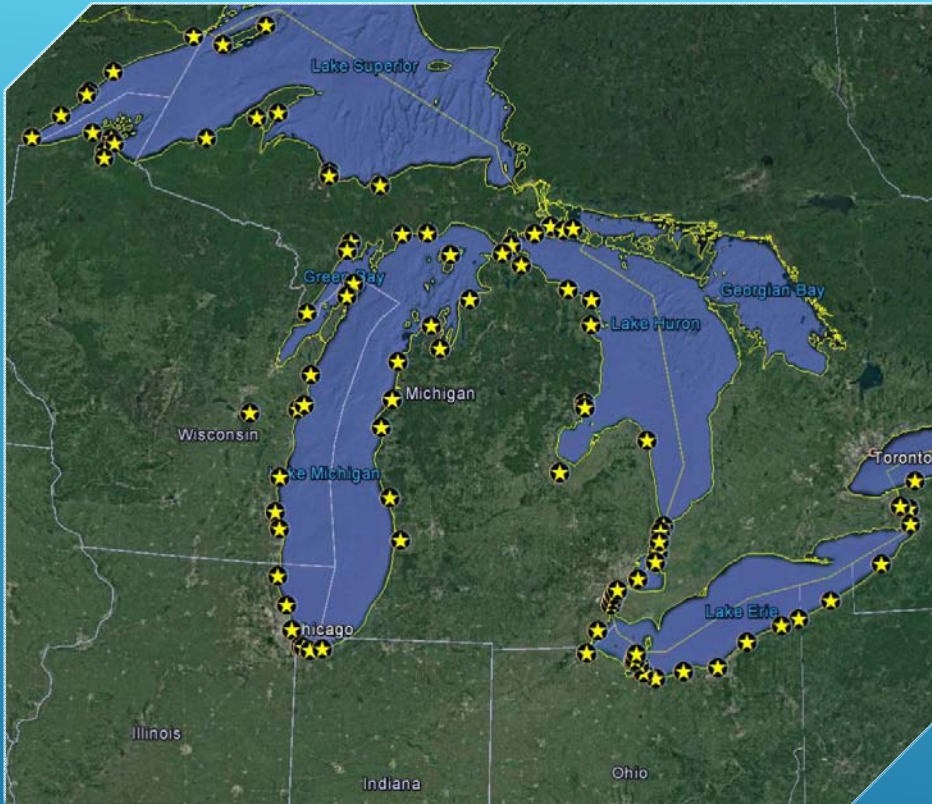
▶ EVALUATE FEASIBILITY OF USING WATER FROM A PUBLIC WATER SYSTEM (PWS) BALLASTING



OVERALL PROJECT APPROACH



- ▶ SELECT A REPRESENTATIVE CROSS SECTION OF LAKER PORTS AND IMPLEMENT LOCATION-SPECIFIC CASE STUDIES FOR THE SELECTED PORTS
- ▶ IDENTIFY POTENTIALLY VIABLE SHORESIDE BALLAST WATER TREATMENT OR SUPPLY OPTIONS FOR EACH PORT
- ▶ DEVELOP COST ESTIMATE FOR EACH VIABLE SHORESIDE OPTION
- ▶ SCALE-UP THE COSTS FROM CASE STUDIES TO ESTIMATE THE OVERALL FEASIBILITY AND COST IMPACT



PORT SELECTION

- ▶ DEVELOP GIS DATABASE TO IDENTIFY KEY FEATURES OF EACH PORT
- ▶ REVIEW BALLAST WATER CLEARINGHOUSE DATA TO QUANTIFY BALLAST INTAKE & DISCHARGE VOLUMES
- ▶ SCREEN PORTS FOR SELECTION CRITERIA
 - ▶ Ballast Water Discharge & Intake Volumes
 - ▶ Number of Docks
 - ▶ Population Density
 - ▶ Number and Location of PWS and POTW
 - ▶ Port Layout/Logistics
 - ▶ Port Location – State/Lake

Port Name	Total Water Treatment within 10 Miles	Distance in Miles					Total Water Supply within 10 Miles	Distance in Miles					Ballast Intake (Gal)	Ballast Discharged (Gal)	# Docks	Furthest Dock	2000 Pop/Sq Mile
		Treatment1	Treatment2	Treatment3	Treatment4	Treatment5		Supply1	Supply2	Supply3	Supply4	Supply5					
Gary, IN	10	3.14	6.53	6.7	6.99	7.72	37	1.53	2.23	3.14	3.37	3.66	1,197,192,744		3	0.03	2048
Indiana Harbor, IN	5	3.84	4.63	5.26	7.82	8.51	36	1.03	1.09	2.4	2.87	3.04	987,925,224		14	0.96	2287.5
St. Clair, MI	4	0.92	2.99	6.93	7.15	12.1	9	0.92	1.43	2.99	3.41	3.5	874,685,856		3	0.12	2117.5
Monroe, MI	3	0.94	7.51	8.16	10.97	11.34	6	0.94	2.06	6.03	7.51	8.16	823,479,096		6	0.68	2196.6
Cleveland, OH	6	1.66	1.78	5.49	6.96	7.53	36	0.85	1.31	1.35	1.66	1.78	702,857,760	79,327,512	45	2.65	6146
Burns Waterway	7	2.19	3.72	4.45	4.85	8.7	27	2.19	2.63	3.57	3.68	4.02	656,736,960		8	0.49	117.7
Detroit Harbor, MI	8	3.36	5.18	5.57	6.98	8.16	23	3.3	3.36	3.7	3.7	4.33	602,753,184	6,445,032	24	3.35	6827.5
Conneaut, OH	2	0.25	8.6	10.3	10.43	11.23	4	0.25	1.4	8.6	9.57	10.3	477,853,200		3	0.21	474.2
Ashtabula, OH	5	0.38	5.52	5.72	9.11	9.49	8	0.61	0.64	0.65	3.9	4.72	399,044,448	43,959,168	15	0.49	2715.3
Ecorse, MI	10	1.04	1.84	4.34	5.38	5.4	20	1.04	1.51	1.67	1.71	1.84	398,604,888		3	0.18	4189.9
River Rouge (Dearborn)	10	0.78	1.97	3.75	5.46	6.66	23	0.59	0.6	0.75	0.78	1.57	290,859,624		39	2.64	3541.8
Marquette, MI	1	1.97	12.14	13.96	14.5	18.84	5	0.6	0.88	1.97	4.47	6.62	288,041,952	422,426,928	2	0.39	1723.1
Green Bay	4	1.78	4.24	9.85	9.85	11.45	23	0.66	1.78	2.17	2.85	4.22	223,573,416		28	5.9	2294
Essexville	3	0.17	1.1	1.38	10.64	10.89	8	0.17	1.1	1.38	2.16	2.53	193,611,792		9	2.13	2769.1
Toledo, OH	6	1.9	2.44	3.37	5.08	8.54	23	1.21	1.33	1.58	2.45	2.58	187,281,072	265,036,992	38	3.54	3723.8
Muskegon, MI	0	11.61	11.92	12.83	13.27	21.04	3	2.29	2.64	3.23	11.56	11.61	182,510,328		16	2.91	2223.1
Duluth	4	1.05	2.74	7.6	8.86	20.13	12	1.05	1.79	1.85	2.25	2.74	175,535,712	530,361,216	33	3.8	1209.2
Milwaukee, WI	3	0.73	4.93	8.89	18.71	19.72	28	0.3	0.73	1.29	2.76	3.23	175,194,888		41	1.66	6164.5
Buffington, IN	5	2.92	3.82	5.3	6.36	8.26	34	1.48	1.72	2.76	2.92	3.05	121,827,288		1	0	
Superior	4	0.08	3.4	5.69	6.52	17.56	10	0.08	1.8	3.4	4.12	4.19	102,187,800	3,501,776,784	27	3.22	691.1
Buffalo, NY	11	0.87	1.86	5.17	5.49	5.95	36	0.54	0.64	0.71	1.86	5.02	93,025,152		40	10.36	7130.8
Saginaw (Carrolton)	5	1.44	2.03	5.93	6.74	9.32	10	1.44	1.97	2.03	2.89	2.98	80,557,752		6	0.8	1908
Erie, PA	1	0.62	10.41	13.36	14.25	15.57	8	0.62	0.72	0.85	1.1	5.38	80,358,432		8	0.64	4605.6
Huron, OH	12	0.6	2.37	3.85	4.05	5.48	25	0.42	0.51	0.6	2.37	4.05	74,717,544		4	0.18	1566.5
Sturgeon Bay	2	0.73	7.7	11.19	15.29	15.64	8	0.73	0.82	0.82	0.82	0.82	73,477,008	70,488,792	14	0.8	891.1
Bay City	5	1.13	1.87	2.38	9.48	9.61	11	0.33	0.59	1.13	1.87	2.38	70,741,440		11	2.91	3290.2
Grand Haven (Ferrysburg)	2	1.54	6.28	15.62	16.06	18.71	8	0.65	1.54	5.35	6.28	6.74	70,633,992		5	0.78	1750.5
Fairport Harbor, OH	10	1.13	3.17	3.52	3.84	4.68	30	0.57	0.78	0.87	1.19	1.34	70,356,000		10	0.67	2864.9
Escanaba, MI	3	3.21	6	6	18.56	21.9	6	1.53	3.21	6	9.49	9.49	68,674,320	282,967,608	7	1.39	1036.3
Silver Bay, MN	2	0.5	3.1	26.26	26.7	44.05	3	0.5	0.62	3.1	11.1	18.41	49,387,536	682,249,920	1	0	267.2
Manistee	1	0.32	20.17	20.9	27.64	36.2	4	0.26	0.32	1.34	2.07	20.17	48,777,432		8	1.27	1775.2
Alpena, MI	1	1.55	27.02	32.35	42.41	44.52	3	0.65	1.55	2.77	27.02	32.04	46,585,176	231,384,648	4	1.12	1251.8
Lorain, OH	9	0.93	4.56	4.72	4.73	4.98	20	0.93	1.01	2.54	3.43	4.31	46,008,600		9	1.14	2847.4
Marine City, MI	4	0.64	4.8	5.86	8.65	12.65	12	0.64	1.62	4.48	4.6	4.8	45,852,312		3	0.14	2124.2
Chicago, IL	1	7.98	10.24	14.39	15.29	16.12	36	1.03	1.04	1.13	1.55	1.85	44,543,400	107,904,192	92	24.84	12546.6

- Dock locations, WWTP and Water Supply locations were provided by LCA.
- Ballast intake and discharge volumes used in this analysis are from the U.S. Coast Guard Report No. CG-D-12-13, which are based off of available data from 2010.
- Population density data obtained from the 2000 U.S. Census.

Ports Selected for Case Studies

Port	State	Lake	Selected for Ballast Treatment or Supply Design Case	No. of docks	Population/Square Mile ¹	Ballast Water Discharged Annually ² (MGal)	Ballast Water Intaken Annually ³ (MGal)
Conneaut	OH	Erie	Supply	3	489.2	-	477.9
Gary	IN	Michigan	Supply	2	1536.4	-	1197.2
Toledo	OH	Erie	Both	27	3348.2	516.2	187.3
Duluth-Superior	MN-WI	Superior	Treatment	36	1263.2*	4252.2	102.2
Calcite	MI	Huron	Treatment	1	607.3	712.2	-

- ▶ **Conneaut, OH** – High BW intake volumes, low population density
- ▶ **Gary, IN** – Highest volume of BW intake, average population, privately owned water supply company
- ▶ **Toledo, OH** – Average BW discharge and intake, high population density
- ▶ **Superior, WI** – Highest volume of BW discharge, low population density
- ▶ **Calcite, MI** – High BW discharge, low population density

ENGINEERING APPROACH

- ▶ **Design Goal** – Minimize delays or disruptions to normal port and vessel operations
- ▶ **Develop Design Basis for Selected Ports**
 - ▶ Instantaneous Loading/Discharge Rate
 - ▶ Ballast Water Volumes per Ship
 - ▶ Daily Maximum Port Discharge Volumes
 - ▶ Location of Treatment Facility
 - ▶ Number of Docks & Pumping Distances
 - ▶ Treatment Rate
 - ▶ Others (Redundancy, materials, etc.)
- ▶ **Identify Key Engineering Considerations**



KEY ENGINEERING CONSIDERATIONS

1. Vessel Modifications
2. Loading/Unloading of Ballast to Shoreside Manifold
3. Transfer Pumps & Piping
4. Storage/Equalization
5. Treatment Approach
6. Operation and Maintenance



PRELIMINARY FINDINGS

- **Potential Advantages of Shoreside Facilities**
 - Greater Flexibility of Shoreside Treatment Options
 - Reduced Challenges of Ship Retrofitting
 - **Engineering Challenges Associated with Shoreside Facilities**
 - Very Large Instantaneous Discharge Volumes and Flowrates
 - High Daily Maximum Volumes
 - Significant Shoreside Infrastructure Required
 - Limited Space for Storage, Treatment, and Piping
 - Capacity and Logistics of POTW Treatment
 - **Other Challenges Associated with Shoreside Facilities**
 - Industry-wide Coordination
 - Permitting & Discharge Concerns – NPDES outfalls, Sensitive Areas
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NEXT STEPS

➤ DEVELOP PRELIMINARY COST ESTIMATES

- Three “Discharge” Ports
- Three “Loading” Ports

➤ EXTRAPOLATE COSTS TO ALL PORTS

- Normalize Costs
- Categorize Ports
- Quantify Local Variables

➤ REPORT OF FINDINGS





Lake Carriers'
Association

THANK YOU!

