Lower Des Plaines River
Winter 2016-2017 Water Quality Report

Lower Des Plaines River
Chloride Workgroup

Date: June 2017
Revised: July 2017

Prepared by:
Huff & Huff, Inc.,
A subsidiary of GZA, Inc.

TABLE OF CONTENTS

LIST OF APPENDICES

LIST OF ACRONYMS AND ABBREVIATIONS

7Q10	7-day, 10-year low flow
AWQMN	Ambient Water Quality Monitoring Network
CAWS	Chicago Area Waterway System
CSSC	Chicago Sanitary & Ship Canal
cfs	cubic feet per second
HCWPG	Hickory Creek Watershed Planning Group
HUC	Hydrologic Unit Code
IDNR	Illinois Department of Natural Resources
IEPA	Illinois Environmental Protection Agency
I&M Canal	Illinois and Michigan Canal
IPCB	Illinois Pollution Control Board
LDPRCW	Lower Des Plaines River Chloride Workgroup
LDWC	Lower DuPage Watershed Coalition
MGD	Millions of gallons per day
mg/L	milligrams per Liter
MS4	Municipal Separate Storm Sewer System
MWRD	Metropolitan Water Reclamation District
MS4	Municipal Separate Storm Sewer System
NPDES	National Pollutant Discharge Elimination System
RM	River mile from Illinois River
STORET	Storage Retrieval and Water Quality Exchange
TRM	Three Rivers Manufacturers' Association
USACE	United States Army Corps of Engineers-Rock Island District
uS/cm	microsiemens per centimeter
US EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WRP	Water Reclamation Plant
WWTP	Wastewater Treatment Plant

1. INTRODUCTION

The Illinois Pollution Control Board (IPCB) published new water quality standards for chloride in 2015 for the Lower Des Plaines River, as well as the Chicago Area Waterways System (CAWS). These new winter chloride standards go into effect on July 1, 2018, except for on the Chicago Sanitary & Ship Canal where a site specific winter chloride water standard was adopted by the IPCB. Due to the new water quality standards for chloride being adopted, the Illinois Environmental Protection Agency (IEPA) will be addressing chlorides in the National Pollutant Discharge Elimination System (NPDES) permits as they come up for renewal.

The IEPA asked Three Rivers Manufacturer's Association, which is comprised of industrial and municipal NPDES permit holders, to host a meeting to identify level of interest to form a workgroup. The workgroup's goal is to implement strategies to reduce winter chloride discharges and impacts to receiving waterways in the Lower Des Plaines River, similar to what Chloride Initiative Workgroup led by MWRD is doing in the CAWS. In 2015, the Lower Des Plaines River Chloride Workgroup (LDPRCW) was formed with the goal of achieving chloride reductions and to seek chloride variance for the Lower Des Plaines River. A variance is a temporary relief mechanism from a water quality standard granted by the IPCB, to which conditions are agreed upon to work toward achieving a water quality standard over a designated period of time.

In preparation for seeking a chloride variance from the IPCB, the LDPRCW established an instream chloride monitoring program in the Des Plaines River. The monitoring program began in January of 2016 and LDPRCW contracted an analytical laboratory services company to sample at three sites in the Lower Des Plaines River. The 2016 instream chloride concentrations collected by LDPRCW and other organizations within the Lower Des Plaines River watershed was reported in October 2016 (Huff & Huff, 2016). Based on the data analysis and recommendations, the LDPRCW recognized the need to expand its chloride monitoring program during the 2016-2017 winter season in preparation of a variance request for the winter chloride water quality standard.

This report presents the LDPRCW's 2016-2017 winter chloride results, additional historical chloride data sampled by Metropolitan Water Reclamation District (MWRD) of Greater Chicago within the Lower Des Plaines River watershed, and the correlation between chloride and specific conductance and its implication on future monitoring. This report also provides recommendations for future monitoring in support of a petition for a chloride variance.

2. BACKGROUND INFORMATION

The project area is within the Des Plaines River drainage basin, Hydrologic Unit Code (HUC) 07120004, as catalogued by the United States Environmental Protection Agency (US EPA, 2016). The Des Plaines River is divided between the Upper Des Plaines and Lower Des Plaines River

sub-basins. The Lower Des Plaines River sub-basin includes several watersheds, within the project area, including Des Plaines River, DuPage River, Hickory Creek, and Chicago Sanitary and Ship Canal-Des Plaines River watersheds (Figure 1, Appendix A). The project area was modified from the 2016 monitoring report, to include the Des Plaines River at I-355 at the Will County line (Figure 1, Sheet 4 in Appendix A) and extends downstream at the confluence of the Kankakee River and Des Plaines River, forming the Illinois River. The drainage area of the Des Plaines River in Illinois is 1,320 square miles. The Des Plaines River has a width ranging from 40 to 100 feet and an average depth of seven feet (IDNR, 2016). At the Brandon Road Lock and Dam on the Des Plaines River (river mile (RM) from Illinois River is 285.9) the normal headwater pool elevation is 538.5 ft. Upstream of the Brandon Road Lock and Dam, the Des Plaines River has an elevation ranging from 528 to 532 ft (USGS, 1991).

2.1. Watershed Planning Groups and Organizations

During the winter of 2016 to 2017 instream chloride sampling within the project area was collected by watershed groups, state agencies, municipalities, and watershed reclamation districts. These included the LDPRCW, MWRD, and Hickory Creek Watershed Planning Group (HCWPG).

The LDPRCW was formed in 2015 to plan, organize, and implement measures toward seeking a chloride variance from IPCB in the Lower Des Plaines River watershed through stakeholder engagement, in-stream chloride monitoring, and technical initiatives. This workgroup consists of industries, municipalities, and watershed groups collaborating to identify strategies in preparation for a chloride variance within the Lower Des Plaines River. In 2016, the LDPRCW sampled instream weekly during the winter months for chlorides at three sampling locations (Huff & Huff, 2016). The 2016 sampling showed very little difference in winter chloride concentrations at sampling site 1 and 3. Based on these results, in-stream grab sampling upstream and downstream of the project area was recommended in order to continue to capture represented chloride concentrations from upstream and industrial discharges into the Des Plaines River. From December 2016 to April 2017, the LDPRCW sampled weekly during the winter months at two sampling locations (sites 1 and 3 in the Des Plaines River (Figure 1, Sheets 1, 3, and 4 in Appendix A). Site 1 is located at the Ruby Street Bridge in Joliet, IL, at the river mile (RM) from Illinois River of 287.7 (Figure 1, Sheet 4 in Appendix A). Site 3 is located at RM 275.8, one mile north of the confluence of Grant Creek and Des Plaines River, at the oil tanking west dock (Figure 1, Sheet 1 in Appendix A). In addition, LDPRCW, in collaboration with the United States Geological Survey (USGS), is sampling continuous specific conductivity at the 05539670 stream gauge in the Des Plaines River at Channahon, IL (Figure 1, Sheet 1 in Appendix A).

The MWRD operates seven wastewater treatment plants. MWRD's largest wastewater treatment plant, Stickney Water Reclamation Plant (WRP), discharges effluent to the CSSC (MWRD, 2016). MWRD samples effluent from its treatment plants. In addition, MWRD conducts instream water quality sampling upstream and downstream of their treatment plant. At the Lockport Forebay on

the CSSC (RM 290.9), just upstream of the confluence with the Des Plaines River, MWRD has monitored continuous instream specific conductance using a probe and derived chloride concentrations based upon conductivity measurements made in 2004. MWRD's monitoring results are presented in Sections 2.3 and 2.4. In 2015, MWRD formed the Chicago Area Waterway System (CAWS) Chloride Reduction Initiative Workgroup, which is comprised of local government, watershed groups, consultants, industries, Illinois Department of Transportation, Illinois Tollway, the Salt Institute, and MWRD. The workgroup consists of five sub-committees; data acquisition, social and economic impact, legal, best management practices, and water quality.

The HCWPG was formed to preserve the Hickory Creek watershed. HCWPG is an active watershed group consisting of municipalities, Forest Preserve, and academia that develops and implements their watershed management plan to improve water quality and restore stream health, enhance public education and stewardship, and develop approaches to measure watershed performance. Since 2012, HCWPG has sampled for chlorides in Hickory Creek and its tributaries (Figure 1, Sheet 3 in Appendix A). HCWPG samples for chlorides weekly during the winter months and monthly the remainder of the year is recommended. The results of winter 2016-2017 collected by HCWPG is presented in Section 2.4 of this report.

The IEPA's Ambient Water Quality Network (AWQMN) is a river monitoring program with assistance from the United States Geological Survey (USGS) and Illinois State Water Survey. The AWQMN consists of 146 fixed stations in Illinois. Historical chloride data have been collected at site G-23 at RM 288.7 (Figure 1, Sheet 4 in Appendix A) and reported in STORET (IEPA, 2016). However, no chloride data were collected in in Des Plaines River as part of AWQMN during winter of 2016 to 2017 under this program.

2.2. Water Resources

The Lower Des Plaines River (project area) starts at the Will County line at I-355 Bridge. The project area ends at the confluence of the Kankakee River and the Des Plaines River, the start of the Illinois River.

The Des Plaines River flows southward for 133 miles through southern Wisconsin and northern Illinois. It has a watershed area of 2,111 square miles, including water artificially diverted from the Metropolitan Chicago area including the Chicago River, CSSC, and I&M Canal. In 2015, MWRD discharged at its largest plant (Stickney) an average flow of 704 million gallons per day (MGD) and 2.56 MGD at their smallest plant (Lemont). The combined effluent discharges from all six wastewater treatment plants (WWTP) flow through the Lower Des Plaines River.

2.2.1. Flow Characteristics

Design flow statistics, such as 7-day, 10-year low flow (7Q10) and harmonic mean, are used to characterize low flow for setting discharge flow and effluent concentration permit limits. The 7Q10 is the lowest average stream flow within a consecutive seven day time period with an average 10 year recurrence interval. The 7Q10 flows in the Des Plaines River and its tributaries are provided in the 2016 Lower Des Plaines River Monitoring Plan (Huff & Huff, 2016).

The harmonic mean flow is used for the design streamflow of waste load allocation "based on protection of human health from life time exposures to carcinogens" (IEPA, 1990, sec 302.658). The harmonic mean flow is intended to represent typical daily flow that occurs in the river, less conservative than the low 7Q10 flow with respect to effluent limitation. The harmonic mean flows of the Des Plaines River and CSSC at the point of merger are 450 cfs (upper Des Plaines River) and 2,900 cfs for the CSSC, or a 3,350 cfs total (Singh and Stall, 1984). At the United States Geological Survey (USGS) Stream Gage 0053900 on Hickory Creek near Joliet, IL the harmonic mean is 19 cfs (Singh and Stall, 1984). The DuPage River at Shorewood has an harmonic mean flow of 185 cfs. Design flow statistics are provided in Appendix C of Huff & Huff (2016).

2.2.2. Stream Gages

The United States Geological Survey (USGS) operates 10 stream gages within the project area. Six gages are located in the Des Plaines River, two gages are located in CSSC, and two in Hickory Creek. Gage locations are provided in Figure 1 in Appendix A. Table 1 lists the location and drainage areas of these stream gages.

USGS 05539670 gage located in the Des Plaines River at Channahon, downstream of the confluence of Lower DuPage River (Figure 1, Sheet 1 in Appendix A). USGS operates this gage with Exelon Corporation and Three Rivers Manufacturers' Association (TRMA). The gage includes a multi-parameter sensor connected to a data logger with a specific conductance probe. From January 23, 2017 to present specific conductance data and from 2012 to 2017 temperature and discharge data were collected at this site.

2.2.3. Municipal and Industrial Discharges

Effluent from wastewater treatment plants (WWTP) (e.g., municipal point source), industrial facilities, and stormwater outfalls can dominate the flow of urban streams, especially during the summer base flow period between July and October.

Within the project area, 431 outfalls were identified as discharging into the Des Plaines River and its tributaries (Hickory Creek, Jackson Branch, DuPage River, CSSC, and Kankakee River). A list of the outfalls discharging effluent within the project area is provided in Figure 1, Sheets 7 to 9 in

Appendix A. Sources of outfall data include the IEPA NPDES permit program, Citgo, ExxonMobil, Village of Channahon, Village of New Lenox, Citgo, Dow Chemical, City of Lockport, and Romeoville. This is an incomplete list of all the outfalls discharging within the Lower Des Plaines River; however, understanding the number of discharges within the project area is a component to determining additional monitoring needed for seeking a chloride variance.

2.2.4. Water Quality

Within Illinois, waters are protected and evaluated under the applicable water quality standards (Title 35 Illinois Administrative Code, Subtitle C, Chapter I). There are three discrete sections of the Lower Des Plaines River from a water quality standards perspectives, as listed below:

Reach	**Chloride Water Quality Standard**
Des Plaines River Above confluence with Chicago Sanitary & Ship Canal	500 mg/L, not to exceed, year around
Des Plaines River From confluence with Chicago Sanitary & Ship Canal to the I-55 Bridge	500 mg/L, not to exceed (May 1 through November 30 until June 1, 2018) 500 mg/L, not to exceed year around (after June 1, 2018)
Des Plaines River from I-55 Bridge to the confluence with the Kankakee River	500 mg/L, not to exceed, year around

The IEPA's *Illinois Integrated Water Quality Report and Section 303(d) List-2016* identifies Des Plaines River at the confluence of Flagg Creek to the confluence with CSSC near S. Material Rd in Lockport (segment ID G-03) and the Des Plaines River downstream with the confluence of CSSC near S. Material Rd in Lockport to the confluence with the Illinois & Michigan (I & M) Canal just 0.2 miles upstream of the Ruby St. in Joliet, IL (segment ID G-11) and Hickory Creek (segment ID GG-06 and GG-22) as impaired and lists chloride as one of the causes of impairment (Appendix C). The Des Plaines River downstream of the confluence with the I & M Canal (segment ID G-24) is not listed as having chloride as one of the causes of impairment. Assessment is based on stream segments defined by the IEPA (IEPA, 2016b). Figure 1 highlights the stream segments within the project area impaired for chlorides in Appendix A.

2.3. Chloride Sampling Results

Table 2 in Appendix B lists the site locations of chloride data for Des Plaines River and Hickory Creek watershed (Hickory Creek, Spring Creek, Marley Creek, E. Branch of Marley Creek, and Union Ditch) during the winter of 2016-2017. These data were collected from LDPRCW, MWRD, and HCWPG. The sampling frequency and time periods are provided in Table 2 (Appendix B). Discrete in-stream chloride data are available at all identified sampling sites, except at sites MWRD_92 at CSSC (RM 290.9) and USGS 05539670 (RM 277) in the Des Plaines River at Route 53 continuous specific conductance and chloride data were collected using a multi-parameter probes. The data are presented further in Section 2.4 and Section 2.5.

Chloride samples collected from the aforementioned organizations as well as others during different periods between years 1982 to 2016 are reported in the Lower Des Plaines River Monitoring Report (Huff & Huff, 2016). Additional instream grab sampling results from the LDPRCW and HCWPG during December 2016 to April 2017 are presented in this report. Each site was sampled weekly during the winter months. A summary table of results is shown below and more details of summary statistics is provided in Table 3 and Table 7 in Appendix B.

Station ID	Stream	Start Date of Sampling	End Date of Sampling	Percent of winter days above 500 mg/L (%)
LDPRCW_03	Des Plaines River[1]	12/15/2016	4/27/2017	5
LDPRCW_01	Des Plaines River[1]	12/15/2016	4/27/2017	0
GGA-02	Spring Creek[2]	12/15/2016	4/20/2017	0
GG-14	Hickory Creek[2]	12/15/2016	4/20/2017	0
GGA-01	Spring Creek	1/19/2017	4/20/2017	0
GGA-A-C2	Spring Creek[2]	12/15/2016	4/20/2017	0
GGB-02	Marley Creek[2]	12/15/2016	4/20/2017	0
HC-MC-01	Marley Creek[2]	12/15/2016	4/20/2017	0
GGB-A	E. Branch of Marley Creek[2]	12/15/2016	4/20/2017	31
GGC-03	Union Ditch[2]	12/15/2016	4/27/2017	0

[1] Chloride concentrations were sampled by the Lower Des Plaines River Chlorides Workgroup (LDPRCW, 2017).

[2] Chloride concentrations were sampled by Hickory Creek Watershed Planning Group (HCWPG).

On the Des Plaines River only the downstream sampling site 3 recorded chloride concentrations above 500 mg/L this past winter. The field and lab specific conductance remained constant throughout the month of April; however, the chloride concentration increased above 500 mg/L (see Table 6). This sample is treated as an anomaly (e.g. sample contamination in either the field or lab). The Hickory Creek watershed, the maximum percentage of winter chloride samples above

500 mg/L occurred at site GGB-A on the East Branch of Marley Creek at RM 312.9 at 31 percent of the winter samples were above the 500 mg/L (Table 3 in Appendix B).

During the winter of 2016 to 2017, there was little difference in median chloride concentrations in the Des Plaines River upstream of Ruby St (Site 1) and downstream at the Oil Tanking docks (Site 3). (See Figure 2 in Appendix A). The minimum chloride concentration values were also similar. However, the maximum chloride concentration differed, 355 mg/L at the upstream end and 646 mg/L at the downstream sampling location. This variance is attributed to sampling after the chloride spike had passed Site 1. Table 4 lists the summary statistics of chloride data collected between 2016 and 2017 in Appendix B.

2.4. Specific Conductance

Specific conductance data were collected from upstream and downstream of the project area. The LDPRCW collected in-stream grab sampled in the Des Plaines River at Ruby St (Site 1) and at the Oil Tanking docks (Site 3) from December 15, 2016 to April 27, 2017. MWRD reported continuous specific conductance samples at the Lockport Forebay in CSSC (MWRD_92, RM 290.8) between December 15, 2016 and April 4, 2017. USGS collected specific conductance (USGS gage 05539670) in the Des Plaines River at Channahon (RM 277) between January 23, 2017 and April 27, 2017. Table 4 (summary statistics) and Table 8 (daily means) in Appendix B lists the specific conductivity data results at these four sampling sites. The medium conductance for the two sites were similar; 1,170 uS/cm to 1,242 uS/cm. The maximum conductance of 2,483 uS/cm was collected on December 19, 2016 in CSSC at Lockport Forebay (MWRD_92, RM 290.8).

2.5. Specific Conductance and Chloride Correlation

Linear regression equations were developed from specific conductance and measured chloride concentration from sampling sites Site 1, Site 3, and MWRD_92 (Figures 3, 4, and 5 in Appendix A). The linear regression equation developed from Site 3 sample results does not include April 27, 2017 sampling event, as this was treated as an anomaly. There is a correlation at all three sites; at the Des Plaines River at Ruby St. (Site 1, RM 288.7) the R-squared was 0.94, Des Planes River at Oil Tanking dock (Site 3, RM 275.8) the R-squared was 0.88, and on the CSSC at Lockport Forebay (MWRD_92, RM 290.8) the R-squared was 0.91 (from 2007-2015). Based on the linear regression equation, five percent of the winter days predicted chloride concentrations were above 500 mg/L on the CSSC at Lockport Forebay (MWRD_92, RM 290.8).

The linear regression equations aforementioned were also used to predict seasonal chloride concentrations in the Des Plaines River at the USGS gage 05539670 in Channahon, IL. Figure 5 in Appendix A, shows predicted chloride concentration based on the three aforementioned linear regression equations. Maximum predicted chloride concentration occurred after a 3-inch snow

event on March 15, 2016 melted at a rate of 0.04 in/hr starting on March 17, 2017 (NOAA, 2017). All three linear regression equations predicted chloride concentration after this snow melt event, ranging from 255 mg/L to 352 mg/L, below the target 500 mg/L..

3. FUTURE MONITORING PLAN

Winter sampling was conducted to determine maximum chloride levels associated with snow melt periods in Des Plaines River and its tributaries. The percentage of chloride concentrations collected during the winter of 2016 to 2017 above the chloride water quality standard of five percent in the Lower Des Plaines River was due to a mild snowfall winter season. All sampling locations within Hickory Creek watershed did not exceed the 500 mg/L; except East Branch Marley Creek resulted in a 31 percent above the 500 mg/L.

Sample locations were prioritized for future monitoring based on the following criteria: feasibility, accessibility, and representability. Feasibility is defined as the capability of LDPRCW to collect more data to demonstrate seasonality of chloride concentrations in the streams, whether it is to increase in-stream grab samples or collect continuous conductivity with a probe. Accessibility is defined as the level of difficulty to reach the location and the capability of having access to enter the land by the landowner. Lastly, representability is defined as how best the location capture chloride concentration from a large number of NPDES discharges (industrial and municipal) in the Des Plaines River. The recommended 2018 in-stream monitoring is provided in Table 5.

3.1. Recommended Sampling Regime

Based on the feasibility, accessibility, and representability, LDPCW's water quality monitoring program for 2018 should include both in-stream grab samples of chloride and continuous conductivity sampling upstream and downstream of the project area. Table 5 in Appendix B lists the recommended sampling locations and sampling regime, based on flow characteristics and available monitoring data. Weekly in-stream discrete sampling is recommended beginning December 1, 2017 to the end of April 30, 2018. In addition, it is recommended that each tributary contributor's address the chlorides in their stream, similar to what HCWPG is already doing. HCWPG is sampling chlorides weekly during the winter months and monthly the remainder of the year is recommended.

3.1.1. In-Stream Grab Samples

In-stream grab sampling upstream (site 1) and downstream (site 3) of the project area are recommended in order to continue to capture represented chloride concentrations from upstream

discharges into the Des Plaines River. Table 5 in Appendix B provides a list of recommended sampling locations and frequency for in-stream grab sampling for 2017/2018. The winter of 2016/2017 was a mild snow season, resulting in few sampling events above the 500 mg/L; however, there was a strong correlation (R^2>0.5) with specific conductance and chloride concentrations collected in CSSC and the Des Plaines River. The recommended frequency of weekly and storm-event sampling at a minimum coupled with continuous conductivity is recommended in order to capture snow melt effect, as well as early spring flush in the Des Plaines River.

In addition to sampling for chlorides and conductivity, LDPRCW should continue to collect pH and temperatures at these two sites. Table 6 provides a list of recommended parameters and containers to sample.

3.1.2. Continuous Specific Conductance Monitoring

Continuous monitoring of specific conductance in the Des Plaines River at Channahon (USGS 05539670, RM 277) is recommended to predict seasonal peak chloride concentrations. The winter of 2016 to 2017 was a mild snow season; therefore, it is recommended to monitor specific conductance an additional year. The linear regression equation developed from specific conductance and measured chloride concentrations from discrete in-stream sampling can be used to predict seasonal chloride concentrations in the Des Plaines River.

4. SUMMARY

In summary, there was one sampling event above the 500 mg/L chloride concentration within Des Plaines River (lower) based on the available chloride data collected between December 2016 and April 2017 of 646 mg/L. The linear regression equation predicted zero percent of winter days above 500 mg/L of chloride based on continuous specific conductance sampled this winter. This low number of values above 500 mg/L is attributed to a mild winter in terms of inches of snow accumulated and road salt applied. Flow characteristics show a six percent increase in Harmonic Mean flow after the CSSC merges to the Des Plaines River compared to the flow above the confluence with the Kankakee, thus continued sampling at the north and south end of the project (Site 1 and Site 3) is recommended. Continued monitoring of conductivity will be used to predict chloride concentrations in the winter months from 2017 to 2018, estimate percent of the winter days above 500 mg/L and calculate both the magnitude and duration samples above 500 mg/L.

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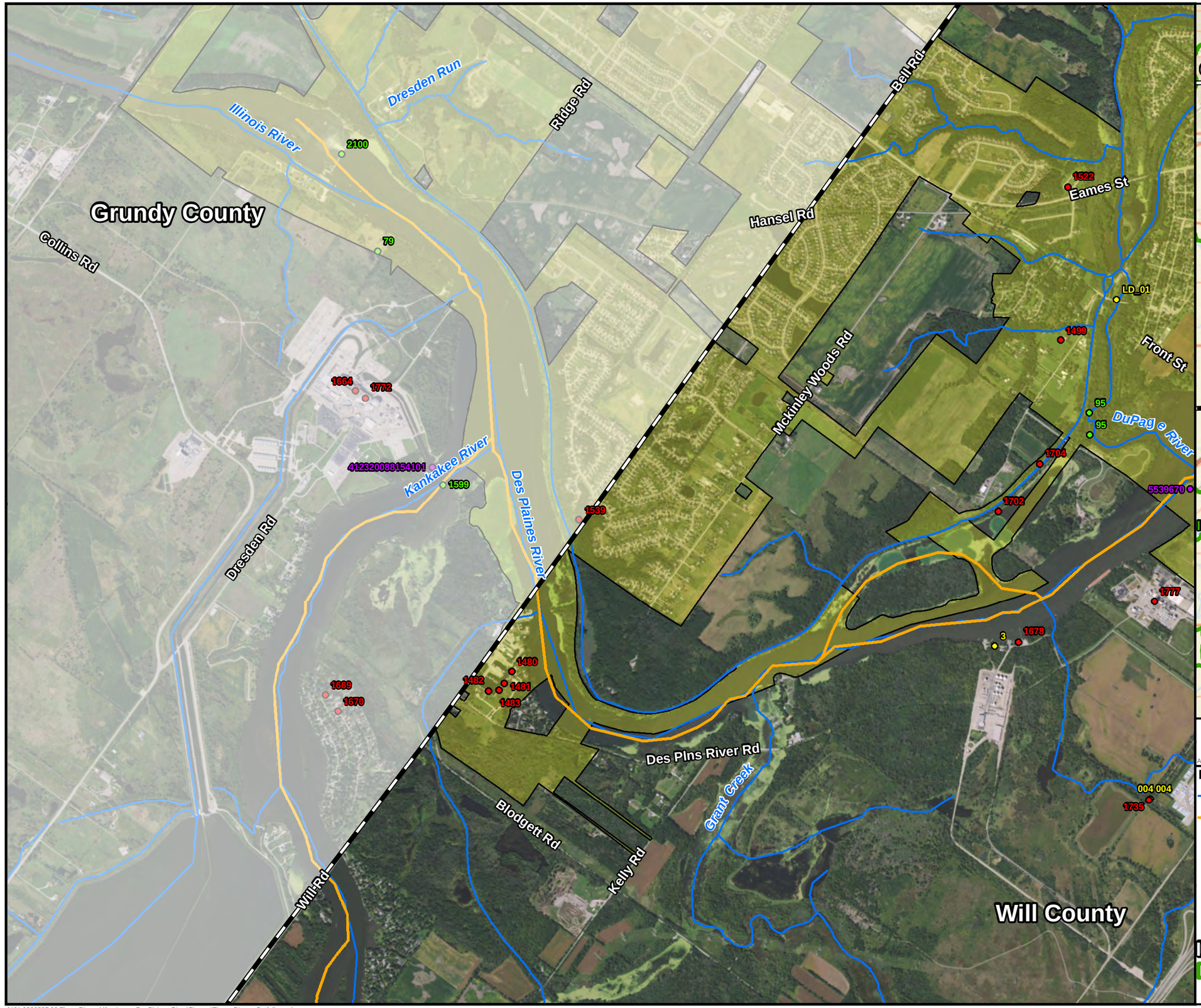
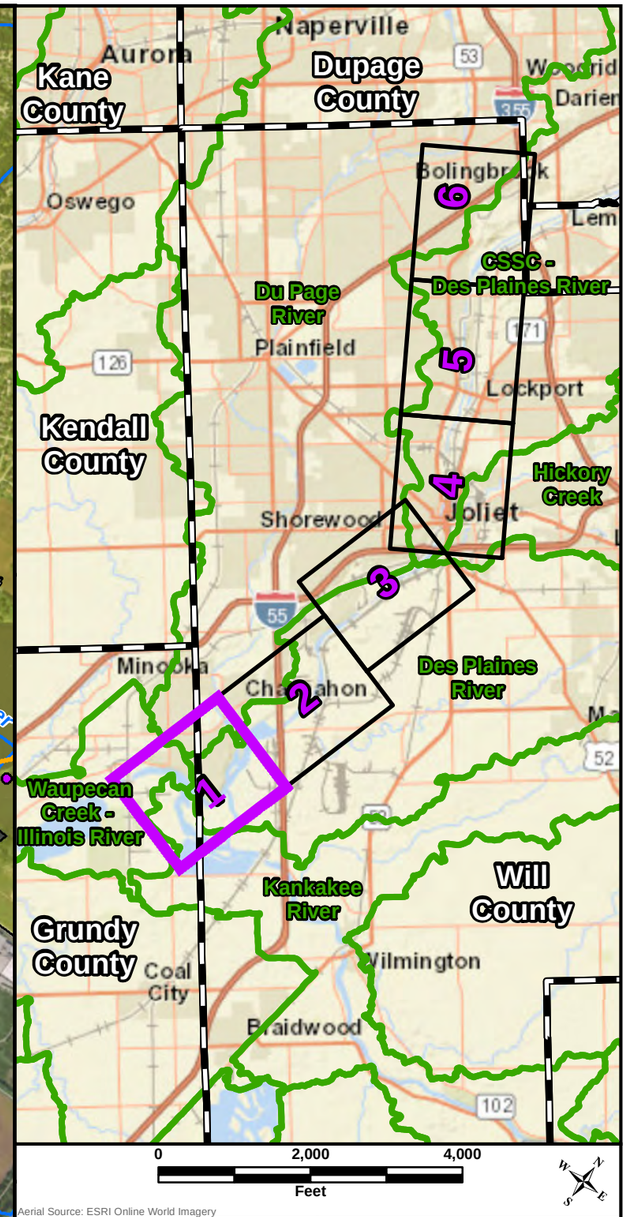
APPENDIX A
FIGURES





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Legend

- Streams
- 303d Impaired Waters
- 7Q10 (cfs)
- Outfall Location
- USGS Stream Gauge
- Chloride Sampling Point
- Municipality
- County Boundary
- Watershed (HUC10)

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Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 1 of 9

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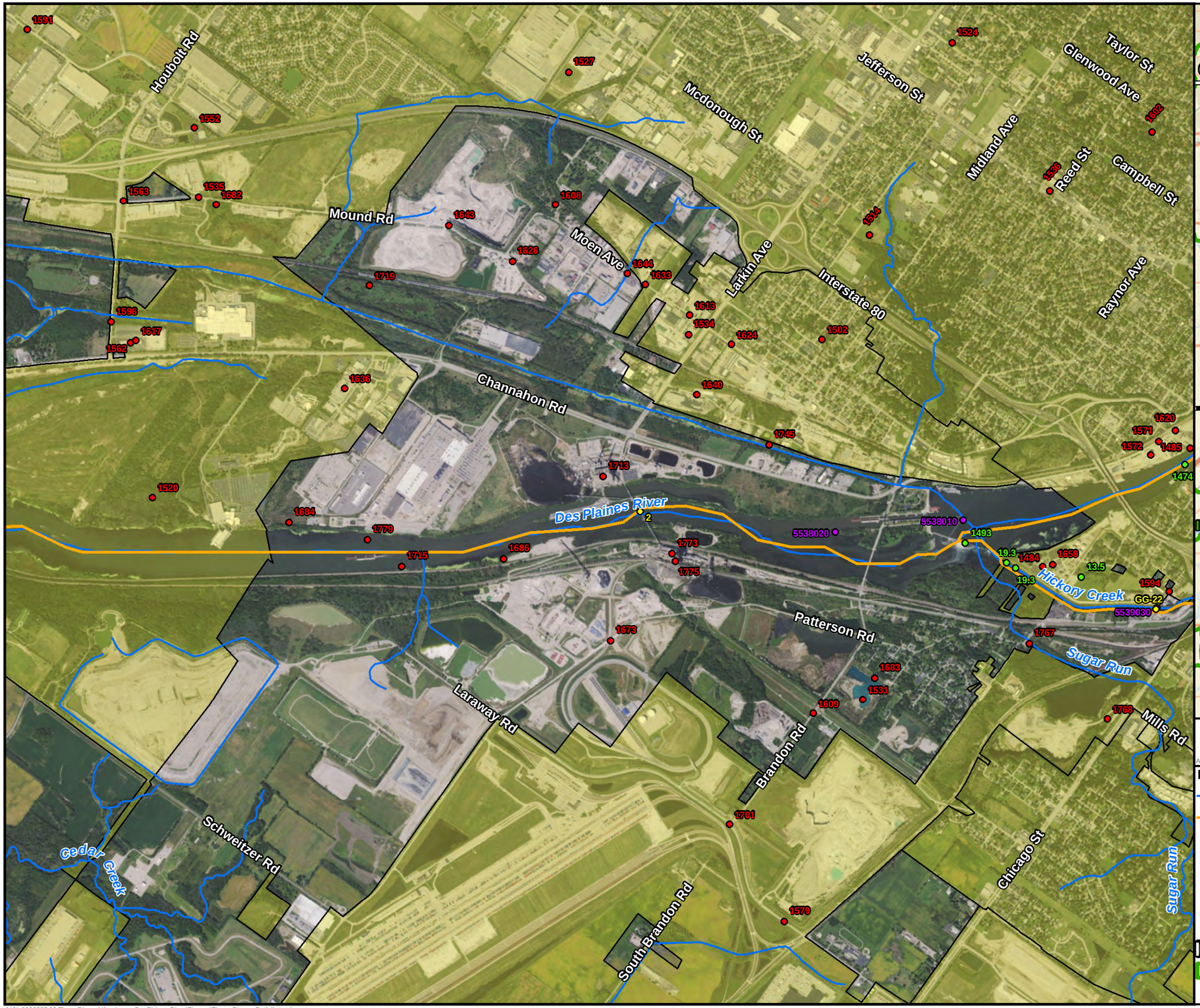

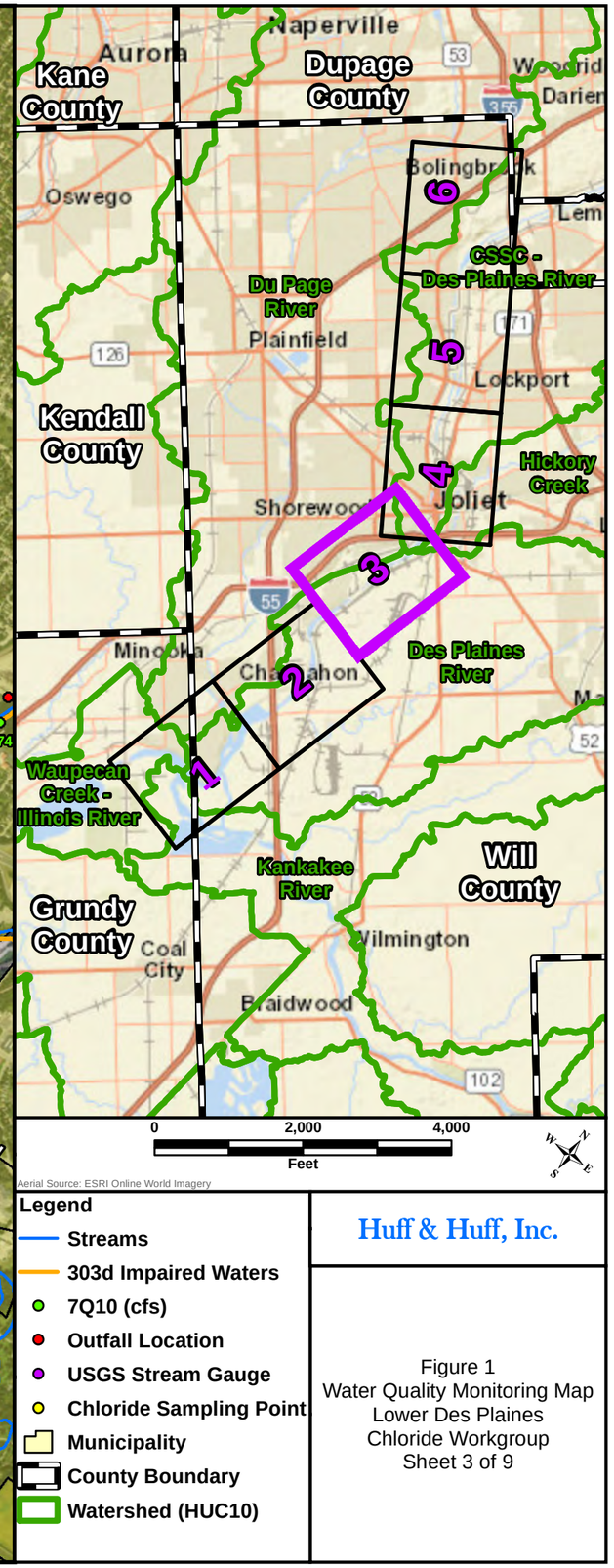

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Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 3 of 9

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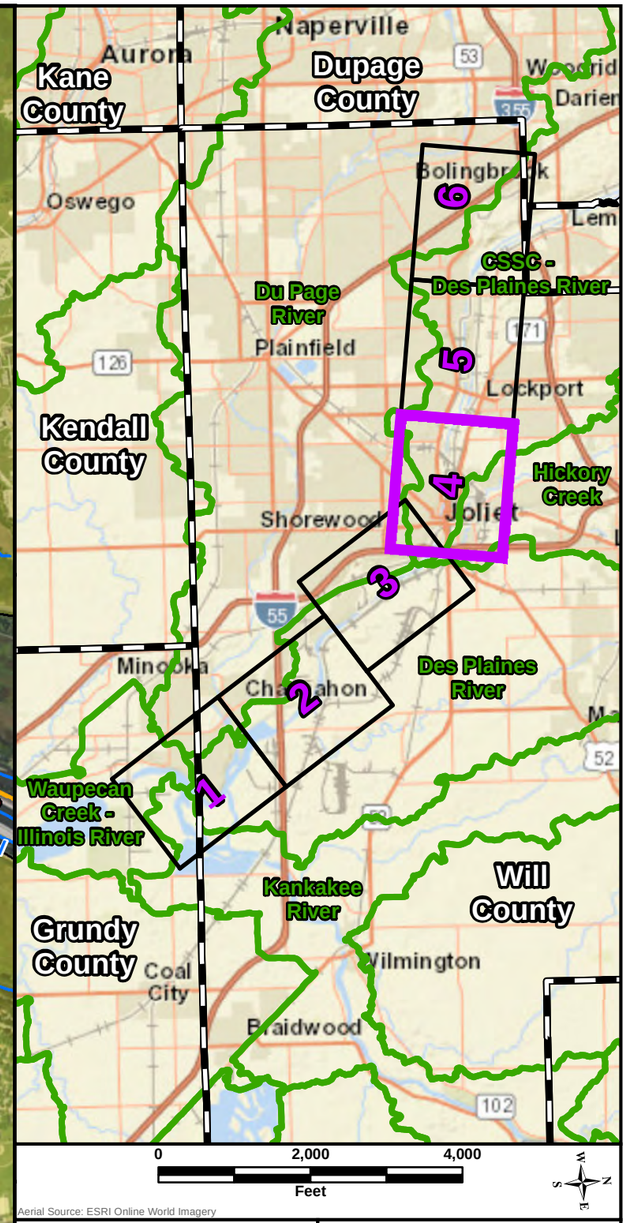

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Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 4 of 9

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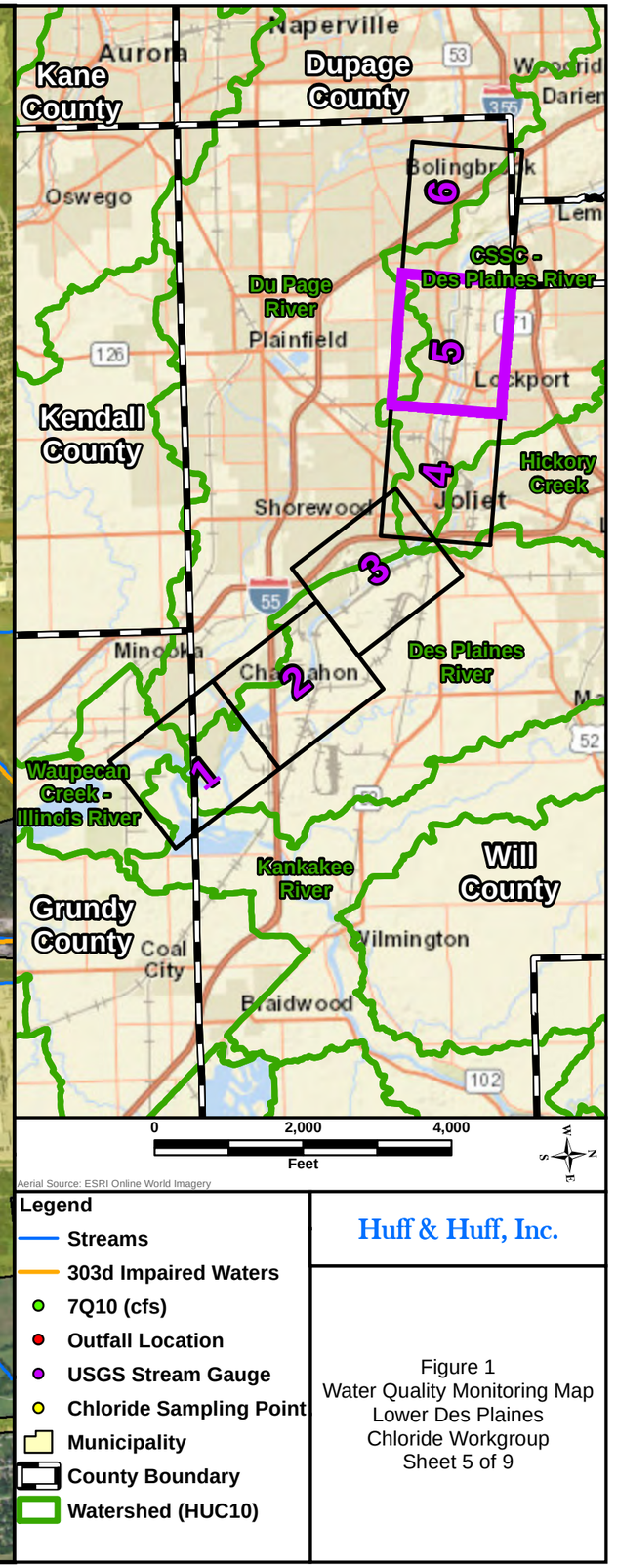

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Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 5 of 9

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Will County
Cook County
DuPage County
Kane County
Dupage County
Kendall County
Grundy County
Normantown Rd
Veterans Pkwy
Interstate 55
Remington Blvd
Lily Cache Ln
Boughton Rd
Schmidt Rd
East Frontage Rd
Belmont Dr
Crossroads Pkwy
Bolingbrook Dr
Independence Blvd
Lily Cache Creek
Des Plaines River
West Frontage Rd
Briarcliff Rd
Ashbury Ave
Rockhurst Rd
Falconridge Way
Pinecrest Rd
Joliet Rd
International Pkwy
Bluff Rd
New Ave
127th St
Janes Ave
Veterans' Memorial Tollway
Woodward Ave
1315
5533600
Naperville
Aurora
Oswego
Plainfield
Du Page River
CSSC - Des Plaines River
Lockport
Joliet
Shorewood
Hickory Creek
Minooka
Channahon
Des Plaines River
Waupecan Creek - Illinois River
Kankakee River
Will County
Coal City
Wilmington
Braidwood
6
5
4
3
2
1
0
2,000
4,000
Feet
Aerial Source: ESRI Online World Imagery

Legend

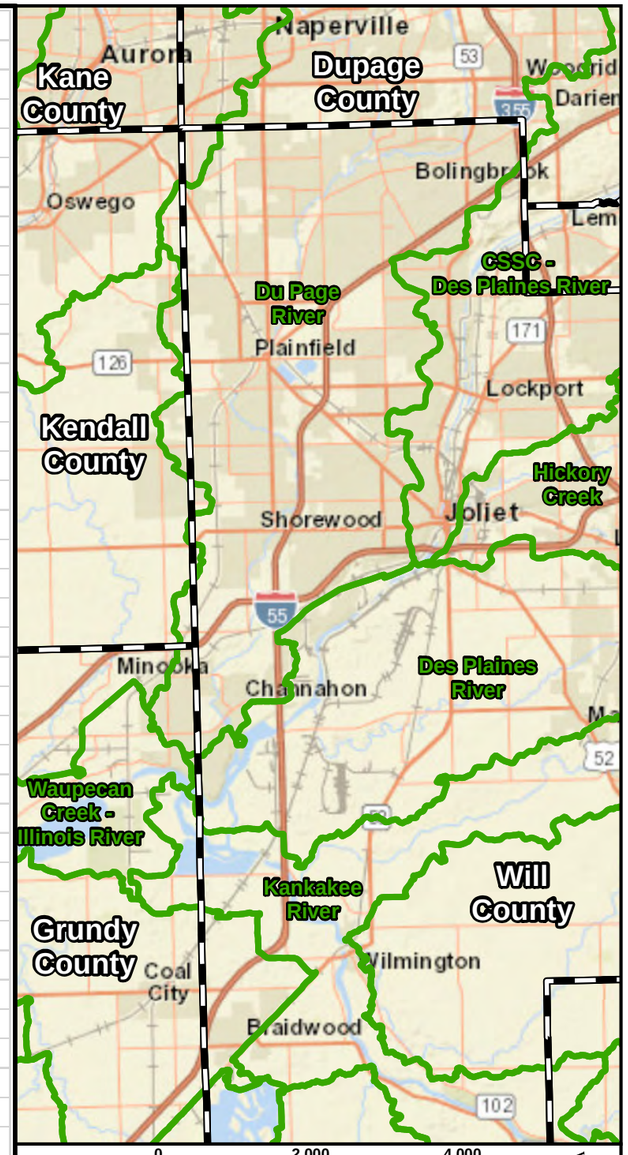
- Streams
- 303d Impaired Waters
- 7Q10 (cfs)
- Outfall Location
- USGS Stream Gauge
- Chloride Sampling Point
- Municipality
- County Boundary
- Watershed (HUC10)

Huff & Huff, Inc.

Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 6 of 9

J:\81.0220527.00 Three Rivers Mfg - Lower DesPlaines River\Figures\Three_Rivers_Outfalls.mxd

Map ID	Source Id	Name	Map ID	Source Id	Name	Map ID	Source Id	Name
1480	STES4	Channahon Stw Village of	1530	ILR10J168	Shorewood Industrial Condos	1580	ILR006722	Knollwood Wastewater Facility
1481	STES3	Channahon Stw Village of	1531	ILR10I998	De Be Land Development, Inc.	1581	ILR006632	Dean Lally Lp
1482	STES2	Channahon Stw Village of	1532	ILR10I966	Joliet Commercial Center	1582	ILR006581	Garvey Marine Inc-Lemont Dock
1483	STES1	Channahon Stw Village of	1533	ILR10I880	Corporate Corridors/Romeoville	1583	ILR006540	Jb Hunt Transport-Channahon
1484	STA913	Joliet Storm Sewer-East River Wall	1534	ILR10I835	Joliet West High School	1584	ILR006503	Filtration Group Inc
1485	ST912	Joliet Storm Sewer-Mcdonough St	1535	ILR10I800	Knight Transportation off/Shop	1585	ILR006352	I-55 Auto Salvage Inc
1486	ST911	Joliet Storm Sewer-Morgan St	1536	ILR10I723	Walgreens-Joliet	1586	ILR006342	Hendrickson Bumper & Trim
1487	ST910	Joliet Storm Sewer-Center St	1537	ILR10I614	Lewis University Airport	1587	ILR006335	Pure Metal Recycling (Joliet Yard)
1488	ST909	Joliet Storm Sewer-Marion	1538	ILR10I614	Lewis University Airport	1588	ILR006335	Acme Refining Scrap Iron&Metal
1489	ST908	Joliet Storm Sewer-Jefferson St	1539	ILR10I585	Berta Crossings Commerical Dev	1589	ILR006140	Brakur Custom Cabinet-Shorwood
1490	ST907	Joliet Storm Sewer-Western- Ave	1540	ILR10I507	Bluff Point III Comm Warehouse	1590	ILR006121	Nanophase Technologies Corp
1491	ST906	Joliet Storm Sewer-Division St	1541	ILR10I491	Logisticenter @ Sauk Village	1591	ILR006117	Unimast
1492	ST905	Joliet Storm Sewer-Stone St	1542	ILR10I396	Cronin Subd Lots 4&5	1592	ILR005908	Plainfield Warehouse
1493	ST904	Joliet Storm Sewer-Lime St	1543	ILR10I336	Bolingbrook Crossroads Lot 5	1593	ILR005520	At&Sf Tofc Intermodal-Hodgkins
1494	ST903	Joliet Storm Sewer-Ruby St	1544	ILR10I313	Lockport Approach Dike	1594	ILR005335	Citiwaste Inc
1495	ST902	Jolieat Storm Sewer-Granite St	1545	ILR10I303	Villas At Khater Farm Com Subd	1595	ILR005297	Greif Bros Corp
1496	ILU999348	West Shore Pipeline-Burr Ridge	1546	ILR10I287	Chase Bank-Romeoville	1596	ILR005294	A&R Transport
1497	ILU000905	Pinnacle Park Warehouse Site#7	1547	ILR10I207	Romeoville Hs Athletic Field	1597	ILR005279	Apex Material Technologies, LLC
1498	ILR400638	Minooka Village of	1548	ILR10H984	Louis Joliet Mann	1598	ILR005212	Toyal America Inc
1499	ILR400623	Channahon, Village of	1549	ILR10H974	Lockport Twp-Renwick Rd Imprv	1599	ILR005092	Joliet Park District Airport
1500	ILR400497	Lemont, Village of	1550	ILR10H718	Nicor Gas #149478	1600	ILR005072	Usf Holland Inc
1501	ILR400436	Romeoville, Village of	1551	ILR10H685	Lewis University	1601	ILR004569	Kodrick Earthworks
1502	ILR400433	Rockdale	1552	ILR10H621	Arby'S Restaurant-Joliet	1602	ILR004535	Graham Construction H.P.
1503	ILR400377	Lockport, City of	1553	ILR10H590	Liberty Meadows Subdivision	1603	ILR004515	Schiek Motor Express Inc
1504	ILR400361	Joliet City of	1554	ILR10H491	Plainfield Ss Truck Line Cons	1604	ILR004352	Welsch Ready Mix Inc
1505	ILR400319	Crest Hill City of	1555	ILR10H294	Multi-Modal Logistics	1605	ILR004349	Valley Concrete
1506	ILR400141	Troy Township	1556	ILR10D972	Inwood Athletic Club	1606	ILR004237	Central Blacktop-Hodgkins
1507	ILR400080	Lockport, City of	1557	ILR10D617	Weber Farm Crossings Crest Hi	1607	ILR003965	Stahly Cartage Co
1508	ILR10S473	Metropolitan Wrdgc-Lemont	1558	ILR10C322	Minooka Stp	1608	ILR003852	Pt Ferro Construction Co
1509	ILR10S463	Southfield Church	1559	ILR10C136	Intertek	1609	ILR003843	Gallagher Asphalt
1510	ILR10J739	Waterfall Glen office Center	1560	ILR106707	Lewis University Airport	1610	ILR003253	Material Service Corporation
1511	ILR10J714	Minooka 5-6 Grade Center	1561	ILR106707	Lewis University Airport	1611	ILR003251	Im Crushing LLC
1512	ILR10J700	Infinite Self Storage of Joliet	1562	ILR007214	Complete Tank Services	1612	ILR003196	Kaluzny Brothers Inc Midwest Recycling Co
1513	ILR10J671	Continental Toyota of Hodgkins	1563	ILR007121	Ellwood Chrome Crankshaft	1613	ILR003124	United Parcel Service
1514	ILR10J626	Stryker Professional Campus	1564	ILR007097	G And W Electric Company	1614	ILR003062	Elgin Joliet & Eastern Railway Co
1515	ILR10J620	Romeoville Hs Stadium Improv	1565	ILR007089	Korall Marine Terminal	1615	ILR002964	Lewis University Airport
1516	ILR10J606	Forest Pres Dist-Old Plank Rd	1566	ILR007065	Pq Corp	1616	ILR002964	Lewis University Airport
1517	ILR10J564	Hd Business Park-Joliet	1567	ILR007005	Rovanco Piping Systems Inc	1617	ILR002878	Ecolab Inc.
1518	ILR10J558	Riverside Ind Prk-10&11-Chnahn	1568	ILR006961	Berlinsky Scrap	1618	ILR002877	Diversified Cpc International
1519	ILR10J530	Michael Lewis Co Fac-McCook	1569	ILR006932	Hyponex Corporatoin	1619	ILR002815	Dudek, Inc.
1520	ILR10J512	First Park Joliet	1570	ILR006928	Vulcan Construction Materials Lp McCook Lime	1620	ILR002802	Pielet Bros Scrap Iron & Metal
1521	ILR10J463	Crest Hill-Fire Station HQ	1571	ILR006918	Buzzi Joliet Cement Storage & Distribution	1621	ILR002676	Sheffield Steel Corp.- Joliet
1522	ILR10J451	Ravines of Channahon	1572	ILR006918	Buzzi Unicem Usa - Joliet Terminal	1622	ILR002676	Gerdau Ameristeel Joliet Mill
1523	ILR10J443	Walmart #1882-06 Sams-6384	1573	ILR006897	Rrr Tank Properties LLC	1623	ILR002591	Webster Warehouse Ii, Inc.
1524	ILR10J371	Breckenridge Homes-Shorewood	1574	ILR006884	Lockport Steel Fabricators, LLC	1624	ILR002148	Modern Builders Industrial Con
1525	ILR10J340	Wilton Industries-Romeoville	1575	ILR006865	First Student #27041	1625	ILR001953	Precision Pallet Company
1526	ILR10J315	Budler Road Retail Center	1576	ILR006850	Linde Gas North America LLC	1626	ILR001882	Mahoney Environmental
1527	ILR10J293	Interstate Warehousing Bldg	1577	ILR006831	Capitol Wholesale Meats	1627	ILR001842	Land & Lakes Co-Willow Ranch
1528	ILR10J221	Nicor Gas #14964	1578	ILR006830	Illinois Marine Towing Inc	1628	ILR001842	Land And Lakes-Willow Ranch
1529	ILR10J175	Shorewood Market Place Lot 3	1579	ILR006826	Ozinga Bros Inc	1629	ILR001734	T & S Auto Recycling, Inc.



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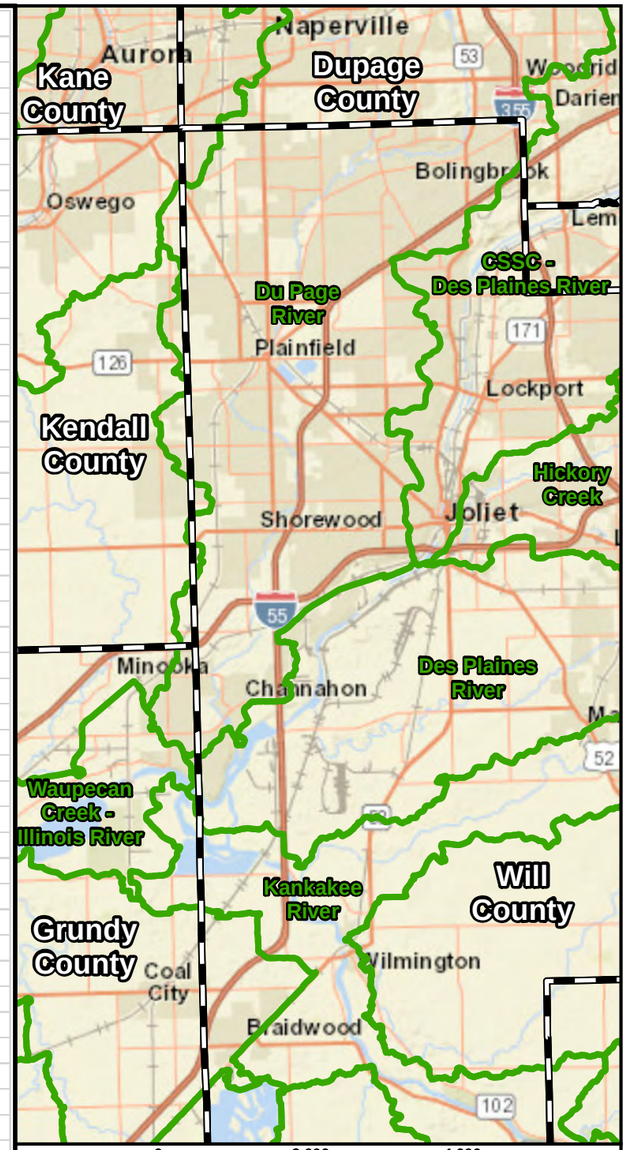
Huff & Huff, Inc.

Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 7 of 9

Map ID	Source Id	Name	Map ID	Source Id	Name	Map ID	Source Id	Name
1630	ILR001731	Speedway Auto Ltd	1680	IL0079090C04	Americas Styrenics, LLC - Joliet Site	1730	IL0046264001	New Lenox Stp #2, Village of
1631	ILR001707	All Will Co Auto Prts/Wrecker	1681	IL0078981	Enbridge Pipeline LLC - Manhattan Station	1731	IL0045993	Il American Wtr-Derby Meadows
1632	ILR001706	Al's Garage & Auto Salvage	1682	IL0078743001	Fjv Development LLC	1732	IL0045381001	Camelot Utilities Inc Stp
1633	ILR001683	Carlson Distribution Services	1683	IL0078603001	De Be Land Development, Inc.	1733	IL0039551	Lemont Csos
1634	ILR001645	Crawford Bus Service	1684	IL0078140001	Centerpoint Business Cntr I-80	1734	IL0037851A04	Dow Chemical ┬Çô Joliet Site
1635	ILR001585	Northfield Block Inc	1685	IL0077941001	Speedway Superamerica - Joliet	1735	IL0037851004	Dow Chemical ┬Çô Joliet Site
1636	ILR001582	Transport Service Co	1686	IL0077780002	Port of Will County	1736	IL0037851	The Dow Chemical Company
1637	ILR001574	Ups-Hodgkins	1687	IL0077780001	Port of Will County	1737	IL0033553001	Joliet West Stp, City of
1638	ILR001388	Dove Products Inc	1688	IL0077534002	Chicago Sanitary And Ship Canal	1738	IL0033375	Material Service Corporation
1639	ILR001280	Pelron	1689	IL0077534001	Chicago Sanitary And Ship Canal	1739	IL0033375	Hanson Material Service
1640	ILR001116	Apollo Colors Inc.	1690	IL0077305001	Lockport Powerhouse	1740	IL0032760INF	Citizens Utilities/Santa Fe Stp
1641	ILR001088	Beaver Oil Company Inc.	1691	IL0076635001	Icc Channahon River Terminal	1741	IL0032760001	Citizens Utilities/Santa Fe Stp
1642	ILR001038	Norwalk Tank Co	1692	IL0076635	Interstate Chemical Company	1742	IL0032760	Illinois American Water Company
1643	ILR000876	Cdt Landfill	1693	IL0076520	Bp Pipelines (North America) Inc - Manhattan Station	1743	IL0032042001	Rp Donohoe Company
1644	ILR000812	Waste Management Inc	1694	IL0076414INF	Joliet Aux Sable Creek Wwtp	1744	IL0031798	Aqua Illinois-Willowbrook Stp
1645	ILR000736	Ivex Packaging Paper LLC	1695	IL0076414001	Joliet Aux Sable Creek Wwtp	1745	IL0030775001	Rockdale Stp
1646	ILR000677	Panduit Corp	1696	IL0076384001	Wolverine Pipe Line Co	1746	IL0029611001	Divison St. Wwtp
1647	ILR000210	Valvoline Inc	1697	IL0075957001	New Lenox Stp #3, Village of	1747	IL0029611	Lockport Stp, City of
1648	ILR000203	Silbrico Corporation	1698	IL0074900001	Mpg Industries, Inc.	1748	IL0026697	Stelle Community Assn Stp
1649	ILR000162	Seeler Industries	1699	IL0073806A01	Dynegy Kendall Energy, LLC	1749	IL0026581004	Canal Terminal Co
1650	ILR000016	Korall Corp	1700	IL0073806001	Dynegy Kendall Energy, LLC	1750	IL0026581003	Canal Terminal Co
1651	ILR000011	American Commerical Transportation Services, LLC (Slip#4)	1701	IL0070530	Vulcan Construction Materials	1751	IL0026581002	Canal Terminal Co
1652	ILR000010	Acl Transportation Services LLC (Slip#3)	1702	IL0069906INF	Channahon Stw Village of	1752	IL0024422	Oak Highlands-Ingalls Park
1653	ILP000028	Industrial Colors Inc	1703	IL0069906001	Channahon Stw Village of	1753	IL0024201	Village of Mokena Wwtp
1654	ILL074713	Elwood Stp, Village of	1704	IL0069906001	Channahon Stp, Village of	1754	IL0022934	Ka Steel Chemicals Inc
1655	ILL064998	Crest Hill Wwtf	1705	IL0069493	Midwestern Gas Transmission Company	1755	IL0021261001	Bonnie Brae Wwtp
1656	ILL055913	Minooka Stp	1706	IL0065188	Dupage County Public Works Knollwood Stp	1756	IL0021121INF	Crest Hill West Stp City of
1657	ILL048526	Romeoville Stp 1&2	1707	IL0064998STR	Crest Hill Wwtf	1757	IL0021121A01	Crest Hill West Stp City of
1658	ILL028070	Metropolitan Wrdgc-Lemont	1708	IL0064998INF	Crest Hill Wwtf	1758	IL0021121001	Crest Hill West Stp City of
1659	ILL022519	Joliet Eastside Stp	1709	IL0064998A01	Crest Hill Wwtf	1759	IL0020559002	New Lenox Stp #1, Village of
1660	ILL021261	Bonnie Brae Forest Manor Sd	1710	IL0064998001	Crest Hill Wwtf	1760	IL0020559001	New Lenox Stp #1, Village of
1661	ILG870734	Minooka Village of	1711	IL0064998	Crest Hill East Stp, City of	1761	IL0020087B01	Geneva Stp
1662	ILG870243	Kens Pond And Lake Management Services	1712	IL0064408	Nexeo Solutions, LLC	1762	IL0002844	Vulcan Construction Materials Lp
1663	ILG870061	Village of Lemont	1713	IL0064254	NRG	1763	IL0002569001	Pq Corp
1664	ILG870020	Exelon Dresden Nuclear Power Station	1714	IL0064254	NRG	1764	IL0002453011	Stepan Co Millsdale Road
1665	ILG840224	Vulcan Construction Materials Lp	1715	IL0063479	Laraway Rdf	1765	IL0002453010	Stepan Co Millsdale Road
1666	ILG840200	McCook Quarry	1716	IL0063061002	Imtt Illinois Joliet Facility	1766	IL0002453001	Stepan Co Millsdale Road
1667	ILG840029	Hanson Material Service	1717	IL0063061001	Imtt Illinois Joliet Facility	1767	IL0002313001	Chicago Street Ccdd LLC
1668	ILG840016	Material Service Corporation	1718	IL0062618001	Matheson Tri-Gas Inc	1768	IL0002313	Joliet Quarry #340
1669	ILG620021	Surface Discharging System 21	1719	IL0061115	Lafarge Aggregates Illinois Inc Lafarge Joilet Quarry	1769	IL0002305003	Chevron Env Services-Lockport
1670	ILG620011	Surface Discharging System 11	1720	IL0056219	Emerald Trails Campground Stp	1770	IL0002305002	Chevron Env Services-Lockport
1671	ILG620006	Surface Discharging System 6	1721	IL0055841	Ranch Oaks Service Assoc Stp	1771	IL0002305001	Chevron Env Services-Lockport
1672	IL0080086	Diversified Cpc International Inc	1722	IL0050571	Longwood Country Club Stp	1772	IL0002224	Exelon Dresden Nuclear Power Station
1673	IL0080075	Joliet Bulk Barge And Rail LLC	1723	IL0048526INF	Romeoville Stp 1&5	1773	IL0002216	NRG
1674	IL0079588011	Natural Gas Pipeline Company of America	1724	IL0048526IN2	Romeoville Stp 1&4	1774	IL0002216	NRG
1675	IL0079588001	Natural Gas Pipeline Company of America	1725	IL0048526A01	Romeoville Stp 1&3	1775	IL0002216	Midwest Generation, LLC
1676	IL0079201001	Aquatic Nuisance Species Dispersal Barrier Iib	1726	IL0048526001	Romeoville Stp 1&2	1776	IL0002208	NRG
1677	IL0079138	McCook Resevoir	1727	IL0046779	Elwood Energy Facility	1777	IL0002038	Loders Croklaan Usa, LLC
1678	IL0079103003	Oiltanking Joliet LLC	1728	IL0046264B01	New Lenox Stp #2, Village of	1778	IL0001813	Electro-Motive Diesel Inc
1679	IL0079103002	Oiltanking Joliet LLC	1729	IL0046264A01	New Lenox Stp #2, Village of	1779	IL0001732	Caterpillar Inc



Legend

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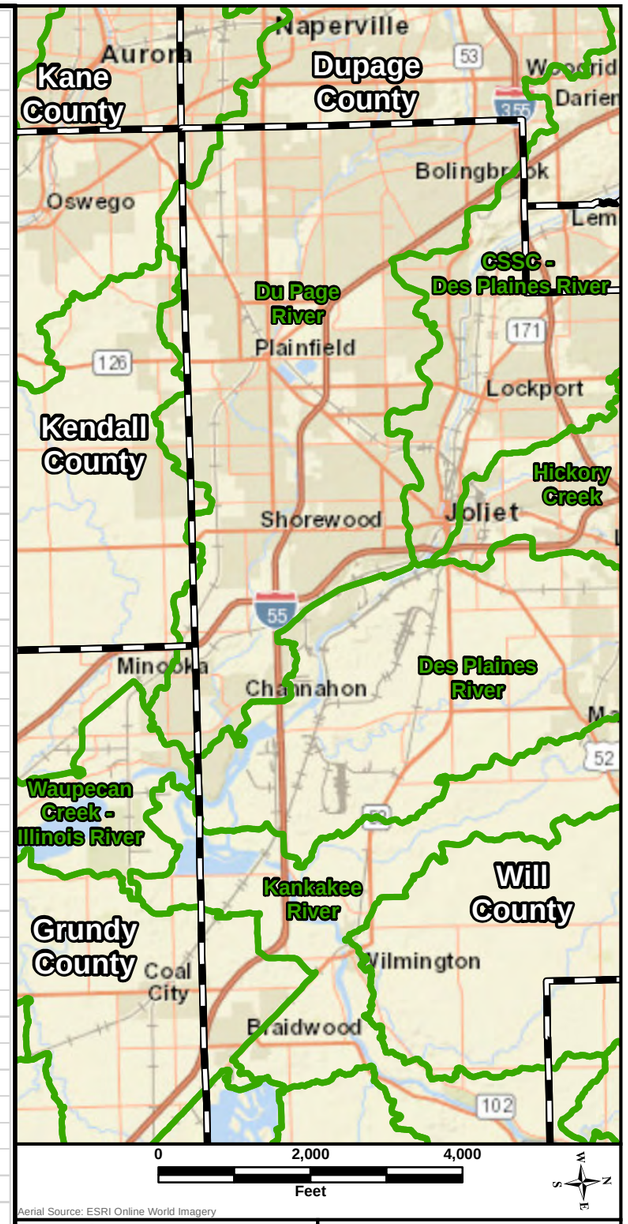
Huff & Huff, Inc.

Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 8 of 9

J:\81.0220527.00 Three Rivers Mfg - Lower DesPlaines River\Figures\Three_Rivers_Outfalls_Table.mxd

Map ID	Source Id	Name	Map ID	Source Id	Name	Map ID	Source Id	Name
1780	IL0001643005	Flint Hills Resources Chemical Intermediates Stormwater	1830	05SC	New Lenox-Spring Creek Stormwater Outfall	1861	50	Lockport - Outfall 50
1781	IL0001643004	Flint Hills Resources Chemical Intermediates	1831	05JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1862	49	Lockport - Outfall 49
1782	IL0001643003	Flint Hills Resources Chemical Intermediates Stormwater	1832	05JB	New Lenox-Jackson Branch Stormwater Outfall	1863	48	Lockport - Outfall 48
1783	IL0001643002	Flint Hills Resources Chemical Intermediates Stormwater	1833	05HC	New Lenox-Hickory Creek Stormwater Outfall	1864	47	Lockport - Outfall 47
1784	IL0001643001	Flint Hills Resources Chemical Intermediates	1834	04SRC	New Lenox-Hickory Creek Stormwater Outfall	1865	46	Lockport - Outfall 46
1785	IL0001619003	Ineos Styrolution America	1835	04SC	New Lenox-Spring Creek Stormwater Outfall	1866	45	Lockport - Outfall 45
1786	IL0001619003	Ineos Styrolution America	1836	04JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1867	44	Lockport - Outfall 44
1787	IL0001619002	Ineos Styrolution America	1837	04JB	New Lenox-Jackson Branch Stormwater Outfall	1868	43	Lockport - Outfall 43
1788	IL0001619002	Ineos Styrolution America	1838	04HC	New Lenox-Hickory Creek Stormwater Outfall	1869	42	Lockport - Outfall 42
1789	IL0001619001	Ineos Styrolution America	1839	03SRC	New Lenox-Hickory Creek Stormwater Outfall	1870	41	Lockport - Outfall 41
1790	IL0001619001	Ineos Styrolution America	1840	03SC	New Lenox-Spring Creek Stormwater Outfall	1871	40	Lockport - Outfall 40
1791	IL0001589	Citgo Petroleum Corp Lemont Refinery	1841	03JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1872	39	Lockport - Outfall 39
1792	IL0001309INT	Auburn Steel Co Lemont Div	1842	03JB	New Lenox-Jackson Branch Stormwater Outfall	1873	38	Lockport - Outfall 38
1793	IL0001309003	Auburn Steel Co Lemont Div	1843	03HC	New Lenox-Hickory Creek Stormwater Outfall	1874	37	Lockport - Outfall 37
1794	IL0001309002	Auburn Steel Co Lemont Div	1844	02SRC	New Lenox-Hickory Creek Stormwater Outfall	1875	36	Lockport - Outfall 36
1795	IL0001309001	Auburn Steel Co Lemont Div	1845	02SC	New Lenox-Spring Creek Stormwater Outfall	1876	35	Lockport - Outfall 35
1796	23HC	New Lenox-Hickory Creek Stormwater Outfall	1846	02JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1877	34	Lockport - Outfall 34
1797	22HC	New Lenox-Hickory Creek Stormwater Outfall	1847	02JB	New Lenox-Jackson Branch Stormwater Outfall	1878	33	Lockport - Outfall 33
1798	21JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1848	02HC	New Lenox-Hickory Creek Stormwater Outfall	1879	32	Lockport - Outfall 32
1799	21HC	New Lenox-Hickory Creek Stormwater Outfall	1849	01SRC	New Lenox-Hickory Creek Stormwater Outfall	1880	31	Lockport - Outfall 31
1800	20JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1850	01SC	New Lenox-Spring Creek Stormwater Outfall	1881	30	Lockport - Outfall 30
1801	20HC	New Lenox-Hickory Creek Stormwater Outfall	1851	01JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1882	29	Lockport - Outfall 29
1802	19JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1852	01JB	New Lenox-Jackson Branch Stormwater Outfall	1883	28	Lockport - Outfall 28
1803	19HC	New Lenox-Hickory Creek Stormwater Outfall	1853	01HC	New Lenox-Hickory Creek Stormwater Outfall	1884	27	Lockport - Outfall 27
1804	18JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1854	009	ExxonMobil Outfall	1885	26	Lockport - Outfall 26
1805	18HC	New Lenox-Hickory Creek Stormwater Outfall	1855	008	ExxonMobil Outfall	1886	25	Lockport - Outfall 25
1806	17JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1856	007	ExxonMobil Outfall	1887	24	Lockport - Outfall 24
1807	17HC	New Lenox-Hickory Creek Stormwater Outfall	1857	006	ExxonMobil Outfall	1888	23	Lockport - Outfall 23
1808	16JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1858	005	ExxonMobil Outfall	1889	22	Lockport - Outfall 22
1809	16HC	New Lenox-Hickory Creek Stormwater Outfall	1859	004	ExxonMobil Outfall	1890	21	Lockport - Outfall 21
1810	15JCB	New Lenox-Jackson Branch Creek Stormwater Outfall	1860	001_002_003	ExxonMobil Outfall	1891	20	Lockport - Outfall 20
1811	15HC	New Lenox-Hickory Creek Stormwater Outfall				1892	19	Lockport - Outfall 19
1812	14JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1893	18	Lockport - Outfall 18
1813	14HC	New Lenox-Hickory Creek Stormwater Outfall				1894	17	Lockport - Outfall 17
1814	13JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1895	16	Lockport - Outfall 16
1815	13HC	New Lenox-Hickory Creek Stormwater Outfall				1896	15	Lockport - Outfall 15
1816	12JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1897	14	Lockport - Outfall 14
1817	12HC	New Lenox-Hickory Creek Stormwater Outfall				1898	13	Lockport - Outfall 13
1818	11JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1899	12	Lockport - Outfall 12
1819	11HC	New Lenox-Hickory Creek Stormwater Outfall				1900	11	Lockport - Outfall 11
1820	10JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1901	10	Lockport - Outfall 10
1821	10HC	New Lenox-Hickory Creek Stormwater Outfall				1902	9	Lockport - Outfall 9
1822	09JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1903	8	Lockport - Outfall 8
1823	09HC	New Lenox-Hickory Creek Stormwater Outfall				1904	7	Lockport - Outfall 7
1824	08JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1905	6	Lockport - Outfall 6
1825	08HC	New Lenox-Hickory Creek Stormwater Outfall				1906	5	Lockport - Outfall 5
1826	07JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1907	4	Lockport - Outfall 4
1827	07HC	New Lenox-Hickory Creek Stormwater Outfall				1908	3	Lockport - Outfall 3
1828	06JCB	New Lenox-Jackson Branch Creek Stormwater Outfall				1909	2	Lockport - Outfall 2
1829	06HC	New Lenox-Hickory Creek Stormwater Outfall				1910	1	Lockport - Outfall 1



Legend

- Streams
- 303d Impaired Waters
- 7Q10 (cfs)
- Outfall Location
- USGS Stream Gauge
- Chloride Sampling Point
- Municipality
- County Boundary
- Watershed (HUC10)

Huff & Huff, Inc.

Figure 1
Water Quality Monitoring Map
Lower Des Plaines
Chloride Workgroup
Sheet 9 of 9

J:\81.0220527.00 Three Rivers Mfg - Lower DesPlaines River\Figures\Three_Rivers_Outfalls_Table.mxd

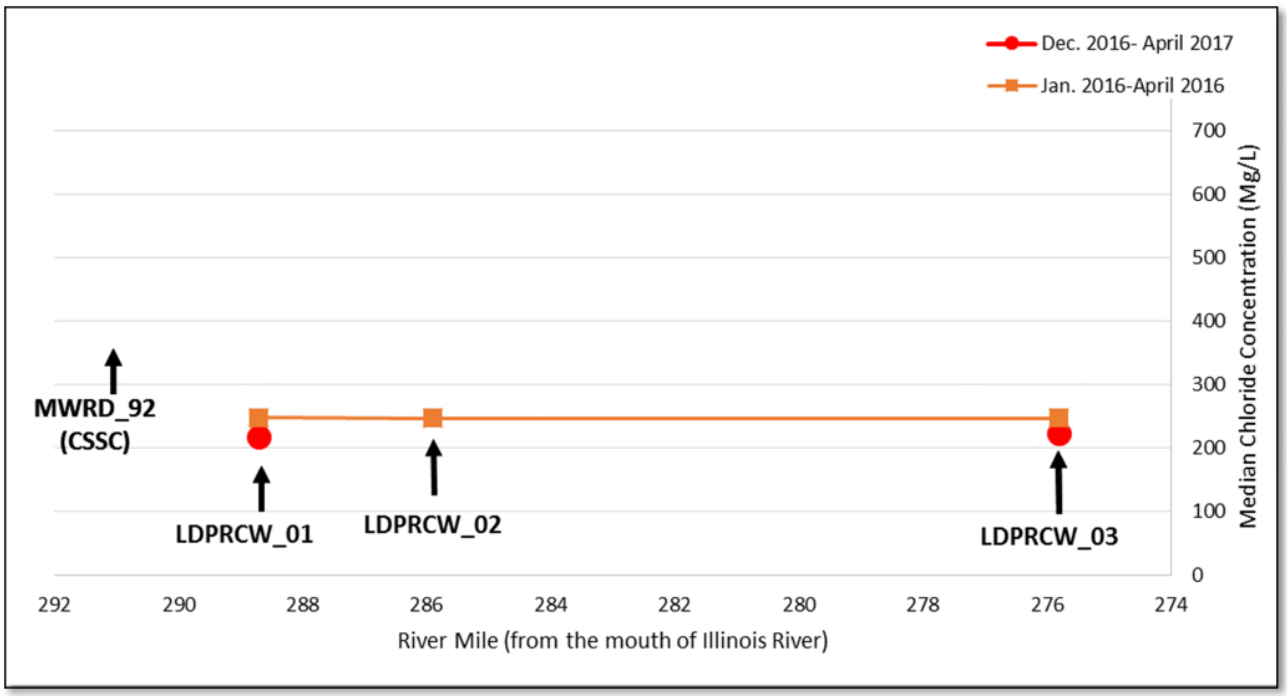


Figure 2: Median chloride concentrations in Lower Des Plaines River (2016-2017).

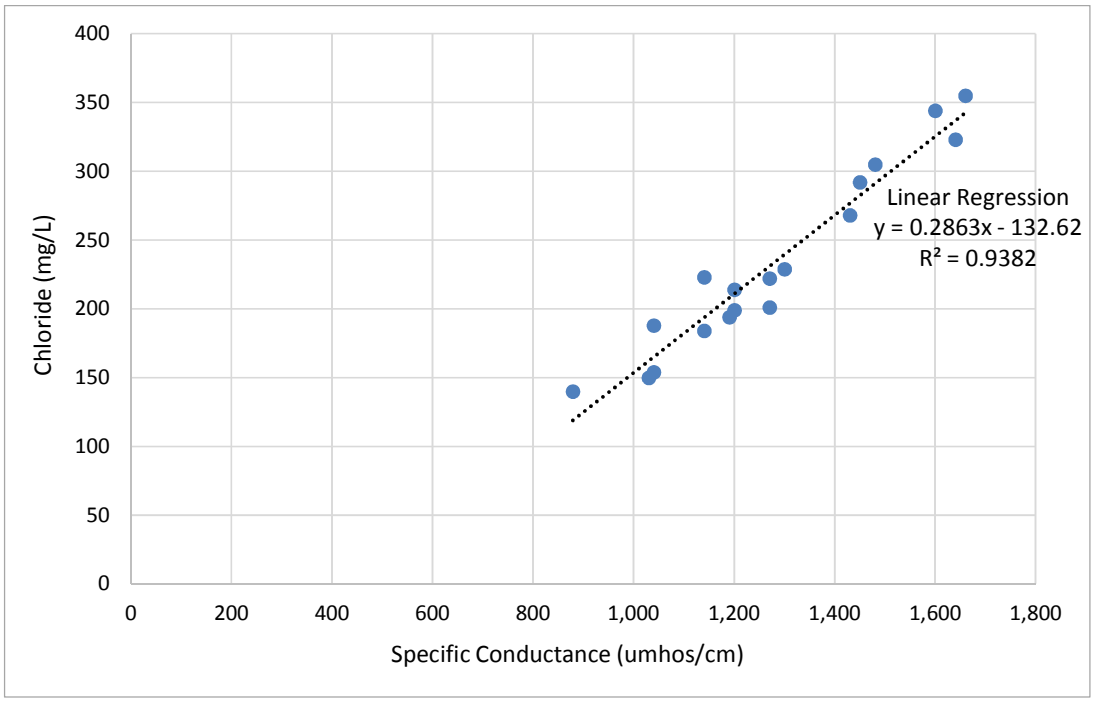


Figure 3: Linear regression of specific conductance versus chloride concentrations in Des Plaines River at Ruby Street Bridge (Site LPRCW_01) in Joliet, IL (Winter 2016-2017).

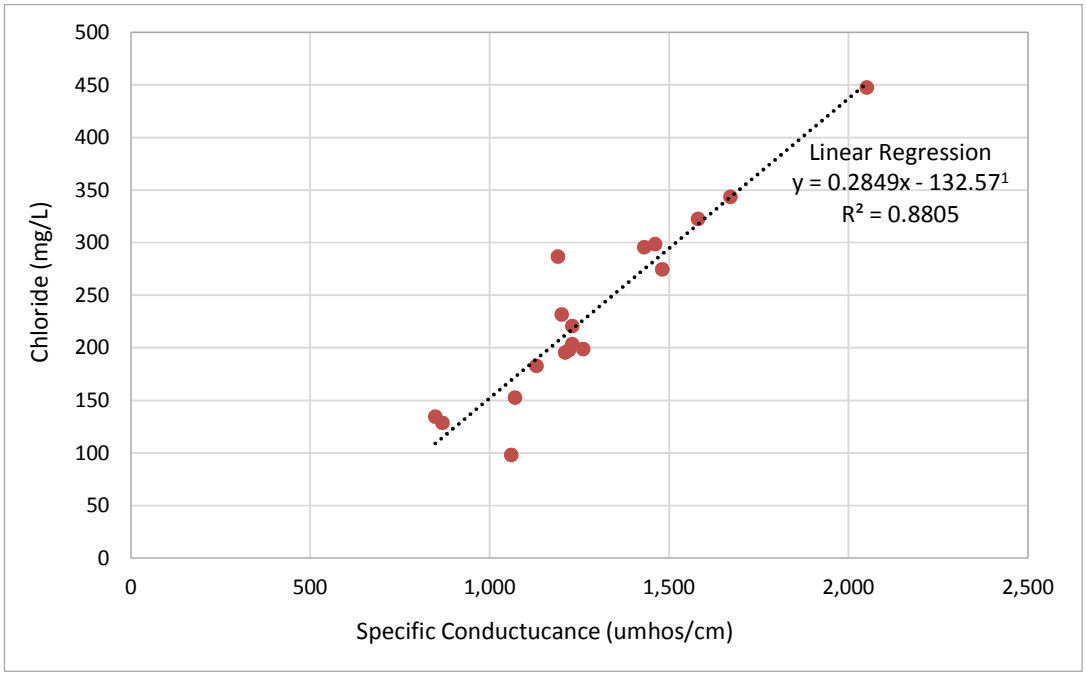


Figure 4: Linear regression of specific conductance versus chloride concentrations in Des Plaines River at Oil Tanking (Site LPRCW_03) in Channahon, IL (Winter 2016-2017).

[1]Linear regression equation does not include sample 4/27/2017, as it is treated as an anomaly

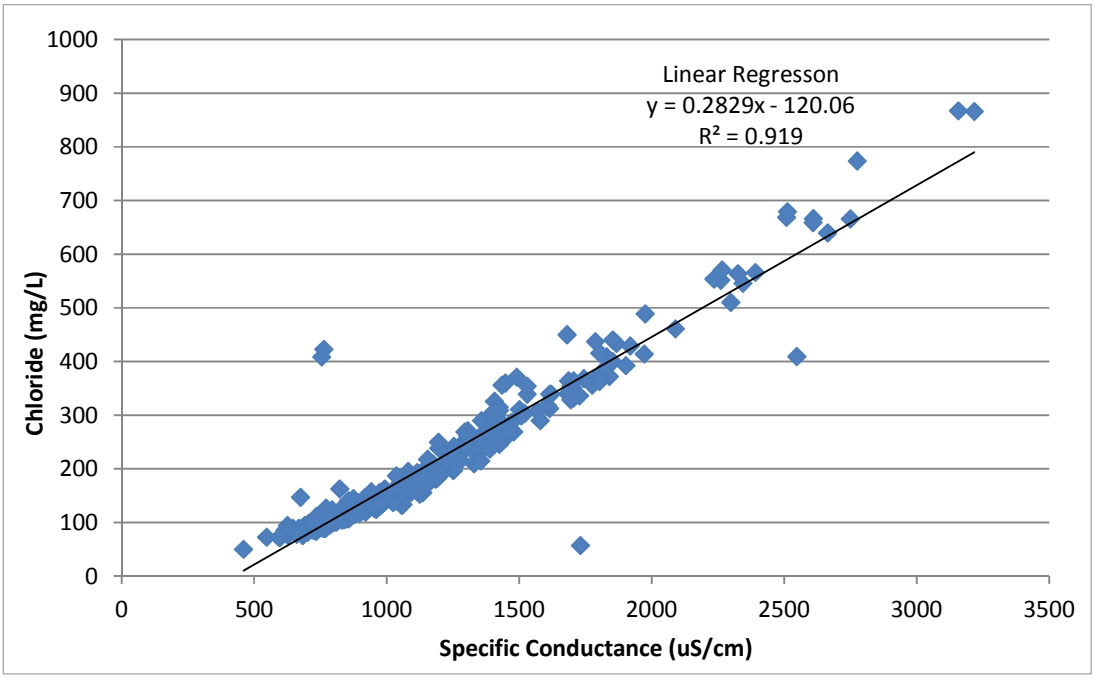


Figure 5: Linear regression of specific conductance versus chloride concentrations in CSSC (Site MWRD_92) in Lockport, IL (2007-2015).

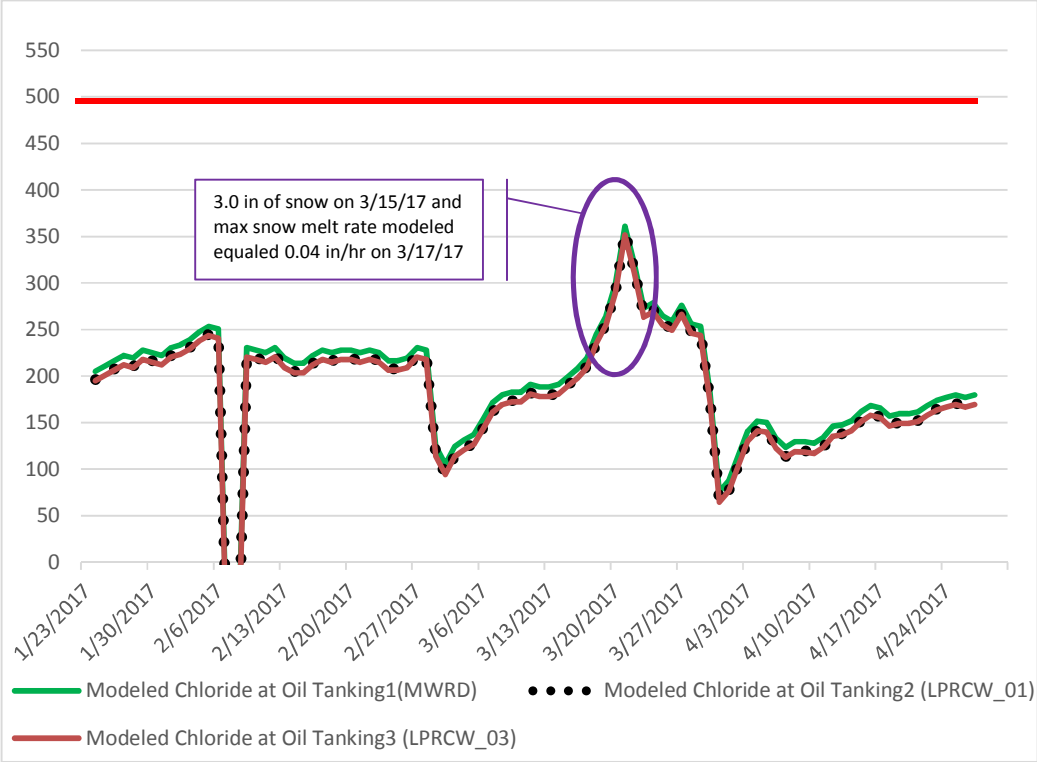


Figure 6: Modeled chloride concentrations in Des Plaines River (Site USGS 05539670) in Channahon, IL (2017).

APPENDIX B

TABLE 1
USGS STREAM GAGES LOCATIONS
LOWER DES PLAINES RIVER CHLORIDES PROJECT

USGS Streamgage Station Name	USGS ID	Latitude	Longitude	Drainage Area (sq mi)
Chicago Sanitary Canal At Lockport Controlling Works, IL	05536998	41.5975	88.0661	740
Des Plaines River At Lockport, IL	05534050	41.5964	88.0686	700
Des Plaines River At Division St At Lockport, IL	05534100	41.5819	88.0714	703
Chicago Sanitary And Ship Canal At Lockport, IL	05537000	41.5703	88.0794	740
Des Plaines River At Route 53 At Joliet, IL	05537980	41.5364	88.0825	1,502
Hickory Creek At Joliet, IL	05539000	41.5150	88.0733	108
Hickory Creek Near Joliet, IL	05539030	41.5078	88.0839	109
Des Plaines River At Rockdale, IL	05538010	41.5050	88.0997	1,506
Des Plaines River In Lock Channel At Rockdale, IL	05538020	41.5000	88.1069	Not Provided
Des Plaines River At Channahon, IL[1]	05539670	41.4144	88.2144	1,711

Source: USGS. 2016. Current Water Data for the Nation. Available at: http://waterdata.usgs.gov/nwis/rt. Accessed on 9-05-16

[1]Joint Agreement with USGS and Three Rivers Manufacturers' Association for sampling specific conductance

TABLE 2
CHLORIDE SAMPLING LOCATIONS AND REGIME
LOWER DES PLAINES RIVER CHLORIDES PROJECT

ID	Station ID	LDPRCW_03	LDPRCW_01	GGA-02	GG-14	GGA-01	GGA-A-C2	GGB-02	HC-MC-01	GGB-A	GGC-03
	Stream	Des Plaines River[1]	Des Plaines River[1]	Spring Creek[2]	Hickory Creek[2]	Spring Creek	Spring Creek[2]	Marley Creek[2]	Marley Creek[2]	E. Branch of Marley Creek[2]	Union Ditch[2]
RM	River Mile (from mouth of Illinois River)	275.8	288.7	292.3	294.6	295.1	302.9	307.8	311.9	312.9	322.9
Name	Sampling Description	Oiltanking west dock	Ruby Street Bridge over the Lower Des Plaines	Spring Cr. at EJE RR yard	Hickory Cr. 800 yds. ups. Vine St.	Spring Creek at Gougar Rd.	Spring Creek at 151st Street	Marley Creek at Francis Road	Marley Creek (upstream) at 179th St	E. Branch of Marley Creek	Union Ditch
Lat	Latitude	41.40043	41.53662	41.53578	41.51566	41.55242	41.61510	41.53958	41.56393	41.54321	41.521406
Long	Longitude	-88.21900	-88.03306	-88.06239	-87.97100	-87.99471	-87.89420	-87.93078	-87.90329	-87.89653	-87.826411
F	Sampling Frequency	W	W	M/BW	M/BW	M/BW	M/BW	M/BW	M/BW	M/BW	M/BW
T	Type of Sampling	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab	Grab
Start	Starting Date of Sampling	12/15/2016	12/15/2016	12/15/2016	12/15/2016	1/19/2017	12/15/2016	12/15/2016	12/15/2016	12/15/2016	12/15/2016
End	Ending Date of Sampling	4/27/2017	4/27/2017	4/20/2017	4/20/2017	4/20/2017	4/27/2017	4/20/2017	4/20/2017	4/20/2017	4/27/2017

[1] Chloride concentrations were sampled by the Lower Des Plaines River Chlorides Workgroup (LDPRCW, 2016).

[2] Chloride concentrations were sampled by Hickory Creek Watershed Planning Group (HCWPG, 2016).

SC=specific conductance

W=Weekly

C=Continuous, hourly

M/BW=Monthly, expect bi-weekly from January to March

V=Varies (month)

M=Monthly

TABLE 3
SUMMARY STATISTICS- CHLORIDE CONCENTRATION (MG/L)
LOWER DES PLAINES RIVER CHLORIDES PROJECT

ID	Station ID	LDPRCW_03	LDPRCW_01	GGA-02	GG-14	GGA-01	GGA-A-C2	GGB-02	HC-MC-01	GGB-A	GGC-03
	Stream	Des Plaines River[1]	Des Plaines River[1]	Spring Creek[2]	Hickory Creek[2]	Spring Creek[2]	Spring Creek[2]	Marley Creek[2]	Marley Creek[2]	E. Branch of Marley Creek[2]	Union Ditch[2]
RM	River Mile (from mouth of Illinois River)	275.8	288.7	292.3	294.6	295.1	302.9	307.8	311.9	312.9	322.9
N	Sample Size	20	20	8	13	13	13	13	13	13	14
Min	Minimum (mg/L)	99	140	50	91	92	109	83	42	107	57
Med	Median (mg/L)	224	219	114	189	194	156	235	199	267	211
Max	Maximum (mg/L)	646	355	157	347	377	245	387	302	646	464
MR	Recorded Date of Max Chloride	4/27/2017	12/27/2016	4/20/2017	3/16/2017	3/16/2017	2/23/2017	12/15/2016	3/16/2017	3/16/2017	3/16/2017
Avg	Average (mg/L)	255	234	109	194	216	165	249	202	343	210
St. Dev.	Standard Deviation (mg/L)	124.2	64.2	60.9	99.2	85.2	57.5	95.6	96.1	196.1	121.3
NA500	Number of Sampling Points Above 500 mg/L	1	0	0	0	0	0	0	0	4	0
PE	Percent of Excedances Above 500 mg/L	5%	0%	0%	0%	0%	0%	0%	0%	31%	0%
Start	Starting Date of Sampling	12/15/2016	12/15/2016	12/15/2016	12/15/2016	1/19/2017	12/15/2016	12/15/2016	12/15/2016	12/15/2016	12/15/2016
End	Ending Date of Sampling	4/27/2017	4/27/2017	4/20/2017	4/20/2017	4/20/2017	4/27/2017	4/20/2017	4/20/2017	4/20/2017	4/27/2017

[1] Chloride concentrations were sampled by the Lower Des Plaines River Chlorides Workgroup (LDPRCW, 2016).

[2] Chloride concentrations were sampled by Hickory Creek Watershed Planning Group (HCWPG, 2016).

TABLE 4
SUMMARY STATISTICS-SPECIFIC CONDUCTANCE (US/CM)
LOWER DES PLAINES RIVER CHLORIDES PROJECT

ID	Station ID	MWRD_92[1]	LDPRCW_01[2]	LDPRCW_03[2]	5539670
Stream	Stream	Chicago Sanitary &	Des Plaines River	Des Plaines River	Des Plaines River
RM	River Mile (from mouth of Illinois Rive	290.9	288.7	275.8	277
N	Sample Size	2,649	19	19	8955
Min	Minimum (uS/cm)	695	879	868	675
Med	Median (uS/cm)	1,242	1,200	1,220	1,170
Max	Maximum (uS/cm)	2,483	1,660	2,050	1,790
Avg	Average (uS/cm)	1,305	1,267	1,282	1,126
St. Dev.	Standard Deviation (uS/cm)	281.6	356.7	281.8	183.9
Start_Date	Starting Date of Sampling	12/15/2016	12/15/2016	12/15/2016	1/23/2017
End_Date	Ending Date of Sampling	4/4/2017	4/27/2017	4/27/2017	4/27/2017

[1]Continuous specific conductance data collected from Jan. 21, 2016 to April 4, 2017 by MWRD. Historical specific conductance extends from Nov. 1, 2015 (MWRD, 2016).

[2]Specific conductance collected by LDPRCW from Jan. 1, 2016 to April 27, 2017 was used for developing summary statistics (LDPRCW, 2017).

[3] Specific conductance collected by USGS from Jan. 23, 2017 to April 27, 2017 was used for developing summary statistics (USGS, 2017).

TABLE 5
PROPOSED CHLORIDE SAMPLING REGIME
LOWER DES PLAINES RIVER CHLORIDES PROJECT

ID	Station ID	5539670	LDPRCW_03	LDPRCW_01	MWRD_92	GGA-02	GG-14	GGA-A-C2	GGB-02	HC-MC-01	GGB-A	GGC-03
	Stream	Des Plaines River[1,4]	Des Plaines River[1]	Des Plaines River[1]	Chicago Sanitary & Ship Canal[2]	Spring Creek[3]	Hickory Creek[3]	Spring Creek[3]	Marley Creek[3]	Marley Creek[3]	E. Branch of Marley Creek[3]	Union Ditch[3]
RM	River Mile (from mouth of Illinois Rive	277	275.8	288.7	290.9	292.3	294.6	302.9	307.8	311.9	312.9	322.9
F	Sampling Frequency	C	W	W	C	M/W	M/W	M/W	M/W	M/W	M/W	M/W
T	Type of Sampling	Sonde	Sonde	Grab	Sonde	Grab	Grab	Grab	Grab	Grab	Grab	Grab
P	Parameter	SC	SC	Chloride	SC	Chloride	Chloride	Chloride	Chloride	Chloride	Chloride	Chloride
LO	Lead Organization	LDPCW/USGS	LDPCW	LDPCW	MWRD	HCWPG	HCWPG	HCWPG	HCWPG	HCWPG	HCWPG	HCWPG

[1] Chloride concentrations were sampled by the Lower Des Plaines River Chlorides Workgroup (LDPRCW, 2016).

[2] Chloride concentrations were sampled by the Metropolitan Water Reclamation District (MWRD, 2016).

[3] Chloride concentrations were sampled by Hickory Creek Watershed Planning Group (HCWPG, 2016).

[4] Chloride concentrations were sampled by United States Geological Survey (USGS, 2016).

SC=specific conductance

W=Weekly

C=Continuous, hourly

M/W=Monthly, except weekly from January to March

V=Varies (month)

M=Monthly

TABLE 6
PROPOSED SAMPLING PARAMETERS
LOWER DES PLAINES RIVER CHLORIDES PROJECT

Parameter	Container	Preservative	Frequency Sampling[1]
Chloride	500 mL HDPE	none	W
pH	Field measurement	none	W
Temperature	Field measurement	none	W
Specific conductance	Field measurement	none	W
Duplicate blank	500 mL HDPE	none	W
Field blank (w/ DI water)	500 mL HDPE	none	W

[1] Chloride concentrations were sampled by the Lower Des Plaines River Chlorides Workgroup (LDPRCW).

Note:

W=weekly from December to the end of April and snow-melt capture events; maximum 5 samples a month.

TABLE 7
IN-STREAM WATER QUALITY RESULTS
LOWER DES PLAINES RIVER CHLORIDES PROJECT

Date	Point 1, Chloride ppm	Point 1, Lab Conductivity umhos/cm	Point 1, Field Conductivity umhos/cm	Point 3, Chloride ppm	Point 3, Lab Conductivity umhos/cm	Point 3, Field Conductivity umhos/cm
12/15/16	216	---	1,416	226	---	1,461
12/22/16	323	1,640	906	448	2,050	1,069
12/27/16	355	1,660	1,173	344	1,670	1,124
1/5/17	305	1,480	997	299	1,460	902
1/11/17	268	1,430	961	275	1,480	943
1/17/17	344	1,600	891	296	1,430	833
1/26/17	223	1,140	586	232	1,200	529
2/1/17	229	1,300	1,369	221	1,230	1,272
2/9/17	199	1,200	681	204	1,230	745
2/16/17	214	1,200	1,098	198	1,220	1,118
2/23/17	194	1,190	1,131	199	1,260	1,191
3/3/17	188	1,040	586	135	848	789
3/9/17	184	1,140	1,072	183	1,130	1,061
3/16/17	201	1,270	1,222	196	1,210	1,165
3/23/17	292	1,450	1,227	323	1,580	1,330
3/30/17	222	1,270	---	287	1,190	---
4/7/17	140	879	876	129	868	867
4/13/17	150	1,030	1,026	153	1,070	1,058
4/20/17	154	1,040	1,037	99	1,060	1,083
4/27/17	281	1,110	1,140	646	1,150	1,083

Point 1=Ruby Street Bridge over the Lower Des Plaines River-Coordinates 41.536621, -88033062
Point 3=Oiltanking west dock at river marker 275.8-Coordinates 41.400427, -88.219

TABLE 8
SPECIFIC CONDUCTANCE AND TEMPERATURE (DAILY MEAN)
DES PLAINES RIVER AT CHANNAHON, IL (USGS 05539670)
LOWER DES PLAINES RIVER CHLORIDES PROJECT

Date	Specific Conductance, umhos/cm (USGS) (Mean)	Temp, C (Mean)
1/23/2017		5.8
1/24/2017	1,150	5.7
1/25/2017	1,170	5.7
1/26/2017	1,190	5.2
1/27/2017	1,210	4.0
1/28/2017	1,200	3.0
1/29/2017	1,230	2.4
1/30/2017	1,220	2.3
1/31/2017	1,210	2.9
2/1/2017	1,240	3.7
2/2/2017	1,250	2.8
2/3/2017	1,270	2.2
2/4/2017	1,300	1.5
2/5/2017	1,320	2.2
2/6/2017	1,310	3.2
2/7/2017		
2/8/2017		
2/9/2017	1,240	3.4
2/10/2017	1,230	2.5
2/11/2017	1,220	4.5
2/12/2017	1,240	5.4
2/13/2017	1,200	5.4
2/14/2017	1,180	5.6
2/15/2017	1,180	5.6
2/16/2017	1,210	8.4
2/17/2017	1,230	8.7
2/18/2017	1,220	8.9
2/19/2017	1,230	9.2
2/20/2017	1,230	10.6
2/21/2017	1,220	11.1
2/22/2017	1,230	11.1
2/23/2017	1,220	12.0
2/23/2017	1,220	12.0
2/24/2017	1,190	11.7
2/25/2017	1,190	9.0
2/26/2017	1,200	8.4
2/27/2017	1,240	8.4
2/28/2017	1,230	9.1

Date	Specific Conductance, umhos/cm (USGS) (Mean)	Temp, C (Mean)
3/1/2017	866	9.3
3/2/2017	797	7.0
3/3/2017	864	6.4
3/4/2017	890	7.1
3/5/2017	910	7.3
3/6/2017	968	8.6
3/7/2017	1,030	10.1
3/8/2017	1,060	9.4
3/9/2017	1,070	9.0
3/10/2017	1,070	8.1
3/11/2017	1,100	7.5
3/12/2017	1,090	7.6
3/13/2017	1,090	6.9
3/14/2017	1,100	6.3
3/15/2017	1,130	6.4
3/16/2017	1,160	7.4
3/17/2017	1,200	7.8
3/18/2017	1,290	7.7
3/19/2017	1,360	8.5
3/20/2017	1,480	8.8
3/21/2017	1,700	8.9
3/22/2017	1,560	8.3
3/23/2017	1,390	7.6
3/24/2017	1,410	9.5
3/25/2017	1,360	11.3
3/26/2017	1,340	11.0
3/27/2017	1,400	11.1
3/28/2017	1,330	10.9
3/29/2017	1,320	10.5
3/30/2017	1,070	9.7
3/31/2017	693	7.8
4/1/2017	735	8.1
4/2/2017	831	9.8
4/3/2017	923	10.2
4/4/2017	961	10.3
4/5/2017	956	9.7
4/6/2017	896	8.9
4/7/2017	861	9.2

Date	Specific Conductance, umhos/cm (USGS) (Mean)	Temp, C (Mean)
4/8/2017	883	10.9
4/9/2017	882	12.5
4/10/2017	876	13.5
4/11/2017	899	13.1
4/12/2017	941	13.2
4/13/2017	946	14.0
4/14/2017	962	14.7
4/15/2017	997	15.9
4/16/2017	1,020	16.5
4/17/2017	1,010	16.6
4/18/2017	979	16.9
4/19/2017	989	17.5
4/20/2017	989	17.1
4/21/2017	996	16.5
4/22/2017	1,020	16.4
4/23/2017	1,040	16.3
4/24/2017	1,050	17.2
4/25/2017	1,060	17.5
4/26/2017	1,050	18.1
4/27/2017	1,060	17.7

APPENDIX C

IEPA 303d List

Appendix A-2. Illinois' 2016 303(d) List (sorted by name)

Order	Priority	Hydrologic Unit Code	Water Name	Assessment ID	Water Size*	Designated Use	Cause
777	Medium	0712000610	CRANBERRY LAKE	IL_UTL	16.00	Aesthetic Quality	Phosphorus (Total)
2303	Medium	0713000805	Crane Creek	IL_EH-01	10.69	Aquatic Life	Oxygen, Dissolved
2325	Medium	0512011302	Crawfish Creek	IL_BZJ	11.81	Aquatic Life	Cause Unknown
1761	Medium	0514020406	Crawford Creek	IL_ATFA-01	9.91	Aquatic Life	Phosphorus (Total)
604	Medium	0712000402	CROOKED	IL_RGZA	140.00	Aesthetic Quality	Phosphorus (Total)
605	Medium	0712000402	CROOKED	IL_RGZA	140.00	Aesthetic Quality	Total Suspended Solids (TSS)
1817	Medium	0714010801	Crooked Creek	IL_IXJAA	6.05	Aquatic Life	Oxygen, Dissolved
31	High	0714020208	Crooked Creek	IL_OJ-07	34.46	Aquatic Life	Oxygen, Dissolved
32	High	0714020208	Crooked Creek	IL_OJ-07	34.46	Aquatic Life	Phosphorus (Total)
33	High	0714020208	Crooked Creek	IL_OJ-08	24.34	Aquatic Life	Iron
34	High	0714020208	Crooked Creek	IL_OJ-08	24.34	Aquatic Life	Phosphorus (Total)
35	High	0714020208	Crooked Creek	IL_OJ-08	24.34	Aquatic Life	Total Suspended Solids (TSS)
36	High	0714020208	Crooked Creek	IL_OJ-11	15.72	Aquatic Life	Oxygen, Dissolved
778	Medium	0712000610	CROSS	IL_UTV	88.91	Aesthetic Quality	Cause Unknown
2343	Medium	0713000112	Crow Creek-East	IL_DO-01	17.98	Primary Contact Recreation	Fecal Coliform
1950	Medium	0512010902	CRYSTAL (CHAMPAIGN)	IL_RBU	7.00	Fish Consumption	Mercury
1668	Medium	0714010609	CRYSTAL (PERRY)	IL_RNZL	6.00	Fish Consumption	Mercury
1257	Medium	0712000612	Crystal Lake Outlet	IL_DTZR-01	6.54	Primary Contact Recreation	Fecal Coliform
1649	Medium	0713000201	Cullom WSS Trib	IL_DSQZA	3.34	Aquatic Life	Boron
1650	Medium	0713000201	Cullom WSS Trib	IL_DSQZA	3.34	Aquatic Life	Oxygen, Dissolved
1932	Medium	0713000509	Dago Slough	IL_DJFCA	3.50	Aquatic Life	Phosphorus (Total)
1933	Medium	0713000509	Dago Slough	IL_DJFCA	3.50	Aquatic Life	Sedimentation/Siltation
2504	Low	0712000610	DAVIS LAKE	IL_STQ	36.00	Aesthetic Quality	Phosphorus (Total)
813	Medium	0404000201	Dead Dog Creek	IL_QE-01	4.67	Aquatic Life	Aldrin
814	Medium	0404000201	Dead Dog Creek	IL_QE-01	4.67	Aquatic Life	Cause Unknown
2003	Medium	0713000604	DECATUR	IL_REA	3,072.00	Fish Consumption	Chlordane
2004	Medium	0713000604	DECATUR	IL_REA	3,072.00	Fish Consumption	Mercury
2005	Medium	0713000604	DECATUR	IL_REA	3,072.00	Fish Consumption	Polychlorinated biphenyls
780	Medium	0712000610	DEEP (LAKE)	IL_VTD	225.50	Fish Consumption	Mercury
2522	Low	0712000610	DEEP (LAKE)	IL_VTD	225.50	Primary Contact Recreation	Fecal Coliform
2122	Medium	0512011205	Deer Creek	IL_BEZY	14.34	Aquatic Life	Iron
2123	Medium	0512011205	Deer Creek	IL_BEZY	14.34	Aquatic Life	Oxygen, Dissolved
2124	Medium	0512011205	Deer Creek	IL_BEZY	14.34	Aquatic Life	Temperature, water
1555	Medium	0512011407	Deer Creek	IL_CDB	17.62	Aquatic Life	Manganese
1556	Medium	0512011407	Deer Creek	IL_CDB	17.62	Aquatic Life	Oxygen, Dissolved
1992	Medium	0713000206	Deer Creek	IL_DSLB	6.25	Aquatic Life	Oxygen, Dissolved
979	Medium	0712000302	Deer Creek	IL_HBDC	8.20	Aquatic Life	Phosphorus (Total)
2580	Low	0712000302	Deer Creek	IL_HBDC	8.20	Primary Contact Recreation	Fecal Coliform
2582	Low	0712000302	Deer Creek	IL_HBDC-02	10.12	Aquatic Life	Oxygen, Dissolved
980	Medium	0712000302	Deer Creek	IL_HBDC-02	10.12	Aquatic Life	Phosphorus (Total)
981	Medium	0712000302	Deer Creek	IL_HBDC-02	10.12	Aquatic Life	Sedimentation/Siltation
2581	Low	0712000302	Deer Creek	IL_HBDC-02	10.12	Primary Contact Recreation	Fecal Coliform
1453	Medium	0709000606	Deer Creek	IL_PQCE	9.66	Aquatic Life	Cause Unknown
639	Medium	0712000402	DEER LAKE	IL_WGZF	59.00	Aesthetic Quality	Phosphorus (Total)
715	Medium	0712000611	DEFIANCE	IL_RTB	47.80	Fish Consumption	Mercury
1697	Medium	0713000108	DEPUE	IL_RDU	524.00	Aquatic Life	Cadmium
1698	Medium	0713000108	DEPUE	IL_RDU	524.00	Aquatic Life	Endrin
1701	Medium	0713000108	DEPUE	IL_RDU	524.00	Aquatic Life	Silver
1702	Medium	0713000108	DEPUE	IL_RDU	524.00	Aquatic Life	Zinc
1699	Medium	0713000108	DEPUE	IL_RDU	524.00	Fish Consumption	Mercury
1700	Medium	0713000108	DEPUE	IL_RDU	524.00	Fish Consumption	Polychlorinated biphenyls
519	Medium	0712000407	Des Plaines River	IL_G-03	8.41	Aquatic Life	Chloride
522	Medium	0712000407	Des Plaines River	IL_G-03	8.41	Aquatic Life	pH
523	Medium	0712000407	Des Plaines River	IL_G-03	8.41	Aquatic Life	Phosphorus (Total)
521	Medium	0712000407	Des Plaines River	IL_G-03	8.41	Fish Consumption	Mercury
524	Medium	0712000407	Des Plaines River	IL_G-03	8.41	Fish Consumption	Polychlorinated biphenyls
520	Medium	0712000407	Des Plaines River	IL_G-03	8.41	Primary Contact Recreation	Fecal Coliform
912	Medium	0712000403	Des Plaines River	IL_G-07	10.78	Aquatic Life	Arsenic
913	Medium	0712000403	Des Plaines River	IL_G-07	10.78	Aquatic Life	Chloride

Appendix A-2. Illinois' 2016 303(d) List (sorted by name)

Order	Priority	Hydrologic Unit Code	Water Name	Assessment ID	Water Size*	Designated Use	Cause
916	Medium	0712000403	Des Plaines River	IL_G-07	10.78	Aquatic Life	Phosphorus (Total)
915	Medium	0712000403	Des Plaines River	IL_G-07	10.78	Fish Consumption	Mercury
917	Medium	0712000403	Des Plaines River	IL_G-07	10.78	Fish Consumption	Polychlorinated biphenyls
914	Medium	0712000403	Des Plaines River	IL_G-07	10.78	Primary Contact Recreation	Fecal Coliform
920	Medium	0712000403	Des Plaines River	IL_G-08	0.97	Aquatic Life	Oxygen, Dissolved
921	Medium	0712000403	Des Plaines River	IL_G-08	0.97	Aquatic Life	Total Suspended Solids (TSS)
919	Medium	0712000403	Des Plaines River	IL_G-08	0.97	Fish Consumption	Mercury
918	Medium	0712000403	Des Plaines River	IL_G-08	0.97	Primary Contact Recreation	Fecal Coliform
525	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Aquatic Life	Aldrin
526	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Aquatic Life	Arsenic
527	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Aquatic Life	Chloride
530	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Aquatic Life	Methoxychlor
531	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Aquatic Life	Oxygen, Dissolved
532	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Aquatic Life	Phosphorus (Total)
529	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Fish Consumption	Mercury
533	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Fish Consumption	Polychlorinated biphenyls
528	Medium	0712000407	Des Plaines River	IL_G-11	9.05	Primary Contact Recreation	Fecal Coliform
1221	Medium	0712000409	Des Plaines River	IL_G-12	8.50	Fish Consumption	Mercury
1222	Medium	0712000409	Des Plaines River	IL_G-12	8.50	Fish Consumption	Polychlorinated biphenyls
250	Medium	0712000405	Des Plaines River	IL_G-15	3.52	Aquatic Life	Chloride
253	Medium	0712000405	Des Plaines River	IL_G-15	3.52	Aquatic Life	Oxygen, Dissolved
254	Medium	0712000405	Des Plaines River	IL_G-15	3.52	Aquatic Life	Phosphorus (Total)
256	Medium	0712000405	Des Plaines River	IL_G-15	3.52	Aquatic Life	Sedimentation/Siltation
252	Medium	0712000405	Des Plaines River	IL_G-15	3.52	Fish Consumption	Mercury
255	Medium	0712000405	Des Plaines River	IL_G-15	3.52	Fish Consumption	Polychlorinated biphenyls
251	Medium	0712000405	Des Plaines River	IL_G-15	3.52	Primary Contact Recreation	Fecal Coliform
257	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Aquatic Life	Arsenic
258	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Aquatic Life	Chloride
261	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Aquatic Life	Methoxychlor
262	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Aquatic Life	Phosphorus (Total)
264	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Aquatic Life	Total Suspended Solids (TSS)
260	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Fish Consumption	Mercury
263	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Fish Consumption	Polychlorinated biphenyls
259	Medium	0712000405	Des Plaines River	IL_G-22	4.31	Primary Contact Recreation	Fecal Coliform
534	Medium	0712000407	Des Plaines River	IL_G-23	3.82	Fish Consumption	Mercury
536	Medium	0712000407	Des Plaines River	IL_G-23	3.82	Fish Consumption	Polychlorinated biphenyls
535	Medium	0712000407	Des Plaines River	IL_G-23	3.82	Indigenous Aquatic Life	Oxygen, Dissolved
1224	Medium	0712000409	Des Plaines River	IL_G-24	5.20	Fish Consumption	Mercury
1225	Medium	0712000409	Des Plaines River	IL_G-24	5.20	Fish Consumption	Polychlorinated biphenyls
1223	Medium	0712000409	Des Plaines River	IL_G-24	5.20	Primary Contact Recreation	Fecal Coliform
922	Medium	0712000403	Des Plaines River	IL_G-25	6.92	Aquatic Life	Arsenic
924	Medium	0712000403	Des Plaines River	IL_G-25	6.92	Aquatic Life	Oxygen, Dissolved
925	Medium	0712000403	Des Plaines River	IL_G-25	6.92	Aquatic Life	Sedimentation/Siltation
926	Medium	0712000403	Des Plaines River	IL_G-25	6.92	Aquatic Life	Total Suspended Solids (TSS)
923	Medium	0712000403	Des Plaines River	IL_G-25	6.92	Fish Consumption	Mercury
265	Medium	0712000405	Des Plaines River	IL_G-26	6.01	Aquatic Life	Cause Unknown
266	Medium	0712000405	Des Plaines River	IL_G-26	6.01	Fish Consumption	Mercury
267	Medium	0712000405	Des Plaines River	IL_G-26	6.01	Fish Consumption	Polychlorinated biphenyls
268	Medium	0712000405	Des Plaines River	IL_G-28	9.02	Aquatic Life	Chloride
271	Medium	0712000405	Des Plaines River	IL_G-28	9.02	Aquatic Life	Oxygen, Dissolved
272	Medium	0712000405	Des Plaines River	IL_G-28	9.02	Aquatic Life	Phosphorus (Total)
270	Medium	0712000405	Des Plaines River	IL_G-28	9.02	Fish Consumption	Mercury
273	Medium	0712000405	Des Plaines River	IL_G-28	9.02	Fish Consumption	Polychlorinated biphenyls
269	Medium	0712000405	Des Plaines River	IL_G-28	9.02	Primary Contact Recreation	Fecal Coliform
274	Medium	0712000405	Des Plaines River	IL_G-30	5.19	Aquatic Life	Chloride
277	Medium	0712000405	Des Plaines River	IL_G-30	5.19	Aquatic Life	Oxygen, Dissolved
278	Medium	0712000405	Des Plaines River	IL_G-30	5.19	Aquatic Life	Phosphorus (Total)

Appendix A-2. Illinois' 2016 303(d) List (sorted by name)

Order	Priority	Hydrologic Unit Code	Water Name	Assessment ID	Water Size*	Designated Use	Cause
79	High	0714020409	Doza Creek	IL_OZD	20.07	Aquatic Life	Sedimentation/Siltation
80	High	0714020409	Doza Creek	IL_OZD	20.07	Aquatic Life	Sludge
2743	Low	0713001003	Drowning Fork	IL_DGLC-01	18.83	Aquatic Life	Chloride
185	High	0713001003	Drowning Fork	IL_DGLC-01	18.83	Aquatic Life	Phosphorus (Total)
186	High	0713001003	Drowning Fork	IL_DGLC-01	18.83	Aquatic Life	Sedimentation/Siltation
187	High	0713001003	Drowning Fork	IL_DGLC-01	18.83	Aquatic Life	Total Suspended Solids (TSS)
601	Medium	0712000402	DRUCE	IL_RGV	87.00	Primary Contact Recreation	Fecal Coliform
2301	Medium	0713000601	Drummer Creek	IL_EY-01	18.97	Aquatic Life	Oxygen, Dissolved
2560	Low	0712000611	DRUMMOND LAKE	IL_UTI	21.00	Aesthetic Quality	Phosphorus (Total)
2561	Low	0712000611	DRUMMOND LAKE	IL_UTI	21.00	Aesthetic Quality	Total Suspended Solids (TSS)
1157	Medium	0714010608	Drury Creek	IL_NDC-01	19.39	Aquatic Life	Oxygen, Dissolved
1158	Medium	0714010608	Drury Creek	IL_NDC-02	1.43	Aquatic Life	Oxygen, Dissolved
1330	Medium	0709000501	Dry Creek	IL_PV-01	9.38	Aquatic Life	Cause Unknown
1638	Medium	0512011503	Dry Fork	IL_CAJ-01	23.14	Aquatic Life	Oxygen, Dissolved
195	High	0714020102	Dry Fork	IL_OZZW	12.03	Aquatic Life	Cause Unknown
448	Medium	0712000408	Du Page River	IL_GB-01	8.14	Aquatic Life	Phosphorus (Total)
447	Medium	0712000408	Du Page River	IL_GB-01	8.14	Fish Consumption	Mercury
449	Medium	0712000408	Du Page River	IL_GB-01	8.14	Fish Consumption	Polychlorinated biphenyls
450	Medium	0712000408	Du Page River	IL_GB-11	10.07	Aquatic Life	Arsenic
2611	Low	0712000408	Du Page River	IL_GB-11	10.07	Aquatic Life	Chloride
452	Medium	0712000408	Du Page River	IL_GB-11	10.07	Aquatic Life	Methoxychlor
453	Medium	0712000408	Du Page River	IL_GB-11	10.07	Aquatic Life	Phosphorus (Total)
454	Medium	0712000408	Du Page River	IL_GB-11	10.07	Aquatic Life	Polychlorinated biphenyls
456	Medium	0712000408	Du Page River	IL_GB-11	10.07	Aquatic Life	Sedimentation/Siltation
451	Medium	0712000408	Du Page River	IL_GB-11	10.07	Fish Consumption	Mercury
455	Medium	0712000408	Du Page River	IL_GB-11	10.07	Fish Consumption	Polychlorinated biphenyls
2612	Low	0712000408	Du Page River	IL_GB-11	10.07	Primary Contact Recreation	Fecal Coliform
2614	Low	0712000408	Du Page River	IL_GB-16	11.31	Aquatic Life	Oxygen, Dissolved
458	Medium	0712000408	Du Page River	IL_GB-16	11.31	Aquatic Life	Phosphorus (Total)
457	Medium	0712000408	Du Page River	IL_GB-16	11.31	Fish Consumption	Mercury
459	Medium	0712000408	Du Page River	IL_GB-16	11.31	Fish Consumption	Polychlorinated biphenyls
2613	Low	0712000408	Du Page River	IL_GB-16	11.31	Primary Contact Recreation	Fecal Coliform
2501	Low	0712000610	DUCK	IL_RTZG	110.00	Aesthetic Quality	Phosphorus (Total)
2502	Low	0712000610	DUCK	IL_RTZG	110.00	Aesthetic Quality	Total Suspended Solids (TSS)
827	Medium	0404000201	DUGDALE	IL_UQA	4.61	Aesthetic Quality	Cause Unknown
1410	Medium	0512011502	Dums Creek	IL_CAW-04	27.90	Aquatic Life	Cause Unknown
2523	Low	0712000610	DUNNS	IL_VTH	68.00	Aesthetic Quality	Phosphorus (Total)
2524	Low	0712000610	DUNNS	IL_VTH	68.00	Aesthetic Quality	Total Suspended Solids (TSS)
1143	Medium	0714010606	DUQUOIN	IL_RNG	244.00	Aesthetic Quality	Phosphorus (Total)
1144	Medium	0714010606	DUQUOIN	IL_RNG	244.00	Aesthetic Quality	Total Suspended Solids (TSS)
1142	Medium	0714010606	DUQUOIN	IL_RNG	244.00	Fish Consumption	Mercury
2315	Medium	0714010506	Dutch Creek	IL_ICD-JB-C2	1.60	Aquatic Life	Oxygen, Dissolved
593	Medium	0712000402	Dutch Gap Canal	IL_GWAB	1.10	Aquatic Life	Arsenic
594	Medium	0712000402	Dutch Gap Canal	IL_GWAB	1.10	Aquatic Life	Manganese
595	Medium	0712000402	Dutch Gap Canal	IL_GWAB	1.10	Aquatic Life	Phosphorus (Total)
596	Medium	0712000402	Dutch Gap Canal	IL_GWAB	1.10	Aquatic Life	Sedimentation/Siltation
1764	Medium	0514020604	Dutchman Creek	IL_ADD-05	4.70	Aquatic Life	pH
1000	Medium	0514020407	Eagle Creek	IL_ATE-02	3.14	Aquatic Life	Oxygen, Dissolved
1001	Medium	0514020407	Eagle Creek	IL_ATE-03	2.66	Aquatic Life	Manganese
1002	Medium	0514020407	Eagle Creek	IL_ATE-03	2.66	Aquatic Life	Oxygen, Dissolved
1003	Medium	0514020407	Eagle Creek	IL_ATE-03	2.66	Aquatic Life	Sulfates
1004	Medium	0514020407	Eagle Creek	IL_ATE-04	1.60	Aquatic Life	Manganese
1005	Medium	0514020407	Eagle Creek	IL_ATE-04	1.60	Aquatic Life	Oxygen, Dissolved
1006	Medium	0514020407	Eagle Creek	IL_ATE-04	1.60	Aquatic Life	pH
1007	Medium	0514020407	Eagle Creek	IL_ATE-04	1.60	Aquatic Life	Sulfates
1008	Medium	0514020407	Eagle Creek	IL_ATE-05	1.76	Aquatic Life	Manganese
1009	Medium	0514020407	Eagle Creek	IL_ATE-05	1.76	Aquatic Life	Oxygen, Dissolved
1010	Medium	0514020407	Eagle Creek	IL_ATE-05	1.76	Aquatic Life	Sulfates
2609	Low	0712000301	EAGLE LAKE	IL_UHH	22.00	Aesthetic Quality	Phosphorus (Total)
2610	Low	0712000301	EAGLE LAKE	IL_UHH	22.00	Aesthetic Quality	Total Suspended Solids (TSS)
2198	Medium	0713000304	East Branch Copperas Creek	IL_DZHC	20.14	Aquatic Life	Cause Unknown
480	Medium	0712000408	East Branch Du Page River	IL_GBL-02	8.01	Aquatic Life	Arsenic

Appendix A-2. Illinois' 2016 303(d) List (sorted by name)

Order	Priority	Hydrologic Unit Code	Water Name	Assessment ID	Water Size*	Designated Use	Cause
1045	Medium	0712000406	Hickory Creek	IL_GG-04	8.11	Aquatic Life	Oxygen, Dissolved
1046	Medium	0712000406	Hickory Creek	IL_GG-04	8.11	Aquatic Life	Phosphorus (Total)
1047	Medium	0712000406	Hickory Creek	IL_GG-06	12.63	Aquatic Life	Arsenic
1048	Medium	0712000406	Hickory Creek	IL_GG-06	12.63	Aquatic Life	Chloride
1049	Medium	0712000406	Hickory Creek	IL_GG-06	12.63	Aquatic Life	pH
1050	Medium	0712000406	Hickory Creek	IL_GG-06	12.63	Aquatic Life	Phosphorus (Total)
1051	Medium	0712000406	Hickory Creek	IL_GG-22	2.25	Aquatic Life	Chloride
1053	Medium	0712000406	Hickory Creek	IL_GG-22	2.25	Aquatic Life	Oxygen, Dissolved
1054	Medium	0712000406	Hickory Creek	IL_GG-22	2.25	Aquatic Life	pH
1055	Medium	0712000406	Hickory Creek	IL_GG-22	2.25	Aquatic Life	Phosphorus (Total)
1056	Medium	0712000406	Hickory Creek	IL_GG-22	2.25	Aquatic Life	Total Suspended Solids (TSS)
1052	Medium	0712000406	Hickory Creek	IL_GG-22	2.25	Primary Contact Recreation	Fecal Coliform
247	High	0714020203	Hickory Creek	IL_ON-01	23.88	Primary Contact Recreation	Fecal Coliform
1606	Medium	0713000408	Hickory Grove Ditch	IL_DKB-01	4.42	Aquatic Life	Manganese
1607	Medium	0713000408	Hickory Grove Ditch	IL_DKB-01	4.42	Aquatic Life	Oxygen, Dissolved
1608	Medium	0713000408	Hickory Grove Ditch	IL_DKB-01	4.42	Aquatic Life	Sedimentation/Siltation
516	Medium	0712000408	HIDDEN	IL_WGZR	10.00	Aesthetic Quality	Phosphorus (Total)
517	Medium	0712000408	HIDDEN	IL_WGZR	10.00	Aesthetic Quality	Total Suspended Solids (TSS)
2515	Low	0712000610	HIDDEN LAKE	IL_UTM	19.00	Aesthetic Quality	Phosphorus (Total)
2517	Low	0712000610	HIDDEN LAKE	IL_UTM	19.00	Aesthetic Quality	Total Suspended Solids (TSS)
2513	Low	0712000610	HIDDEN LAKE	IL_UTM	19.00	Aquatic Life	Oxygen, Dissolved
2514	Low	0712000610	HIDDEN LAKE	IL_UTM	19.00	Aquatic Life	pH
2516	Low	0712000610	HIDDEN LAKE	IL_UTM	19.00	Aquatic Life	Phosphorus (Total)
2518	Low	0712000610	HIDDEN LAKE	IL_UTM	19.00	Aquatic Life	Total Suspended Solids (TSS)
298	Medium	0712000405	Higgins Creek	IL_GOA-01	1.69	Aquatic Life	Phosphorus (Total)
299	Medium	0712000405	Higgins Creek	IL_GOA-02	2.57	Aquatic Life	Cause Unknown
761	Medium	0712000610	HIGHLAND	IL_RTZP	103.00	Aesthetic Quality	Phosphorus (Total)
210	High	0714020404	HIGHLAND SILVER	IL_ROZA	600.00	Aquatic Life	pH
209	High	0714020404	HIGHLAND SILVER	IL_ROZA	600.00	Fish Consumption	Mercury
1719	Medium	0713001202	Hodges Creek	IL_DAG-02	11.37	Aquatic Life	Cause Unknown
1497	Medium	0514020404	Hogg Creek	IL_ATFFA	11.02	Aquatic Life	Oxygen, Dissolved
2339	Medium	0712000704	HOLIDAY	IL_VTX	326.00	Fish Consumption	Mercury
1734	Medium	0714010102	HOLIDAY SHORES	IL_RJN	430.00	Aesthetic Quality	Total Suspended Solids (TSS)
1733	Medium	0714010102	Holiday Shores Creek	IL_JQO-HS-C1	0.25	Aquatic Life	Phosphorus (Total)
2417	Low	Lake Michigan Beaches	Hollywood/Ostermann Beach	IL_QN-03	0.27	Fish Consumption	Mercury
2418	Low	Lake Michigan Beaches	Hollywood/Ostermann Beach	IL_QN-03	0.27	Fish Consumption	Polychlorinated biphenyls
2115	Medium	0512010906	HOMER	IL_RBO	102.00	Fish Consumption	Mercury
2552	Low	0712000611	HONEY	IL_RTZU	66.00	Aesthetic Quality	Phosphorus (Total)
2551	Low	0712000611	HONEY	IL_RTZU	66.00	Primary Contact Recreation	Fecal Coliform
767	Medium	0712000610	HOOK LAKE	IL_STW	35.00	Aesthetic Quality	Phosphorus (Total)
768	Medium	0712000610	HOOK LAKE	IL_STW	35.00	Aesthetic Quality	Total Suspended Solids (TSS)
2116	Medium	0512010908	Hoopeston Branch	IL_BPGD	4.80	Aquatic Life	Phosphorus (Total)
1803	Medium	0713000707	Hoover Branch	IL_EOAD-11	2.95	Aquatic Life	Sedimentation/Siltation
2326	Medium	0512011501	Horse Creek	IL_CAN-01	31.05	Aquatic Life	Cause Unknown
2101	Medium	0713000706	Horse Creek	IL_EOC-02	35.86	Aquatic Life	Oxygen, Dissolved
2102	Medium	0713000706	Horse Creek	IL_EOC-02	35.86	Aquatic Life	Sedimentation/Siltation
249	High	0714020408	Horse Creek	IL_OB-03	30.63	Aquatic Life	Sedimentation/Siltation
2749	Low	0714010803	HORSESHOE	IL_RIA	1,890.00	Aesthetic Quality	Phosphorus (Total)
1677	Medium	0714010803	HORSESHOE	IL_RIA	1,890.00	Aesthetic Quality	Total Suspended Solids (TSS)
2730	Low	0714010104	HORSESHOE (MADISON)	IL_RJC	2,107.00	Aesthetic Quality	Phosphorus (Total)
2731	Low	0714010104	HORSESHOE (MADISON)	IL_RJC	2,107.00	Aesthetic Quality	Total Suspended Solids (TSS)
1123	Medium	0714010104	HORSESHOE (MADISON)	IL_RJC	2,107.00	Fish Consumption	Polychlorinated biphenyls
2427	Low	Lake Michigan Beaches	Howard Beach	IL_QN-08	0.16	Fish Consumption	Mercury
2428	Low	Lake Michigan Beaches	Howard Beach	IL_QN-08	0.16	Fish Consumption	Polychlorinated biphenyls
426	Medium	0712000301	HUMBOLDT PARK LAGOON	IL_RHB	19.90	Aesthetic Quality	Phosphorus (Total)
427	Medium	0712000301	HUMBOLDT PARK LAGOON	IL_RHB	19.90	Aesthetic Quality	Total Suspended Solids (TSS)

Harmonic Mean Flow

Contract Report 521

Harmonic Mean Flows for Illinois Streams

by Krishan P. Singh and Ganapathi S. Ramamurthy
Office of Surface Water Resources & Systems Analysis

Prepared for the
Illinois Environmental Protection Agency

December 1991

Illinois State Water Survey
Hydrology Division
Champaign, Illinois

A Division of the Illinois Department of Energy and Natural Resources

3.1.4 Determination of Q_{HM}: An Example

The Q_{HM} in the Kyte River near Flagg Center was calculated as 22 cfs under the 1990 effluent flow conditions. The 22 cfs flow comprised 16 cfs natural flow, 5 cfs effluent flow from Rochelle, and 1 cfs effluent from Ashton.

3.2 MAP 2 — NORTHEASTERN ILLINOIS REGION

The Northeastern Illinois region covers the area drained by the Chicago Sanitary and Ship Canal and the Chicago, Des Plaines, Du Page, and Fox Rivers.

3.2.1 Q_{HM} at Gaging Stations

USGS daily-flow records for 44 gaging stations were analyzed to determine the Q_{HM} for each year of record at these stations. The Q_{HM} values at each station were determined by following the procedures outlined in chapter 2. The USGS number, stream and gaging station, drainage area, period of record, percent of zero-flow days, and the Q_{HM} are given in table 3.2.

3.2.2 Wastewater Treatment Plants and Effluents

The Metropolitan Water Reclamation District of Greater Chicago (MWRDGC) operates three major WTPs: Northside, West-Southwest, and Calumet. Since the mid-1970s the MWRDGC has put into operation three new medium-sized plants: Hanover Park, John Egan, and O'Hare. The North Shore Sanitary District (NSSD) also operates two new WTPs.

The monthly operation reports from various towns, cities, and industries were obtained from the IEPA. These reports contain information on the amount of water in gallons per day (gpd) leaving the plant after treatment and any wastewater bypassed during rains in the case of combined sewer systems. The effluent records were analyzed to derive the Q_{HM}s in the year 1990. Some municipal and industrial WTP managers were contacted by phone to verify the information collected from the files.

3.2.3 Fox Chain-of-Lakes

In-stream lakes and pools generally reduce the year low flow. Lakes and pools expose considerable water surface areas to evaporation, thus reducing the natural low flows. The upper part of the Fox River Basin in Illinois has a flat low-lying terrain abounding in lakes, swamps, marshes, and sloughs. Included in this area are the Fox Chain of Lakes with a combined water surface of 13 mi^2. The principal lakes in the chain are Pistakee, Nippersink, Fox, Petite, Channel, and Catherine. There are two dams in the area: the McHenry and Algonquin Dams. The McHenry Dam creates a pool extending upstream to the Pistakee Lake outlet. The surface area of the pool is 403 acres. The Algonquin Dam creates a 16.34-mile-long pool, with a surface area of 849 acres, extending upstream to the McHenry Dam. Gates at the McHenry Dam are operated to maintain the water level in the Chain of Lakes for recreational purposes.

The Q_{HM}S at Wilmot and Algonquin, adjusted for 1990 effluent discharge conditions, are 380 and 625 cfs, respectively.

3.2.4 Flow Regulation for Navigation

Flows in the MWRDGC waterways and in the Illinois River are regulated through a series of locks and dams for navigation purposes. The observed losses are attributed to evaporation, leakage, and storage because of regulation. Because all these losses are proportional to water surface area, the distribution of losses along the river is found by the use of the lake, river, and backwater surface areas at different points along the river.

Table 3.2: Map 2 - Gaging Stations and Harmonic Mean Flows

USGS Gage	*Stream and Gaging Station*	*Area (mi^2)*	*Period of Record*	*Zero-Flow Days (%)*	*Q_{HM} (cfs)*
05527500	Kankakee River near Wilmington	5150	72(1916-1987)	0.00	2240
05527800	Des Plaines River at Russell	123	20(1968-1987)	0.07	12
05528000	Des Plaines River near Gurnee	232	19(1969-1987)	0.00	100
05528500	Buffalo Creek near Wheeling	19.6	24(1964-1987)	0.28	2.0
05529000	Des Plaines River near Des Plaines	360	47(1941-1987)	0.36	150
05529500	McDonald Creek near Mount Prospect	7.90	35(1953-1987)	12.67	0.0
05530000	Weller Creek at Des Plaines	13.2	37(1951-1987)	4.58	1.2
05530500	Willow Creek near Park Ridge	19.7	8(1951-1958)	1.68	53
05530990	Salt Creek at Rolling Meadows	30.5	14(1974-1987)	0.59	3.8
05531500	Salt Creek at Western Springs	114	42(1946-1987)	0.00	81
05532000	Addison Creek at Bellwood	17.9	36(1952-1987)	0.01	8.0
05532500	Des Plaines River at Riverside	630	44(1944-1987)	0.01	370
05533000	Flag Creek near Willow Springs	16.5	36(1952-1987)	0.00	15
05534500	N. Br. Chicago River at Deerfield	19.7	35(1953-1987)	4.84	2.0
05535000	Skokie River at Lake Forest	13.0	36(1952-1987)	0.14	3.5
05535070	Skokie River near Highland Park	21.1	20(1968-1987)	0.00	6.4
05535500	W. F. of N. Br. Chicago River at Northbrook	11.5	35(1953-1987)	0.19	7.0
05536000	N. Br. Chicago River at Niles	100	37(1951-1987)	0.00	48
05536195	Little Calumet River at Munster, IN	90.0	30(1959-1988)	0.00	24
05536210	Thorn Creek near Chicago Heights	17.2	16(1965-1980)	6.21	1.5
05536215	Thorn Creek at Glenwood	24.7	38(1950-1987)	0.00	28
05536235	Deer Creek near Chicago Heights	23.1	39(1949-1987)	0.67	2.2
05536255	Butterfield Creek at Flossmoor	23.5	39(1949-1987)	2.11	0.0
05536265	Lansing Ditch near Lansing	8.80	39(1949-1987)	0.84	1.2
05536270	North Creek near Lansing	16.8	32(1949-1980)	3.09	2.7
05536275	Thorn Creek at Thornton	104	39(1949-1987)	0.00	48
05536290	Little Calumet River at South Holland	205	40(1948-1987)	0.00	85
05536340	Midlothian Creek at Oak Forest	12.6	37(1951-1987)	3.11	1.0
05536500	Tinley Creek near Palos Park	11.2	36(1952-1987)	5.95	0.0
05537000	Chicago Sanitary and Ship Canal at Lockport	739	36(1954-1989)	0.00	2900
05537500	Long Run near Lemont	20.9	36(1952-1987)	6.57	1.2
05539000	Hickory Creek at Joliet	107	43(1945-1987)	0.00	19
05539900	W. Br. Du Page River near West Chicago	28.5	26(1962-1987)	0.00	23
05540095	W. Br. Du Page River near Warrenville	90.4	19(1969-1987)	0.00	52
05540500	Du Page River at Shorewood	324	47(1941-1987)	0.00	185

Table 3.2: Map 2 - Continued

USGS Gage	Stream and Gaging Station	Area (mi^2)	Period of Record	Zero-Flow Days (%)	Q_{HM} (cfs)
05543500	Illinois River at Marseilles	8259	68(1920-1987)	0.00	7200
05546500	Fox River at Wilmot, WI	868	49(1940-1988)	0.00	380
05548280	Nippersink Creek near Spring Grove	192	21(1967-1987)	0.00	95
05549000	Boone Creek near McHenry	15.5	34(1949-1982)	0.00	10
05550000	Fox River at Algonquin	1403	72(1916-1987)	0.00	625
05550500	Poplar Creek at Elgin	35.2	36(1952-1987)	0.00	5.4
05551200	Ferson Creek near St. Charles	51.7	26(1962-1987)	0.00	12
05551700	Blackberry Creek near Yorkville	70.2	27(1961-1987)	0.00	27
05552500	Fox River at Dayton	2642	63(1925-1987)	0.00	1190

3.2.5 Streams in Urbanizing Basins

For streams with a rapidly urbanizing drainage area, the low flows each year exhibit a pronounced upward trend with time. As an example, consider the annual Q_{HM} flows for the Salt Creek at Western Springs (USGS gage 05531500) during the period 1946-1987. The five-year moving average of the Q_{HM}s is plotted in figure 3.1. The best-fit curve shows the trend and yields a Q_{HM} of 81 cfs for the 1990 conditions of inflows to Salt Creek above the gaging station. Various inflows above the gaging station for the years 1940, 1950, 1960, 1970, and 1980 are given below.

Inflows above Station 05531500
Salt Creek at Western Springs

Source	Inflows (cfs)				
	1940	1950	1960	1970	1980
John Egan Plant		.	.	.	19.5
Elk Grove Devon	-	-	-	-	0.1
Springbrook	-	0.03	0.42	0.80	1.5
Wood Dale	-	-	0.36	1.1	1.7
Addison	0.08	0.08	0.88	3.8	5.5
Salt Creek S. D.	1.1	1.4	3.4	4.6	2.8
Elmhurst	1.9	2.6	4.8	7.3	10.4
Oakbrook Terrace		.	.	0.12	
Oak Brook	-	-	0.09	1.6	
TOTAL	3.08	4.11	9.95	19.32	41.5

The total inflow in 1990 was about 60 cfs. Most of the communities in the basin depend on wells for their water supply. Water pumped from the ground or supplied from Lake Michigan is discharged as wastewater effluent. In the southern part of the basin, the glacial drift is thin, and the basal sand and gravel, though too thin to be used as an aquifer, do provide a hydraulic connection between the Salt Creek bed and the dolomite aquifer underlying the sand and gravel. This relationship is a critical factor in ground-water recharge in the southern part of the basin. The entire reach of the Salt Creek south