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Water Transport during Normal Operations of Towboats and Barges in the Illinois River

January 2011 (Updated October 2012)

Homeland Security

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16. Abstract (MAXIMUM 200 WORDS)

The primary objective of this study was to determine whether barges and towboats can provide a means for Asian carp to bypass the electrical dispersal barrier in the Chicago Sanitary and Ship Canal (CSSC). Visual inspections of ballast tanks and voids on 132 barges (empty and loaded) and 14 towboats were completed in August 2010. If the water level in an individual tank or void was greater than or equal to 2inches, water depth and temperature of water in the barge tank was determined using a calibrated Yellow Springs Instrument temperature-dissolved oxygen probe. A total of 969 individual ballast tanks and voids were inspected. Only 5 percent of the tanks contained a measurable amount of water. Water depths in barges and towboats ranged between 2 - 117 inches with an average water depth of 11 inches. Water temperature in barge and towboat tanks ranged between 69.2 - 86.7 °F. Dissolved oxygen (DO) in tanks ranged between 0.44 - 7.80 mg/L. Water temperature and DO concentrations in ballasts tanks were within documented ranges of tolerances for Asian carp and other carp species. Although the water quality conditions in the tanks and voids were not optimal and water depth averaged only 11 inches, water quality conditions could support early developmental stages of Asian carp.

A follow-on survey of barges operating locally near the barrier conducted in July 2012 found similar results. Of the 285 barge tanks surveyed, only 18 (6 percent) contained sufficient water to measure temperature and DO. Water in tanks ranged between 81.1 – 86 °F with DO values of 2.85 – 7.07 mg/L

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In 2010

- Illinois Marine Towing (IMT)
- American River Transportation Company (ARTCO)
- Hanson Material Services
- Kindra Lake Towing
- American Commercial Lines

In 2012

- Illinois Marine Towing (IMT)
- American River Transportation Company (ARTCO)
- Hanson Material Services
- Midwest Generation, LLC

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EXECUTIVE SUMMARY

The purpose of this study was to determine whether towboats and barges operating in the Chicago Sanitary and Ship Canal (CSSC) are a possible transport mechanism for Asian carp, an aquatic nuisance species, to cross the United States Army Corps of Engineers (USACE) electric dispersal barrier.

Asian carp (bighead, silver, grass, and black) were initially brought to the United States from Europe in 1831. More recently they have been used to control submersed aquatic vegetation in aquaculture ponds and to improve water quality of aquaculture ponds. Following escape from ponds or deliberate introductions, they invaded local rivers and were first documented in the Upper Mississippi River System (UMRS) in 1982. They now inhabit these waters and, because they are voracious eaters, they reproduce rapidly. They may grow up to four feet in length and weigh up to 100 pounds. In some areas of the Mississippi River, bighead and silver carp are now some of the most abundant species and constitute 90% of the aquatic biomass. Many scientists suggest that these varieties of Asian carp will ultimately reach the Great Lakes and threaten the viability of native species if left unchecked.

USACE constructed a permanent electrical barrier within the CSSC to protect Lake Michigan and the Great Lakes from Asian carp that are moving up the Mississippi River and to protect the Mississippi River from fish species advancing down river from Lake Michigan. The CSSC Dispersal Barrier stretches three rows of electrodes across the canal. The electrodes direct current into the water at precise voltage, cycle and pulse duration that cause fish to turn back rather than pass through the electric current.

In June 2010, the Illinois Department of Natural Resources found one 20-pound live Asian carp in Lake Calumet, which lies near the Illinois-Indiana border and is connected to Lake Michigan through a canal system. This fish represents the first physical specimen of Asian carp that has been found above an electric barrier system. While the electric barrier is designed to keep adult Asian carp from getting into the Great Lakes, little information exists on potential transport mechanisms for other stages of Asian carp, including eggs and larvae.

This study used visual inspections and measured water quality parameters such as temperature and dissolved oxygen (DO) concentration in tanks and voids of barges and towboats to assess the potential for early developmental stages (eggs and larvae) to survive and potentially be transported above the barrier.

Results of this study indicate that most (95 percent) of the barge and towboat ballast tanks were dry. For those barge and towboats that contained measurable amounts (more than 2 - 3 inches) of water in an individual tank, water temperatures and DO concentrations were within published tolerances for either Asian carp or other carp species.

Results from this study suggest that water quality conditions in barge and towboat ballast tanks during one season (summer) would be able to sustain juvenile to adult Asian carp. Earlier life stages (i.e., eggs, larvae) have lower tolerances, thus it is not known whether Asian carp eggs or larvae could survive or how long they could survive in ballast tanks. If these stages are able to survive in the ballast tanks, it is possible that these stages could be discharged through leaks or ballast tank exchange above the barrier. Further investigation into survival of early life stages in tanks is needed.

2012 Update:

A follow-on survey of tanks on barges operating in the immediate vicinity of the USACE electric dispersal barriers was conducted in July 2012 to determine whether locally operating barges engaged in different ballasting procedures and frequencies than the barges surveyed in 2010. Initially, the focus was intended to shift from the large barge companies as previously reported to local/small barge providers. It was found that there are no small companies that move barges within the dispersal barrier focus area, but a few of the previously visited large companies do designate many of their barges to work in the local barrier area. The inspection team focused on these local groups of barges to collect this supplemental report data.

The survey team was able to collect data on 39 barges rafted along areas of the river, but only two tugboats were available for inspection. The barges inspected were usually empty and in generally good condition. Discussions with operators revealed that ballasting procedures and frequencies were nearly the same for the local barges as for the longer distance barges surveyed earlier. Similarly, only 6 percent of the local barge tanks inspected contained water deep enough (about 4 inches) to measure temperature and DO. Temperature and DO readings were at the upper ranges of those measured in 2010.

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LIST OF ACRONYMS

ARTCO	American River Transportation Company
CSSC	Chicago Shipping and Sanitary Canal
DNA	Deoxyribonucleic Acid
DO	Dissolved oxygen
e-DNA	Environmental DNA
EPA	Environmental Protection Agency
GLRI	Great Lakes Restoration Initiative
IDNR	Illinois Department of Natural Resources
IMT	Illinois Marine Towing
KLT	Kindra Lake Towing
NIS	Non-indigenous species
RDC	Research & Development Center
ULT	Upper lethal temperature
UMRS	Upper Mississippi River System
USACE	United States Army Corps of Engineers
USCG	United States Coast Guard
YSI	Yellow Springs Instrument

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1 INTRODUCTION

The United States Coast Guard (USCG) is tasked by the National Aquatic Nuisance Prevention and Control Act (1990) and National Invasive Species Act (1996) with eliminating as much as possible the introduction of non-indigenous species (NIS) via ballast water. Under the Great Lakes Restoration Initiative (GLRI) Act, the Coast Guard has been funded by the U.S. Environmental Protection Agency (EPA) to investigate the potential for towboats and barges to transport Asian carp and other species within the Chicago Shipping and Sanitary Canal (CSSC) and across the electrical dispersal barrier constructed by the U. S. Army Corps of Engineers (USACE) as a preventive measure to keep fish from migrating into and out of the Great Lakes.

Five species of Asian carp now flourish in waterways of the contiguous United States. These include grass carp (*Ctenopharyngodon idella*), common carp (*Cyprinus carpio*), silver carp (*Hypophthalmichthys molotrix*), bighead carp (*H. nobilis*) and black carp (*Mylopharyngodon piceus*). These species were introduced to control submersed aquatic vegetation and improve water quality of aquaculture ponds. They have now invaded river systems following escape from ponds or deliberate introductions. Big head and Silver carp are filter feeders that grow and reproduce quickly and effectively out-compete native species of fish.

There is significant concern that if Asian carp successfully cross the dispersal barrier, they can establish a reproducing population in Lake Michigan and spread to the remaining Great Lakes. This would threaten the Great lakes ecosystem as well as the multibillion dollar recreational and sportfishing industries.

Both bighead carp and silver carp are established in the Illinois River downstream of the CSSC. On November 20, 2009, USACE announced that a single sample of environmental Deoxyribonucleic Acid (e-DNA) from Asian carp had been found above the electric dispersal barrier in the CSSC. On December 2, 2009 the CSSC was closed to allow for scheduled maintenance for the electric dispersal barrier. In order to prevent the upstream migration of Asian carp while the dispersal barrier was offline, the Illinois Department of Natural Resources (IDNR) and other members of the Rapid Response Committee began dispersing rotenone, a fish poison, to a six mile stretch of the river immediately north of the Lockport lock and dam. Although no Asian carp were found in that area of the CSSC during the two months of commercial and electrofishing before the December 2009 discovery, the massive fish kill did result in the finding of a single Asian carp (J. Garcia, reporter for ABC in Chicago, 2009).

There is a continuing concern that Asian carp eggs, larvae and fry may be taken up in ballast water or leakage water of towboats and barges downstream of the electric barriers and that these vessels may be transport vectors for these species allowing them to cross the USACE electric dispersal barrier. If they are released during deballasting upstream of the dispersal barrier, Asian carp could enter the Great Lakes and potentially become established. This Towboat/Barge Sampling Study assesses the scope of the potential threat by surveying barges and towboats to determine the percentage of tanks carrying water and the number of vessels transiting the CSSC.

Results of a second survey conducted on barges operating around and across the barrier are included as an update in Section 6 of this report.

2 METHODS

Visual inspections of barge and towboat ballast tanks and voids (hereafter called ballast tanks) were conducted along the CSSC in the vicinity of Lemont, IL (Figure 1) between 18 and 26 August 2010. Barge companies in this area were contacted for access to available barges and towboats. In addition to barges in the Lemont, Channahon, and Romeoville areas, barges owned and operated by Kindra Lake Towing (KLT) in Chicago were also inspected. KLT occasionally moves barges/towboats through the Lemont area. Table 1 indicates the locations of vessels inspected during this study.

Figure 1. Barge and towboat ballast tank sampling locations (red dots) along CSSC (red line), August 2010.

Table 1. Vessel company and location of barge and towboat sampling, August 2010.

Vessel Company	Location
American River Transportation Company (ARTCO)	ARTCO Shipyard (Lemont)
Illinois Marine Towing (IMT)	Channahon, IL
IMT	Heritage Storage Yard
IMT	IMT (Channahon)
IMT	Lemont, IL
American Commercial Lines	Lemont, IL
ARTCO	Lemont, IL
ARTCO	Morris, IL
ARTCO	Ottawa, IL
ARTCO	Power Plant (Romeoville, IL)
Hanson Material Services	Romeoville, IL
Hanson Material Services	Romeoville/Loading area
ARTCO	Seneca, IL
Kindra Lake Towing	South Chicago, IL
Kindra Lake Towing	Walsh Slip (Chicago, IL)

Ballast tanks from barges, either rafted along the river bank or at the operator's shipyards, were visually inspected for the presence of condensation and/or measureable amounts of water. Three types of barges were sampled: tank barges, deck barges, and hopper barges. The number of ballast tanks per barge ranged from 6 to 18, depending on the type of barge. Tank barges had separate port and starboard wing tanks with a bow and stern tank, while deck barges had separate port and starboard tanks separated by a bulkhead at the keel creating separate port/starboard ballast tanks. Several of the deck barges were found to have port, center, and starboard tanks per section resulting in a high number of ballast tanks present. Ballast tanks ran side to side on hopper barges.

Data for all barges and towboats inspected was recorded on data sheets in the field. Data included: barge type, number of ballast tanks, location of ballast tank inspected, hatch type and condition, condensation presence, and whether hatch was sealed. Water depth was determined using a weighted measuring tape that was lowered into the ballast tank. Depth was determined from deck level by measuring the point where the weight was observed hitting the surface of the water to the point the weight reached bottom of the tank. If the water level in an individual ballast tank was measurable (defined as greater than or equal to 2 inches, as determined with a tape measure), a Yellow Springs Instrument (YSI) Model 550A Temperature-Dissolved Oxygen probe was then used to record temperature and dissolved oxygen (DO).

Information regarding the number of barges and towboats passing through the CSSC annually (2007 data) was also obtained from the USACE and is presented below in Section 3.4. This information does not necessarily reflect the actual number of vessels transiting over the dispersal barrier as some local vessels cross the barrier but do not transit the full CSSC.

3 RESULTS

3.1 Water Depth

3.1.1 Barges

Between August 16 and 25, 2010 a total of 969 individual ballast tanks were inspected on 132 barges and 14 towboats. Data obtained during the survey is provided as a table in Appendix A. The photographs in APPENDIX B show several barge types, hatch arrangements, and clearances under bridges. Barges sampled included 19 deck barges, 99 hopper barges, and 14 tank barges. Of the 969 ballast tanks inspected, 50 ballast tanks (5.2 percent), all of which were on barges, had measurable levels of water. Water depths in these ballast tanks ranged from a low of 2 inches to a high of 117 inches (Figure 2). Water depth in deck barges ranged between 4.5 – 24 inches, while hopper barges ranged between 2 – 117 inches (Figure 2). No measurable water was found on tank barges.

For all barges with measurable water in their ballast tanks, overall average water depth was just over 11.0 inches. When three hopper barge tanks with depths of 42, 76, and 117 inches are excluded, water depth averaged 7.2 inches. No information was available to determine why these three tanks contained more water than the remaining 47 tanks with measurable water.

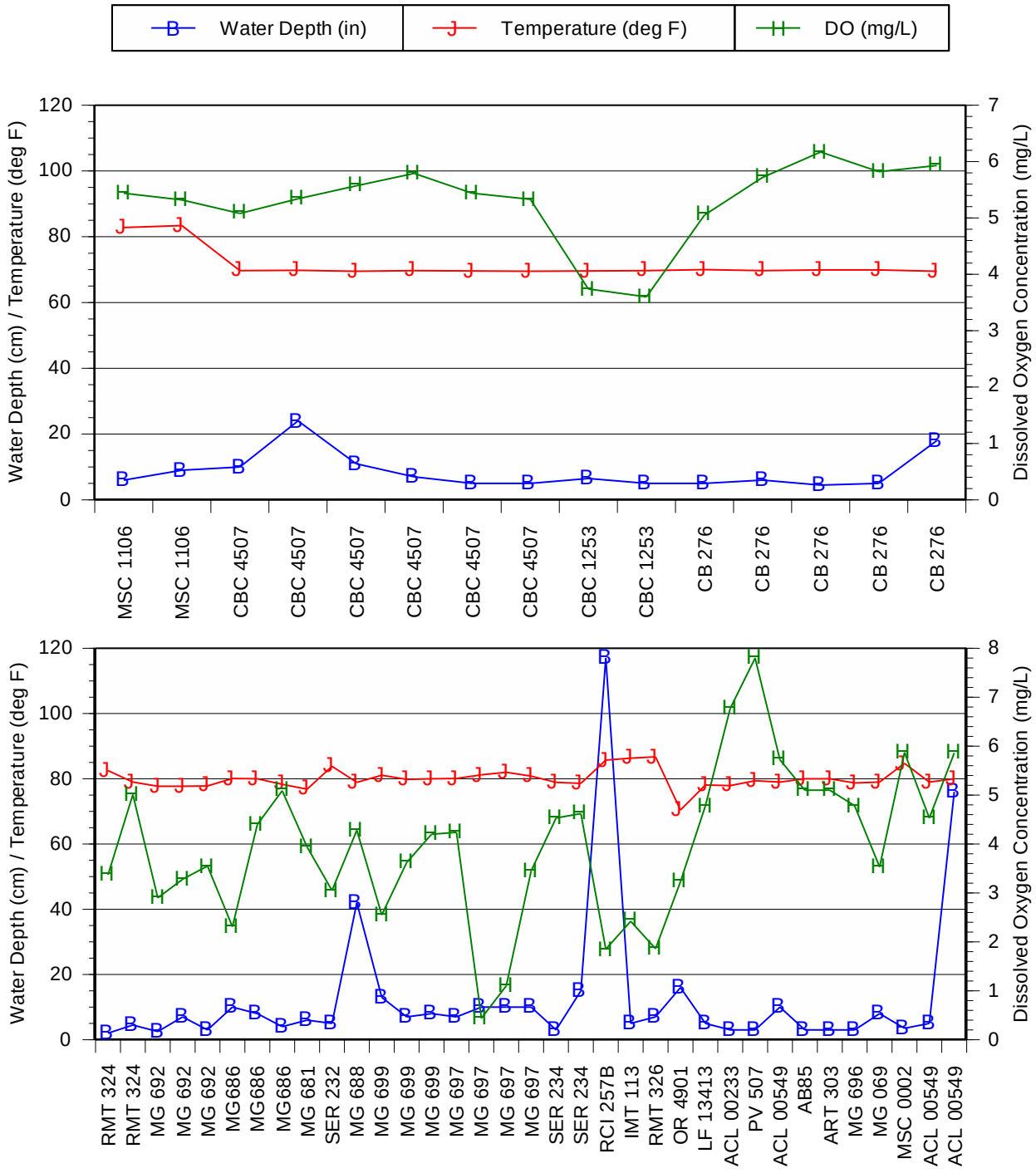

Figure 2. Water depth (inches), water temperature (°F), and DO concentration (mg/L) for deck barge (top) and hopper barge (bottom) ballast tanks sampled in August 2010.

3.1.2 Towboats

Of the 14 towboats inspected in August 2010, only four had measurable amounts of water in their ballast tanks. Water depths for towboats ranged from a low of 18 inches to a high of 72 inches (Figure 3). Average water depth for towboats was 50.5 inches. No information regarding the ballasting of the towboats was available. Towboat operators indicated that ballasting is not routinely conducted.

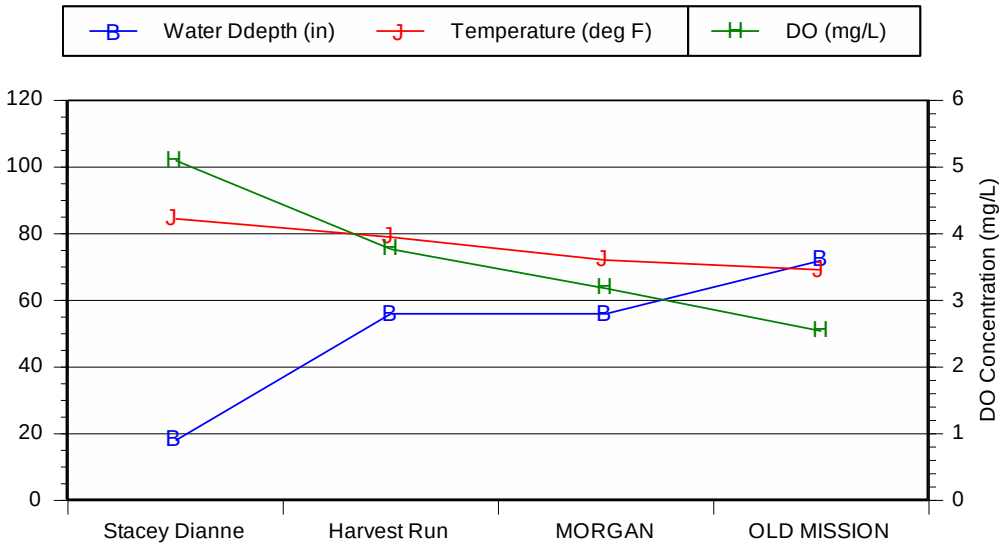

Figure 3. Water depth (inches), water temperature (°F), and DO concentration (mg/L) for towboat ballast tanks sampled in August 2010.

3.2 Water Temperature

3.2.1 Barges

Water temperature (°F) was recorded for the 50 barge ballast tanks that contained measurable amounts of water and ranged between 69.5 - 86.7 °F. Water temperature was relatively consistent in most ballast tanks. For deck barges, water temperature ranged between 69.5 - 83.4 °F, with an average of 71.5 °F (Figure 2). Water temperatures for hopper barges ranged between 70.4 - 86.7 °F (Figure 2). Average water temperature in hopper barges was 80.0 °F. For all hopper and tank barges combined, average water temperature was 77.4 °F. As mentioned above, there was no measurable water in tank barges.

3.2.2 Towboats

Water temperature in towboat ballast tanks ranged between 69.2 - 84.5 °F (Figure 3) with higher temperatures found in those tanks with less water. Similarly, the ballast tank with the most water (72 inches) had the lowest temperature. Average water temperature in towboat ballast tanks was 76.2 °F.

3.2.3 Ambient Conditions

Ambient water temperature was measured at approximately 1 meter depth alongside the barges twice during the survey. Water temperature at the IMT Channahon facility on August 17 was 86.3 °F. Water temperature of 70.0 °F was recorded at the Kindra Lake Towing facility near Chicago on August 19. In general, one can expect higher water temperatures in summer in the Lemont area (average = 80 °F) than in those areas closer to Lake Michigan (average = 71.5 °F).

3.3 Dissolved Oxygen (DO)

3.3.1 Barges

DO concentrations in the water of the 50 ballast tanks ranged between 0.44 - 7.80 mg/L and were highly variable. For deck barges, DO ranged between 3.60 - 6.17 mg/L, with an average of 5.29 mg/L (Figure 2). For hopper barges DO concentrations ranged between 0.44 - 7.80 mg/L. Average DO in hopper barges was 3.98 mg/L. No apparent trends in DO concentration were observed between barges with more water compared to those with less water in their ballast tanks. Tank barges did not contain sufficient water to measure DO. This is not unexpected since tank barges are inspected by Coast Guard after collisions, elisions, etc and, if leaks are found, are removed from service until repairs are made.

3.3.2 Towboats

DO concentrations in ballast water from towboats ranged from 2.54 - 5.10 mg/L (Figure 2). Average DO in towboats was 3.65 mg/L.

3.3.3 Ambient Conditions

As was done with water temperature, ambient DO was also measured twice during the survey at approximately 1 meter depth alongside the barge. DO at the IMT Channahon facility on August 17 was 2.76 mg/L, while DO at the Kindra Lake Towing facility near Chicago on August 19 was 8.46 mg/L. This large difference could potentially be an artifact of sampling since the KLT sample was taken in the morning and the IMT sample was recorded in the afternoon.

3.4 Vessel Traffic

Annual vessel traffic across the electric fish barrier was obtained from USACE for 2007 and is presented in Figure 4. A total of 5,792 vessels crossed the electric fish barrier in Romeoville in 2007, including 2,246 liquid hazardous cargo barges, 2,650 commercial vessels, and 896 recreational vessels. A variety of barge types cross the electric barrier each year, including hopper, tank, and deck barges similar to those inspected in this study.

4 DISCUSSION/CONCLUSIONS

It is widely accepted that water temperature, flow conditions, food, and predation are important factors influencing larval survival and growth. Little information exists on water quality tolerances such as temperature and DO for Asian carp, especially the early stages of development such as eggs and larvae. Most of the existing literature focuses on common carp (*Cyprinus carpio L)* and grass carp (*Ctenopharyngodon idella*), which is also an Asian carp species.

Figure 4. Annual vessel traffic across the electric fish barrier in 2007 (Source USACE/OMNI).

Opuszynski et al. (1989) found the upper lethal temperature (ULT) for silver carp was 43.5 - 46.5 °C (110-116 °F) and also found no significant differences in survival of fish reared at lower and higher temperatures when proper food was used. Golovanov and Smirnov (2007) used the chronic lethal impact method with a water heating rate of 1 °C/day or 0.04 °C/h (1.8 °F/day or 0.07 °F/hr) to determine ULT for common carp. At 1 °C/day, (1.8 °F/day) fish successfully acclimated to temperature increases.

Silver carp are also quite tolerant to low water temperatures and have been reported to feed at water temperatures of 10 to 19°C (50-66 °F) in Israel (Leventer 1979, cited in Wrigley et al. 1988). When the water temperature dropped below 15°C (59 °F), the appetite of silver carp was reduced, and below 8-10°C (46-50 °F), feeding almost ceased (FAO 1980; Tripathi 1989). At water temperatures below 18°C (64 °F) or higher than 31°C (88 °F), rates of ovulation and hatching of silver carp have been reported to be low with high rates of abnormal embryonic development (FAO 1980).

Grass carp tolerate a wide range of water temperatures from 0 - 33 °C (32 - 91 °F), with temperatures greater than 38 °C (100 °F) being lethal for adults (Fedorenko and Fraser, 1978). ULT for grass carp fry ranges from 33 - 41 °C (91 - 106 °F), and for yearlings the range is 35 - 36 °C (95-97 °F), depending on season (Chilton and Muoneke, 1992). Grass carp also appear to tolerate moderately rapid changes in temperature. Shireman and Smith (1983) found fingerlings (5 - 7 cm or 2 - 3 inches) could tolerate temperature increases from 4 - 22 °C (39 - 72 °F) over a relatively short amount of time (~2 - 3 hours).

Bighead carp can tolerate extremes in water temperature, from cold temperate to tropical (Kolar, et al. 2007). In their native range in China, bighead carp can spawn at temperatures as low as 18°C (64 °F) in the Han River (Chunsheng, et al. 1980). Negonovskaya (1980) reported bighead carp fingerlings feeding activity continued at 10 °C (50 °F) in lakes in Russia's Pskov Region, but most active feeding activity occurs at 20 - 22 °C (68 - 72 °F). Experiments with thermal preferences conducted in Texas (Bettoli, et al. 1985) indicated that young bighead carp (56 - 73 mm) acclimated to temperatures at 23.0 ºC (73 °F), selected a mean temperature of 25.4 ºC (78 °F), and had their critical thermal maximum at 38.8 ºC (102 °F). Although little information exists on lower water temperature lethal limits for this species, the presence of bighead carp in rivers and reservoirs in the Manchurian Plain that remain frozen 4 to 6 months out of the year suggests that the species is quite cold tolerant.

The vast majority of ballast tanks sampled (919 of 969; 95 percent) were dry; water in the ballast tanks sampled in the current study had little variability in temperature and ranged between approximately 70 - 87 °F (21 - 30 °C) which was similar to the two ambient river temperatures measured. Comparison of temperature ranges in the barge ballast tanks with values found in the literature suggests that Asian carp larvae could potentially tolerate the range of temperatures found in the tanks and probably the fairly rapid changes in temperature in both the barge and towboat ballast tanks.

Information on carp (adult, juvenile, or larvae) tolerances to DO is extremely limited. Cudmore and Mandrak (2004) found DO levels below 3 mg/L can cause stress in grass carp. Shireman and Smith (1983) reported that the same species could tolerate oxygen concentrations as low as 0.2 mg/L and fingerlings survived in DO levels between 0.41 - 28 mg/L. Other studies have also found that young grass carp are more susceptible to low oxygen concentrations than older fishes and that vulnerability varies with season (Chilton and Muoneke, 1992) with less tolerance for lower DO concentrations in colder (winter) water compared to more tolerance for lower DO concentrations in summer, when the waters are warmer (Versar, Inc., 1999).

DO concentrations in barge and towboat ballast tanks measured in this study ranged between 0.44 - 7.80 mg/L. This is well within the range of tolerances for other carp species and is likely within the range for bighead and silver carp. This suggests that water quality conditions with ballast tanks, although not optimal, could support early life stages of Asian carp.

Of the 969 tanks and voids inspected during August 2010, 50 barge tanks (5.2 percent) had measurable levels of water. In April 2010, a visual ballast tank inspection was conducted (no water quality sampling) and found that of the 127 ballast tanks inspected, only 4 tanks (3.1 percent) had greater than approximately 3 inches of water (visual inspection). A worst case scenario can be constructed by assuming that no barge has more than one ballast tank with measurable water (2 inches or more) and that the roughly 5 percent rate for tanks with measurable water is representative. Applying this 5 percent rate to the USACE 2007 data for the number of cargo vessels passing through the electric barrier (see Section 3.4), it can be estimated that approximately 112 barges with water in their ballast tanks could potentially pass through the electric barrier each year.

5 RECOMMENDATIONS

Information collected during this study is useful in understanding volumes and water quality conditions in barge and towboat ballast tanks and voids and is useful as a baseline for the development of additional studies to test whether ballast tanks are a viable vector for Asian carp transport. Although the existing literature is sparse on the tolerances of Asian carp, information on other species of carp suggests these species would be able to tolerate a wide range of water quality conditions, including high water temperature and low DO concentrations. It must be noted that the current study only provides a "snapshot" of what ballast water conditions are during a summer event and that no barge history was recorded for those tanks that contained substantial amounts of water. It is possible that those barges had leaks and had remained rafted in place rather than being kept in use. Additional sampling events and barge information during other time periods may be warranted to look at possible seasonal variability within barge and towboat ballast tanks and voids.

Larval fish survivability within a barge or towboat ballast tank has never been studied. In determining whether ballast tanks are to be considered a possible vector for larval transport, the next step should be to determine whether early developmental stages of Asian carp (eggs and larvae) are able to tolerate/survive in these tanks. In addition, other studies should be performed to help evaluate transport mechanisms for Asian carp. These should include sampling barge tanks for different life stages of Asian carp, evaluating the effects that tank leakage has on the potential transport of Asian carp, and investigating the effect of deliberate ballasting via pumps on early life stages.

6 UPDATE FROM 2012 SURVEY OF LOCAL BARGES

6.1 Introduction to 2012 Survey

The November 2010 Towboat/Barge Sampling Study focused on large barge companies that move hundreds of barges across the electric dispersal barrier. The July 2012 survey addressed localized barges and towboats that regularly work within 10 miles of and regularly transit over the USACE dispersal barrier. The study examined the condition and amount of measurable water found in ballast tanks of those local vessels.

Initially, the intent was to shift from the large barge companies previously surveyed to local/small barge providers. Research revealed there are no small companies that move barges within the dispersal barrier

focus area, but a few of the large companies previously visited do designate some of their barges and tow boats to work in the local barrier area. Therefore the inspection team focused on these local groups of barges operating in the immediate vicinity of the dispersal barrier.

6.2 Methods Used in 2012

The methods used in the previous survey were again used in this survey. Locally operating barge companies provided towboat transportation for the inspection team to locally operating barges along the CSSC in the vicinity of Lemont and Romeoville, IL (Table 2) between 30 July and 1 August 2012. Barges were located near the USACE electrical dispersal barrier indicated in Figure 1.

Table 2. Vessel Company and Location of Barge and Towboat Sampled, July-August 2012.

Vessel Company	Location
IMT	Lemont, IL
ARTCO	Romeoville, IL (Power Plant)
Midwest Generation, LLC	Romeoville, IL (Power Plant)
Hanson Material Services	Romeoville, IL (Loading area)

Ballast tanks of barges either rafted along the river bank or at the operator's facilities on the CSSC were visually inspected for the presence of condensation and/or measureable amounts of water. Hopper barges were the only type of barges available during the inspections. Cargos were either construction materials (sand, gravel) or coal. The barges inspected were double-hull construction with single or double-raked ends. On most of the barges ballast tanks run from side-to-side without obstructions. Eleven older barges had a bulkhead in the center which separated port and starboard tanks. Barges additionally had a stern tank, bow tank, or both which ran from side to side. The number of tanks per barge ranged from 6 to 13 depending on the construction, although 70 percent had 10 tanks each.

Data for all barges and towboats inspected was recorded on data sheets in the field, which were then transferred to the tables included in Appendix C. Barge location, barge type, number of tanks, location of tank inspected, condensation/water presence, and if hatch was found sealed were recorded for each barge inspected. If water was present in a tank, a sounding device (tape measure/sounding stick/string and weight) was used to determine if the water level was greater than 4 inches. Four inches of water allowed use of a Yellow Springs Instrument (YSI) Model 550A Temperature-Dissolved Oxygen probe to measure temperature and dissolved oxygen (DO). Ambient river temperature and DO in the vicinity of the barges were also recorded twice a day for a baseline comparison. Photographs of tanks and barge configurations seen during the survey are provided in Appendix D.

6.3 Results of 2012 Survey

Only two towboats were available for transportation and inspection. Both crews reported that they rarely adjust the ballast water in their tanks. A crewman from the towboat STACY DIANE (Hanson Material Services) reported the ballast water in the towboat stern tank was at least 4-6 months old.

Of the 39 barges inspected, the majority were in generally good condition. Most were empty and all were rafted along various portions of the CSSC. Barge ballast tanks were typically accessible through a hinged manhole type hatch (Figure 5) with a rubber seal and edge hatch dogs to latch securely. All hatches were closed but none were found latched. A few barges used a round removable tank manhole cover (Figure 6). A small number of these covers were found loosely sitting over the access hole and not mated tightly closed.

Figure 5. Ballast tank hinged manhole hatch.

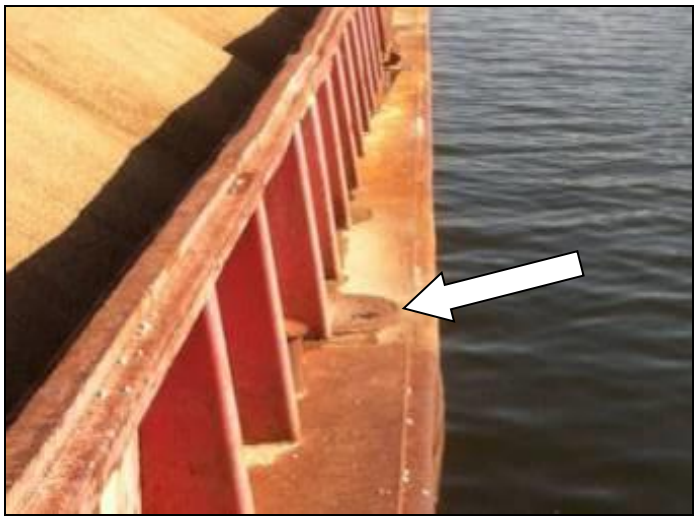

Figure 6. Ballast tank removable manhole cover.

Some barges also incorporated 7-inch tank access tubes (Figure 7). This type of access tube was not reported in the 2010 survey and appeared to be on older barges. These tubes are covered with a hinged cap and are used to conveniently insert pump hoses when needed. The barge crewmen stated these tubes were used as a primary access to the tank when sounding or when pumping into/out of the tanks. Because the crewmen prefer to regularly use these smaller tank accesses, many of the associated larger tank hatch covers were rusted shut from lack of use. The inspection team was able to evaluate the tank water level and perform measurements using these tube accesses.

Figure 7. Ballast tank access tubes.

Barge ballast tanks were approximately 10 feet deep. Typically only a small amount of water was found in the tank and the bottom 4-inch cross-members were usually visible (Figure 8).

Figure 8. Typical tank inspection view.

6.3.1 Water Depth in Tanks 2012

A total of 288 barge tanks were inspected; however, three hatches were not accessible due to covers that could not be opened for inspection resulting in 285 barge tanks evaluated for water content**.**

As shown in Table 3, results of the barge inspection indicated 44 percent of all tanks were completely dry and 50 percent had only a trace amount of water. Only 6 percent of the tanks held water above the 4-inch measurable threshold that allowed the use of the YSI meter.

Table 3. Barge Tank Water Content, July-August 2012.

	Number of Tanks	Percent of Total Tanks
Dry	126	44%
Less than 4"	141	50%
Equal to or greater than 4"	18	6%
Total	**285**	**100%**

Of the two towboats accessible to inspect, both had a bow and stern tank. The STACY DIANE (Hanson Material Services) had an empty bow tank and held 32 inches of ballast water in the stern tank. The WINDY CITY (Illinois Marine Towing) had an empty stern tank and held 24 inches of ballast water in the bow tank.

6.3.2 Water Temperatures and Dissolved Oxygen 2012

Water temperature in barge and towboat tanks ranged between 81.1 - 86 °F. DO in tanks ranged between 2.85 - 7.07 milligram per liter (mg/L) (Figure 9). Tank water in the STACY DIANE was 90 °F and had a DO reading of 3.11 mg/L when measured during mid-morning. The WINDY CITY bow had a temperature of 84.5 °F and DO was 6.65 mg/L when the water was measured in the afternoon. River baseline measurements of temperature and DO were 82.1 to 90 °F and 3.11 to 7.55 mg/L, respectively.

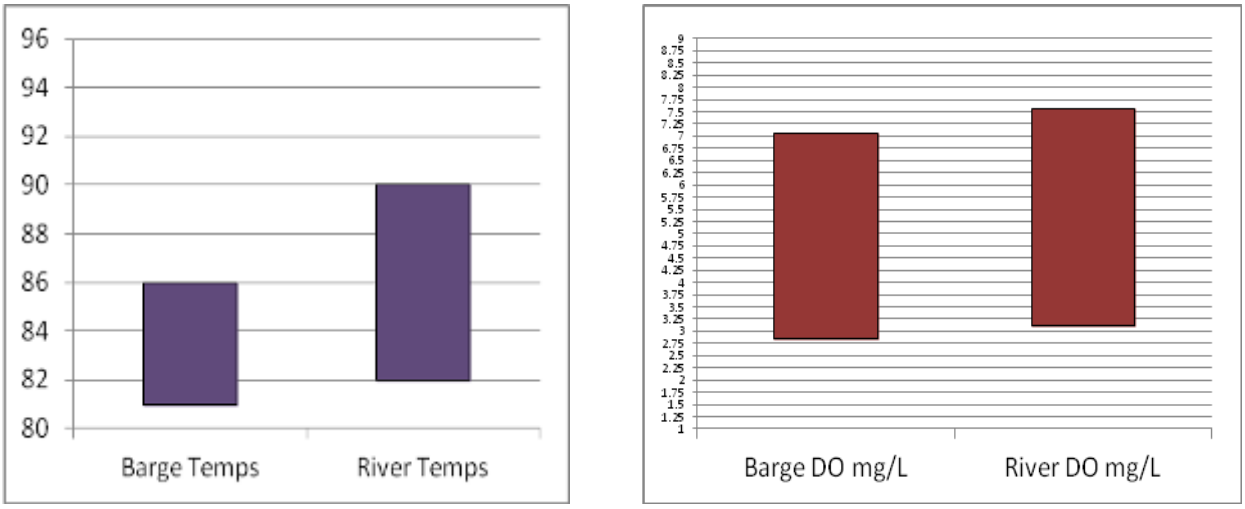

Figure 9. Water Temperature and Dissolved Oxygen Comparisons.

6.4 Conclusions from 2012 Survey

The overall findings of this survey of local barge traffic near the dispersal barrier compares closely to the condition and water content/levels of the larger initial barge study of 2010. The percentage of tanks with measurable amounts of water (5 percent versus 6 percent) and the temperature and DO in those tanks are very similar. Due to lack of availability, only two tow boats were inspected. Each tow boat contained 2 feet or more of ballast tank water; at least one tank had been filled for several months. Because towboat tanks are actively filled more frequently than barge tanks, additional tow boat inspections may be warranted. Due to the extended period of time the towboat tanks remain filled, long-term survival of Asian carp larvae in them is unlikely.

The team was able to collect data on 39 barges rafted along areas of the river. The barges inspected were usually empty and in generally good condition. One crewmember commented that most barges sit uncovered the majority of the time so there is a potential for rainwater to seep through small weld cracks or holes contributing to the trace amounts of water that were found. One barge manager reported that the empty barges moored along the river are not checked regularly for water in ballast tanks, but are inspected anytime they are moved. He said barges are also monitored for water in the ballast tanks every 6 hours while in use, which is the same schedule reported by operators of longer distance barges in 2010.

The barge companies have experienced a recent slowdown in activity around the dispersal barrier focus area and consequently fewer barges/tugboats were available for access. A local barge company representative from the area mentioned that his company was one of the main barge providers that traverse the dispersal barrier. He informed the team that regular coal deliveries will end by mid-September 2012, and his barges will no longer be used to transport coal through the barrier and up to the Chicago area. This slowdown will dramatically reduce the total number of barges that cross through the dispersal barrier.

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APPENDIX A. SURVEY DATA DURING AUGUST 2010

Table A-1 presents the data collected during the August 2010 survey of towboat and barge tanks and voids.

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/16/10	13:16	Lemont, IL	IMT	RMT 324	H	Bow	--	S	N				docked, empty
8/16/10	13:16	Lemont, IL	IMT	RMT 324	H	S2	--	S	N				docked, empty
8/16/10	13:16	Lemont, IL	IMT	RMT 324	H	S3	--	S	N				docked, empty
8/16/10	13:34	Lemont, IL	IMT	RMT 324	H	S4	--	S	N				docked, empty
8/16/10	13:36	Lemont, IL	IMT	BOI 1006B	H	Bow	6	S	N				docked, covered
8/16/10	13:43	Lemont, IL	IMT	MBL 957	H	Bow/Stern	6	S	N				docked, empty
8/16/10	13:48	Lemont, IL	IMT	PML 1303B	H	Bow/Stern	6	S	N				docked, empty
8/16/10	13:16	Lemont, IL	IMT	RMT 324	H	Stern	6	S	Y	2.00	82.5	3.37	docked, empty
8/16/10	13:16	Lemont, IL	IMT	RMT 324	H	S1	--	S	Y	4.50	79.0	5.01	docked, empty
8/16/10	14:14	Heritage Storage Yard	IMT	KIRBY 28709	Tank	All	12	S	N				
8/16/10	14:27	Heritage Storage Yard	IMT	KIRBY 15011	Tank	All	12	S	N				
8/16/10	14:33	Heritage Storage Yard	IMT	IB 1016	Tank	All	14	S	N				
8/16/10	14:38	Heritage Storage Yard	IMT	CBC 45	Tank	All	12	S	N				
8/16/10	14:42	Heritage Storage Yard	IMT	CBC 109	Tank	All	12	S	N				
8/16/10	14:45	Heritage Storage Yard	IMT	CBC 140	Tank	All	12	S	N				
8/16/10	14:52	Heritage Storage Yard	IMT	CBC 148	Tank	All	12	S	N				
8/16/10	14:58	Heritage Storage Yard	IMT	CBC 135	Tank	All	12	S	N				
8/16/10	15:04	Heritage Storage Yard	IMT	CBC 146	Tank	All	12	S	N				
8/16/10	15:12	Heritage Storage Yard	IMT	CBC 150	Tank	All	12	S	N				
8/17/10	8:47	Power Plant - Romeoville	ARTCO	MG 698	H	S	--	S	N				docked, empty
8/17/10	8:50	Power Plant - Romeoville	ARTCO	MWG 202	H	S	6	S	N				docked, empty
8/17/10	9:00	Power Plant - Romeoville	ARTCO	MG 685	H	All	6	S	N				docked, empty
8/17/10	9:18	Power Plant - Romeoville	ARTCO	AT 664B	H	S	6	S	N				docked, loaded
8/17/10	9:21	Power Plant - Romeoville	ARTCO	CBL 314	H	S	6	S	N				docked, empty
8/17/10	9:32	Power Plant - Romeoville	ARTCO	MWG 205	H	S	6	S	N				docked, loaded
8/17/10	9:34	Power Plant - Romeoville	ARTCO	AT 310	H	S	6	S	N				docked, loaded
8/17/10	10:06	Power Plant - Romeoville	ARTCO	MWG 206	H	S	6	S	N				docked, empty

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/17/10	10:43	ARTCO Shipyard - Lemont	ARTCO	CGB 416	H	S	6	S	N				docked, empty
8/17/10	14:17	IMT - Channahon	IMT	IMT 207B	H	S	6	S	N				docked, loaded
8/17/10	14:20	IMT - Channahon	IMT	IMT 141	H	S	6	S	N				docked, loaded
8/17/10	14:23	IMT - Channahon	IMT	IMT 115	H	S	6	S	N				docked, loaded
8/17/10	14:43	IMT - Channahon	IMT	RMT 305	H	S	6	S	N				docked, loaded
8/17/10	14:46	IMT - Channahon	IMT	MST 648B	H	S	6	S	N				docked, loaded
8/17/10	14:53	IMT - Channahon	IMT	ABC 778	H	S	6	S	N				docked, loaded
8/17/10	14:57	IMT - Channahon	IMT	RMT 325	H	S	6	S	N				docked, loaded
8/17/10	15:05	IMT - Channahon	IMT	MST 706B	H	S	6	S	N				docked, loaded
8/17/10	15:20	IMT - Channahon	IMT	MST 642B	H	S	6	S	N				docked, loaded
8/17/10	8:22	Power Plant - Romeoville	ARTCO	MG 692	H	S1	6	S	Y	2.50	77.7	2.90	docked, empty
8/17/10	8:22	Power Plant - Romeoville	ARTCO	MG 692	H	S3	--	S	Y	7.00	77.7	3.28	docked, empty
8/17/10	8:22	Power Plant - Romeoville	ARTCO	MG 692	H	Stern	--	S	Y	3.00	77.8	3.55	docked, empty
8/17/10	8:34	Power Plant - Romeoville	ARTCO	MG686	H	S4	6	S	Y	10.00	80.1	2.31	docked, empty
8/17/10	8:34	Power Plant - Romeoville	ARTCO	MG686	H	S1	--	S	Y	8.00	80.0	4.40	docked, empty
8/17/10	8:34	Power Plant - Romeoville	ARTCO	MG686	H	Bow	--	S	Y	4.00	78.3	5.09	docked, empty
8/17/10	8:53	Power Plant - Romeoville	ARTCO	MG 681	H	Bow	6	S	Y	6.00	76.8	3.94	docked, empty
8/17/10	9:12	Power Plant - Romeoville	ARTCO	SER 232	H	S1	6	S	Y	5.00	83.8	3.05	docked, loaded
8/17/10	9:26	Power Plant - Romeoville	ARTCO	MG 688	H	Stern	6	S	Y	42.00	78.9	4.28	docked, loaded
8/17/10	9:42	Power Plant - Romeoville	ARTCO	MG 699	H	S	6	S	Y	13.00	81.1	2.55	docked, empty
8/17/10	9:42	Power Plant - Romeoville	ARTCO	MG 699	H	S	--	S	Y	7.00	79.8	3.62	docked, empty
8/17/10	9:42	Power Plant - Romeoville	ARTCO	MG 699	H	S	--	S	Y	8.00	80.0	4.20	docked, empty

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/17/10	9:54	Power Plant - Romeoville	ARTCO	MG 697	H	Stern	6	S	Y	7.00	80.1	4.24	docked, empty
8/17/10	9:54	Power Plant - Romeoville	ARTCO	MG 697	H	S2	--	S	Y	10.00	81.2	0.44	docked, empty
8/17/10	9:54	Power Plant - Romeoville	ARTCO	MG 697	H	S1	--	S	Y	10.00	82.0	1.10	docked, empty
8/17/10	9:54	Power Plant - Romeoville	ARTCO	MG 697	H	Bow	--	S	Y	10.00	80.8	3.45	docked, empty
8/17/10	10:55	ARTCO Shipyard - Lemont	ARTCO	SER 234	H	S2	6	S	Y	3.00	78.9	4.53	docked, empty
8/17/10	10:55	ARTCO Shipyard - Lemont	ARTCO	SER 234	H	Stern	--	S	Y	15.00	78.6	4.62	docked, empty
8/17/10	15:00	IMT - Channahon	IMT	RCI 257B	H	Stern	6	S	Y	117.00	85.7	1.85	ambient DO = 2.76 mg/L temp = 86.3
8/17/10	15:07	IMT - Channahon	IMT	IMT 113	H	S3	6	S	Y	5.00	86.3	2.42	docked, loaded
8/17/10	15:11	IMT - Channahon	IMT	RMT 326	H	S1	6	S	Y	7.00	86.7	1.86	docked, loaded
8/17/10	14:50	IMT - Channahon	IMT	CBC 205	Tank	All	12	S	N				docked, loaded
8/17/10	15:48	IMT - Channahon	IMT	Mary C	Towboat	Bow	1	S	N				
8/18/10	9:28	Romeoville	Hanson Marine	MSC 9801	Deck	All	6	S	N				
8/18/10	9:35	Romeoville	Hanson Marine	MSC 8100	Deck	All	6	S	N				
8/18/10	9:44	Romeoville	Hanson Marine	MSC 0005	Deck	All	6	S	N				
8/18/10	9:51	Romeoville	Hanson Marine	MSC 0101	Deck	All	6	S	N				
8/18/10	9:56	Romeoville	Hanson Marine	MSC 9302	Deck	All	6	S	N				
8/18/10	10:05	Romeoville	Hanson Marine	MSC 0004	Deck	All	6	S	N				
8/18/10	10:11	Romeoville	Hanson Marine	MSC 8900	Deck	All	6	S	N				
8/18/10	10:14	Romeoville	Hanson Marine	MSC 1107	Deck	All	6	S	N				
8/18/10	10:18	Romeoville	Hanson Marine	MSC 1109	Deck	All	6	S	N				

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/18/10	10:38	Romeoville	Hanson Marine	MSC 9600	Deck	All	6	S	N				
8/18/10	10:42	Romeoville	Hanson Marine	MSC 9601	Deck	All	6	S	N				
8/18/10	10:46	Romeoville	Hanson Marine	MSC 9800	Deck	All	6	S	N				
8/18/10	10:49	Romeoville	Hanson Marine	MSC 0003	Deck	All	6	S	N				
8/18/10	10:52	Romeoville	Hanson Marine	MSC 9300	Deck	All	6	S	N				
8/18/10	10:25	Romeoville	Hanson Marine	MSC 1106	Deck	P2	6	S	Y	6.00	82.8	5.44	
8/18/10	10:27	Romeoville	Hanson Marine	MSC 1106	Deck	P1	6	S	Y	9.00	83.4	5.32	
8/18/10	11:26	Romeoville	Hanson Marine	Morris	Towboat	Bow	1	S	N				
8/18/10	9:02	Romeoville	Hanson Marine	Stacey Dianne	Towboat	Bow	1	S	Y	18.00	84.5	5.10	
8/19/10	8:28	south Chicago	Kindra Lake Towing	TMS 200	Deck	All	14	S	N				
8/19/10	8:48	south Chicago	Kindra Lake Towing	CBC 4507	Deck	P4	6	S	Y	10.00	69.7	5.08	
8/19/10	8:53	south Chicago	Kindra Lake Towing	CBC 4507	Deck	P3	--	S	Y	24.00	69.8	5.34	
8/19/10	8:58	south Chicago	Kindra Lake Towing	CBC 4507	Deck	P2	--	S	Y	11.00	69.5	5.57	
8/19/10	9:03	south Chicago	Kindra Lake Towing	CBC 4507	Deck	P1	--	S	Y	7.00	69.7	5.79	
8/19/10	9:08	south Chicago	Kindra Lake Towing	CBC 4507	Deck	Bow1	--	S	Y	5.00	69.6	5.44	
8/19/10	9:15	south Chicago	Kindra Lake Towing	CBC 4507	Deck	Bow2	--	S	Y	5.00	69.5	5.33	
8/19/10	9:48	south Chicago	Kindra Lake Towing	CBC 1253	Deck	P1	18	S	Y	6.50	69.6	3.74	
8/19/10	9:50	south Chicago	Kindra Lake Towing	CBC 1253	Deck	P4	18	S	Y	5.00	69.7	3.60	

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/19/10	9:55	south Chicago	Kindra Lake Towing	CB 276	Deck	S6	14	S	Y	5.00	70.0	5.05	
8/19/10	10:00	south Chicago	Kindra Lake Towing	CB 276	Deck	S5	--	S	Y	6.00	69.7	5.72	
8/19/10	10:05	south Chicago	Kindra Lake Towing	CB 276	Deck	S4	--	S	Y	4.50	69.9	6.17	
8/19/10	10:10	south Chicago	Kindra Lake Towing	CB 276	Deck	S3	--	S	Y	5.00	69.9	5.82	
8/19/10	10:15	south Chicago	Kindra Lake Towing	CB 276	Deck	Bow	--	S	Y	18.00	69.5	5.93	
8/19/10	8:16	south Chicago	Kindra Lake Towing	OR 5367	H	P	6	S	N				
8/19/10	9:32	south Chicago	Kindra Lake Towing	MST 748B	H	S	6	S	N				
8/19/10	9:35	south Chicago	Kindra Lake Towing	MST 739B	H	S	6	S	N				
8/19/10	9:43	south Chicago	Kindra Lake Towing	ING 2175	H	S	6	S	N				
8/19/10	10:50	Walsh Slip	Kindra Lake Towing	IMT 140	H	S	6	S	N				
8/19/10	10:52	Walsh Slip	Kindra Lake Towing	T 13969	H	S	6	S	N				
8/19/10	10:55	Walsh Slip	Kindra Lake Towing	ING 4766	H	S	6	S	N				
8/19/10	8:10	south Chicago	Kindra Lake Towing	OR 4901	H	P2	6	S	Y	16.00	70.4	3.23	
8/19/10	8:38	south Chicago	Kindra Lake Towing	BUCKLEY	Towboat	Bow	1	S	N				
8/19/10	8:32	south Chicago	Kindra Lake Towing	MORGAN	Towboat	Bow	1	S	Y	56.00	72.1	3.18	
8/19/10	8:40	south Chicago	Kindra Lake Towing	OLD MISSION	Towboat	Stern	1	S	Y	72.00	69.2	2.54	Ambient: 70.0 deg F; 8.46 mg/L DO
8/20/10	8:40	Lemont	American Commercial Lines	TTBL 4104B	H	All	6	S	N				

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/20/10	8:54	Lemont	American Commercial Lines	ACL 00549	H	All	6	S	N				
8/20/10	8:56	Lemont	American Commercial Lines	ACBL 1431	H	All	6	S	N				
8/20/10	9:03	Lemont	American Commercial Lines	WWT 846	H		6	S	N				
8/20/10	8:15	Lemont	American Commercial Lines	LF 13413	H	S	6	S	Y	5.00	78.1	4.78	
8/20/10	8:33	Lemont	American Commercial Lines	ACL 00233	H	P1	6	S	Y	3.00	77.9	6.77	
8/20/10	8:45	Lemont	American Commercial Lines	PV 507	H	S3	6	S	Y	3.00	79.4	7.80	
8/20/10	9:22	Lemont	American Commercial Lines	ACL 00549	H	P4	6	S	Y	10.00	79.0	5,72	Being cleaned/tanks being pumped out
8/20/10	10:21	Lemont	ARTCO	ACL 00549	H	P2	--	S	Y	5.00	79.0	4.53	
8/20/10	10:22	Lemont	ARTCO	ACL 00549	H	Bow	--	S	Y	76.00	80.0	5.86	
8/20/10	8:20	Lemont	American Commercial Lines	Chem 239	Tank	All	12	S	N				
8/20/10	8:23	Lemont	American Commercial Lines	Chem 229	Tank	All	12	S	N				
8/20/10	8:28	Lemont	American Commercial Lines	Hines 412	Tank	All	12	S	N				
8/20/10	8:07	Lemont	American Commercial Lines	T.E. Ragsdale	Towboat	Bow	1	S	N				NO BALLAST TANKS

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/20/10	9:00	Lemont	American Commercial Lines	Jack Crowley	Towboat	Bow	1	S	N				NO BALLAST TANKS
8/20/10	9:46	Lemont	American Commercial Lines	Steve McKinny	Towboat	Bow	1	S	N				NO BALLAST TANKS
8/20/10	10:17	Lemont	ARTCO	Buster White	Towboat	Bow	1	S	N				
8/20/10	10:20	Lemont	ARTCO	Harvest Run	Towboat	Bow	1	S	Y	56.00	79.0	3.77	
8/23/10	9:01	Ottawa	ARTCO	AT 315	H	All	6	S	N				
8/23/10	9:06	Ottawa	ARTCO	AB 133	H	All	6	S	N				
8/23/10	9:09	Ottawa	ARTCO	AT 346B	H	All	6	S	N				
8/23/10	9:12	Ottawa	ARTCO	AT 732B	H	All	6	S	N				
8/23/10	9:15	Ottawa	ARTCO	AT 608B	H	All	6	S	N				
8/23/10	9:15	Ottawa	ARTCO	SER 230	H	All	6	S	N				
8/23/10	9:18	Ottawa	ARTCO	AT 636B	H	All	6	S	N				
8/23/10	9:24	Ottawa	ARTCO	ART 35263B	H	All	6	S	N				
8/23/10	9:27	Ottawa	ARTCO	CBL 315	H	All	6	S	N				
8/23/10	9:30	Ottawa	ARTCO	TCB 444	H	All	6	S	N				
8/23/10	9:30	Ottawa	ARTCO	XL 656	H	All	6	S	N				
8/23/10	9:39	Ottawa	ARTCO	AT 749B	H	All	6	S	N				
8/23/10	9:39	Ottawa	ARTCO	ART 603B	H	All	6	S	N				
8/23/10	9:42	Ottawa	ARTCO	ART 164	H	All	6	S	N				
8/23/10	9:42	Ottawa	ARTCO	ART 164	H	All	6	S	N				
8/23/10	9:59	Ottawa	ARTCO	SER 234	H	All	6	S	N				
8/23/10	9:59	Ottawa	ARTCO	CAB 416	H	All	6	S	N				
8/23/10	11:37	Seneca	ARTCO	ATI 680B	H	All	6	S	N				
8/23/10	11:37	Seneca	ARTCO	TCB463B	H	All	6	S	N				
8/23/10	11:40	Seneca	ARTCO	RRS 8182	H	All	6	S	N				
8/23/10	11:40	Seneca	ARTCO	AT735B	H	All	6	S	N				
8/23/10	12:27	Morris	ARTCO	AB67	H	All	6	S	N				
8/23/10	12:27	Morris	ARTCO	AB97	H	All	6	S	N				
8/23/10	8:56	Ottawa	ARTCO	AB85	H	S2	6	S	Y	3.00	80.0	5.10	
8/23/10	8:58	Ottawa	ARTCO	ART 303	H	Stern	1	S	Y	3.00	80.0	5.10	
8/23/10	10:05	Ottawa	ARTCO	Gold Star	Towboat	Bow	1	S	N				
8/23/10	10:05	Ottawa	ARTCO	Mary "G"	Towboat	Bow	1	S	N				

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/23/10	12:37	Morris	ARTCO	Bob Page	Towboat	Bow	1	S	N				
8/24/10	9:06	Lemont, power plant	ARTCO	MWG 204	H	All	6	S	N				
8/24/10	9:08	Lemont, power plant	ARTCO	MG 699	H	All	6	S	N				2nd check different location
8/24/10	9:08	Lemont, power plant	ARTCO	MG 697	H	All	6	S	N				2nd check different location
8/24/10	9:11	Lemont, power plant	ARTCO	MG 698	H	All	6	S	N				2nd check different location
8/24/10	9:14	Lemont, power plant	ARTCO	MG 680	H	All	6	S	N				
8/24/10	9:18	Lemont, power plant	ARTCO	MG 206	H	All	6	S	N				
8/24/10	9:21	Lemont, power plant	ARTCO	MG 207	H	All	6	S	N				
8/24/10	8:54	Lemont, power plant	ARTCO	MG 696	H	STERN	6	S	Y	3.00	78.7	4.78	
8/24/10	8:54	Lemont, power plant	ARTCO	MG 069	H	STERN	6	S	Y	8.00	79.0	3.53	
8/25/10	9:06	Channahon	IMT	IMT 143	H	All	6	S	N				
8/25/10	9:08	Channahon	IMT	IMT 129	H	All	6	S	N				
8/25/10	9:10	Channahon	IMT	IMT 111	H	All	6	S	N				
8/25/10	9:12	Channahon	IMT	TBL 39	H	All	6	S	N				
8/25/10	9:25	Channahon	IMT	IMT 205B	H	All	6	S	N				
8/25/10	9:25	Channahon	IMT	IMT 118	H	All	6	S	N				
8/25/10	9:27	Channahon	IMT	OR 5490	H	All	6	S	N				
8/25/10	9:27	Channahon	IMT	IMT 137	H	All	6	S	N				
8/25/10	9:34	Channahon	IMT	INO 71010	H	All	6	S	N				
8/25/10	9:38	Channahon	IMT	ING 2400	H	All	6	S	N				
8/25/10	9:52	Channahon	IMT	INO 75116	H	All	6	S	N				
8/25/10	9:55	Channahon	IMT	INO 85171	H	All	6	S	N				
8/25/10	9:55	Channahon	IMT	ING 2147	H	All	6	S	N				
8/25/10	13:16	Romeoville/Loading area	Hanson Marine	MSC 9301	H	All	6	S	N				
8/25/10	13:16	Romeoville/Loading area	Hanson Marine	MSC 9903	H	All	6	S	N				
8/25/10	13:20	Romeoville/Loading area	Hanson Marine	MSC 9001	H	All	6	S	N				
8/25/10	13:26	Romeoville/Loading area	Hanson Marine	MSC 8803	H	All	6	S	N				
8/25/10	13:26	Romeoville/Loading area	Hanson Marine	MSC 9900	H	All	6	S	N				
8/25/10	13:28	Romeoville/Loading area	Hanson Marine	MSC 9904	H	All	6	S	N				

Table A-1. August 2010 survey data.

Date	Time	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Tank Sampled (Port, Starbrd)	Total # Tanks	Hatch Sealed (S) or Unsealed (U)	Water Present (Y or N)	Water Depth (inches)	Temp (°F)	DO (mg/L)	Comments
8/25/10	13:33	Romeoville/Loading area	Hanson Marine	MSC 8405	H	All	6	S	N				
8/25/10	13:33	Romeoville/Loading area	Hanson Marine	MSC 8700	H	All	6	S	N				
8/25/10	13:20	Romeoville/Loading area	Hanson Marine	MSC 0002	H	P3	6	S	Y	3.50	84.7	5.87	

APPENDIX B. SURVEY PHOTOS, AUGUST 2010

Figure B-1. Loaded (upper) and unloaded (lower) barges. Note minimal clearance under bridge.

Figure B-2. Interior of empty hopper barge (upper). Loading hopper barge (lower).

Figure B-3. Raised and flush hatch covers on rafted barges (Upper). Raised access hatch (lower).

Figure B-4. Measuring temperature and dissolved oxygen on rafted barge (upper). Interior of barge void space (lower). Water depth approximately 3 inches.

APPENDIX C. SURVEY DATA DURING JULY-AUGUST 2012

Table A-1 presents the data collected during the July-August 2012 survey of towboat and barge tanks and voids.

Table C-1. Survey Data July-August 2012.

Barge Survey Data *Page 1 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/30	9:52	Romeoville, IL	Hanson Materials	Stacy Diane	Towboat	1	Stern	Sealed	Yes	32	87.9	N/A	
	10:14	River Baseline									90	3.11	
	10:22	Romeoville, IL	Hanson Materials	MSC8700	Hopper	9	Stbd 1	Sealed	No				* Depth less than 4" not evaluated
							Port 1		Yes	1*			
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		Yes	2			
							Stbd 4		Yes	3			
							Port 4		No				
							Stern		Yes	1			
7/30	10:35			MSC8801		11	Stbd 1	Sealed	Yes	1			
							Port 1		Yes	1			
							Stbd 2		No				
							Port 2		Yes	2			
							Stbd 3		Yes	2			
							Port 3		Yes	1			
							Stbd 4		No				
							Port 4		Yes	3			
							Stbd 5		No				
							Port 5		Yes	1			
							Stern		No				
7/30	10:52			MSC8401		9	Stbd 1		Yes	1			
							Port 1		No				

Table C-1. Survey Data July-August 2012 (Continued).

Barge Survey Data *Page 2 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/30	10:52	Romeoville, IL	Hanson Materials	MSC8401	(continued)		Stbd 2	Sealed	Yes	1			
							Port 2		Yes	1			
							Stbd 3		No				
							Port 3		Yes	1			
							Stbd 4		Yes	1			
							Port 4		Yes	1			
							Port 5		No				
							Stern		Yes	2			
7/30	11:03			MSC8103	Hopper	9	Stbd 1		No				
							Port 1		Yes	1			
							Stbd 2		Yes	2			
							Port 2		Yes	1			
							Stbd 3		Yes	1			
							Port 3		Yes	1			
							Stbd 4		Yes	1			
							Port4		Yes	2			
							Port 5		Yes	1			
							Stern		No				
7/30	11:10			MSC9901	Hopper	9	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port4		No				
							Stern		Yes	1			

Barge Survey Data *Page 3 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/30	11:22	Romeoville, IL	Hanson Materials	MSC8702		9	Stbd 1	Sealed	Yes	1			
							Port 1		No				
							Stbd 2		Yes	1			
							Port 2		Yes	1			
							Stbd 3		No				
							Port 3		Yes	2			
							Stbd 4		Yes	1			
							Port 4		No				
							Port 5		No				
							Stern		Yes	2			
7/30	11:35	River Baseline									85.5	7.01	
7/31	7:50	Romeoville, IL	Hanson Materials	MSC9004	Hopper	9	Stbd 1		Yes	2			
							Port 1		Yes	4.5	84.7	2.85	
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Port 5		No				
							Stern		Yes	3			
7/31	8:04			MSC8803	Hopper	9	Stbd 1		Yes	0.5			
							Port 1		Yes	4.5	84.7	2.85	
							Stbd 2		Yes	3			
							Port 2		No				
							Stbd 3		Yes	2			
							Port 3		No				

Table C-1. Survey Data July-August 2012 (Continued).

Barge Survey Data *Page 4 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/31	8:04	Romeoville, IL	Hanson Materials	MSC8803	(continued)		Stbd 4	Sealed	Yes	5	84.5	7.01	
							Port 4		No				
							Port 5		Yes	2.5			
							Stern		Yes	3.5			
7/31	8:17			MSC9903	Hopper	9	Stbd 1		No				
							Port 1		Yes	12	85.5	7.07	
							Stbd 2		No				
							Port 2		Yes	1			
							Stbd 3		No				
							Port 3		Yes	1			
							Stbd 4		No				
							Port 4		Yes	2			
							Port 5		No				
							Stern		No				
7/31	8:24			MSC9800	Hopper	9	Stbd 1		No				
							Port 1		Yes	13	86	5.2	
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Port 5		No				
							Stern		No				
7/31	8:27			MSC0102	Hopper	13	Stbd 1		Yes	2			
							Port 1		Yes	2.5			
							Stbd 2		No				
							Port 2		No				

Barge Survey Data *Page 5 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/31	8:27	Romeoville, IL	Hanson Materials	MSC0102	(continued)		Stbd 3	Sealed	No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Stbd 5		No				
							Port 5		No				
							Stbd 6		No				
							Port 6		No				
							Stern		Yes	3			
7/31	8:32			MSC8903	Hopper	9	Stbd 1		Yes	2			
							Port 1		No				
							Stbd 2		Yes	2			
							Port 2		No				
							Stbd 3		Yes	1			
							Port 3		No				
							Stbd 4		Yes	2			
							Port 4		No				
							Port 5		No				
							Stern		Yes	6	85.3	6.8	
7/31	8:37			MSC8100	Hopper	9	Stbd 1		Yes	3			
							Port 1		Yes	2			
							Stbd 2		Yes	3			
							Port 2		Yes	2			
							Stbd 3		No				
							Port 3		Yes	2			
							Stbd 4		Yes	2			
							Port 4		No				

Table C-1. Survey Data July-August 2012 (Continued).

Barge Survey Data *Page 6 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/31	8:37	Romeoville, IL	Hanson Materials	MSC8100	(continued)		Port 5	Sealed	Yes	2			
							Stern		Yes	2			
7/31	12:57	Lemont, IL	Illinois Marine	IMT146	Hopper	6	Stbd 1		Yes	2			
							Port 1		Yes	2			
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Bow		No				
							Stern		Yes	1			
7/31	13:03	River Baseline									82.6	6.7	
7/31	13:03			TBL126	Hopper	6	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Bow		No				
							Stern		No				
7/31	13:06			MM9705B	Hopper	7	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		Yes	1			

Barge Survey Data *Page 7 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/31	13:06	Lemont, IL	Illinois Marine	MM9705B	(continued)		Stbd 3	Sealed	No				
							Port 3		No				
							Stbd 4		Yes	1			
							Port 4		Yes	2			
							Stbd 5		No				
							Port 5		Yes	2			
							Bow		Yes	3			
							Stern		Yes	2			
7/31	13:10			MM9725B	Hopper	7	Stbd 1		Yes	1			
							Port 1		No				
							Stbd 2		Yes	1			
							Port 2		No				
							Stbd 3		Yes	1			
							Port 3		No				
							Stbd 4		Yes	2			
							Port 4		No				
							Stbd 5		Yes	2			
							Port 5		Yes	1			
							Bow		Yes	2			
							Stern		Yes	2			
7/31	13:13			ACL01145	Hopper	6	Stbd 1		No				
							Port 1		Yes	0.5			
							Stbd 2		No				
							Port 2		Yes	2			
							Stbd 3		No				
							Port 3		Yes	1			
							Stbd 4		No				
							Port 4		Yes	1			

Table C-1. Survey Data July-August 2012 (Continued).

Barge Survey Data *Page 8 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/31	13:13	Lemont, IL	Illinois Marine	ACL01145	(continued)		Stbd 5	Sealed	No				
							Port 5		Yes	1			
							Stern		Yes	2			
7/31	13:18	Lemont, IL	Illinois Marine	Windy City	Towboat	1	Bow		Yes	24	84.5	6.65	
7/31	13:26			RCI253B	Hopper	10	Stbd 1		Yes	0.5			
							Port 1		Yes	2			
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Stbd 5		Yes	1			
							Stern		Yes	2			
							Bow		Yes	1			
7/31	13:28			RCI251B	Hopper	7	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		N/A				Bolted closed
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Stbd 5		No				
							Port 5		No				

Barge Survey Data *Page 9 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
7/31	13:28	Lemont, IL	Illinois Marine	RCI251B	(continued)		Bow	Sealed	Yes	1			
							Stern		Yes	2			
7/31	13:38			RCI256B	Hopper	6	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		Yes	1			
							Port 4		No				
							Stbd 5		No				
							Port 5		No				
							Bow		Yes	2			
7/31	13:40			RCI259B	Hopper	7	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		N/A				Bolted Closed
							Stbd 3		No				
							Port 3		No				
							Stbd 4		Yes	0.5			
							Port 4		Yes	1			
							Stbd 5		Yes	1			
							Port 5		Yes	1			
							Bow		Yes	1			
							Stern		Yes	3			
7/31	13:44			IMT122	Hopper	6	Stbd 1		No				
							Port 1		Yes	2			

Table C-1. Survey Data July-August 2012 (Continued).

Barge Survey Data *Page 11 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
8/1		Romeoville, IL	Midwest Generation	MWG205	(continued)		Bow	Sealed	No				
							Stern		No				
8/1				MG493	Hopper	6	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Bow		Yes	1			
							Stern		No				
8/1	7:54			MG683	Hopper	6	Stbd 1		Yes	1			
							Port 1		Yes	3			
							Stbd 2		Yes	1			
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		Yes	1			
							Port 4		No				
							Bow		Yes	5	81.2	6.31	
							Stern		Yes	1			
8/1	8:03			MG685	Hopper	6	Stbd 1		No				
							Port 1		Yes	3			
							Stbd 2		Yes	1			
							Port 2		No				
							Stbd 3		Yes	1			
							Port 3		Yes	3			

Barge Survey Data *Page 12 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
8/1		Romeoville, IL	Midwest Generation	MG685	(continued)		Stbd 4	Sealed	Yes	1			
							Port 4		No				
							Bow		Yes	2			
							Stern		Yes	2			
8/1	8:06			MWG208	Hopper	6	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Bow		No				
							Stern		Yes	3			
8/1	8:08			AGS434B	Hopper	6	Stbd 1		No				
							Port 1		Yes	3			
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		Yes	2			
							Stbd 4		Yes	2			
							Port 4		Yes	1			
							Bow		Yes	6	81.6	5.4	
							Stern		Yes	1			
8/1	8:23			MG695	Hopper	6	Stbd 1		Yes	1			
							Port 1		Yes	1			
							Stbd 2		Yes	1			
							Port 2		Yes	1			

Table C-1. Survey Data July-August 2012 (Continued).

Barge Survey Data *Page 13 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
8/1		Romeoville, IL	Midwest Generation	MG695	(continued)		Stbd 3	Sealed	Yes	1			
							Port 3		Yes	1			
							Stbd 4		Yes	1			
							Port 4		Yes	1			
							Bow		Yes	1			
							Stern		Yes	6	83.3	4.25	
8/1	8:26			MG689	Hopper	6	Stbd 1		Yes	3			
							Port 1		Yes	2			
							Stbd 2		Yes	4	83.5	5.04	
							Port 2		Yes	3			
							Stbd 3		Yes	6	84.2	4.88	
							Port 3		Yes	4	82.7	5.67	
							Stbd 4		Yes	2			
							Port 4		Yes	3			
							Bow		No				
							Stern		Yes	3			
8/1	8:29			MG690	Hopper	6	Stbd 1		Yes	1			
							Port 1		No				
							Stbd 2		Yes	1			
							Port 2		Yes	1			
							Stbd 3		Yes	2			
							Port 3		No				
							Stbd 4		Yes	1			
							Port 4		Yes	1			
							Bow		Yes	5	82.9	6.47	
							Stern		Yes	2			
8/1	8:34			MG694	Hopper	6	Stbd 1		Yes	1			
							Port 1		Yes	1.5			

Barge Survey Data *Page 14 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
8/1		Romeoville, IL	Midwest Generation	MG694	(continued)		Stbd 2	Sealed	Yes	1			
							Port 2		Yes	1			
							Stbd 3		Yes	1			
							Port 3		Yes	0.5			
							Stbd 4		Yes	1			
							Port 4		No				
							Bow		Yes	3			
							Stern		No				
8/1				AGS811B	Hopper	7	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Stbd 5		No				
							Port 5		Yes	1			
							Bow		Yes	1			
							Stern		Yes	7	84.5	5.54	
8/1	10:35			MG201	Hopper	6	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		N/A				Rusted closed
							Stbd 4		No				
							Port 4		No				

Table C-1. Survey Data July-August 2012 (Continued).

Barge Survey Data *Page 15 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
8/1		Romeoville, IL	Midwest Generation	MG201	(continued)		Bow	Sealed	Yes	1			
							Stern		No				
8/1	10:35			MWG204	Hopper	6	Stbd 1		No				
							Port 1		No				
							Stbd 2		No				
							Port 2		No				
							Stbd 3		No				
							Port 3		No				
							Stbd 4		No				
							Port 4		No				
							Bow		Yes	3			
							Stern		No				
8/1	10:37			MG681	Hopper	6	Stbd 1		Yes	3			
							Port 1		Yes	1			
							Stbd 2		Yes	3			
							Port 2		No				
							Stbd 3		Yes	2			
							Port 3		Yes	1			
							Stbd 4		Yes	3			
							Port 4		Yes	3			
							Bow		Yes	2			
							Stern		Yes	3			
8/1	10:41			MG699	Hoper	6	Stbd 1		No				
							Port 1		Yes	5	83.1	5.65	
							Stbd 2		Yes	3			
							Port 2		Yes	7	83.6	5.31	
							Stbd 3		Yes	1			
							Port 3		Yes	1			

Barge Survey Data *Page 16 of 16*

Date	Time (CST)	Location	Vessel Company	Vessel Name & ID	Type (Hopper, Platform, Towboat)	Total # Tanks	Tank Sampled (Port Starbord)	Hatch Sealed (S) Unsealed (U)	Water Present (y or N)	Water Depth (inches)	Temp (F)	DO (mg/L)	Comments
8/1		Romeoville, IL	Midwest Generation	MG699	(continued)		Stbd 4	Sealed	Yes	4	84.3	5.82	
							Port 4		Yes	1			
							Bow		Yes	1			
							Stern		Yes	1			
8/1	10:51	Romeoville, IL	River Baseline								82.8	7.55	
x	x	x	END	x	x	x							

APPENDIX D. SURVEY PHOTOS, JULY-AUGUST 2012

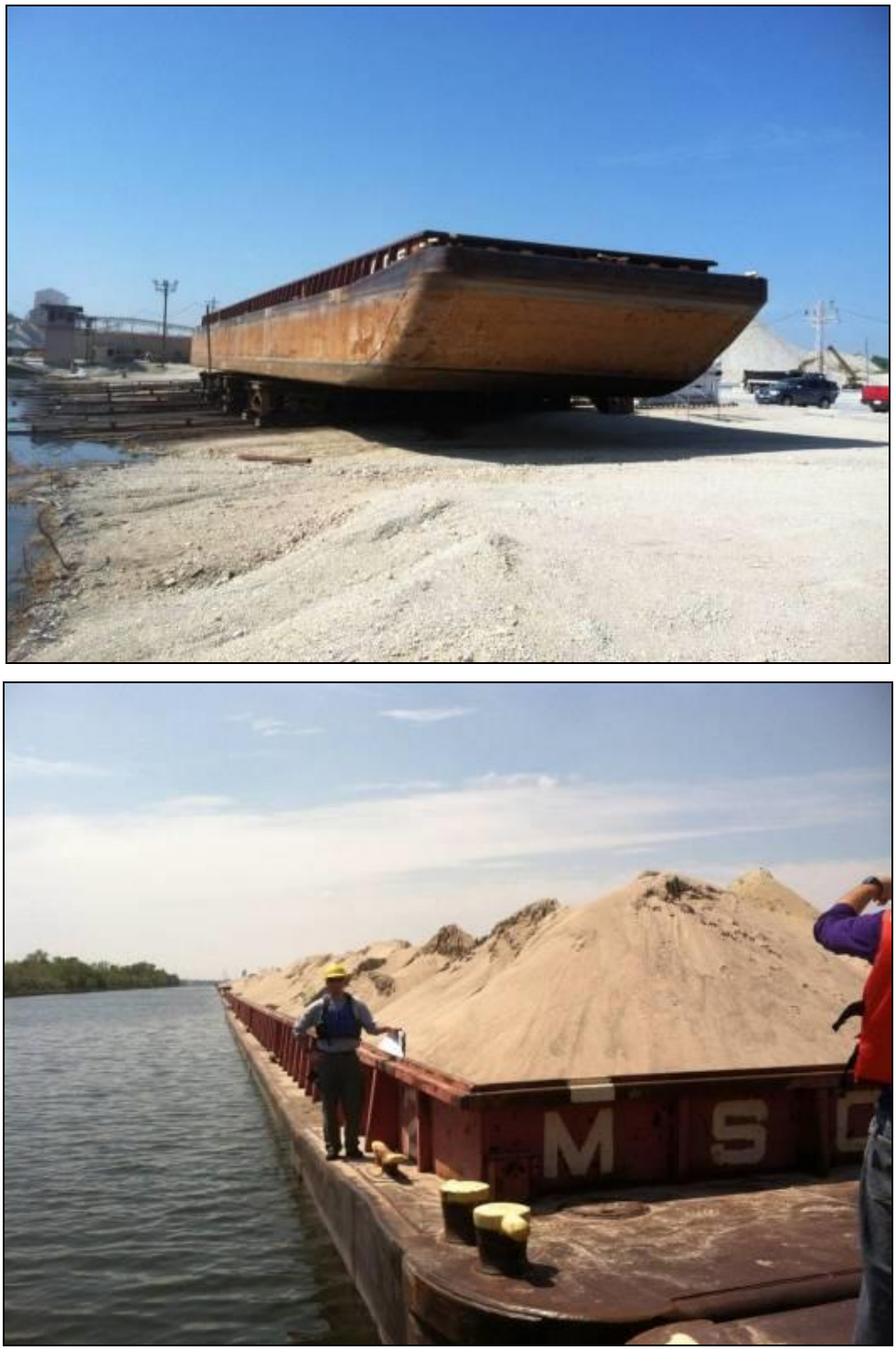

Figure D-1. Hopper barge dry-docked for repair, note hull depth to freeboard (upper). Hopper barge fully loaded with construction grade sand (lower).

Figure D-2. Loaded barges rafted at construction materials site (upper). Covers being installed to protect cargo on hopper barge, note added height (lower).

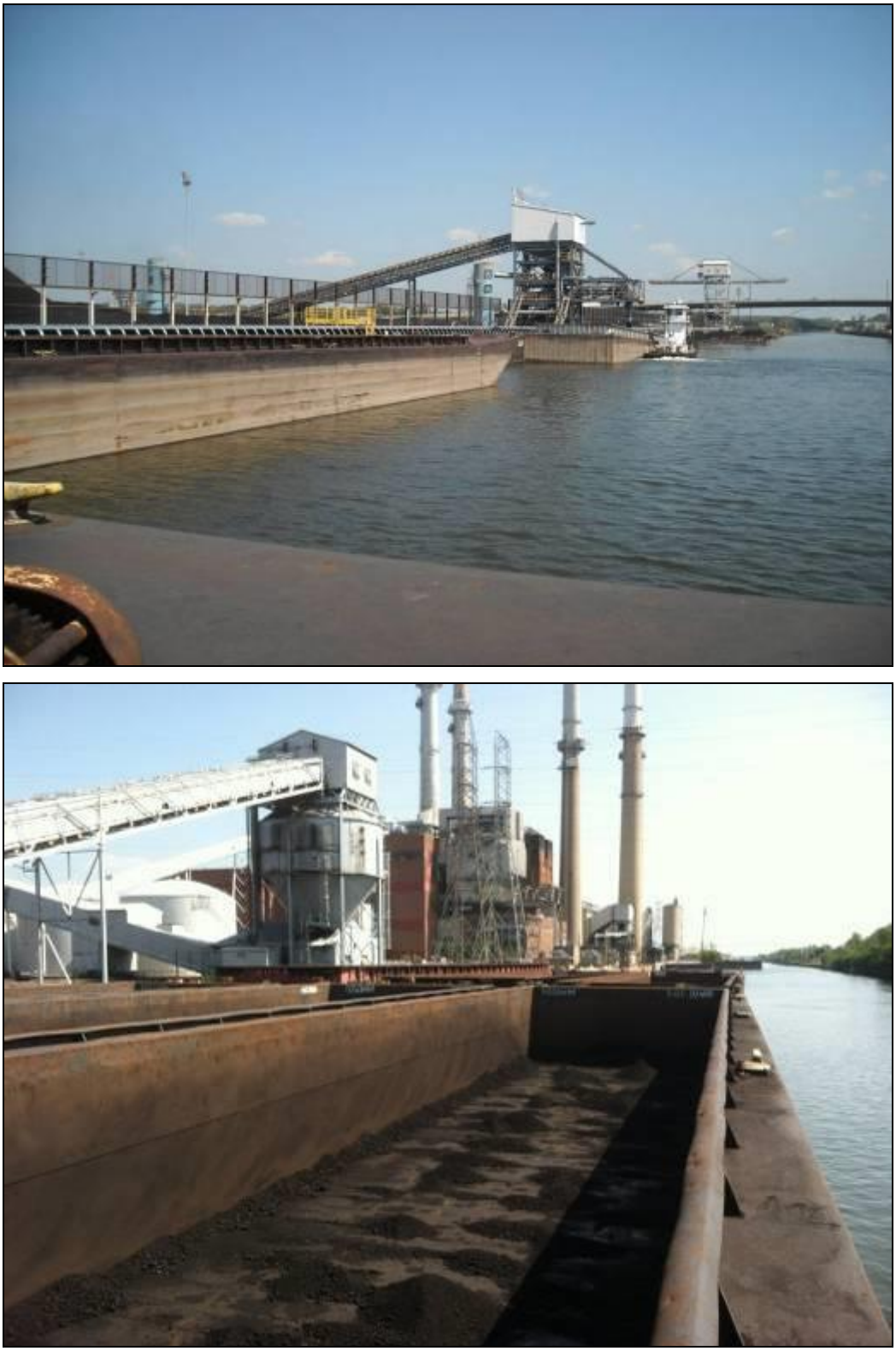

Figure D-3. Barge being loaded with loose material near dispersal barrier (upper). Empty hopper barge at Midwest Generation on CSSC (lower).

Figure D-4. Recording data aboard towboat in CSSC (upper). Warning sign on CSSC near dispersal barrier (lower).