Upper Kaskaskia River and Lake Fork Watershed Total Maximum Daily Load

Stage 3 Report for Public Review

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Acronyms and Abbreviations

AWQMN	Ambient Water Quality Monitoring Network
BMP	best management practice
CAFO	confined animal feeding operation
CSA	critical source area
CWA	Clean Water Act
DO	dissolved oxygen
IEPA	Illinois Environmental Protection Agency
IDOT	Illinois Department of Transportation
IEPA	Illinois Environmental Protection Agency
ILSAM	Illinois Streamflow Assessment Model
IPCB	Illinois Pollution Control Board
KCl	potassium chloride
LA	load allocation
LRS	load reduction strategy
MOS	margin of safety
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service (U.S. Department of Agriculture)
RC	reserve capacity
STP	sewage treatment plant
TMDL	total maximum daily load
USACE	United States Army Corp of Engineers (U.S. Department of Defense)
USDA	United States Department of Agriculture
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey (U.S. Department of the Interior)
WLA	wasteload allocation
WQS	water quality standards
WWTP	wastewater treatment plant

Units of Measure

mg/L	milligrams per liter

Executive Summary

The Clean Water Act (CWA) and U.S. Environmental Protection Agency (EPA) regulations require that Total Maximum Daily Loads (TMDLs) be developed for waters that do not support their designated uses. In simple terms, a TMDL is a plan to attain and maintain water quality standards in waters that are not currently meeting them.

This TMDL study addresses approximately 150-square miles draining to two impaired segments in the 243-square mile Upper Kaskaskia River and Lake Fork watershed located in central Illinois. Two stream segments within the project are receiving chloride TMDLs. The sources of pollutants in the watershed include NPDES permitted facilities, such as wastewater treatment facilities, and nonpoint pollution resulting from several key sources including stormwater runoff and onsite wastewater treatment systems.

A TMDL identifies the total allowable load that a waterbody can assimilate (the loading capacity) and still meet water quality standards or targets. The loading capacity for each stream is determined using a load duration curve framework. TMDLs are presented in Section 7. A TMDL is equal to the loading capacity for a waterbody, and that loading capacity is distributed among load allocations to nonpoint and background sources, wasteload allocations to point sources, margin of safety, and reserve capacity. The required pollutant reductions vary between zero and 55 percent, depending on the waterbody and pollutant. Zero percent reductions for chlorides in Lake Fork despite samples exceeding the standard are a result of the very low flow; samples may have been collected from non-flowing pools in the stream and from a flowing reach with extremely low flow (less than 0.5 cubic feet per second) during baseflow conditions.

An implementation plan is provided in Section 8 which includes potential implementation activities to address sources of pollutants. This plan, when combined with the entire TMDL study, is provided to meet U.S. EPA's Nine Minimum Elements for CWA section 319 funding requirements, and includes an analysis of critical areas, extent of needed implementation, schedule, milestones, partners, and estimated costs.

The State of Illinois uses a three-stage approach to develop TMDLs:

Stage 1 – Watershed characterization, historical dataset evaluation, data analysis, methodology selection, data gap identification

Stage 2 – Data collection to fill in data gaps, if necessary

Stage 3 – Model calibration, TMDL scenarios, and implementation plan

This final report represents a compilation of Stage 1, 2, and 3.

1 Introduction

The Clean Water Act (CWA) and U.S. Environmental Protection Agency (U.S. EPA) regulations require that Total Maximum Daily Loads (TMDLs) be developed for waters that do not support their designated uses. In simple terms, a TMDL is a plan to attain and maintain water quality standards in waters that are not currently meeting standards. This TMDL study addresses a portion of the Upper Kaskaskia River watershed in central Illinois. The project area, referred to as the Upper Kaskaskia River and Lake Fork watershed, is approximately 243 square miles and includes impairments in Lake Fork (Figure 1). A previous TMDL study was completed in the larger Upper Kaskaskia River major watershed and relevant information from the study is included herein where applicable: *Upper Kaskaskia River Watershed TMDL Report* (Illinois Environmental Protection Agency [IEPA] 2018).

Several waters in the Upper Kaskaskia and Lake Fork watershed have been placed on the State of Illinois 303(d) list and require the development of a TMDL. This project addresses two impaired segments along Lake Fork. Concurrent with this TMDL study in the Upper Kaskaskia and Lake Fork watershed, TMDL studies are being conducted in the Middle and Lower Kaskaskia watersheds, East Fork Kaskaskia and Farina Lake watershed, and Crooked Creek/Lost Creek watershed.

1.1 TMDL Development Process

The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and instream conditions. This allowable loading represents the maximum quantity of the pollutant that the waterbody can receive without exceeding water quality standards. The TMDL also includes a margin of safety (MOS), which reflects uncertainty, as well as the effects of seasonal variation, and a reserve capacity (RC) to account for future loading. By following the TMDL process, States can establish water quality-based controls to reduce pollution from both point and nonpoint sources and restore and maintain the quality of their water resources (U.S. EPA 1991).

The State of Illinois uses a three-stage approach to develop TMDLs:

Stage 1 – Watershed characterization, historical dataset evaluation, data analysis, methodology selection, data gap identification

Stage 2 – Data collection to fill in data gaps, if necessary

Stage 3 – Model calibration, TMDL scenarios, and implementation plan

The original Stage 1 report is included in Appendix A; relevant sections of the original Stage 1 report are now included in this full Stage 3 document. As part of the Stage 2 TMDL development process, additional monitoring was gathered by Illinois State Water Survey on behalf of the IEPA in 2019. Appendix B includes data collected as part of Stage 2 and data summaries are now included in this full Stage 3 document.

An implementation plan is also provided, which includes potential implementation activities to address sources of pollutants to those waters receiving a TMDL. This plan, when combined with the entire TMDL study, is provided to meet U.S. EPA's Nine Minimum Elements for CWA section 319 funding requirements, and includes an analysis of critical areas, extent of needed implementation, schedule, milestones, partners, and estimated costs. IEPA will be working with stakeholders to implement the necessary controls to improve water quality in the impaired waterbodies and meet water quality standards. It should be noted that the controls for nonpoint sources (e.g., agriculture) will be strictly voluntary.

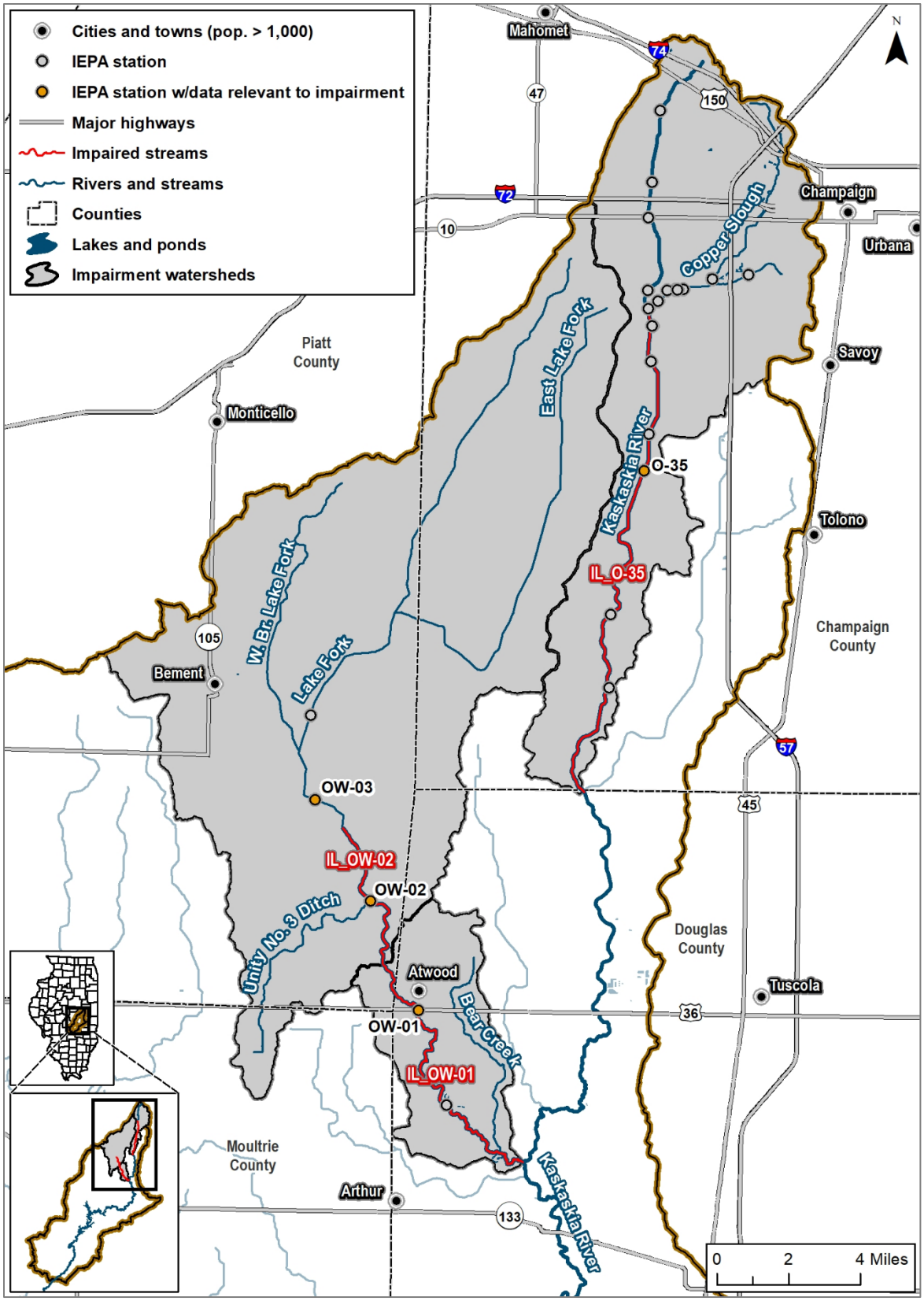

Figure 1. Upper Kaskaskia River and Lake Fork watershed, TMDL project area.

Note: Segment IL-O-35 is not addressed in this TMDL study.

1.2 Water Quality Impairments

Two TMDLs were developed to address two impaired segments of Lake Fork (Table 1 and Figure 1). There are other impaired waters in the Upper Kaskaskia River and Lake Fork watersheds that are not being addressed by this TMDL study: Segment IL_O-35 of the Kaskaskia River is recommended for delisting, and dissolved oxygen impairments on Lake Fork are recommended for recategorization. See Appendix C for the justifications for delisting and recategorization.

Table 1. Impairments in the Upper Kaskaskia River and Lake Fork watershed

Name	Segment ID	Impaired Designated Uses	Cause(s)	Action
Kaskaskia River	IL_O-35	Aquatic Life	Dissolved Oxygen	Recommend delisting
			pH	Recommend delisting
(Lake Fork	IL_OW-01	Aquatic Life	**Chloride** [a]	**TMDL (chloride)**
			Dissolved Oxygen [a]	Recommend recategorization
	IL_OW-02	Aquatic Life	**Chloride**	**TMDL (chloride)**
			Dissolved Oxygen	Recommend recategorization

TMDLs presented in this report are **bolded in yellow**.
a. The chloride and dissolved oxygen impairments for Lake Fork segment IL_OW-01 were erroneously removed from Illinois's 2020/2022 303(d) list. The impairments will be restored in Illinois's 2024 303(d) list.

1.3 Prior TMDL Development in the Watershed

The *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018) was approved by U.S. EPA in 2018 for the larger Upper Kaskaskia River watershed. The 2018 TMDL study addressed fecal coliform and sediment-related impairments. Both TMDLs and load reduction strategies (LRSs) were provided (Table 2, Figure 2). LRSs have historically been developed for pollutant that do not have numeric water quality standards in Illinois.

Table 2. TMDLs and LRSs from the *Upper Kaskaskia River Watershed TMDL Report*

Name	Segment ID	Segment Length (Miles)	Watershed Area (Sq. Miles)	Designated Uses	TMDL Parameters	LRS Parameters
Kaskaskia River	IL_O-02	13.53	491	Primary contact recreation	Fecal coliform	-
Kaskaskia River	IL_O-15	14.76 [a]	519	Primary contact recreation	Fecal Coliform	-
Becks Creek	IL_OQ-01	29.8	204	Primary contact recreation	Fecal Coliform	--
West Okaw River	IL_OT-02	5.39	142	Primary contact recreation	Fecal Coliform	--
Jonathon Creek	IL_OU-01	19.25	58	Primary contact recreation	Fecal Coliform	--
Lake Fork	IL_OW-01	9.72	171	Aquatic life	--	Sedimentation/Siltation
Lake Fork	IL_OW-02	4.91	150	Aquatic life	--	Sedimentation/Siltation
Asa Creek	IL_OZZT-01	9.22	15	Aquatic life	--	Sedimentation/Siltation

Source: IEPA 2018.
a. This length is from Illinois's 2020/2022 Integrated Report.

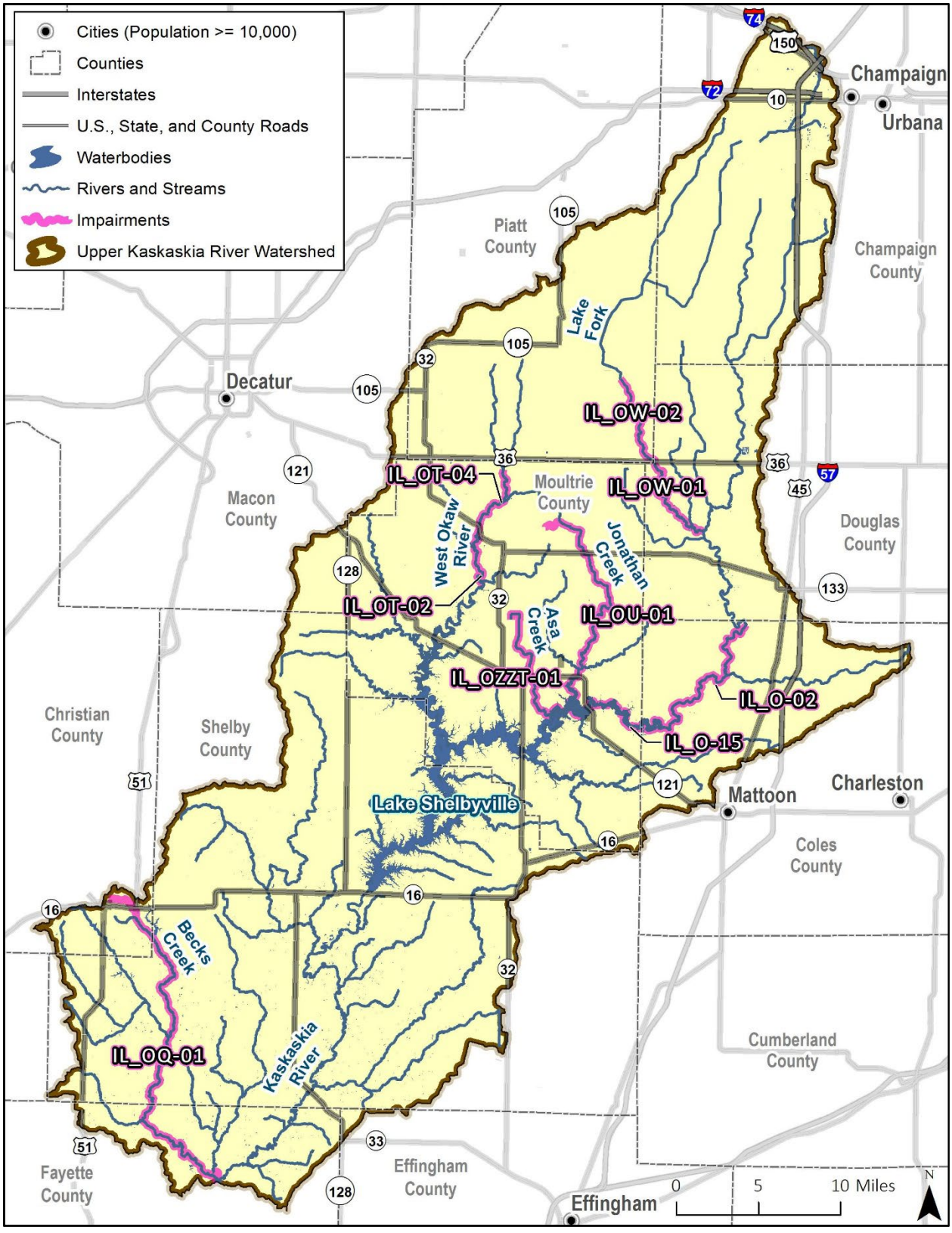

Figure 2. 2018 TMDL study impaired waters.

2 Water Quality Standards and TMDL Endpoints

This section presents information on the water quality standards (WQS) that are used for TMDL endpoints. WQS are designed to protect beneficial uses. The authority to designate beneficial uses and adopt WQS is granted through Title 35 of the Illinois Administrative Code. Designated uses to be protected in surface waters of the state are defined under Section 303, and WQS are designated under Section 302 (Water Quality Standards). Designated uses and WQS are discussed below.

2.1 Designated Uses

IEPA uses rules and regulations adopted by the Illinois Pollution Control Board (IPCB) to assess the designated use support for Illinois waterbodies. The following are the use support designations provided by the IPCB that apply to waterbodies in the Upper Kaskaskia River and Lake Fork watershed:

General Use Standards – These standards protect for aquatic life, wildlife, agricultural uses, primary contact (where physical configuration of the waterbody permits it, any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing), secondary contact (any recreational or other water use in which contact with the water is either incidental or accidental and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, commercial and recreational boating, and any limited contact incident to shoreline activity), and most industrial uses. These standards are also designed to ensure the aesthetic quality of the state's aquatic environment.

2.2 Water Quality Standards

Environmental regulations for the State of Illinois are contained in the Illinois Administrative Code, Title 35. Specifically, Title 35, Part 302 contains water quality standards promulgated by the IPCB. This section presents the standards applicable to impairments in the study area. Note that the recommendations for delisting and recategorization for pH and dissolved oxygen are presented in Appendix C; these recommendations rely on the standards presented in Table 3.

Table 3. Summary of water quality standards for the Upper Kaskaskia River and Lake Fork watersheds

Parameter	Units	General Use Water Quality Standard
Chloride	mg/L	500
Dissolved oxygen [a]	mg/L	March-July > 5.0 min. and > 6.0- 7-day mean Aug-Feb > 3.5 min, > 4.0- 7-day mean and > 5.5- 30-day mean
pH	SU	6.5 < pH < 9.0

mg/L = milligram per liter
SU = standard units
a. Applies to the dissolved oxygen concentration in the main body of all streams, in the water above the thermocline of thermally stratified lakes and reservoirs, and in the entire water column of unstratified lakes and reservoirs.

Aquatic life use assessments in streams are typically based on the interpretation of biological information, physicochemical water data and physical-habitat information from the Intensive Basin Survey, Ambient Water Quality Monitoring Network or Facility-Related Stream Survey programs. The primary biological measures used are the fish Index of Biotic Integrity (fIBI; Karr et al. 1986; Smogor 2000, 2005), the macroinvertebrate Index of Biotic Integrity (mIBI; Tetra Tech 2004) and the Macroinvertebrate Biotic Index (MBI; IEPA 1994). Physical habitat information used in assessments includes quantitative or qualitative measures of stream bottom composition and qualitative descriptors of channel and riparian conditions. Physicochemical water data used include measures of —conventional parameters (e.g., DO, pH and temperature), priority pollutants, non-priority pollutants, and other pollutants (U.S. EPA 2002a

and https://www.epa.gov/wqc). In a minority of streams for which biological information is unavailable, aquatic life use assessments are based primarily on physicochemical water data.

When a stream segment is determined to be Not Supporting aquatic life use, generally, one exceedance of an applicable Illinois WQS (related to the protection of aquatic life) results in identifying the parameter as a potential cause of impairment. Additional guidelines used to determine potential causes of impairment include site-specific standards (35 Ill. Adm. Code 303, Subpart C), or adjusted standards (published in the IPCB's Environmental Register at https://pcb.illinois.gov/Resources/EnvironmentalRegister).

2.3 TMDL Endpoints

The TMDL target for chloride impairments that address impaired segments IL_OW-01 and IL_OW-02 of Lake Fork is the water quality standard of 500 milligrams per liter (mg/L).

3 Watershed Characterization

The Upper Kaskaskia River and Lake Fork watershed is in central Illinois (Figure 1). The headwaters begin near Champaign, IL. Lake Fork joins the Upper Kaskaskia River upstream of Shelbyville Lake and the Kaskaskia River eventually joins the Mississippi River south of St. Louis, Missouri.

The *Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies* (IEPA 2018) was approved by U.S. EPA in 2018 for the larger Upper Kaskaskia River watershed and much of the information presented in that report is applicable to the Upper Kaskaskia River and Lake Fork project area (see Section 1.3).

There have been no known changes in the project area, therefore the *Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies* report provides much of the basis for the watershed characterization and source assessment for the Upper Kaskaskia River and Lake Fork watershed below.

3.1 Jurisdictions and Population

Relevant information on jurisdictions and population can be found in Section 2.1 of the *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018). The Upper Kaskaskia River and Lake Fork watershed is in Champaign, Douglas, Moultrie, and Piatt counties, with the city of Champaign located in the headwaters of the Upper Kaskaskia River and the villages of Atwood and Bement draining to Lake Fork.

3.2 Climate

In general, the climate of the region is continental with hot, humid summers and cold winters. Relevant information on climate can be found in Section 2.2 in the *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018). IEPA considers the climate summary from the 2018 TMDL report to be representative of current climactic conditions.

3.3 Land Use and Land Cover

Relevant information on land use and land cover can be found in Section 2.3 in the *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018). Cultivated crops make up the majority of the land cover in the watershed. Developed areas are also present surrounding Champaign, Atwood and Bement.

3.4 Topography

Relevant information on topography can be found in Section 2.4 of the *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018).

3.5 Soils

Relevant information on soils can be found in Section 2.5 of the *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018). Soils are primarily silt loam or loam with moderate infiltration rates when there is no high water table. Much of the area appears to have a high-water table that has been drained through agricultural tiling.

3.6 Hydrology

Relevant information on hydrologic conditions can be found in Section 2.6 of *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018). IEPA considers the hydrology summary from the 2018 TMDL report to be representative of current climactic conditions. Note that IEPA used recent flow data to develop the load duration curves discussed in Section 6.

Active U.S. Geological Survey (USGS) flow gage sites are located along Lake Fork segment IL_OW-01 (05590800) and downstream of Upper Kaskaskia River segment IL_O-35 (05590520).

3.7 Watershed Studies and Information

Relevant information for this section can be found in section 2.7 of the *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018). In addition, the U.S. Army Corps of Engineers (USACE 2010) completed a river morphology study of Kaskaskia River. County soil and water conservation districts and health departments were also contacted for additional information; no new information was provided.

4 Watershed Source Assessment

Source assessments are an important component of water quality management plans and TMDL development. This section provides a summary of potential sources that contribute listed pollutants to the Upper Kaskaskia River and Lake Fork watershed.

4.1 Pollutant of Concern

The pollutant of concern evaluated in this source assessment is chloride. This pollutants can originate from an array of sources including point and nonpoint sources. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels. Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters, particularly overland runoff. This section provides a summary of potential point and nonpoint sources that contribute to the impaired waterbodies.

4.2 Point Sources

Point source pollution is defined by the Federal CWA §502(14) as:

> *"any discernible, confined and discrete conveyance, including any ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation [CAFO], or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agriculture storm water discharges and return flow from irrigated agriculture."*

Under the CWA, all point sources are regulated under the National Pollutant Discharge Elimination System (NPDES) program. A municipality, industry, or operation must apply for an NPDES permit if an activity at that facility discharges wastewater to surface water. Point sources can include facilities such as municipal wastewater treatment plants (WWTPs), industrial facilities, CAFOs, or regulated storm water including municipal separate storm sewer systems (MS4s). There are no permitted CAFOs in the watershed and there are no municipal separate storm sewers (MS4s) contributing to IL_OW-01 or IL_OW-02.

Table 4 and Figure 3 summarize the NPDES permitted facilities upstream of impaired waters receiving a TMDL. Two facilities are sewage treatment plants (STPs) with individual NPDES permits and one facility is a public water supply covered by a general NPDES permit (ILG640). Design average and maximum flows and downstream impairments are included in the facility summaries (Table 4). One municipal wastewater facility drains directly to Lake Fork IL_OW-01 and one municipal and one industrial facility drains to tributaries to IL_OW-02. All facilities except for Atwood Village STP (IL0025097) discharge to upstream unimpaired tributaries.

The two sewage treatment plants do not monitor chloride concentration in the plants' treated effluent. However, treated effluent may be a source of chloride because sanitary wastewater can contain high levels of chlorides derived from salt in food. Groundwater can also be a source of chlorides to wastewater because groundwater is a source of potable water, and this part of Illinois can have higher levels of hardness in groundwater. As is discussed in Sections 5 and 7, chloride exceedances occur during lower flow conditions, when point source discharges are a relatively higher portion of in-stream loads.

Table 4. NPDES permitted facilities in impairment watersheds

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Impairment(s)	Design Average Flow (MGD)	Design Maximum Flow (MGD)
IL0025097	Village of Atwood	STP	Lake Fork Branch of Kaskaskia River	IL_OW-01	0.2	0.5
IL0032549	Village of Bement	STP	Unnamed tributary of West Branch Lake Fork	IL_OW-02, IL_OW-01	0.176	0.480
ILG640209	Village of Ivesdale	Public water supply	East Lake for of Kaskaskia River	IL_OW-02, IL_OW-01	0.0014	--

STP – Sewage treatment plant

MGD – Million gallons per day

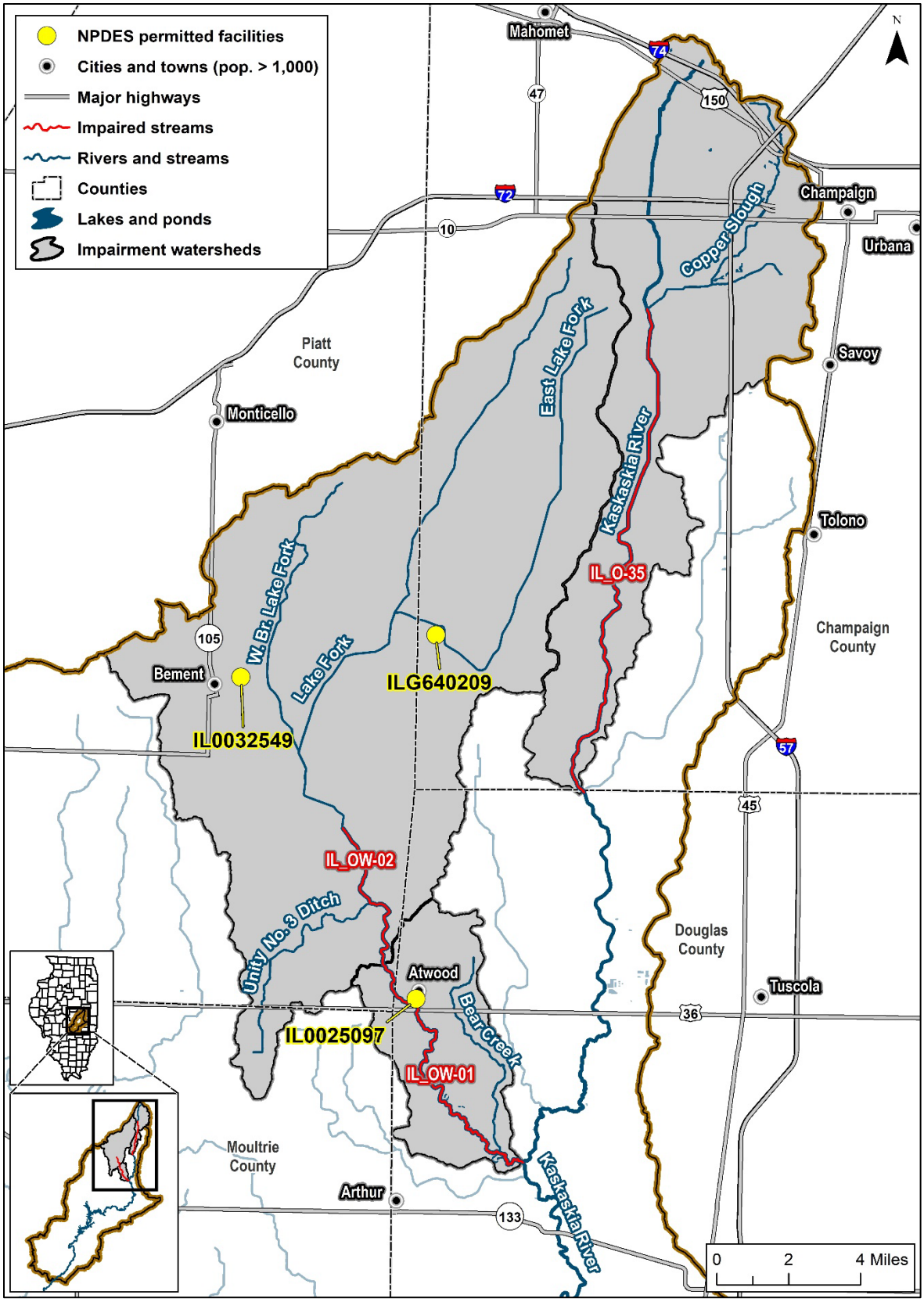

Figure 3. NPDES permitted facilities in impaired watersheds.

4.3 Nonpoint Sources

The term nonpoint source pollution is defined as any source of pollution that does not meet the legal definition of point sources. Nonpoint source pollution typically results from overland stormwater runoff that is diffuse in origin, as well as background conditions. As part of the water resource assessment process, IEPA has identified several sources as contributing to the Upper Kaskaskia River and Lake Fork watershed impairments; however, that assessment process was focused upon the impairments due to low dissolved oxygen.

Nonpoint pollutant sources potentially contributing to chloride and low DO impairments include stormwater and agricultural runoff, onsite wastewater treatment systems, animal agriculture activities, and streambank erosion. The implementation plan in section 8 provides additional information on sources.

While nonpoint sources of chlorides are summarized in the following subsections, the relative contributions of chloride were estimated during the development of the implementation plan (Section 8). IEPA has made the policy decision to summarize the sources of nonpoint source loading here in Section 4.3 and to present loading estimates in the implementation plan in Section 8.

4.3.1 Stormwater and Agricultural Runoff

During wet-weather events (snowmelt and rainfall), pollutants are incorporated into runoff and can be delivered to downstream waterbodies. The resultant pollutant loads are linked to the land uses and practices in the watershed. Agricultural and developed areas can have significant effects on water quality if proper best management practices are not in place.

Urban areas, which are not within a regulated MS4, can contribute chloride from the application of de-icing agents on roads, parking lots, driveways, and sidewalks. Spring snowmelt and other precipitation events can result in runoff that can transport chloride-containing de-icing agents to surface waterways. As chloride is a conservative pollutant, it can be transported long distances.

Agricultural areas can also contribute to chloride loading from chloride-rich fertilizers (i.e., potassium chloride). Chloride-containing fertilizers can be incorporated into runoff from agricultural land during wet weather events, into the air from wind erosion, and into tile drainage or shallow groundwater through infiltration. The application and storage of road salt can also be linked to high chloride concentrations in streams. Because chloride is a very conservative pollutant, it can move to shallow groundwater and discharge to streams during low flow conditions as baseflow.

4.3.2 Onsite Wastewater Treatment Systems

Onsite wastewater treatment systems (e.g., septic systems) that are properly designed and maintained should not serve as a source of contamination to surface waters. However, onsite systems do fail for a variety of reasons potentially releasing high levels of phosphorus. Common soil-type limitations which contribute to failure include seasonally high water tables, compact glacial till, bedrock, and fragipan. When these septic systems fail hydraulically (surface breakouts) or hydrogeologically (inadequate soil filtration) there can be adverse effects to surface waters (Horsley and Witten 1996).

Onsite wastewater treatment systems can also contribute to chloride loading, particularly in areas where water softeners are used. Home water softeners remove calcium and magnesium in water and exchange them for sodium (salt) that is added to the system in the form of water softener salt. The chloride from water softener salt use then makes its way to the environment as it is discharged from a septic system.

County health departments were contacted for information on septic systems and unsewered communities; no new information was provided. Due to a lack of information available from county health departments, county-wide estimates from the National Environmental Service Center for 1992 and 1998 were area weighted to estimate the number of septic systems in each watershed (Table 5). An estimated 802 septic systems are in the watershed draining to IL_OW-01, which is approximately 5 septic system per square mile.

Table 5. Estimated (area weighted) septic systems

Waterbody	Segment	Number of septic systems
Lake Fork	IL_OW-01	802
Lake Fork	IL_OW-02	704

Source: NESC 1992 and 1998 (data obtained from U.S. EPA Region 5 Spreadsheet Tool for Estimating Pollutant Loads Model database)

5 Water Quality

Background information on water quality monitoring can be found in the *Upper Kaskaskia River Watershed TMDL Report* (IEPA 2018). In the Upper Kaskaskia River and Lake Fork watershed, relevant water quality data were found for two stations that are part of the IEPA Ambient Water Quality Monitoring Network (AWQMN). Monitoring stations with data relevant to the impaired segments are presented in Figure 1 and Table 6. Parameters sampled in the streams include field measurements (e.g., water temperature) as well as those that require lab analyses (e.g., nutrients, chloride).

An important step in the TMDL development process is the review of water quality conditions, particularly data and information used to list segments. Examination of water quality monitoring data is a key part of defining the problem that the TMDL is intended to address. This section provides a brief review of available water quality information provided by the IEPA.

The most recent 10 years of data collection, 2007–2016, were used to evaluate impairment status. Data that are greater than 10 years old are not included. Each data point was reviewed to ensure the use of quality data in the analysis below.

Table 6. Upper Kaskaskia River and Lake Fork watershed water quality data

Waterbody	Impaired Segment	AWQMN Sites	Location	Period of Record
Lake Fork	IL_OW-01	OW-01	RT 36 Br. at Atwood	2002, 2007, 2012
	IL_OW-02	OW-02	2 Mi. NW Atwood	2019
	Upstream of IL_OW-02	OW-03	5 Mi. NW Atwood	2007

Data collected at monitoring station OW-01 on segment IL_OW-01 were used by IEPA to assess and determine impairment in segment IL_OW-02. The proximity of station OW-01 to segment IL_OW-02 enables assessment of these adjoining segments with equal weight. Aquatic life use assessments can be made within approximately 10 miles upstream and downstream from the sample site for wadable streams and 25 miles for unwadable streams (IEPA 2016).

IEPA assesses Lake Fork segments IL_OW-01 and IL_OW-02 using chloride data collected at monitoring site OW-01 on segment IL_OW-01 (i.e., IEPA used chloride data collected at site OW-01 that exceeds the chloride standard to list both segments IL_OW-01 and IL_OW-02 on Illinois's 303(d) list). The agency assesses these segments separately for other pollutants using data collected at multiple sites spanning both segments. Additionally, chloride impaired Lake Fork (IL_OW-02) is directly upstream of Lake Fork (IL_OW-01) and is therefore contributing to its impairment as indicated by the monitoring data collected at site OW-01.

Six chloride samples were collected at site OW-01 between 2007 and 2012, three chloride samples were collected from site OW-01 in 2017, and three chloride samples were collected from site OW-03 in 2007 (Table 7 and Figure 4).

- **OW-01**: The general use WQS for chloride was exceeded on August 1, 2012 (876 mg/L) and September 19, 2017 (612 mg/L). A high concentration was also observed on September 24, 2012 (487 mg/L). The two samples that exceeded the chloride WQS confirm impairment for both segments IL_OW-01 and IL_OW-02.
- **OW-03**: Chloride concentrations do not exceed the WQS upstream of the impaired segments at site OW-03.

The chloride exceedance and near-exceedance both occurred during the summer, under drier, lower flow conditions. At such times, Lake Fork has less flow, and thus, less assimilative capacity.

Table 7. Chloride data summary, Lake Fork IL_OW-01 and IL_OW-02 segments, 2007-2012

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	CV (standard deviation/ average)	Number of exceedances of general use water quality standard (500 mg/L)
OW-01	6	36	256	876	1.37	1
OW-03 (upstream of IL_OW-02)	3	29	53	91	0.63	0

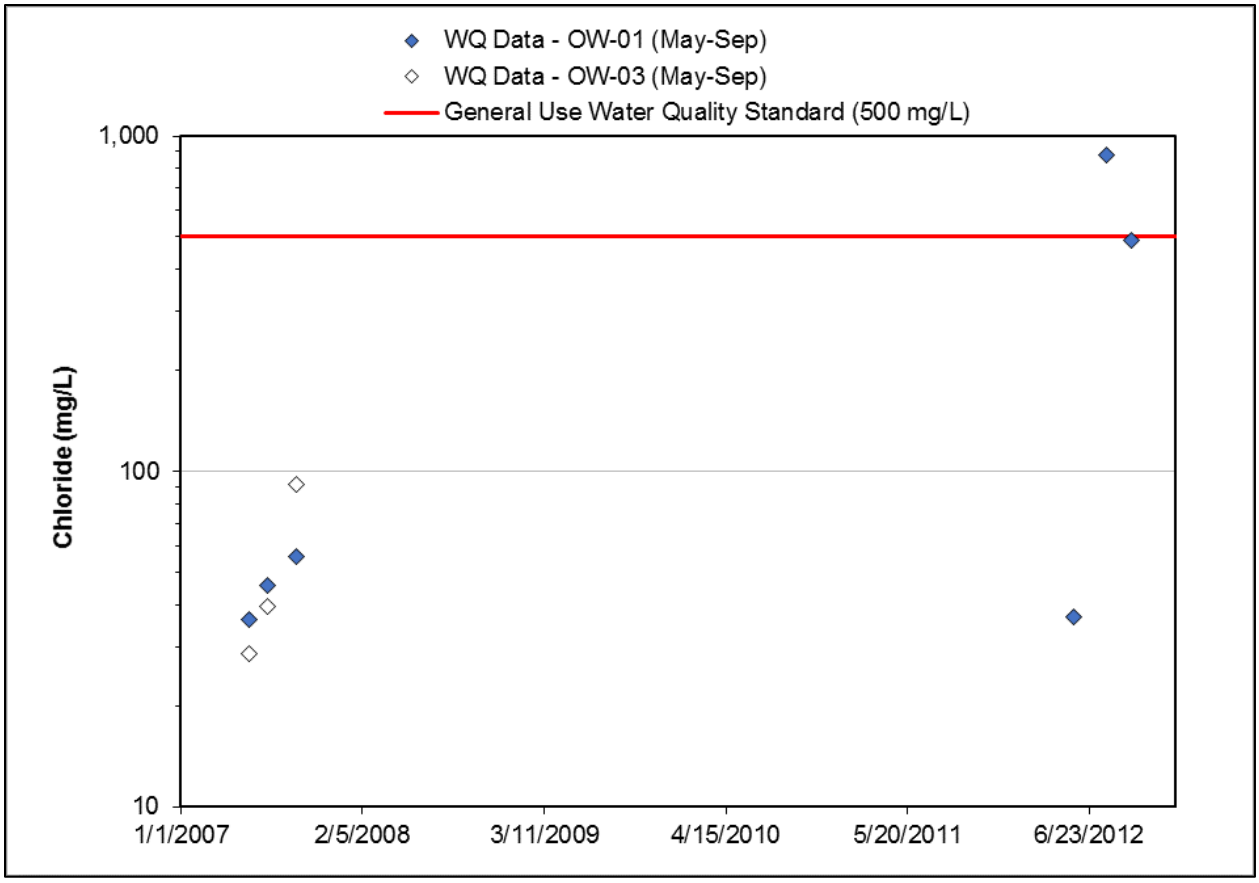

Figure 4. Chloride water quality time series, Lake Fork, 2007-2012.

6 TMDL Development

The types of data available, their quantity and quality, and their spatial and temporal coverage relative to impaired segments or watersheds drive the approaches used for TMDL model selection and analysis. Credible data are those that meet specified levels of data quality, with acceptance criteria defined by measurement quality objectives, specifically their precision, accuracy, bias, representativeness, completeness, and reliability.

A duration curve approach is used to evaluate the relationships between hydrology and water quality and to calculate the TMDLs for chloride impairments. The primary benefit of duration curves in TMDL development is to provide insight regarding patterns associated with hydrology and water quality concerns. The duration curve approach is particularly applicable because water quality is often a function of stream flow. For instance, sediment concentrations typically increase with rising flows as a result of factors such as channel scour from higher velocities. Other parameters, such as chloride, may be more concentrated at low flows and more diluted by increased water volumes at higher flows. The use of duration curves in water quality assessment creates a framework that enables data to be characterized by flow conditions. The method provides a visual display of the relationship between stream flow and water quality.

Allowable pollutant loads have been determined with load duration curves. Discussions of load duration curves are presented in *An Approach for Using Load Duration Curves in the Development of TMDLs* (U.S. EPA 2007). This approach involves calculating the allowable loadings over the range of flow conditions expected to occur in the impaired stream by taking the following steps:

1. A flow duration curve for the stream is developed by generating a flow frequency table and plotting the data points to form a curve. The data reflect a range of natural occurrences from extremely high flows to extremely low flows.
2. The flow curve is translated into a load duration (or TMDL) curve by multiplying each flow value (in cubic feet per second) by the water quality standard/target for a contaminant (mg/L), then multiplying by conversion factors to yield results in the proper unit (i.e., pounds per day). The resulting points are plotted to create a load duration curve.
3. Each water quality sample is converted to a load by multiplying the water quality sample concentration by the average daily flow on the day the sample was collected. Then, the individual loads are plotted as points on the TMDL graph and can be compared to the water quality standard/target, or load duration curve.
4. Points plotting above the curve represent deviations from the water quality standard/target and the daily allowable load. Those plotting below the curve represent compliance with standards and the daily allowable load. Further, it can be determined which locations contribute loads above or below the water quality standard/target.
5. The area beneath the TMDL curve is interpreted as the loading capacity of the stream. The difference between this area and the area representing the current loading conditions is the load that must be reduced to meet water quality standards/targets.
6. The final step is to determine where reductions need to occur. Those exceedances at the right side of the graph occur during low flow conditions and may be derived from sources such as illicit sewer connections. Exceedances on the left side of the graph occur during higher flow events and may be derived from sources such as runoff. Using the load duration curve approach allows IEPA to determine which implementation practices are most effective for reducing loads based on flow regime.

Water quality duration curves are created using the same steps as those used for load duration curves except that concentrations, rather than loads, are plotted on the vertical axis. Flows are categorized into the following five hydrologic zones (U.S. EPA 2007):

- High flow zone: stream flows that plot in the 0 to 10-percentile range, related to flood flows
- Moist zone: flows in the 10 to 40-percentile range, related to wet weather conditions
- Mid-range zone: flows in the 40 to 60-percentile range, median stream flow conditions
- Dry zone: flows in the 60 to 90-percentile range, related to dry weather flows
- Low flow zone: flows in the 90 to 100-percentile range, related to drought conditions

The duration curve approach helps to identify the issues surrounding the impairment and to roughly differentiate between sources. Table 8 summarizes the general relationship between the five hydrologic zones and potentially contributing source areas (the table is not specific to any individual pollutant). For example, the table indicates that impacts from point sources are usually most pronounced during dry and low flow zones because there is less water in the stream to dilute their loads. In contrast, impacts from stormwater are most pronounced during moist and high flow zones due to increased overland flow from stormwater source areas during rainfall events.

Table 8. Relationship between duration curve zones and contributing sources

Contributing Source Area	Duration Curve Zone				
	High	Moist	Mid-Range	Dry	Low
Point source				M	H
Livestock direct access to streams				M	H
Onsite wastewater systems	M	M-H	H	H	H
Stormwater: Impervious		H	H	H	
Stormwater: Upland	H	H	M		
Field drainage: Natural condition	H	M			
Field drainage: Tile system	H	H	M-H	L-M	

Note: Potential relative importance of source area to contribute loads under given hydrologic condition (H: High; M: Medium; L: Low).

The load reduction approach also considers critical conditions and seasonal variation in the TMDL development as required by the CWA and U.S. EPA's implementing regulations. Because the approach establishes loads based on a representative flow regime, it inherently considers seasonal variations and critical conditions attributed to flow conditions. An underlying premise of the duration curve approach is correlation of water quality impairments to flow conditions. The duration curve alone does not consider specific fate and transport mechanisms, which may vary depending on watershed or pollutant characteristics.

6.1 Loading Capacity and Reductions

A waterbody's loading capacity represents the maximum rate of pollutant loading that can be assimilated without violating water quality standards (40 CFR 130.2(f)). Establishing the relationship between in-stream water quality and source loading is an important component of TMDL development. It allows the determination of the relative contribution of sources to total pollutant loading and the evaluation of potential changes to water quality resulting from implementation of various management options. The following section describes the methodology used in this analysis; results are then presented by waterbody.

A TMDL is the total amount of a pollutant that can be assimilated by the receiving water while still achieving water quality standards. TMDLs are composed of the sum of individual wasteload allocations (WLAs) for regulated sources and load allocations (LAs) for unregulated sources and natural background levels. In addition, the TMDL must include a margin of safety (MOS), either implicitly or explicitly, that accounts for the uncertainty in the relationship between pollutant loads and the quality of the receiving waterbody and may contain a reserve capacity (RC) if needed. Conceptually, this is defined by the equation:

$$\mathbf{TMDL = \sum WLAs + \sum LAs + MOS + RC}$$

Allowable loads and associated allocations for each of the impaired waterbodies are provided.

TMDL targets are discussed in Section 2.3 and 5.2 and briefly summarized herein: the chloride TMDL target for Lake Fork (IL_OW-01 and IL_OW-02) is based on the water quality standard of 500 mg/L.

A duration curve approach is used to evaluate the relationships between hydrology and water quality and calculate the TMDLs for chloride in Lake Fork (IL_OW-01 and IL_OW-02). Stream flow for both Lake Fork impairments was estimated from USGS gauge 05590800 (Lake Fork at Atwood, IL). Stream flow data for the USGS gauge was downloaded from the National Water Information System (NWIS;

https://waterdata.usgs.gov/nwis) and area-weighted to each of the impairment watersheds using the gauges' watershed area relative to the impairment watershed area.

6.2 Load Allocations

Load allocations represent the portion of the allowable daily load that is reserved for nonpoint sources and natural background conditions. The load allocations are based on subtracting the WLAs, the MOS, and RC from allowable loads. Load allocations are summarized for each of the waterbody pollutant combinations along with the baseline loads and WLAs.

An individual load allocation has been provided for Illinois Department of Transportation (IDOT) managed roads for the chloride TMDLs; IDOT roads are not regulated for stormwater in this watershed. The load allocation was calculated as a percent of the available load allocation based on the total area of IDOT roads within each chloride TMDL watershed. IDOT managed road areas (Figure 5) were calculated using the total length of each road multiplied by an estimated right-of-way width of 90 feet.

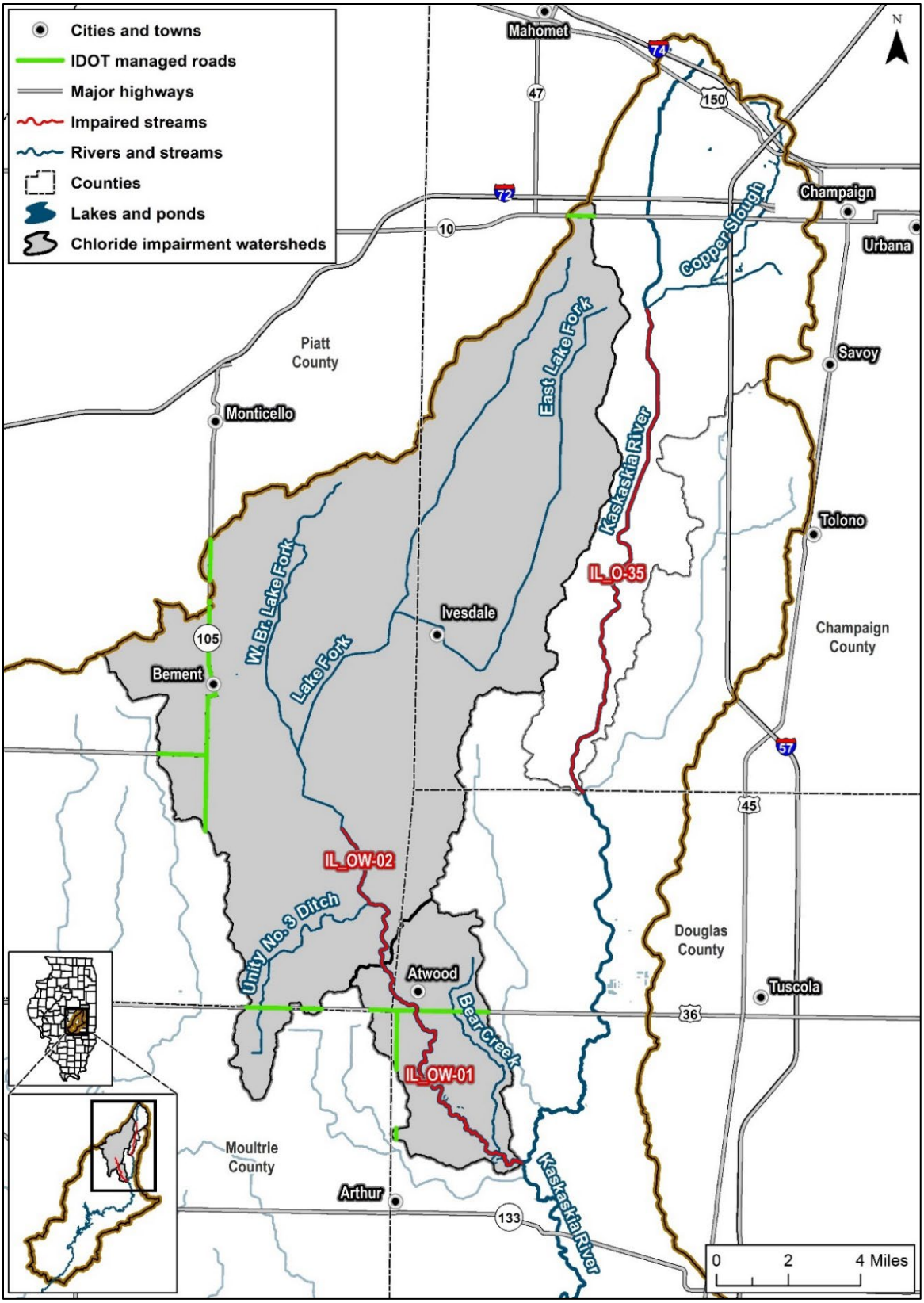

Figure 5. IDOT maintained roads within chloride TMDL watersheds.

Note: Segment IL-O-35 is not addressed in this TMDL study.

6.3 Wasteload Allocations

NPDES-permitted facilities within the watershed with the potential to discharge chloride to the Lake Fork impairments are presented in Table 9.

Wastewater can be a source of chlorides, however neither of the sewage treatment plants that discharge upstream of the chloride-impaired segments IL_OW-01 and IL_OW-02 have permit limits or monitoring requirements for chloride. However, a monitoring requirement is recommended to be added in the next permit renewal cycle. The Ivesdale public water supply (covered by general permit ILG640) does have a permit limit included for chloride (500 mg/L daily maximum) and monitors chloride monthly. All three facilities are provided a chloride WLA. Chloride WLAs are based on NPDES permit information and meeting the 500 mg/L general use water quality standard in the effluent.

Facility design flows are used to calculate a daily load which serve as the WLA. Permitted design maximum flows are used for WLAs under high flow conditions and permitted design average flows are used for moist to low flows. Illinois assumes that facilities will have to discharge at their maximum flow during both high and moist flows based on the following:

> *For municipal NPDES permits in Illinois, page 2 of the NPDES permit lists 2 design flows: a design average flow (DAF) and a design maximum flow (DMF). These are defined in 35 Ill. Adm. Code 370.211(a) and (b) (see https://pcb.illinois.gov/documents/dsweb/Get/Document-12042/). Since rain (and to a certain extent, high ground water) causes influent flows to wastewater treatment facilities to increase and precipitation also leads to higher river levels, a correlation between precipitation and treatment flows exists. The load limits in these permits gives a tiered load limit, one based on DAF for flows of DAF and below, and another load limit in the permit for flows above DAF through DMF.*

Table 9. NPDES-permitted facilities discharging to impairments

IL Permit ID	Facility Name	Type of Discharge	Design Average Flow (MGD)	Design Maximum Flow (MGD)	Downstream Impairment(s)
IL0025097	Village of Atwood,	Sewage treatment plant	0.2	0.5	IL_OW-01
IL0032549	Village of Bement	Sewage treatment plant	0.176	0.480	IL_OW-02, IL_OW-01
ILG640209	Village of Ivesdale	Public water supply	0.0014	-- [a]	IL_OW-02, IL_OW-01

a. The Village of Ivesdale public water supply does not have a design maximum flow. Thus, the design average flow will be used to calculate the wasteload allocation for high flow conditions.

6.4 Margin of Safety

The CWA requires that a TMDL include a margin of safety (MOS) to account for uncertainties in the relationship between pollutants loads and receiving water quality. U.S. EPA guidance explains that the MOS may be implicit (i.e., incorporated into the TMDL through conservative assumptions in the analysis) or explicit (i.e., expressed in the TMDL as loadings set aside for the MOS).

A 10% explicit MOS has been applied as part of the chloride TMDLs. A moderate MOS was specified because the use of load duration curves is expected to provide accurate information on the loading capacity of the stream, but this estimate of the loading capacity may be subject to potential error associated with the method used to estimate flows.

6.5 Reserve Capacity

RC is provided to those watersheds that are expected to further develop. A 10% RC is set aside to accommodate future growth. IEPA now allocates 10% RC for all TMDLs.

6.6 Critical Conditions and Seasonality

The CWA requires that TMDLs take into account critical conditions for stream flow, loading, and water quality parameters as part of the analysis of loading capacity. Through the load duration curve approach, it was determined that load reductions are needed for specific flow conditions; however, the critical conditions (the periods when the greatest reductions are required) vary by location and are inherently addressed by specifying different levels of reduction according to flow.

The allocation of point source loads (i.e., the WLA) also considers critical conditions by assuming that the facilities will always discharge at their design flows. In reality, many facilities discharge below their design flows.

The CWA also requires that TMDLs be established with consideration of seasonal variations. The load duration approach accounts for seasonality by evaluating allowable loads on a daily basis over the entire range of observed flows and by presenting daily allowable loads that vary by flow.

7 Allocations

7.1 Lake Fork (IL_OW-01) Chloride TMDL

A chloride TMDL has been developed for Lake Fork segment IL_OW-01. Figure 6 presents the chloride load duration curve and Table 10 summarizes the TMDL and required reductions. Table 11 summarizes the individual wasteload allocations.

The chloride sample results from the low-flow conditions in Figure 6 are 876 mg/L on August 1, 2012, and 487 mg/L on September 24, 2012; the former result exceeded the 500 mg/L standard by 43%. Flow at USGS gage 05590800 from July 29, 2012, through August 16, 2012, was reported as 0.00 cubic feet per second; no gage height was reported (at this gage, gage height below 1.20 feet is not reported). Lake Fork may have been a stagnant pool during this time period. Flow on September 24, 2012, was reported as 0.07 cubic feet per second, with a gage height of 1.49 feet. On both August 1 and September 24, 2012, high instream chloride concentrations were likely influenced by baseflow that contained high chloride concentrations (i.e., upwelling groundwater contaminated with residual chlorides from winter de-icing practices).

Three additional chloride samples were collected in 2017. A sample collected on September 19, 2017 (612 mg/L) during low-flow conditions (0.33 cubic feet per second at the gage) also exceeded the standard (500 mg/L).

A concentration-based reduction of 43% is needed for the August 1, 2012, sample of 876 mg/L. A load reduction is the low flow zone is not needed because the load at the midpoint of the flow zone is larger than the load for August 1, 2012, which is at an extreme low-flow.

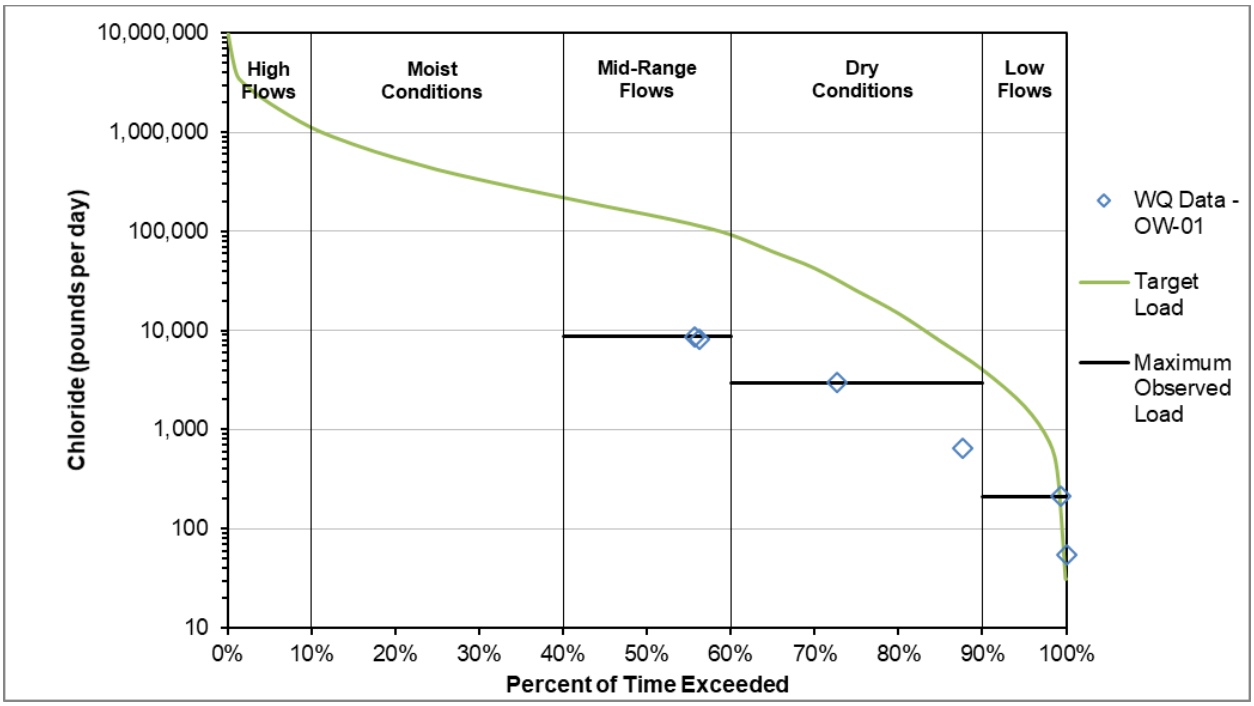

Figure 6. Chloride load duration curve, Lake Fork at IL_OW-01.

Table 10. Chloride TMDL summary, Lake Fork at IL_OW-01

TMDL Parameter		Flow Zones				
		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
		Chloride Load (pounds/day)				
Wasteload Allocation	NPDES-permitted facilities	4,106	1,566	1,566	1,566	c
Load Allocation: IDOT road area [a]		4,376	929	325	52	c
Load Allocation: Non-IDOT area		1,574,467	334,250	116,961	18,549	c
RC		197,869	42,093	14,856	2,521	172
MOS		197,869	42,093	14,856	2,521	172
Loading Capacity		**1,978,687**	**420,931**	**148,564**	**25,209**	**1,724**
Existing Load		-	-	8,611	2,983	211
Load Reduction [b]		-	-	0%	0%	0%

a. The IDOT road area is 0.28% of the watershed. Therefore, 0.28% of the total LA is allocated to IDOT.

b. TMDL reduction is based on the observed maximum load in each flow regime.

c. The permitted wastewater treatment facility design flows exceed the long-term monitored stream flow in the low flow zones. NPDES-permitted facilities can discharge under these flow conditions if meeting permit conditions. To account for these unique situations only, the allocations are expressed as an equation rather than an absolute number: Wasteload Allocation or Load Allocation = (flow contribution from a given source) x (500 mg/L). The allowable concentration is based on the water quality standard.

Table 11. Individual chloride WLAs, Lake Fork at IL_OW-01

Permit ID	Facility Name	Design Average Flow (MGD)	Design Maximum Flow (MGD)	Chloride WLA (pounds/day)	
				High Flows –Design Maximum Flow	Moist Conditions to Low Flows – Design Average Flow
IL0025097	Atwood, Village of	0.2	0.5	2,100	830
IL0032549	Bement, Village of	0.176	0.480	2,000	730
ILG640209	Ivesdale, Village of	0.0014	--	5.8 [a]	5.8
			Total	**4,106**	**1,566**

a. The permit does not include a design maximum flow, therefore, the design average flow was used to calculate the WLA.

7.2 Lake Fork (IL_OW-02) Chloride TMDL

A chloride TMDL has been developed for Lake Fork segment IL_OW-02. Figure 7 presents the chloride load duration curve and Table 12 summarizes the TMDL and required reductions. Table 13 summarizes the individual wasteload allocations.

No chloride data were collected from segment IL_OW-02. Observed loads presented in Figure 7 were calculated using chloride results from site OW-01 on segment IL_OW-01 and area-weighted flow from gage 05590800. The low flow discussion presented in Section 7.1 applies here as well.

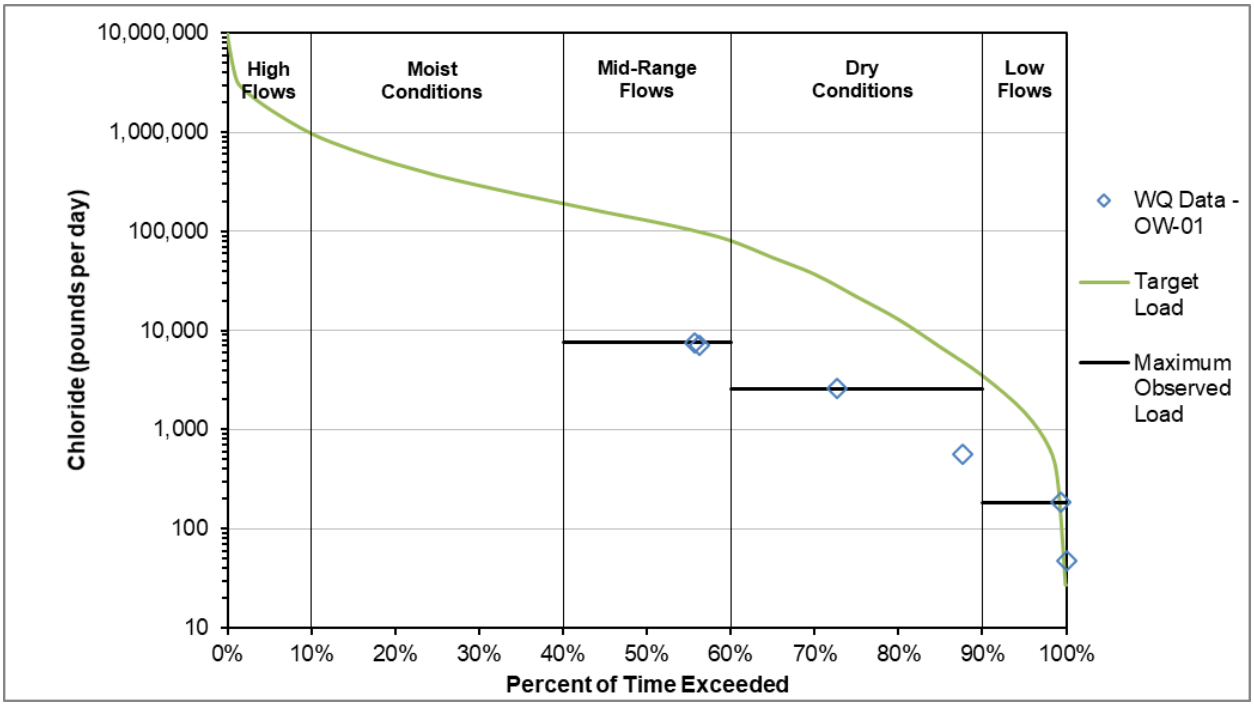

Figure 7. Chloride load duration curve, Lake Fork at IL_OW-02.

Table 12. Chloride TMDL summary, Lake Fork at IL_OW-02

TMDL Parameter		Flow Zones				
		High Flows	Moist Conditions	Mid-Range Flows	Dry Conditions	Low Flows
		Chloride Load (pounds/day)				
Wasteload Allocation	NPDES-permitted facilities	2,006	736	736	736	736
Load Allocation: IDOT road area [a]		3,094	658	231	38	1
Load Allocation: Non-IDOT area		1,374,195	292,026	102,594	16,798	465
RC		172,412	36,678	12,945	2,197	150
MOS		172,412	36,678	12,945	2,197	150
Loading Capacity		**1,724,119**	**366,776**	**129,451**	**21,966**	**1,502**
Existing Load		-	-	7,503	2,600	184
Load Reduction [b]		-	-	0%	0%	0%

a. The IDOT road area is 0.22% of the watershed. Therefore, 0.22 % of the total LA is allocated to IDOT.

b. TMDL reduction is based on the observed maximum load in each flow regime.

Table 13. Individual chloride WLAs, Lake Fork at IL_OW-02

Permit ID	Facility Name	Design Average Flow (MGD)	Design Maximum Flow (MGD)	Chloride WLA (pounds/day)	
				High Flows –Design Maximum Flow	Moist Conditions to Low Flows – Design Average Flow
IL0032549	Bement, Village of	0.176	0.480	2,000	730
ILG640209	Ivesdale, Village of	0.0014	--	5.8 [a]	5.8
			Total	**2,006**	**736**

a. The permit does not include a design maximum flow, therefore, the design average flow was used to calculate the WLA.

8 Implementation Plan and Reasonable Assurance

The objective of this implementation plan is to identify recommend activities that stakeholders could consider reducing nonpoint pollutant loads and improve the conditions of the Upper Kaskaskia River and Lake Fork watershed in a cost effective and timely manner. These implementation activities help to achieve reductions and attain water quality standards and will result in a cleaner, healthier watershed for the people who depend on the resources of the watershed for their livelihood now and in the future.

This implementation plan is a framework that watershed stakeholders may use to guide implementation of best management practices (BMPs) to address chloride and phosphorus TMDLs in the Upper Kaskaskia River and Lake Fork watershed. This framework is flexible and incorporates adaptive management to allow watershed stakeholders to adjust the implementation plan to align with their priorities and limitations. This flexibility is necessary because the implementation of nonpoint source controls is voluntary. As more data are collected to better understand the sources of chloride, the steps outlined in this implementation plan may need to be modified to account for results.

8.1 Clean Water Act Section 319 Eligibility

An important factor for implementation of the recommended BMPs is access to technical and financial resources. One potential source of funding is the CWA Section 319 Nonpoint Source Management grants. Section 319 grant funding supports implementation activities including technical and financial assistance, education, training, demonstration projects, and monitoring to assess the success of nonpoint source implementation projects. To be eligible for these funds, watershed management plans must address nine elements identified by U.S. EPA (2008, revised 2014) as critical for achieving improvements in water quality. These nine elements include:

- Identification of causes of impairment and pollutant sources or groups of similar sources that need to be controlled to achieve load reductions estimated within the plan
- Estimate of the load reductions expected from management measures
- Description of the nonpoint source management measures that will need to be implemented to achieve load reductions estimated in element 2; and identification of critical areas
- Estimate of the amounts of technical and financial assistance needed, associated costs, and the sources and authorities (e.g., ordinances) that will be relied upon to implement the plan
- An information and public education component; early and continued encouragement of public involvement in the design and implementation of the plan
- Implementation schedule
- A description of interim, measurable milestones for determining whether nonpoint source management measures or other control actions are being implemented
- Criteria to measure success and reevaluate the plan
- Monitoring component to evaluate the effectiveness of the implementation efforts over time

While pollutants impacting chloride and phosphorus levels may originate from a combination of point and nonpoint sources, only nonpoint sources will be evaluated further in this plan. The Upper Kaskaskia River and Lake Fork watershed TMDL report, including this implementation plan, is considered a watershed plan that meets U.S. EPA's nine elements. Table 14 illustrates which sections of the document contain information that fulfills U.S. EPA's nine elements.

Table 14. Comparison of TMDL and implementation plan to U.S. EPA's Nine Elements.

Section 319 Nine Elements	Applicable Section of the TMDL/Implementation Plan
1. Identification of **causes of impairment and pollutant sources** or groups of similar sources that need to be controlled to achieve **load reductions** estimated within the plan.	Section 8.2
2. Estimate of the **load reductions expected from management measures.**	Section 8.3.4
3. Description of the **nonpoint source management measures** that will need to be implemented to **achieve load reductions** estimated in element 2; and identification of **critical areas.**	Section 8.2.4, and 8.3
Estimate of the amounts of **technical and financial assistance needed**, associated **costs**, and the **sources and authorities** (e.g., ordinances) that will be relied upon to implement the plan.	Section 8.4
An **information and public education component**; early and continued encouragement of public involvement in the design and implementation of the plan.	Section 8.5
Implementation schedule	Section 8.6
A description of **interim, measurable milestones** for determining whether nonpoint source management measures or other control actions are being implemented.	Section 8.6
Criteria to **measure success** and **reevaluate** the plan**.**	Section 8.7
Monitoring component to evaluate the effectiveness of the implementation efforts over time.	Section 8.8

8.2 Critical Areas for Implementation

*This section contains the requirement for U.S. EPA's **element one:** identification of causes of impairment and pollutant sources.*

Successful implementation begins with identifying and focusing resources in critical areas for implementation. Critical areas are the focus of outcome-based plans because they represent those locations where project funding will provide the greatest environmental benefit. Upon identification of critical areas, BMPs can be evaluated and selected to address the needs of each area. Critical areas for implementation were determined for each impaired subwatershed and then analyzed for any overlapping area or multi-pollutant reduction to further prioritize actions.

Critical areas for implementation in the Upper Kaskaskia River and Lake Fork watershed were determined using the suggested process provided in U.S. EPA's *Critical Source Area Identification and BMP Selection: Supplement to Watershed Planning Handbook* (2018) (Figure 8). In accordance with this guidance, critical source areas (CSAs) were determined for the first five years of implementation. Upon completion of the first five years of implementation, adaptive management principles (outlined in Section 8.7) can be used to determine CSAs for the next ten years, and so on. The U.S. EPA's (2018) suggested process for CSA selection is summarized by step in this section.

8.2.1 Step 1: Establish Priorities

The Illinois 303(d) list and the Upper Kaskaskia River and Lake Fork watershed TMDLs establish the priorities for this plan. The objective of this implementation plan is to restore the impaired waters of Lake Fork (IL_OW-01 and IL_OW-02). Both segments are listed as impaired for aquatic life due to high chloride concentrations. As such, TMDL allocations and reductions were developed for chlorides in Section 7 and are summarized below.

The goal of this implementation plan is to achieve the following water quality standards and required reductions:

- Lake Fork (IL_OW-01)
  - 500 mg/L or a 43% reduction in chloride
- Lake Fork (IL_OW-02)
  - 500 mg/L or a 43% reduction in chloride

8.2.2 Step 2: Describe Connections

Understanding the nature of nonpoint source pollutants and the potential pathways to deliver those pollutants to impaired waters can help determine CSAs to target for implementation.

Nonpoint sources of chloride loading to impaired waters include road salt, fertilizer application, wastewater, and upstream impairments. These nonpoint sources are connected to the chloride-impaired segments via the following pathways:

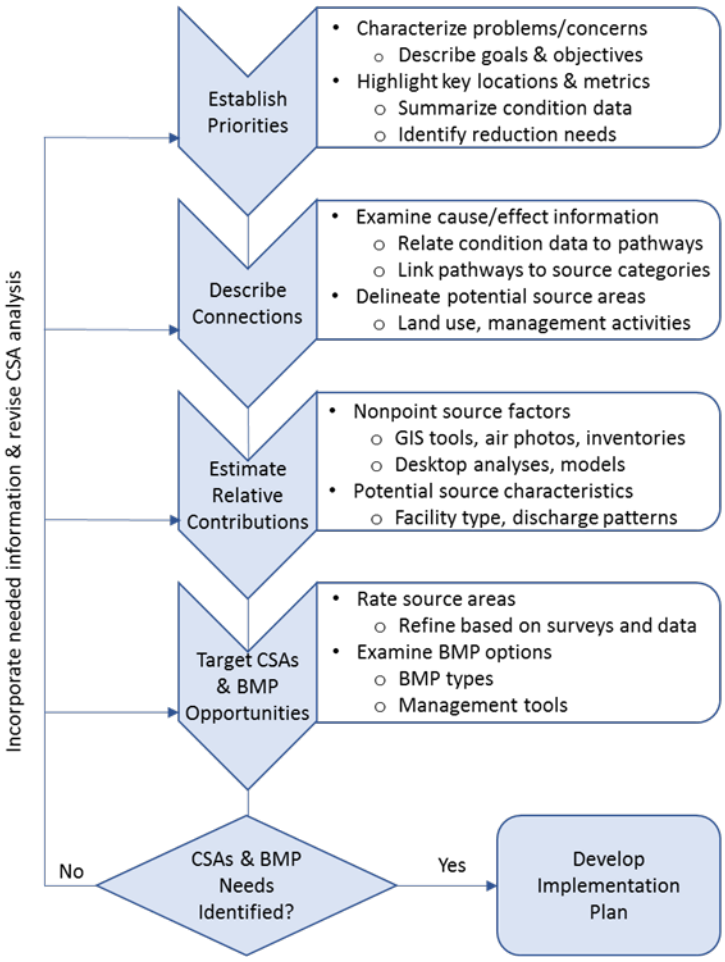

Figure 8. Critical area selection process (U.S. EPA 2018).

CSA = critical source area

Snow and ice management. Salts applied to roads, parking lots, sidewalks and other surfaces for snow and ice management can be quickly incorporated into runoff during wet weather events such as snowmelt or rainfall and delivered to downstream waterbodies. Runoff can occur from salt storage areas that are not protected from wet weather events. In addition, chlorides can leach into the shallow groundwater system over time and be transported to streams via baseflow.

Cropland runoff. Chlorides, specifically potassium chloride (KCl) can be a constituent in certain fertilizers applied to agricultural lands. Chloride-containing fertilizers can be incorporated into runoff from agricultural land during wet weather events, into the air from wind erosion, and into tile drainage or shallow groundwater through infiltration.

Onsite wastewater treatment systems. Properly functioning and sited onsite wastewater treatment systems (e.g., septic systems) can provide effective treatment for many pollutants associated with human waste; however, they are not designed to treat chlorides. Chloride loading from septic systems can be problematic if households are softening their water. Home water softeners remove calcium and magnesium in water and exchange them for sodium (salt) that is added to the system in the form of water softener salt. The chloride from water softener salt use then makes its way to the environment as it is discharged from a septic system.

Upstream impairments. Once in a water system, chloride is very difficult to remove and is not readily taken up by the environment. Chloride impaired Lake Fork (IL_OW-02) is directly upstream of Lake Fork (IL_OW-01) and is therefore contributing to its impairment. The segment directly upstream of Lake Fork (IL_OW-02) is unimpaired for chloride.

8.2.3 Step 3: Estimate Relative Contributions

Once the sources and pathways of pollutants are known, estimating the relative contributions from these areas can help to further prioritize areas to target for implementation. U.S. EPA (2018) states that estimates of relative contributions "…can range from narrative descriptors (e.g., high, medium, low) derived from aerial photo analysis or field inventories to quantitative values developed from desktop screening tools or models". The approaches used to estimate the relative contribution of pollutants may vary depending on the size of the contributing area, type of pollutant, and amount of available information. Estimates of relative contributions for each pollutant are described in the following subsections.

Relative chloride contributions to Lake Fork (IL_OW-01) and Lake Fork (IL_OW-02) were estimated using available literature and known watershed characteristics. An Illinois State Water Survey report (Kelly et al. 2012) summarizes chloride concentrations from a variety of sources, including identified nonpoint sources such as de-icing salts and wastewater. In the surveyed watersheds, chloride concentrations from road salt runoff were notably higher than concentrations found in tile drain samples and septic system discharge (Table 15).

Table 15.Chloride concentrations (mg/L) for potential sources in Illinois (Kelly et al. 2012).

Sample Type	Location	Chloride concentration (mg/L)		
		Min	Median	Max
Road salt runoff	Willow Springs	-	8,930	-
	Pekin	-	1,572	-
Tile drain (cropland runoff)	Ludlow	10.3	14.5	17.8
	Champaign	23.1	25.4	36.5
Septic system discharge	SW Illinois	20.8	91	5,620

Snow and ice management practices which involve the application of de-icing salt are likely contributing significant chloride pollution to impaired streams. De-icing salt application commonly occurs on impervious surfaces, primarily in or near developed areas or on paved roads. Developed areas with more impervious cover are likely to receive greater quantities of de-icing salts as part of snow and ice management. Developed areas comprise around 6% of total land use within the chloride-impaired Lake Fork subwatersheds. These developed areas are largely concentrated in and around several small towns (including the Village of Atwood which is located directly upstream of the monitoring site for Lake Fork (IL_OW-01). Within developed areas, de-icing salts are commonly applied by individuals or organizations at their homes and businesses.

Paved road surfaces within the impaired subwatersheds include federal highways (U.S. Route 36), state highways (Illinois Route 105 and 10), and several county and local roads. Application rates and storage of road de-icing salt and other de-icing agents on these roads may vary depending on road maintenance policies or regulations and can be subject to other considerations, such as road surface characteristics, weather conditions, and community expectations. Commonly, application and storage of road salt is handled by local, regional, or state-level authorities and is part of a larger infrastructure maintenance system.

The distribution of impervious cover is not uniform across the chloride-impaired Lake Fork subwatersheds. Smaller drainage areas were delineated within the impaired subwatersheds using USGS topography and National Hydrology Dataset flowlines and land cover data from the Cropland Data Layer (U.S. Department of Agriculture [USDA] 2019). Delineated drainage areas near the Villages of Atwood and Bement contain the largest percentage of impervious cover. Percent impervious cover for each of these delineated drainage areas is provided in Figure 9.

Cropland runoff from fields where chloride containing fertilizers are applied may be a significant source of chlorides to the impaired Lake Fork segments. Potassium chloride (KCl) fertilizers are the cheapest and most commonly available potassium (potash) fertilizers and are applied widely in Illinois (Kelly et al. 2012). While exact application rates of KCl on agricultural land in the impaired subwatersheds is currently unknown, an estimated 77% of corn fields and 61% of soybean fields in Illinois receive potassium fertilizers (ERS 2018). As cultivated crops, primarily corn and soybeans, comprise the majority (75%) of land cover in the larger Upper Kaskaskia River and Lake Fork watershed, cropland is likely a significant watershed source of chlorides to the impaired Lake Fork segments.

Onsite wastewater treatment systems may contribute to chloride impairments depending on a variety of factors, most importantly, the presence of a water softening treatment system. Wastewater from these systems contains a lower concentration of chlorides than road salt (Table 15), but can impact water quality year-round, making it a potential source during a range of flow conditions. There are an estimated 802 systems in the chloride-impaired Lake Fork subwatersheds (NESC 1992, 1998). However, information on water softener use within the impaired subwatersheds is currently unavailable, so the relative contributions of chlorides from onsite wastewater treatment systems is unknown.

Upstream waters may contribute chloride to impaired Lake Fork segment IL_OW-02 but the amount and magnitude is unknown at this time. No chloride water quality monitoring data are available on or directly below Lake Fork segment IL_OW-02. Monitoring recommended during the Stage 1 Report (Appendix A) and in this TMDL implementation plan (see Section 8.8) will help determine the relative chloride contributions from upstream waters.

A summary of the relative contributions of chloride from these sources is provided in Table 16.

Table 16. Relative contribution of chloride to Lake Fork (IL_OW-01) and Lake Fork (IL_OW-02)

Source of Chlorides	Relative Contribution
Snow and ice management (de-icing salt application)	High
Cropland runoff	Medium
Onsite wastewater treatment systems	Unknown
Upstream waters	Unknown

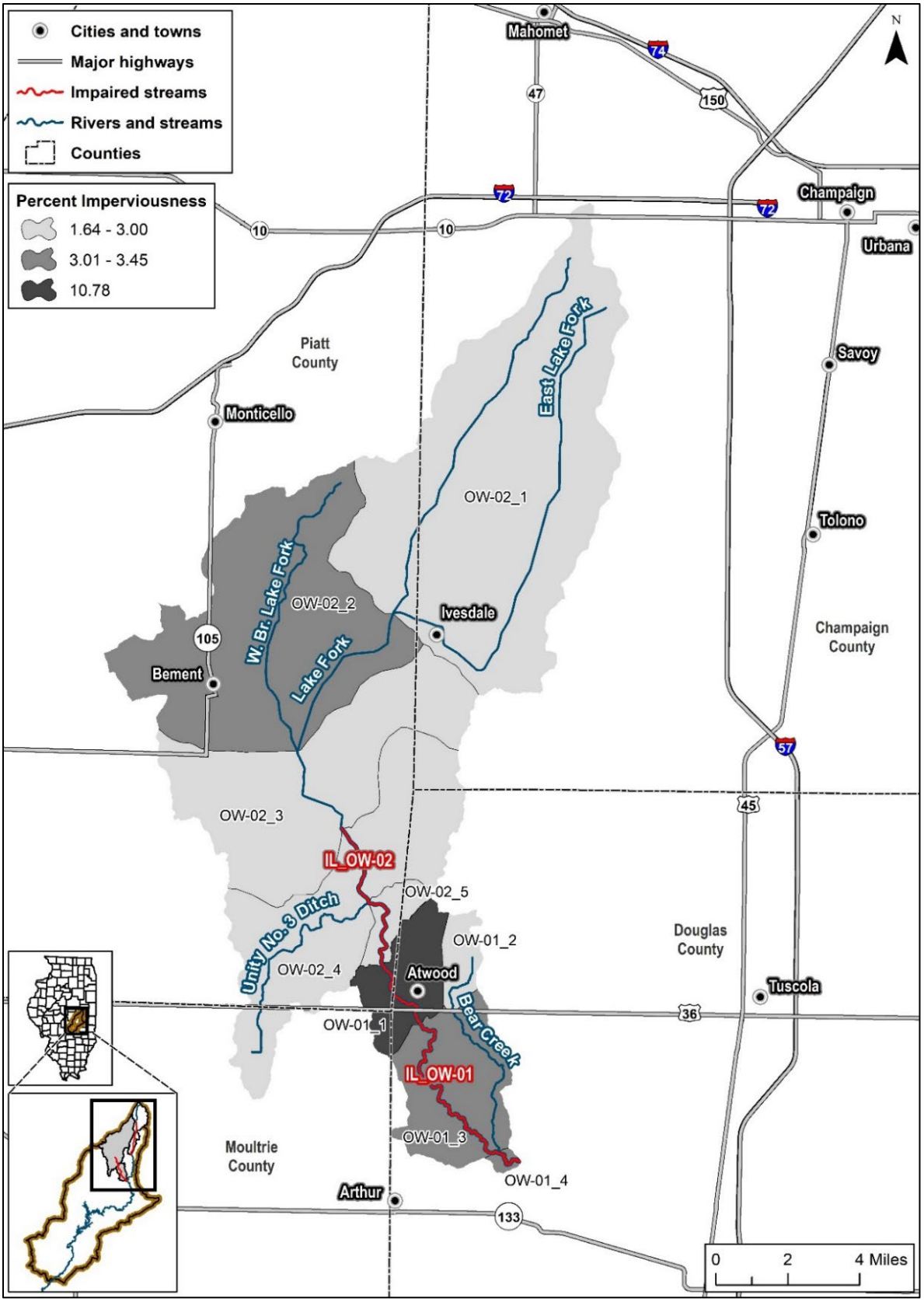

Figure 9. Percent imperviousness for delineated drainage areas within Lake Fork (IL_OW-01) and Lake Fork (IL_OW-02).

8.2.4 Step 4: Target Critical Areas and BMP Opportunities

*This section contains part of the requirement for U.S. EPA's **element three:** identification of critical areas.*

Critical areas are considered by the U.S. EPA (2018) as areas that are 1) large sources of pollutants, 2) have the greatest pollutant transport potential, and 3) provide opportunity for improvements (i.e., areas disproportionately impacting impaired streams, areas with local support and participation, etc.). Critical area selection is an iterative process (U.S. EPA 2018). When all information is not known or more information is needed, monitoring of plan implementation and use of an adaptive management approach will help to determine what areas to target for implementation. Sources and pathways of pollutants and their relative contribution (Steps 1-3) were used to determine critical areas for the first five years of implementation for impaired streams.

Critical areas for snow and ice management practices for Lake Fork (IL-OW-01) and Lake Fork (IL_OW-02) (Figure 10) are delineated drainage areas that have been identified as having the highest levels of impervious cover where large quantities of de-icing salts are likely applied. While chloride containing fertilizer is also a significant source of chlorides to the impaired Lake Fork segments, row crops are prevalent throughout both subwatersheds. As such, no specific areas were selected as critical areas for chloride containing fertilizer management.

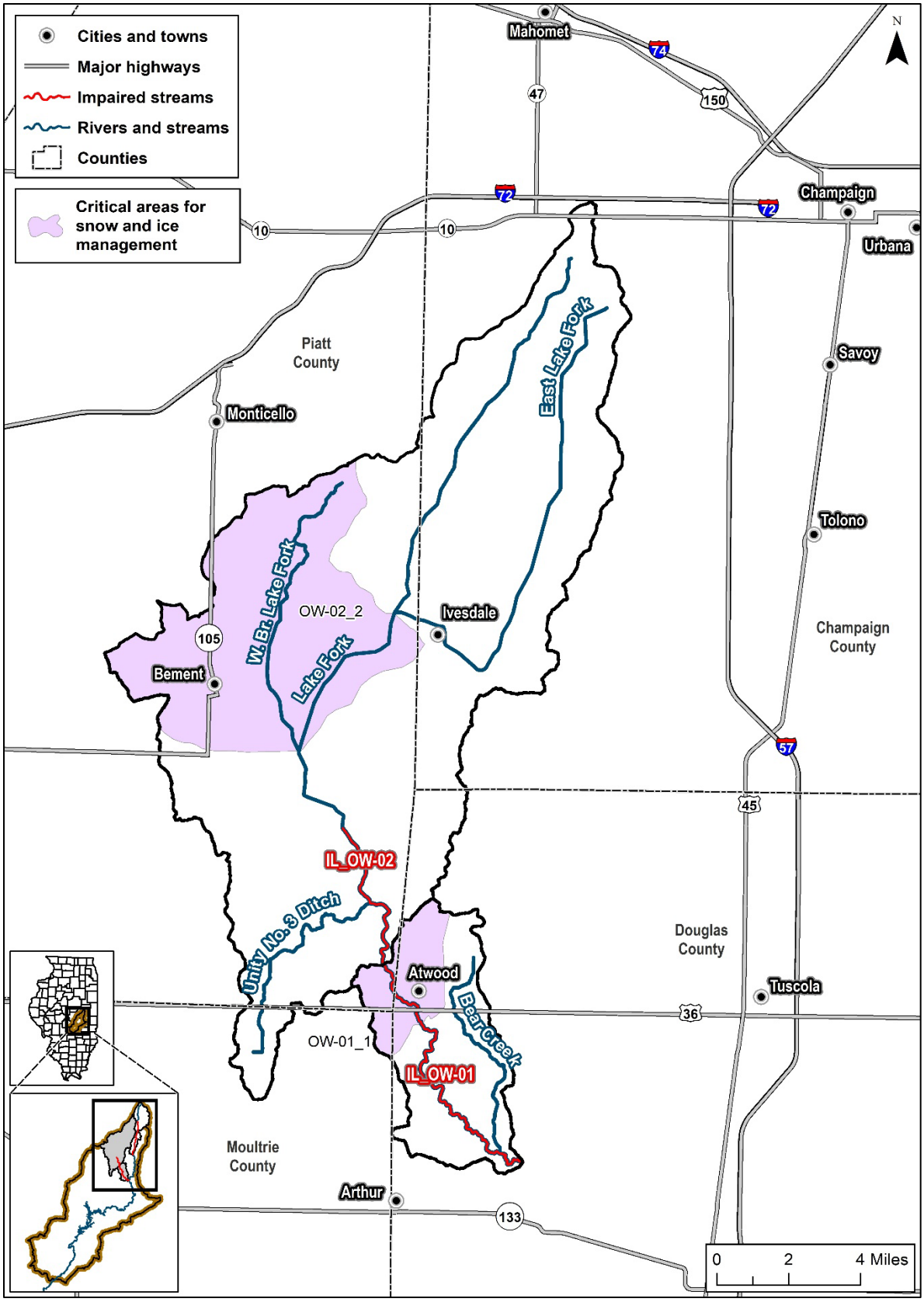

Figure 10. Critical areas for snow and ice management to address chloride impairments in the Lake Fork (IL_OW-01) and Lake Fork (IL_OW-02) subwatersheds.

8.3 Best Management Practices

*This section contains the second requirement for U.S. EPA's **element three:** description of nonpoint management measures needed to achieve load reductions.*

Within the watershed planning framework, candidate BMPs are identified and then evaluated to determine which BMPs will best address the causes and sources of pollutant loads. For watersheds with multiple causes and sources such as the Upper Kaskaskia River and Lake Fork watershed, suites of BMPs must be identified and evaluated. BMPs are presented in this section to address each of the critical areas. Recommended BMPs were selected to address pollutant sources with the highest relative contribution, as determined in Step 3. Table 17 includes a suite of BMPs that could be used to achieve necessary load reductions in the watershed. Descriptions of each BMP and the level of effort necessary to achieve required reductions follow. There are many different BMP scenarios that could be used to achieve pollutant load reductions, this plan provides one example.

Table 17. Chloride BMP removal efficiencies and costs.

Source	BMP	Chloride Removal Efficiency (%) [a]	Costs [a]
Snow and ice management	**Road salt application and storage BMPs**		
	Calibrating equipment	30-50% (depending on current practices)	Cost reduction expected
	Apply road salt according to pavement temperature		
	Anti-icing and pre-wetting road salt		37-75% cost reduction (depending on current practices)
	Alternative non-chloride deicers	100%	Acetates: $600-2,000 per ton Other alternatives: $0.55-4 per gallon
	Home and business salt application BMPs		
	Replace salt with sand or grit for traction	100%	Cost reduction expected (depending on frequency and magnitude of use) Some additional cleanup, maintenance costs expected
	Apply recommended rates	Varies based on current application rates	Cost reduction expected
Cropland runoff	Fertilizer (KCl) management	Varies based on current application rates	Cost reduction expected
Onsite wastewater treatment systems	Upgrading or replacing failing onsite wastewater treatment system	Varies based on existing system conditions	$2,000-10,000 per system [b]
	Onsite wastewater treatment system maintenance		$100-300 per system [b]
Upstream waters	Additional monitoring is recommended (see section 5.8)		

All removal efficiencies and cost are based on the *DuPage River Salt Creek Work Group Chloride Usage Education and Reduction Program Study* (CDM 2007) unless otherwise noted.
a. IEPA 2018.

8.3.1 Snow and Ice Management Practices

BMPs which address chloride loading from snow and ice management at homes, businesses, and on roads are presented in the following subsections.

Home and Business Salt Application BMPs

Home and business salt application BMPs can minimize the amount of salt applied to areas including parking lots, driveways, and sidewalks. Recommendations include:

- Early snow removal and removal of snow before applying de-icing salts
- Use sand or grit for traction instead of salt
- Sweep up excess salt for re-use
- Store salt in a sealed container
- Use only enough salt that is required to reduce safety hazard

Road Salt Application and Storage BMPs

Road salt application BMPs help to ensure that only as much salt as needed is placed upon the road during winter maintenance operations. The purpose of road salt in such operations is not to melt snow or ice, but rather to prevent the bond of snow or ice to the pavement. If snow or ice has already bonded to the pavement, the purpose of the salt is to break the bond. Road salt application BMPs include:

- Public education, staff training, and improved salt storage and handling practices
- Watershed-wide implementation of pre-wetting and anti-icing programs

Pounds of Ice Melted Per Pound of Salt

Pavement Temp. °F	One Pound of Salt (NaCl) melts	Melt Times
30	46.3 lbs of ice	5 min.
25	14.4 lbs of ice	10 min.
20	8.8 lbs of ice	20 min.
15	6.3 lbs of ice	1 hour
10	4.9 lbs of ice	Dry salt is ineffective and will blow away before it melts anything.
5	4.1 lbs of ice	
0	3.7 lbs of ice	
-8	3.2 lbs of ice	

Figure 11. Recommended salt application for different pavement temperatures (Clear Roads 2015).

- Consideration of alternative non-chloride products such as acetate deicers and beet and corn derivatives
- Varying road salt application according to pavement temperature to maximize salt effectiveness (Figure 11)

Road salt storage BMPs can minimize the loss of road salt from storage and transfer areas:

Store road salt on an impermeable pad under a structure or tarp that provides cover from wet weather events

Practice “good housekeeping” practices when salt is being moved by sweeping up any spilled salt and returning it to the stockpile. These practices should aim to ensure that as little salt as possible is spilled and that any salt which is spilled should be swept up and returned to storage in a timely manner to minimize loss of salt.

8.3.2 Cropland Runoff Practices

BMPs to address chloride loading from cropland runoff are presented herein and the estimated reductions are summarized in Table 17. A subset of the management practices provided in the Illinois Nutrient Loss Reduction Strategy are included for use in the Upper Kaskaskia River and Lake Fork watershed. Other management practices can also be used to achieve the goals of the TMDL and this plan. The Illinois Council on Best Management Practices provides additional information on these and other BMPs (http://illinoiscbmp.com/).

Application of fertilizer on cropland according to nutrient management planning practice standards can reduce chloride levels in cropland runoff (Natural Resources Conservation Service [NRCS] 2019). In general, fertilizer management optimizes application rates and improves storage and disposal of fertilizer to reduce pollution in runoff.

The Illinois Agronomy Handbook lists guidelines for fertilizer application rates based on the inherent properties of the soil (typical regional soil phosphorus and potassium concentrations, root penetration, pH, etc.), the starting soil test phosphorus concentration for the field, and the crop type and expected yield (University of Illinois Extension 2009). Limiting commercial application of fertilizers to only fields with soil test phosphorus levels below the recommended maintenance can reduce nutrient loading from excess fertilization. Application of fertilizer should address application rates, methods, and timing as described in the NRLS and according to the 4Rs – **R**ight Source, **R**ight Rate, at the **R**ight Time, and in the **R**ight Place and should be incorporated into nutrient management planning. Application to frozen ground or snow cover should be strongly discouraged. Researchers studying loads from agricultural fields in east-central Illinois found that fertilizer application to frozen ground or snow followed by a rain event could transport 40% of the total annual phosphorus load (Gentry et al. 2007).

Fertilizer transport, storage, and disposal practices should also be monitored to reduce potential pollution in runoff. Commercial fertilizers should be stored at least 100 feet from nearby surface waters and should not be stored underground or in pits. Application equipment should be cleaned, inspected, and calibrated regularly, and excess fertilizer from wash water should be recovered for reuse. Disposal of commercialized fertilizers should follow manufacturer guidelines. Improvements to storage and disposal practices may require improvements to existing equipment or storage infrastructure to reduce potential leakages.

8.3.3 Onsite Wastewater Treatment System Practices

BMPs to reduce chloride and phosphorus loading from wastewater sources include the maintenance and inspection of private onsite wastewater treatment systems. The most effective BMP for managing loads from these systems is regular maintenance. U.S. EPA recommends that septic tanks be pumped every 3 to 5 years depending on the tank size and number of residents in the household (U.S. EPA 2002b). When not maintained properly, septic systems can cause the release of pathogens, as well as excess nutrients, into surface water. Annual inspections, in addition to regular maintenance, ensure that systems are functioning properly. An inspection program can identify those systems that are currently connected to tile drain systems or storm sewers. Inspections also help to determine if systems discharge directly to a waterbody (“straight pipe”) and can recommend alternative solutions. Additional point of sale inspections, or inspections when a property is sold and purchased, can improve the baseline understanding of septic conditions and decrease occurrences of leaks potentially contributing to phosphorus loading in the watershed. These may include a soil boring to determine if the soil has adequate separation, and an examination of the inside of the tank after it has been pumped.

The use of water softeners, and management of the discharge associated with water softeners, may be a source of chlorides in onsite wastewater treatment systems if softener backwash is discharged into septic systems. Further work is needed to determine the potential for water softeners to contribute to chloride impairments.

Education and outreach are a crucial component of reducing pollution from septic systems and can occur through public meetings, mass mailings, and radio and television advertisements. An inspection program can also help with public education because inspectors can educate owners about proper operation and maintenance during inspections. Education and outreach programming should also be utilized to collect data on wastewater characteristics in the watershed, including numbers of failing systems, locations of unsewered communities, and additional private wastewater management practices that might implicate water quality. This data collection should support a centralized system of information that can be used for future implementation and watershed planning efforts.

8.3.4 Level of BMP Implementation

*This section contains the requirement for U.S. EPA's **element two:** estimate of the load reductions expected from management measures.*

To the extent possible, implementation should align with the goals of existing plans such as the Upper Kaskaskia River TMDL for sediment impairments addressed via LRSs (IEPA 2018) and the Kaskaskia River Watershed Study (Southwestern Illinois RC&D, Inc. 2002). The Kaskaskia River Watershed Study has the following requirements for BMPs:

- Efforts must be based on planning and an approach that includes local citizens and all levels of government.
- Recognition of private property rights and the public interest should strive for a balance.
- Actions must be based upon good science and economic data.
- Primary action should be focused on the protection, restoration and enhancement of the high-quality resources that are at risk and that have the greatest potential for recovery.
- Programs should be voluntary and incentive based.
- Actions should be consistent with ecosystem-based management strategies.

While critical areas identify locations in which to target implementation activities for the first five years of the plan, it is unlikely that the needed TMDL reductions will be met with only work in these areas. Therefore, a general level of implementation was calculated for each impaired subwatershed to provide an estimate of the effort required to achieve load reductions. These calculations may increase or decrease as management activities are evaluated and monitored through the adaptive management process.

A 43% reduction in chloride is needed to meet water quality standards for Lake Fork (IL_OW-01 and IL_OW-02). Based on the estimated relative contributions of nonpoint sources of chloride to both impaired segments, and the BMPs identified in previous sections, the following level of implementation is recommended to achieve necessary chloride load reductions. It is important to note that the following implementation recommendations do not consider existing BMPs on the landscape; these BMPs can be counted towards meeting load reduction requirements.

Road salt application and storage BMPs: Watershed-wide implementation of pre-wetting and anti-icing programs on state and county roads.

Home and business salt application BMPs: Education, outreach, and training programs in developed areas, such as the Villages of Atwood and Bement, on appropriate de-icing salt application and use of alternative de-icers.

Cropland runoff practices: Implement fertilizer management on 50% of cropland where chloride containing fertilizer is applied.

8.4 Technical and Financial Assistance

*This section contains the requirements for U.S. EPA's **element four:** technical and financial assistance needed, associated costs, and the sources and authorities that will be relied upon for implementation.*

A significant portion of this implementation plan focuses on voluntary efforts. As a result, technical and financial assistance are essential to successful implementation over time. This section identifies sources of funding and technical assistance to implement the recommended implementation practices. This section also identifies the watershed partners who will likely play a role in implementation.

8.4.1 Implementation Costs

The total cost to implement this plan is estimated between $1.5 million and $2.9 million over 15 years. A breakdown of these costs is provided in Table 18.

Table 18. Plan cost estimate.

BMP/Activity [a]	Cost Estimates
Road salt application and storage BMPs	Cost reduction expected [b]
Home and business salt application BMPs	Cost reduction expected [b]
Onsite wastewater treatment system upgrades or replacements	$282,000 – 1,410,000
Local capacity to implement the plan [c]	$1,200,000 – 1,500,000
Total costs	**$1,482,000 – $2,910,000**

a. Recommended BMPs outlined in Section 8.3, level of recommended BMP implementation provided in 8.3.4.

b. Expected cost reductions vary depending on current application, storage, and outreach practices.

c. Local capacity includes staff time and resources necessary to implement BMPs. This also includes programmatic costs associated with recommended monitoring, education, and outreach components.

8.4.2 Financial Assistance Programs

There are many existing financial assistance programs which may assist with funding implementation activities. Many involve cost sharing, and some may allow the local contribution of materials, land, and in-kind services (such as construction and staff assistance) to cover a portion or the entire local share of the project. Several of these programs are presented in Table 19. In addition to these programs, partnerships between local governments can help to leverage funds. State and federal grant programs may also be available, depending on the nature of the implementation activity.

Table 19. Potential funding sources

Funding Program	Type of Funding	Entity	Eligible Projects	Eligible Applicants	Available Funding	Website
Federal Programs						
Five Star Wetland and Urban Water Restoration Grant	Grant	U.S. EPA	On-the-ground wetland, riparian, in-stream and/or coastal habitat restoration, education and training activities through community outreach, participation and/or integration with K-12 environmental curriculum. Projects that provide benefits to the community through ecological and environmental efforts, and partnerships.	Non-profits, state government agencies, local and municipal governments, Indian tribes, and educational institutions	$10,000-$40,000 per project	http://www.nfwf.org/fivestar/Pages/home.aspx
Wetland Program Development Grants	Grant	U.S. EPA	Projects that promote the understanding of water pollution through review and refinements of wetland programs. Cause and effects, reduction and prevention, and elimination of water pollution.	States, tribes, local governments, interstate associations, and intertribal consortia (Regional grants) Nonprofits, interstate associations and intertribal consortia (National grants)	$20,000 to $600,000/fiscal year	https://www.epa.gov/wetlands/wetland-program-development-grants
North American Wetlands Conservation Act (standard grant)	Grant through the North American Wetlands Conservation Act	USFWS	Wetlands conservation projects in the United States, Canada, and Mexico. Projects must provide long-term protection, restoration, and/or enhancement of wetlands and associated uplands habitats.	Non-profits, state government agencies, local and municipal governments, Indian tribes, and educational institutions	Since 1995 1,025 projects have been funded with a combined total of over $850 million grant dollars. Requires a 1-1 partner contribution	https://www.fws.gov/service/north-american-wetlands-conservation-act-nawca-grants-us-standard
North American Wetlands Conservation Act (small grant)	Grant through the North American Wetlands Conservation Act	USFWS	Wetlands conservation projects in the United States, Canada, and Mexico. Grant requests must not exceed $100,000.	Non-profits, state government agencies, local and municipal governments, Indian tribes, and educational institutions	Since 1996, 750 projects have been funded with a combined total of $43.2 million grant dollars Requires a 1-1 partner contribution	https://www.fws.gov/service/north-american-wetlands-conservation-act-nawca-grants-us-small
Environmental Quality Incentive Program (EQIP)	Cost-share through contract (usually 3 years)	NRCS	Approved conservation practices that are constructed according to NRCS.	Farmers in livestock, agricultural, or forest production who utilize approved conservation practices	Up to 75% of project cost	https://www.nrcs.usda.gov/wps/portal/nrcs/il/programs/financial/eqip/
National and State Conservation Innovation Grants	EQIP funded grants	NRCS	Innovative problem-solving projects that boost production on farms, ranches, and private forests that improve water quality, soil health, and wildlife habitat.	Non-federal governmental or nongovernmental organizations, American Indian Tribes, or individuals. Producers involved in CIG funded projects must be EQIP eligible.	More than $22.6 million was awarded to 33 projects in 2017 Grantees much match funds	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/financial/cig/
Environmental Education Grants Program	Grant	U.S. EPA	Environmental education programs that promote environmental awareness and stewardship and help provide people with the skills to take responsible actions to protect the environment.	Local education agencies State education or environmental agencies Colleges or universities Non-profit organizations 501(c)(3) Noncommercial educational broadcasting entities Tribal education agencies (including schools and community colleges controlled by an Indian tribe, band, or nation)	In 2015, 35 projects in the country were funded for a total of $3,306,594	https://www.epa.gov/education/environmental-education-ee-grants
State/Federal Partnerships						
Nonpoint Source Management Program (319)	Grant	U.S. EPA / IEPA	Priority given to projects that implement cost-effective corrective and preventative BMPs on a watershed scale. Also available for BMPs on a non-watershed scale and the development of information/education nonpoint source pollution control programs.	Units of government and other organizations	Approximately $3,000,000 is available per year, awarded amongst approximately 15 projects. Provides up to 60% project cost share	https://www2.illinois.gov/epa/topics/water-quality/watershed-management/nonpoint-sources/Pages/grants.aspx Supplemental guidance on 319 funding for urban BMPS: http://www.epa.state.il.us/water/watersh

Funding Program	Type of Funding	Entity	Eligible Projects	Eligible Applicants	Available Funding	Website
			Projects that meet requirements of a NPDES permit are not eligible for 319 funding.			ed/publications/nps-pollution/urban-bmps-supplemental-guidance.pdf
Clean Water State Revolving Fund	Low interest loans, purchase of debt or refinance, subsidization	IEPA	Nonpoint source pollution control. Green infrastructure projects, construction of municipal wastewater facilities and decentralized wastewater treatment systems, watershed pilot projects, stormwater management, technical assistance (qualified nonprofit organizations only).	Corporations, partnerships, governmental entities, tribal governments, state infrastructure financing authorities	Varies	https://www.epa.gov/cwsrf
Healthy Forest Reserve Program	Easements, 30-year contracts, 10-year contracts	USDA	Projects that restore, enhance, and protect forestland reserves on private land to measurably increase the recovery of threatened or endangered species, improve biological diversity, or increase carbon storage.	Private landowners	10-year restoration cost-share agreement: up to 50% of average cost of approved conservation practices 30-year easement: up to 75% of the easement value of the enrolled land plus 75% of the average cost of the approved conservation practices 30-year contract on acreage owned by Indian Tribes Permanent easements: up to 100% of the easement value of the enrolled land plus 100% of the average cost of the approved conservation practices	https://www.nrcs.usda.gov/wps/portal/nrcs/main/national/programs/easements/forests/
Healthy Watersheds Consortium Grant	Grant	EPA, NRCS and U.S. Endowment for Forestry and Communities	"Healthy watershed" program development projects that aim to preserve and protect natural areas, or local demonstration/trainings Conservation easements are *not* eligible Grants awarded are generally within three categories: Short term funding to leverage larger financing for targeted watershed protection Funds to help build the capacity of local organizations for sustainable, long term watershed protection New replicable techniques or approaches that advance the state of practice for watershed protection.	Consortiums or "one entity who is linked with or in a collaborative partnership with other groups or organizations having similar healthy watersheds protection goals"	$50,000-150,000 per project	https://www.epa.gov/hwp/healthy-watersheds-consortium-grants-hwcg
Partners for Fish and Wildlife Program	Technical and financial support	USFWS	Collaborations and partnerships with private landowners to improve fish and wildlife habitat on their lands. Voluntary, community-based stewardship for fish and wildlife conservation.	Private landowners	Varies per project/partners	https://www.fws.gov/program/partners-fish-and-wildlife
State Programs						
Streambank Stabilization and Restoration Program	Grant	Illinois Department of Agriculture	Labor, equipment, and materials for effective streambank stabilization demonstration sites that use inexpensive vegetative and bio-engineering techniques.	This program is currently not funded but may be reinstated in the future.	This program is currently not funded but may be reinstated in the future.	Contact Illinois Department of Agriculture for more information: https://www.agr.state.il.us/conservation/
Green Infrastructure Grant Opportunities	Grant	Illinois EPA	Improvements to water quality through the construction of BMPs, especially to reduce stormwater runoff.	Units of government and organizations, colleges and universities, conservation/park districts	Reimbursement for a total of $5,000,000 annually starting in 2021.	https://www2.illinois.gov/epa/topics/grants-loans/water-financial-assistance/Pages/gigo.aspx
Open Space Lands Acquisition and Development (OSLAD) Grant/Land and Water Conservation Fund	Grant	IDNR	Acquisition and/or development of land for public parks and open space by Illinois governments. *Note: OSLAD program will not be available for Fiscal Year 2021 according to DNR website.*	Local governments	Up to $750,000 for acquisition projects and $400,000 for development/renovation projects. Funding up to 50% of project cost	https://www.dnr.illinois.gov/aeg/pages/openspacelandsaquisitiondevelopment-grant.aspx
Unsewered Communities Planning and	Grant	Illinois EPA	Funding available through the Rebuild Illinois Capital Plan over five years for Construction Grants for wastewater collection and/or treatment facilities and for the next 4 years for Planning Grants to assist small and disadvantaged	Unsewered communities with inadequate wastewater systems such as individual septic systems	$ 1,000,000 for Planning Grants and $1, 000,000 for Construction Grants	https://www2.illinois.gov/epa/topics/grants-loans/unsewered-communities/Pages/default.aspx

Funding Program	Type of Funding	Entity	Eligible Projects	Eligible Applicants	Available Funding	Website
Construction Grant Programs			communities in developing a Project Plan that identifies a solution to their wastewater collection and treatment needs. A well-developed Project Plan would then allow communities to apply for the Construction Grant			
Illinois Buffer Partnership	Cost share, on site assistance from Trees Forever (Iowa) staff, project signs and field days	Illinois Buffer Partnership	Eligible projects include: Installation of streamside buffer plantings on projects including riparian buffers, livestock buffers, streambank stabilization projects, wetland development, pollinator habitat, rain gardens, and agroforestry projects.	Landowners willing to implement projects on their lands which can serve as a demonstration site to showcase benefits of conservation buffers.	Reimbursed up to $2,000 for 50 percent of the expenses remaining after other grant programs are applied	http://www.treesforever.org/Illinois_Buffer_Partnership.

Note: BMP = best management practice; EQIP = Environmental Quality Incentive Program; IDNR = Illinois Department of Natural Resources; IEPA = Illinois Environmental Protection Agency; NRCS = Natural Resources Conservation Service; USDA = U.S. Department of Agriculture; U.S. EPA = U.S. Environmental Protection Agency; USFWS = U.S. Fish and Wildlife Service.

8.4.3 Partners

There are several partners within the Upper Kaskaskia River and Lake Fork watershed that may provide technical or financial assistance to promote successful TMDL implementation and watershed management:

- Central Illinois Crappie Club
- County Forest Preserve Districts
- Farm Service Agency
- Heartlands Conservatory
- Illinois Department of Agriculture
- Illinois Department of Natural Resources
- Illinois Certified Crop Adviser Program
- Illinois EPA
- Illinois Farm Bureau
- Illinois Rural Water Association
- Illinois State Water Survey
- Kaskaskia Watershed Association
- Kaskaskia Regional Port District
- Kaskia-Kaw Rivers Conservancy
- Lake Shelbyville Development Association
- Lake Shelbyville Fish Habitat Alliance
- Local and regional governments
- National Great Rivers Research and Education Center
- NRCS
- Original Kaskaskia Area Wilderness
- Soil and Water Conservation District offices
- Upper Kaskaskia Watershed Ecosystem Partnership
- University of Illinois Extension
- USACE
- U.S. EPA Region 5

The Upper Kaskaskia River and Lake Fork watershed is in the headwaters of the larger Kaskaskia River watershed. The partners and organizations within the larger Kaskaskia River watershed can also support successful TMDL implementation and watershed management. A full list of stakeholders within the Kaskaskia River watershed can be found in the Kaskaskia River Watershed Study (Southwestern Illinois RC&D, Inc. 2002).

8.5 Public Education and Outreach

*This section contains the requirements for U.S. EPA's **element five** of a watershed plan: information and education component.*

Raising stakeholders' awareness about issues in the watershed and developing strategies to change stakeholder behavior is essential to promoting voluntary participation. Successful implementation in this watershed will rely heavily on effective public education and outreach activities to encourage engagement. This section presents recommendations related to developing and implementing coordinated watershed-wide education and outreach.

The first step in a successful information and education strategy is identifying target audiences and determining how to best reach these audiences. Potential audiences in the Upper Kaskaskia River and Lake Fork watershed may include residents, landowners, public works departments and staff, and snow and ice management professionals. Consideration should be given to the complexity of the water resource concerns of each of these groups. Whenever possible, stakeholder attitudes and preferences should be considered in the implementation of protection activities and should influence message development, selection of outreach platforms, and other aspects of information and education.

Keeping in line with the adaptive nature of a nine-element plan, engagement and outreach strategies should also be flexible to accommodate future changes in stakeholder awareness and behaviors. A pre- and post-implementation survey can be used to measure these changes, and the results of these surveys

should be shared between local partners. These surveys might be used to measure changes in the level of stakeholder knowledge and involvement and will help watershed outreach campaign organizers to further develop tailored outreach messages. Other measures of change might include the number of producers signing up for cost-share programs or participating in field days or demonstration projects. Results from these outreach activities should be used to inform potential changes and adaptations to this implementation plan. Potential targeted audiences, concerns, and communication channels are outlined in Table 20.

Table 20. Potential audience concerns and communication channels

Key Target Audiences	Potential Audience Concerns	Potential Communication Channels
Residents with onsite wastewater treatment systems	• Wastewater treatment system operation, maintenance, and cost • Water quality issues (safety, aesthetics, quality) • Drinking water quality • Property values	• Social media • Local media and newspapers • Local governments • SWCDs • Watershed groups • Informational meetings • Brochures and other handouts • County and state health departments • Community events and gatherings • Existing community, waterfront, and neighborhood associations
Home and business salt applicators	• Costs of salt • Home and road safety and liability	
Riparian landowners	• Streambank erosion • Water quality issues (safety, aesthetics) • Property values • Flooding • Drinking water quality • Quality of fisheries	
Public works departments and staff	• Additional programmatic and regulatory requirements • Technical and financial support from state and federal partners to implement recommended BMPs • Zoning and planning • Public safety and liability	• Other local governments (e.g., SWCD, counties, cities) • State agencies • Watershed groups • Presentations and stakeholder meetings
Snow and ice management professionals	• Costs and savings from different snow and ice management practices • Road safety and liability	• Training sessions • Local governments • Brochures and other handouts

Key Target Audiences	Potential Audience Concerns	Potential Communication Channels
Row crop producers	• On-field practices to implement • Costs and programmatic requirements of funding programs • Water quality issues (safety, aesthetics, quality) • Loss of cropland acreages • Flooding	• Agricultural associations • 4-H groups • Local media • Brochures and handouts • SWCDs • Watershed groups • Demonstration farms • Radio and newspapers • Word of mouth • On-site visits • Informational meetings
Certified crop advisors	• Areas and practices to target for implementation • Costs and programmatic requirements for funding programs • Updated information to pass along to agricultural producers	• Training sessions • Outreach and distributed information from research institutions • Informational meetings

SWCD = soil and water conservation district

Resources exist which are relevant to several of these stakeholders. Training programs for road salt applicators and effective communication channels between applicators, farmers, permitted entities, and neighboring areas can help support successful implementation of the implementation plan. Training and education programs for crop and livestock producers are also effective methods of increasing implementation and long-term maintenance of agricultural BMPs.

The University of Illinois Extension has several units within the Upper Kaskaskia River and Lake Fork watershed. Each unit has extensive education and outreach programs in place that range in topic from commercial agriculture, horticulture, energy, and health that can provide meaningful resources to the information and education effort in the watershed.

- Champaign, Ford, Iroquois, Vermilion Extension Unit
  - https://extension.illinois.edu/cfiv
- Coles-Cumberland-Douglas-Moultrie-Shelby Extension Unit
  - http://web.extension.illinois.edu/ccdms/
- DeWitt, Macon, Piatt Extension Unit
  - https://extension.illinois.edu/dmp

8.6 Schedule and Milestones

*This section contains the requirements for U.S. EPA's element **six and seven** of a watershed plan: implementation schedule and a description of interim measurable milestones.*

A key part of U.S. EPA's nine-elements is interim milestones that provide meaningful evaluation points and a focus for program activities. Interim milestones are steps that demonstrate that implementation measures are being executed in a manner that will ensure progress over time. Milestones are not changes in water quality. Measurable milestones are an important tool for directing limited resources towards the array and number of sources and nonpoint source pollution problems across the watershed. Interim measurable milestones are presented in Table 21.

A 15-year implementation schedule is assumed and divided into two phases: 2020-2025 and 2025-2035. Each phase will rely on an adaptive management approach and will build upon previous phases. Short-term efforts (Year 1-5) include implementing practices in critical areas. longer-term efforts (Year 6-15) are intended to build on the results of short-term implementation activities and result in the watershed reaching full pollutant load reductions. This includes evaluating the success of Phase 1 projects installed (success rate, BMP performance, pollutant reductions realized, actual costs, etc.).

Table 21. Schedule and milestones for TMDL implementation.

Watershed (AUID)	Pollutant	Source	BMP Type	Milestones	
				Year 1-5	Year 6-15
Lake Fork (IL_OW-01) and Lake Fork (IL_OW-_02)	Chlorides	Snow and ice management	Road salt application and storage	Conduct educational and outreach program for key audiences in critical areas for chloride reduction	Continue education and outreach program in all areas. Develop incentive/ training program for local residents, business owners to reduce salt use
			Home and business salt application	Conduct survey to determine de-icing salt use and salt storage methods by municipality, agency, or private applicator, beginning in critical areas	Develop training program for road salt applicators on alternatives Inspections on all salt storage facilities Pre-wetting and anti-icing programs throughout critical areas for chloride reduction
		Cropland runoff	Cropland runoff practices	Implement fertilizer management on 10% of cropland where chloride containing fertilizer is applied	Implement fertilizer management on 50% of cropland where chloride containing fertilizer is applied.
		All	Monitoring and surveying	Conduct monitoring at stations OW-01, OW-02 and OW-03 to better determine cause of impairment in Lake Fork (IL_OW-02) (See Section 8.8) Conduct a chloride inventory to determine impacts of non-de-icing salt sources (e.g., onsite wastewater treatment systems) on impaired segments	Adjust critical areas and implementation activities, if needed, based on monitoring and survey results Continued monitoring

8.7 Progress Benchmarks and Adaptive Management

*This section contains the requirements for U.S. EPA's **element eight** of a watershed plan: a set of criteria that can be used to determine whether loading reductions are being achieved over time.*

To guide plan implementation through each of the three phases using adaptive management, water quality benchmarks are identified to track progress towards attaining water quality standards. Progress benchmarks (Table 22) are intended to reflect the time it takes to implement management practices, as well as the time needed for water quality indicators to respond.

Table 22. Progress benchmarks.

Indicator	In-Stream Target	Segments	Timeframe	Progress Benchmark
Chloride	500 mg/L	Lake Fork (IL_OW-01) Lake Fork (IL_OW-02)	Year 1-5	20% of load reductions
			Year 6-15	Full attainment of load reductions.

To ensure management decisions are based on the most recent knowledge, the implementation plan follows the form of an adaptive and integrated management strategy and establishes milestones and benchmarks for evaluation of the implementation program. U.S. EPA (2008) recognizes that the processes involved in watershed assessment, planning, and management are iterative and that actions might not result in complete success during the first or second cycle. For this reason, it is important to remember that implementation will be an iterative process, relying upon adaptive management.

Adaptive management is a strategy to address natural resource management that involves a temporal sequence of decisions (or implementation actions), in which the best action at each decision point depends on the state of the managed system. As a structured iterative implementation process, adaptive management offers the flexibility for responsible parties to monitor implementation actions, determine the success of such actions and ultimately, base management decisions upon the measured results of completed implementation actions and the current state of the system. This process, depicted in Figure 12, enhances the understanding and estimation of predicted outcomes and ensures refinement of necessary activities to better guarantee desirable results. In this way, understanding of the resource can be enhanced over time, and management can be improved.

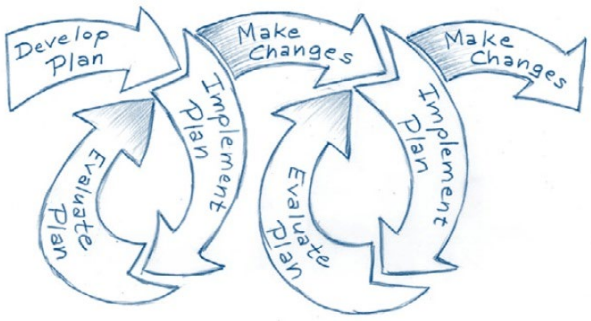

Figure 12. Adaptive management iterative process (U.S. EPA 2008).

In addition to focusing future management decisions, with established assessment milestones and benchmarks, adaptive management can include a re-assessment of the TMDLs. Re-assessment of a TMDL is particularly relevant when completion of key studies, projects or programs result in data showing load reductions or the identification/quantification of alternative sources. Reopening/ reconsidering the TMDLs may include refinement or recalculation of load reductions and allocations.

The implementation phases, milestones, and benchmarks will guide the adaptive management process, helping to determine the type of monitoring and implementation tracking that will be necessary to gauge progress over time. Evaluation for adaptive management can include a variety of evaluation components

to gain a comprehensive understanding of implementation progress. An implementation evaluation determines if non-structural and structural activities are put in place and maintained by implementation partners according to schedule; this is often referred to as an output evaluation. An outcome evaluation focuses on changes to behaviors and water quality as a result of implementation actions. This type of evaluation looks at changes in stakeholder behavior and awareness (i.e., non-structural BMP effectiveness), structural BMP performance, and changes to ambient water quality.

8.8 Follow Up Monitoring

*This section contains the requirements for U.S. EPA's **element nine** of a watershed plan: a monitoring component to evaluate the effectiveness of the implementation efforts over time.*

The ultimate measure of success will be documented changes in water quality, showing improvement over time (see Table 22 for progress benchmarks). In addition, long-term monitoring of the overall health and quality of the watershed is important. Monitoring will help determine whether the implementation actions have improved water quality and support future resource management decisions. In addition, monitoring will help determine the effectiveness of various BMPs and indicate when adaptive management should be initiated. The primary goal of the monitoring plan is to assess the effectiveness of source reduction strategies for attaining water quality standards and designated uses.

Water Quality Monitoring

Progress towards achieving water quality standards will be determined through ambient monitoring by IEPA (i.e., AWQMN). The state conducts routine water quality monitoring by evaluating watersheds on a rotating basis, collecting measurements of physical, chemical, and biological parameters. This ambient monitoring program will continue as the Upper Kaskaskia River and Lake Fork watershed TMDL is implemented. In addition to the ambient monitoring program conducted by IEPA, USGS, and NPDES-permitted facilities conduct water quality monitoring in the Upper Kaskaskia River and Lake Fork watershed. Water quality monitoring efforts may also be supported through volunteer citizen monitoring efforts that typically allow for more frequent monitoring at a lower cost. Formation of a monitoring committee may help streamline efforts.

Recommended monitoring in the watershed includes collection of chemical and flow data. At a minimum, in order to track changes in water quality in impaired streams, and as recommended in Appendix A, chloride and/or DO levels should continue to be monitored along each impaired stream segment. Increased frequency of monitoring will further allow additional evaluation of sources. Synoptic stream sampling can be used to better understand sources of pollutants and identify hot spots or additional critical areas in the impaired streams.

Sampling during different flow regimes is also critical to understanding sources. Monitoring flow is also recommended for each site when water quality samples are taken. Very low flow conditions can be found throughout the watershed, documenting when streams have zero or close to zero flow is also relevant to understanding sources and impairment status.

The timing of chloride sample collection is important to fully understand the sources and pathways of chloride movement in the watershed. Currently, all available data were collected between May through September; there are no available winter or early spring (during melt) data. Sampling moving forward should be completed during spring melt and winter months at monitoring sites OW-01, OW-02 and OW-03 to better pinpoint potential sources of chloride.

BMP Effectiveness Monitoring

Multiple BMPs will be needed to address the water quality impairments in the Upper Kaskaskia River and Lake Fork watershed. There are limited local data on the effectiveness of many BMPs; therefore, monitoring the results of programs and representative practices are critical. BMP monitoring can include quantitative monitoring of physical components (e.g., water quality and flow) qualitative (i.e., visual) monitoring of physical components (e.g., vegetation), and monitoring of behaviors. A monitoring program should be put in place as BMPs are implemented to 1) measure success and 2) identify changes that could be made to increase effectiveness.

8.9 Reasonable Assurance

U.S. EPA requires that a TMDL provide reasonable assurance that the required chloride load reductions will be achieved, and water quality will be restored. Several watershed groups are already active in the TMDL watershed and have developed strategic plans, projects, and on-going programming that will support successful attainment of the water quality standards outlined in this implementation plan. Several relevant groups and projects are summarized below:

- **Kaskaskia Watershed Association:** The Kaskaskia Watershed Association partners across the watershed to protect the watershed and balance navigation, recreation, water supply, and conservation. Recent projects include the establishment of an Illinois conservation 2000 Ecosystem Partnership with the IDNR for financial support on 88 projects within the larger Kaskaskia River watershed, as well as development of a comprehensive watershed management strategy. The Kaskaskia Watershed Association hosts an Annual Summit where regional leaders and stakeholders share knowledge and information about ongoing and future water quality concerns. The association also developed the Kaskaskia River Watershed Study (Southwestern Illinois RC&D, Inc. 2002) to begin a coordinated restoration process, based on sound ecosystem principles, for the Kaskaskia River Watershed, in Central and Southwestern Illinois.

- **Heartlands Conservancy:** Dedicated to protecting open spaces, farmland, and cultural assets in Southwestern Illinois, the Heartlands Conservancy provide consultation, support, funding, and outreach activities to local communities and partners. Their work involves a wide range of ongoing projects, including the purchase and preservation of conservation easements, targeted BMP implementation, regional watershed and ecological planning support, and a wide range of education and outreach activities for local communities. Heartlands also supports and partners with many local organizations and supports the KWA's annual conference.

- **The Kaskaskia Project:** An ongoing University of Illinois Urbana-Champaign project study is currently researching the impact of existing and projected environmental and socio-cultural stressors on agro-ecosystem services in the Kaskaskia River watershed. More information on this project is available on their website (https://publish.illinois.edu/kaskaskia/).

The efforts of these organizations will be essential to the success of this implementation plan. Local organizations with a legacy of positive community and watershed impact are more likely to encounter support and acceptance from local communities.

Technical and financial assistance, as summarized in Section 8.4, provides the resources needed to improve water quality and meet watershed goals. Additional assurance can be achieved in implementation of the TMDLs through contracts, memorandums of understanding, and other similar agreements, especially for BMPs that receive outside funds and cost share. The recommendations in this implementation plan can reasonably be achieved by the continued efforts from appropriate local and regional groups and the engagement of agricultural communities.

9 Public Participation

A public meeting was held on December 12, 2018, at the Carlyle Lake Visitor Center in Carlyle, IL to present the Stage 1 report and findings. A public notice was placed on the Illinois EPA website. There were many stakeholders present including representatives from the US Army Corps of Engineers, the Kaskaskia Watershed Association, and the Original Kaskaskia Area Wilderness, Inc. The public comment period closed on January 12, 2019. A comment provided by the Illinois Department of Transportation and response are below.

> Illinois Department of Transportation comment: "…. Six chloride samples were collected between 2007 and 2012 in Lake Fork (IL_OW-01 & IL_OW-02). One sample exceeded the general water quality standard for chloride. I suggest IEPA continue to collect data to see if this exceedance was an anomaly. If a TMDL is developed for chloride, IDOT requests to be included in the TMDL calculations."
>
> Response: IEPA will continue to monitor Lake Fork as part of their Intensive Basin Survey program which is conducted on a five-year rotation. At this time, a chloride TMDL is proposed. Illinois Department of Transportation will be included as a permitted MS4 entity if that applies; IEPA will further communicate with Illinois Department of Transportation during the Stage 3 TMDL development process.

A virtual public meeting was held on xxxxx at the xxxxx to present the Stage 3 report and findings. A public notice was placed on the Illinois EPA website. The public comment period closed on xxxxx. Comments and response to comments are provided in Appendix D.

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Appendix A – Stage 1 Report

Upper Kaskaskia River and Lake Fork Watershed Total Maximum Daily Load

Final Stage 1 Report

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Report Prepared by:

TETRA TECH

February 2019

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Acronyms and Abbreviations

AFOs	animal feeding operations
AWQMN	Ambient Water Quality Monitoring Network
CAFO	confined animal feeding operation
CWA	Clean Water Act
Illinois EPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
MGD	millions of gallons per day
MS4	municipal separate storm sewer system
NOAA	National Oceanic and Atmospheric Administration
NPDES	National Pollutant Discharge Elimination System
STP	sewage treatment plant
TMDL	total maximum daily load
U.S. EPA	United States Environmental Protection Agency
USGS	United States Geological Survey
WQS	water quality standards
WWTP	wastewater treatment plant

1. Introduction

The Clean Water Act and U.S. Environmental Protection Agency (U.S. EPA) regulations require that Total Maximum Daily Loads (TMDLs) be developed for waters that do not support their designated uses. In simple terms, a TMDL is a plan to attain and maintain water quality standards in waters that are not currently meeting standards. This TMDL study addresses a portion of the Upper Kaskaskia River watershed in central Illinois. The project area, referred to as the Upper Kaskaskia River and Lake Fork watershed, is approximately 243 square miles and includes impairments in the Lake Fork and the Upper Kaskaskia River (Figure 1). A TMDL study has been completed in the larger Upper Kaskaskia River major watershed and relevant information from the study is included herein where applicable (Tetra Tech 2018 draft).

1.1 TMDL Development Process

The TMDL process establishes the allowable loading of pollutants or other quantifiable parameters for a waterbody based on the relationship between pollution sources and instream conditions. This allowable loading represents the maximum quantity of the pollutant that the waterbody can receive without exceeding water quality standards. The TMDL also includes a margin of safety, which reflects uncertainty as well as the effects of seasonal variation. By following the TMDL process, States can establish water quality-based controls to reduce pollution from both point and nonpoint sources, and restore and maintain the quality of their water resources (U.S. EPA 1991).

The Illinois EPA will be working with stakeholders to implement the necessary controls to improve water quality in the impaired waterbodies and meet water quality standards. It should be noted that the controls for nonpoint sources (e.g., agriculture) will be strictly voluntary.

1.2 Water Quality Impairments

Several waters in the Upper Kaskaskia River and Lake Fork watersheds have been placed on the State of Illinois §303(d) list (Table 1 and Figure 1) and require development of TMDLs. This TMDL project is intended to address documented water quality problems in these watersheds.

Table 1. Upper Kaskaskia River and Lake Fork watershed impairments and pollutants (2016 Illinois 303(d) Draft List)

Name	Segment ID	Segment Length (Miles)	Watershed Area (Sq. Miles)	Designated Uses	TMDL Parameters
Kaskaskia River	O-35	15.25	72	Aquatic Life	Dissolved Oxygen, *pH*
Lake Fork	OW-01	9.72	171	Aquatic Life	Chloride, Dissolved Oxygen
Lake Fork	OW-02	4.91	150	Aquatic Life	Chloride, Dissolved Oxygen

Italics – Based on evaluation of the last ten years of available data (2007–2016), it was determined that Kaskaskia River segment O-35 is not impaired for pH (see Appendix A – Unimpaired Stream Data Analysis).

1.3 TMDL Endpoints

This section presents information on the water quality standards (WQS) that are used for TMDL endpoints. WQS are designed to protect beneficial uses. The authority to designate beneficial uses and adopt WQS is granted through Title 35 of the Illinois Administrative Code. Designated uses to be protected in surface waters of the state are defined under Section 303, and WQS are designated under Section 302 (Water Quality Standards). Designated uses and WQS are discussed below.

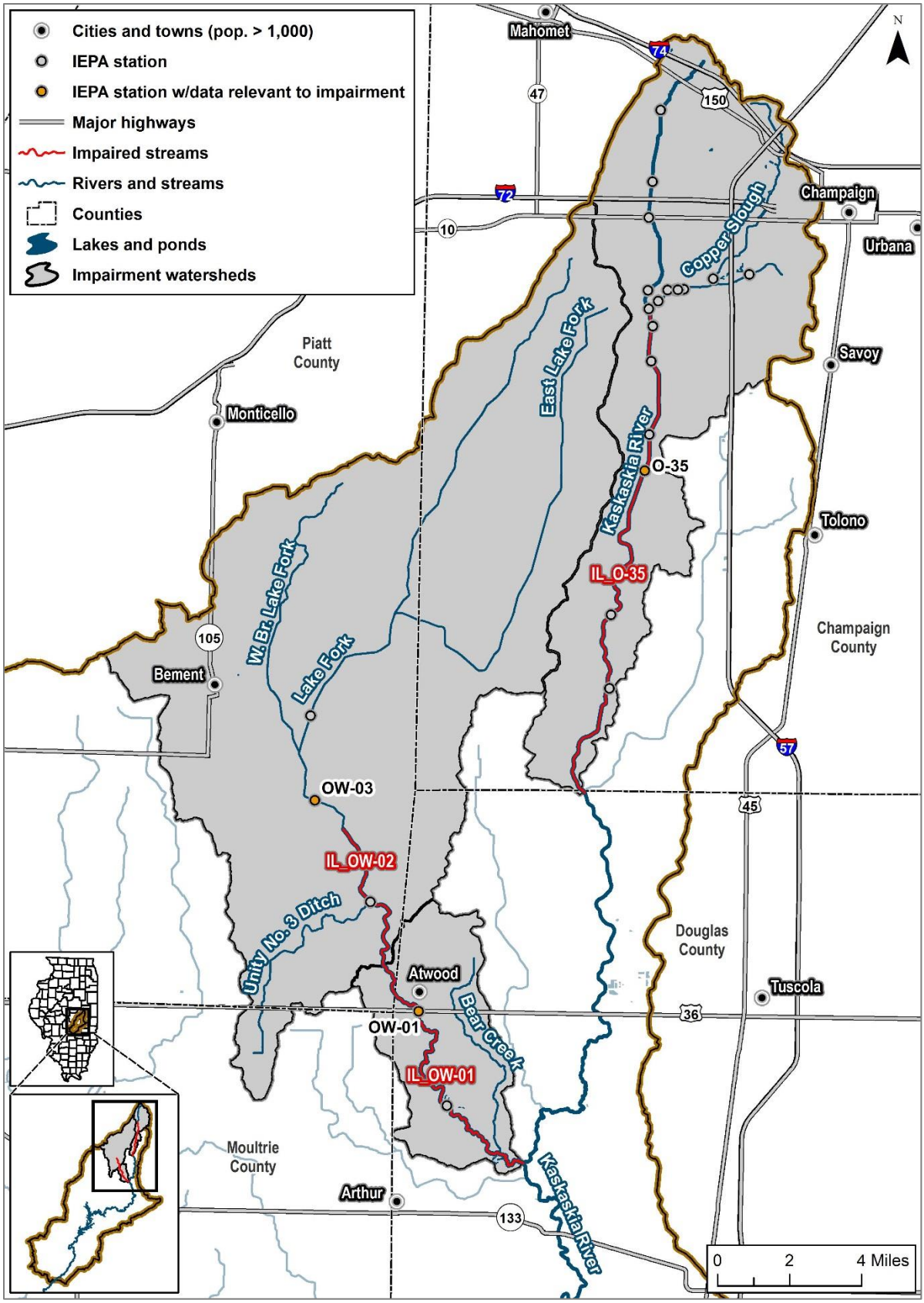

Figure 1. Upper Kaskaskia River and Lake Fork watershed, TMDL project area.

1.3.1 Designated Uses

Illinois EPA uses rules and regulations adopted by the Illinois Pollution Control Board (IPCB) to assess the designated use support for Illinois waterbodies. The following are the use support designations provided by the IPCB that apply to waterbodies in the Upper Kaskaskia River and Lake Fork watershed:

General Use Standards – These standards protect for aquatic life, wildlife, agricultural uses, primary contact (where physical configuration of the waterbody permits it, any recreational or other water use in which there is prolonged and intimate contact with the water involving considerable risk of ingesting water in quantities sufficient to pose a significant health hazard, such as swimming and water skiing), secondary contact (any recreational or other water use in which contact with the water is either incidental or accidental and in which the probability of ingesting appreciable quantities of water is minimal, such as fishing, commercial and recreational boating, and any limited contact incident to shoreline activity), and most industrial uses. These standards are also designed to ensure the aesthetic quality of the state's aquatic environment.

1.3.2 Water Quality Standards and TMDL Endpoints

Environmental regulations for the State of Illinois are contained in the Illinois Administrative Code, Title 35. Specifically, Title 35, Part 302 contains water quality standards promulgated by the IPCB. This section presents the standards applicable to impairments in the study area. Water quality standards are the endpoints to be used for TMDL development in the Upper Kaskaskia River and Lake Fork watershed (Table 2).

Table 2. Summary of water quality standards for the Upper Kaskaskia River and Lake Fork watersheds

Parameter	Units	General Use Water Quality Standard
Chloride	mg/L	500
Dissolved Oxygen [a]	mg/L	March-July > 5.0 min. and > 6.0- 7-day mean Aug-Feb > 3.5 min, > 4.0- 7-day mean and > 5.5- 30-day mean

a. Applies to the dissolved oxygen concentration in the main body of all streams, in the water above the thermocline of thermally stratified lakes and reservoirs, and in the entire water column of unstratified lakes and reservoirs.

Aquatic life use assessments in streams are typically based on the interpretation of biological information, physicochemical water data and physical-habitat information from the Intensive Basin Survey, Ambient Water Quality Monitoring Network or Facility-Related Stream Survey programs. The primary biological measures used are the fish Index of Biotic Integrity (fIBI; Karr et al. 1986; Smogor 2000, 2005), the macroinvertebrate Index of Biotic Integrity (mIBI; Tetra Tech 2004) and the Macroinvertebrate Biotic Index (MBI; Illinois EPA 1994). Physical habitat information used in assessments includes quantitative or qualitative measures of stream bottom composition and qualitative descriptors of channel and riparian conditions. Physicochemical water data used include measures of ―conventional parameters (e.g., dissolved oxygen, pH and temperature), priority pollutants, non-priority pollutants, and other pollutants (USEPA 2002 and www.epa.gov/waterscience/criteria/wqcriteria.html). In a minority of streams for which biological information is unavailable, aquatic life use assessments are based primarily on physicochemical water data.

When a stream segment is determined to be Not Supporting aquatic life use, generally, one exceedance of an applicable Illinois WQS (related to the protection of aquatic life) results in identifying the parameter as a potential cause of impairment. Additional guidelines used to determine potential causes of impairment

include site-specific standards (35 Ill. Adm. Code 303, Subpart C), or adjusted standards (published in the ICPB's Environmental Register at http://www.ipcb.state.il.us/ecll/environmentalregister.asp).

2. Watershed Characterization

The Upper Kaskaskia River and Lake Fork watershed is located in central Illinois (Figure 1). The headwaters begin near Champaign, IL. Lake Fork joins the Upper Kaskaskia river upstream of Shelbyville Lake and the Kaskaskia River eventually joins the Mississippi River south of St. Louis, Missouri. A TMDL has recently been developed for the larger Upper Kaskaskia River watershed (Tetra Tech 2018 draft) and much of the information presented in that report is applicable to the Upper Kaskaskia River and Lake Fork project area. There have been no known changes in the project area, therefore the Upper Kaskaskia River Watershed TMDL provides much of the basis for the watershed characterization and source assessment for the Upper Kaskaskia River and Lake Fork project area below.

2.1 Jurisdictions and Population

Relevant information on jurisdictions and population can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft). The project area is located in Champaign, Douglas, Moultrie and Piatt counties, with the city of Champaign located in the headwaters of the Upper Kaskaskia River and the villages of Atwood and Bement draining to Lake Fork.

2.2 Climate

In general, the climate of the region is continental with hot, humid summers and cold winters. Relevant information on climate can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft).

2.3 Land Use and Land Cover

Relevant information on land use and land cover can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft). Cultivated crops make up the majority of the land cover in the project area. Developed areas are also present surrounding Champaign, Atwood and Bement.

2.4 Topography

Relevant information on topography can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft).

2.5 Soils

Relevant information on soils can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft). Soils are primarily silt loam or loam with moderate infiltration rates when there is no high water table. Much of the area appears to have a high water table that has been drained through agricultural tiling.

2.6 Hydrology

Relevant information on hydrologic conditions can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft). Active U.S. Geological Survey (USGS) flow gage sites are located along Lake Fork segment OW-01 (05590800) and downstream of Upper Kaskaskia River segment O-35 (05590520).

2.7 Watershed Studies and Information

Relevant information for this section can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft). In addition, the U.S. Army Corps of Engineers completed a river morphology study of Kaskaskia River (USACE 2010). County soil and water conservation districts and health departments were contacted for additional information; no new information was provided.

3. Watershed Source Assessment

Source assessments are an important component of water quality management plans and TMDL development. This section provides a summary of potential sources that contribute listed pollutants to the Upper Kaskaskia River and Lake Fork project area.

3.1 Pollutants of Concern

Pollutants of concern evaluated in this source assessment include chloride and parameters influencing dissolved oxygen such as biochemical oxygen demand, phosphorus, and ammonia. These pollutants can originate from an array of sources including point and nonpoint sources. Eutrophication (high levels of algae) is also often linked directly to low dissolved oxygen conditions and therefore nutrients are also a pollutant of concern. Point sources typically discharge at a specific location from pipes, outfalls, and conveyance channels. Nonpoint sources are diffuse sources that have multiple routes of entry into surface waters, particularly overland runoff. This section provides a summary of potential point and nonpoint sources that contribute to the impaired waterbodies.

3.2 Point Sources

Point source pollution is defined by the Federal Clean Water Act (CWA) §502(14) as:

> *"any discernible, confined and discrete conveyance, including any ditch, channel, tunnel, conduit, well, discrete fissure, container, rolling stock, concentrated animal feeding operation [CAFO], or vessel or other floating craft, from which pollutants are or may be discharged. This term does not include agriculture storm water discharges and return flow from irrigated agriculture."*

Under the CWA, all point sources are regulated under the NPDES program. A municipality, industry, or operation must apply for an NPDES permit if an activity at that facility discharges wastewater to surface water. Point sources can include facilities such as municipal wastewater treatment plants (WWTPs), industrial facilities, CAFOs, or regulated storm water including municipal separate storm sewer systems (MS4s). There are no permitted CAFOs in the watershed.

There are seven individual NPDES permitted facilities in the Upper Kaskaskia and Lake Fork project area (Table 3). Average and maximum design flows and downstream impairments are included in the facility

summaries. Three industrial wastewater facilities and one municipal wastewater facility drain to tributaries to Kaskaskia River segment O-35. One municipal wastewater facility drains directly to Lake Fork OW-01 and one municipal and one industrial facility drains to tributaries to OW-02. All facilities with the exception of Atwood Village STP (IL0025097) in Table 3 discharge to upstream unimpaired tributaries and are therefore not contributing to project impairments.

Table 3. Individual NPDES permitted facilities discharging to impaired segments

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Impairment(s)	Average Design Flow (MGD)	Maximum Design Flow (MGD)
IL0004227	*KRAFT FOODS GLOBAL-CHAMPAIGN*	*Stormwater and non-contact cooling water*	*COPPER SLOUGH*	*O-35*	*0.289*	--
IL0025097	ATWOOD, VILLAGE OF	STP	LAKE FORK BRANCH OF KASKASKIA RIVER	OW-01	0.2	0.5
IL0031526	*URBANA-CHAMPAIGN SD SW STP*	*STP*	*COPPER SLOUGH*	*O-35*	*7.98*	*17.25*
IL0032549	*BEMENT, VILLAGE OF*	*STP*	*UNNAMED TRIB OF W BRANCH LAKE FORK*	*OW-02, OW-01*	*0.176*	*0.480*
IL0062812	*MARATHON PETROLEUM-CHAMPAIGN*	*Hydrostatic test water and stormwater*	*UNNAMED DITCH*	*O-35*	*0.0073 (sum of outfall 001 and 002)*	--
IL0067202	*COMMERICAL FLOORING, INC*	*Treated sanitary waste and water soften backwash*	*UNNAMED STREAM TRIB TO KASKASKIA RV*	*O-35*	*0.008*	--
ILG640209	*IVESDALE, VILLAGE OF*	*Public water supply*	*EAST LAKE FORK OF KASKASKIA RIVER*	*OW-02, OW-01*	*0.0014*	--

Italics – NPDES facility draining to unimpaired segment.
STP – Sewage treatment plant
MGD – Million gallons per day

There are three MS4 communities and two MS4 road authorities discharging to unimpaired tributaries to Kaskaskia River segment O-35 and are therefore not contributing to project impairments. Additional information on existing permitted sources can be found in the Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft).

3.3 Nonpoint Sources

The term nonpoint source pollution is defined as any source of pollution that does not meet the legal definition of point sources. Nonpoint source pollution typically results from overland stormwater runoff that is diffuse in origin, as well as background conditions. It should be noted that stormwater collected and conveyed through a regulated MS4 is considered a controllable point source. As part of the water resource assessment process, Illinois EPA has identified several sources as contributing to the Upper Kaskaskia River and Lake Fork watershed impairments (Table 4). These sources include channelization that is a non-pollutant source. Channelization can result in low dissolved oxygen conditions due to lack of in-stream structure that would reaerate the water column. Nonpoint pollutant sources potentially contributing to chloride and low dissolved oxygen impairments include stormwater and agricultural runoff (including road salt application), onsite wastewater treatment systems, and animal agriculture activities.

Table 4. Potential sources in project area based on the draft 2016 305(b) report

Watershed	Segment	Sources
Kaskaskia River	O-35	Channelization and source unknown
Lake Fork	OW-01	Channelization, crop production (crop land or dry land), and source unknown
Lake Fork	OW-02	Channelization, crop production (crop land or dry land), and source unknown

3.3.1 Stormwater Runoff

During wet-weather events (snowmelt and rainfall), pollutants are incorporated into runoff and can be delivered to downstream waterbodies. The resultant pollutant loads are linked to the land uses and practices in the watershed. Agricultural and developed areas can have significant effects on water quality if proper best management practices are not in place, specifically contributing to high biochemical oxygen demand and nutrients that can affect the dissolved oxygen conditions in streams. The application and storage of road salt is often linked to high chloride concentrations in streams.

In addition to pollutants, alterations to a watershed's hydrology as a result of land use changes, ditching, and stream channelization can detrimentally affect habitat and biological health. Imperviousness associated with developed land uses and agricultural field tiling can result in increased peak flows and runoff volumes and decreased base flow as a result of reduced ground water discharge. Drain tiles also transport agricultural runoff directly to ditches and streams, whereas runoff flowing over the land surface may infiltrate to the subsurface and may flow through riparian areas.

3.3.2 Onsite Wastewater Treatment Systems

Onsite wastewater treatment systems (e.g., septic systems) that are properly designed and maintained should not serve as a source of contamination to surface waters. However, onsite systems do fail for a variety of reasons. Common soil-type limitations which contribute to failure include seasonally high water tables, compact glacial till, bedrock, and fragipan. When these septic systems fail hydraulically (surface breakouts) or hydrogeologically (inadequate soil filtration) there can be adverse effects to surface waters (Horsley and Witten 1996). Septic systems contain all the water discharged from homes and business and can be significant sources of pollutants.

Relevant information for this section can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft). County health departments were contacted for information on septic systems and unsewered communities; no new information was provided.

3.3.3 Animal Feeding Operations (AFOs)

Animal feeding operations that are not classified as CAFOs are known as animal feeding operations (AFOs) in Illinois. Non-CAFO AFOs are considered nonpoint sources by U.S. EPA. AFOs in Illinois do not have state permits. However, they are subject to state livestock waste regulations and may be inspected by the Illinois EPA, either in response to complaints or as part of the Agency's field inspection responsibilities to determine compliance by facilities subject to water pollution and livestock waste regulations. The animals raised in AFOs produce manure that is stored in pits, lagoons, tanks and other storage devices. The manure is then applied to area fields as fertilizer. When stored and applied properly, this beneficial re-use of manure provides a natural source for crop nutrition. It also lessens the need for fuel and other natural resources that are used in the production of fertilizer.

AFOs, however, can pose environmental concerns, including the following:

- Manure can leak or spill from storage pits, lagoons, tanks, etc.
- Improper application of manure can contaminate surface or ground water.
- Manure over application can adversely impact soil productivity.

Livestock are potential sources of bacteria and nutrients to streams, particularly when direct access is not restricted and/or where feeding structures are located adjacent to riparian areas. Watershed specific data are not available for livestock populations. However, county wide data available from the 2012 Census of Agriculture were downloaded and area weighted to estimate the animal population in the project area. An estimated 6,615 animals are in the project area.

4. Water Quality

Background information on water quality monitoring can be found in the recently completed Upper Kaskaskia River Watershed Total Maximum Daily Load and Load Reduction Strategies report (Tetra Tech 2018 draft). In the Upper Kaskaskia River and Lake Fork watershed, water quality data were found for numerous stations that are part of the Illinois EPA Ambient Water Quality Monitoring Network (AWQMN). Monitoring stations with data relevant to the impaired segments are presented in Figure 1 and Table 5. Parameters sampled in the streams include field measurements (e.g., water temperature) as well as those that require lab analyses (e.g., nutrients, chloride).

The most recent 10 years of data collection, 2007–2016, were used to evaluate impairment status. Data that are greater than 10 years old are not included. Each data point was reviewed to ensure the use of quality data in the analysis below. Many sites have historical data that are greater than 10 years old. Data were obtained directly from Illinois EPA.

Table 5. Upper Kaskaskia River and Lake Fork watershed water quality data

Waterbody	Impaired Segment	AWQMN Sites	Location	Period of Record
Kaskaskia River	O-35	O-35	RM 283.1, Co Rd. 900N Br. 3 Mi. N of Sadorus	*2002*, 2007, 2012
Lake Fork	OW-01	OW-01	RT 36 Br. at Atwood	*2002*, 2007, 2012
	OW-02	OW-03	5 Mi. NW Atwood	2007

Italics – Data are greater than 10 years old
RM – River Mile

An important step in the TMDL development process is the review of water quality conditions, particularly data and information used to list segments. Examination of water quality monitoring data is a key part of defining the problem that the TMDL is intended to address. This section provides a brief review of available water quality information provided by the Illinois EPA.

4.1 Kaskaskia River (O-35)

Kaskaskia River is impaired for aquatic life due to low levels of dissolved oxygen. One Illinois EPA sampling site is present on segment O-35 of the Kaskaskia River (Table 6 and Figure 2). Six samples were collected at the site from 2007–2012, and continuous data were collected in 2012 and 2017. The violations of the general use water quality standard verify impairment.

Table 6. Data summary, Kaskaskia River O-35

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	CV (standard deviation/ average)	Number of exceedances of general use water quality standard (>5 mg/L (Mar-Jul) and >3.5 mg/L (Aug-Feb))
Dissolved Oxygen						
O-35	6	4.4	7.5	11.4	0.36	1

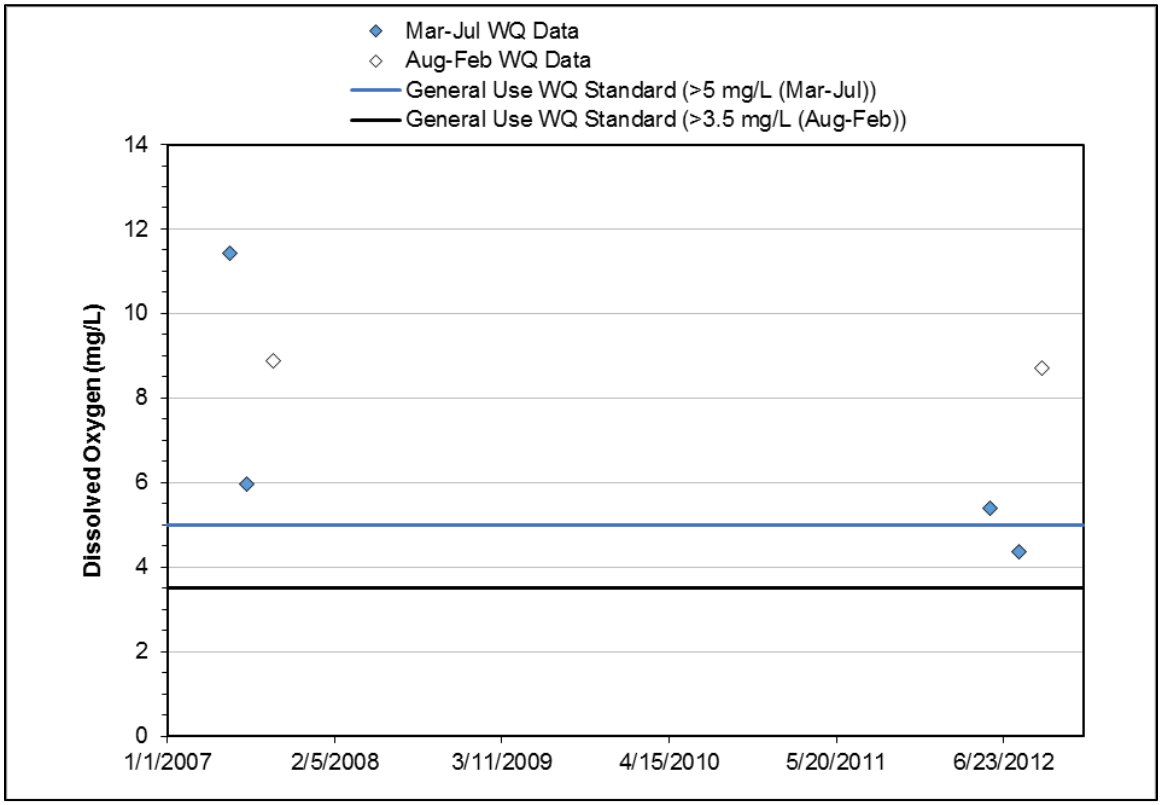

Figure 2. Dissolved oxygen water quality time series, Kaskaskia River O-35 segment.

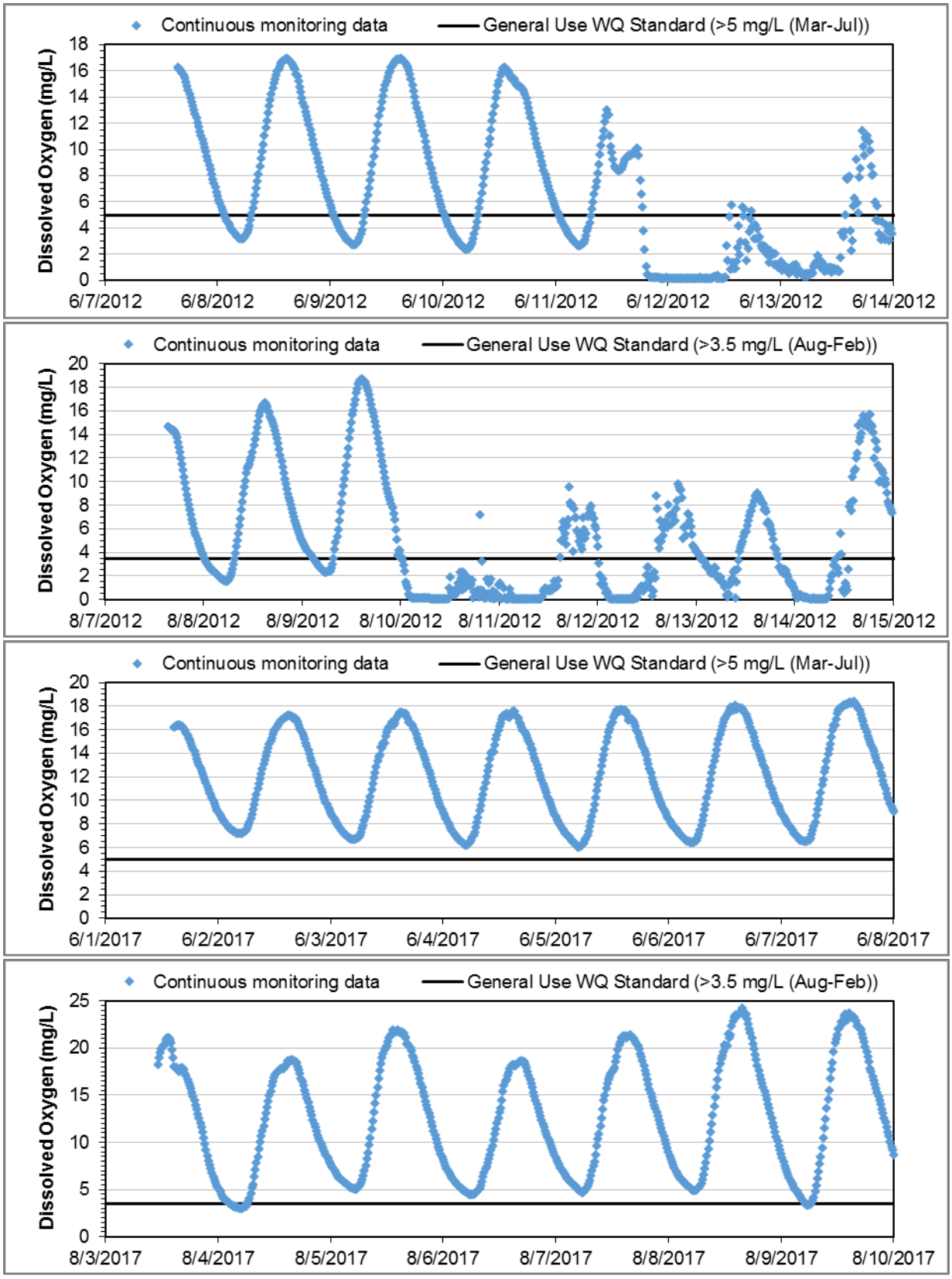

Figure 3. Continuous water quality time series for dissolved oxygen, Kaskaskia River O-35 segment.

Further review of available data was conducted to determine the cause of impairment:

- **Point Sources:** There are no point sources contributing to the impaired segment. All point sources are located upstream of the impaired segment and discharge into unimpaired segments based on available data. Point sources are not likely contributing to the O-35 low dissolved oxygen impairment.

- **Eutrophication:** Dissolved oxygen data was paired with phosphorus and chlorophyll-a data to determine if eutrophication is contributing to low dissolved oxygen conditions. Data older than 10 years were included in the analysis based on the assumption that conditions have not changed along the segment. Phosphorus versus dissolved oxygen data collected from 2002–2012 does not indicate a strong correlation (Figure 4). Chlorophyll-*a* and dissolved oxygen data collected from 2002–2007 show a weak correlation, however, chlorophyll-*a* values are very low and do not indicate eutrophic conditions (Figure 5).

- **Physical Properties:** There is only one monitoring station on the segment with relevant data, and that station represents the upper part of the stream segment referred to as Kaskaskia Ditch. Kaskaskia Ditch is small and highly ditched and channelized based on review of air photos.

Although the impairment has been verified, a strong link to a pollutant is not present. Additional data could be collected to further evaluate the cause and extent of impairment.

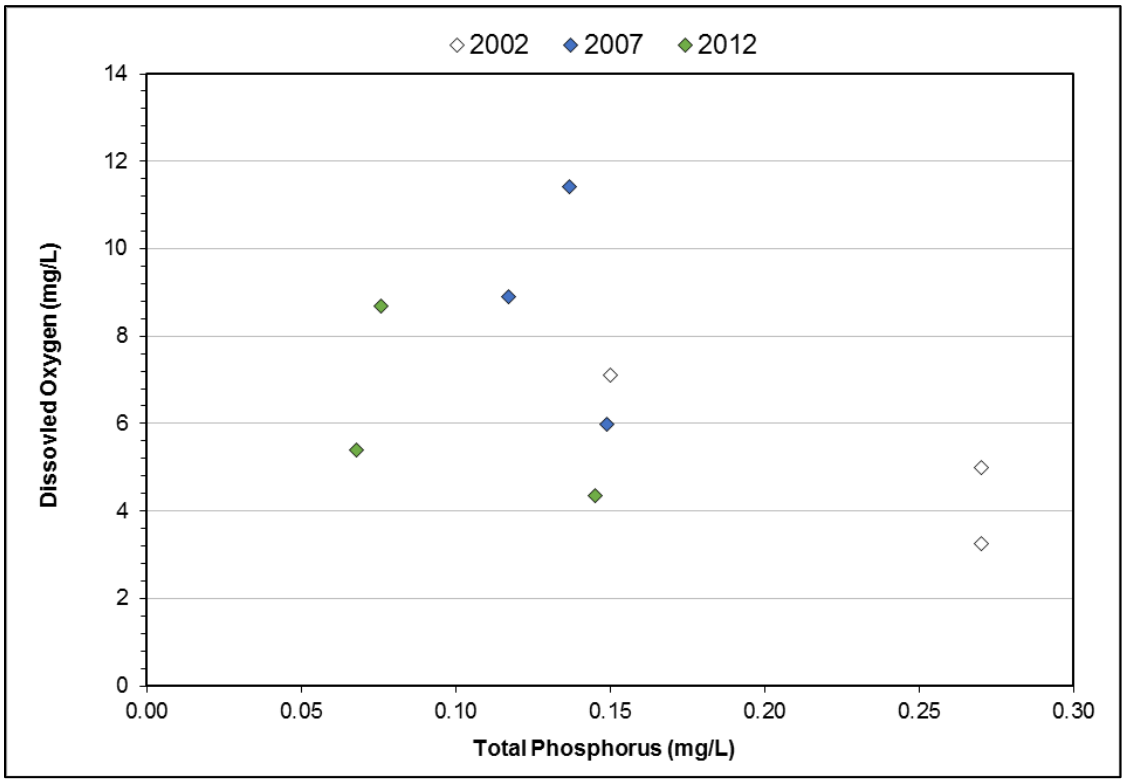

Figure 4. Total phosphorus versus dissolved oxygen, 2002–2012, Kaskaskia River O-35 segment.

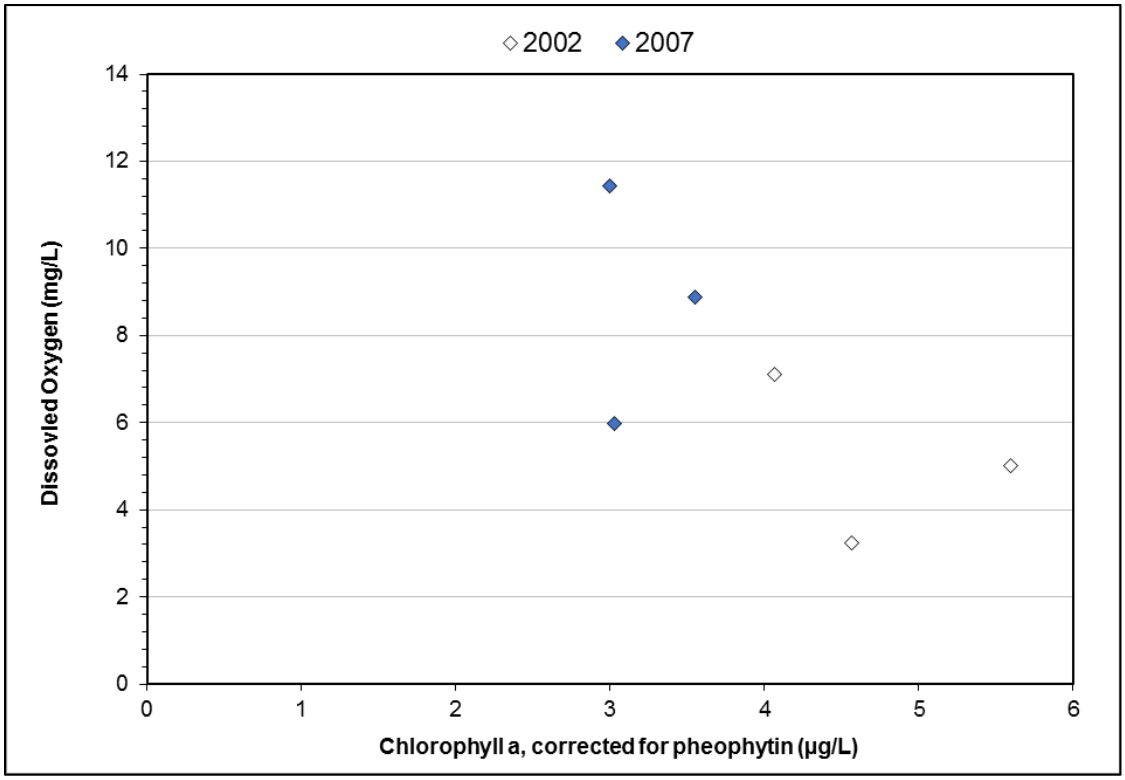

Figure 5. Chlorophyll-a versus dissolved oxygen, 2002–2007, Kaskaskia River O-35 segment.

4.2 Lake Fork (OW-01, OW-02)

Lake Fork is listed impaired for aquatic life due to low dissolved oxygen and elevated levels of chloride along two segments: OW-01 and OW-02. There is one Illinois EPA sampling site located on segment OW-01 (sampling site OW-01) and one Illinois EPA sampling site located one mile upstream of segment OW-02 (sampling site OW-03). There are no data available for OW-02; however, data collected at OW-01 were used by Illinois EPA to assess and determine impairment in OW-02. The proximity of station OW-01 to segment OW-02 enables assessment of these adjoining segments with equal weight. Aquatic life use assessments can be made within approximately 10 miles upstream and downstream from the sample site for wadable streams and 25 miles for unwadable streams (IEPA 2016).

Six chloride and dissolved oxygen samples were collected on OW-01 between 2007 and 2012, and 3 samples were collected on OW-03 in 2007 (Table 7, Figure 6 and Figure 7). One exceedance of the general use water quality standard for chloride was observed in August 2012 at OW-01, with an additional sample close to the standard during the following month. The one chloride exceedance confirms aquatic life use impairment on segments OW-01 and OW-02. Chloride concentrations do not exceed the standard upstream of the impaired segments at OW-03. The timing of chloride sample collection is important to fully understand the sources and pathways of chloride movement in the watershed. Currently, all available data were collected between May through September; there are no available winter data. Additional sampling should be completed during spring melt and winter months to determine pollutant sources.

Multiple violations of the general use standard for dissolved oxygen were observed at OW-01 in August of 2012 and 2017 (Figure 8), and the dissolved oxygen impairments on segments OW-01 and OW-02 are confirmed. No violations of the standard were observed upstream of the impaired segments at OW-03; therefore, point sources are not likely contributing to any impairment along OW-02. Available

phosphorus data were evaluated to determine if eutrophication was contributing to low dissolved oxygen conditions; however, no correlation was found between phosphorus and dissolved oxygen (Figure 9).

Table 7. Data summary, Lake Fork OW-01 and OW-02 segments

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	CV (standard deviation/ average)	Number of exceedances of general use water quality standard (500 mg/L)
Chloride						
OW-01	6	36	256	876	1.37	1
OW-03 (upstream of OW-02)	3	29	53	91	0.63	0
Sample Site	**No. of samples**	**Minimum (mg/L)**	**Average (mg/L)**	**Maximum (mg/L)**	**CV (standard deviation/ average)**	**Number of exceedances of general use water quality standard (>5 mg/L (Mar-Jul) and >3.5 mg/L (Aug-Feb))**
Dissolved Oxygen						
OW-01	6	4.6	7.5	13.6	0.44	1
OW-03 (upstream of OW-02)	3	7.2	9.1	10.2	0.18	0

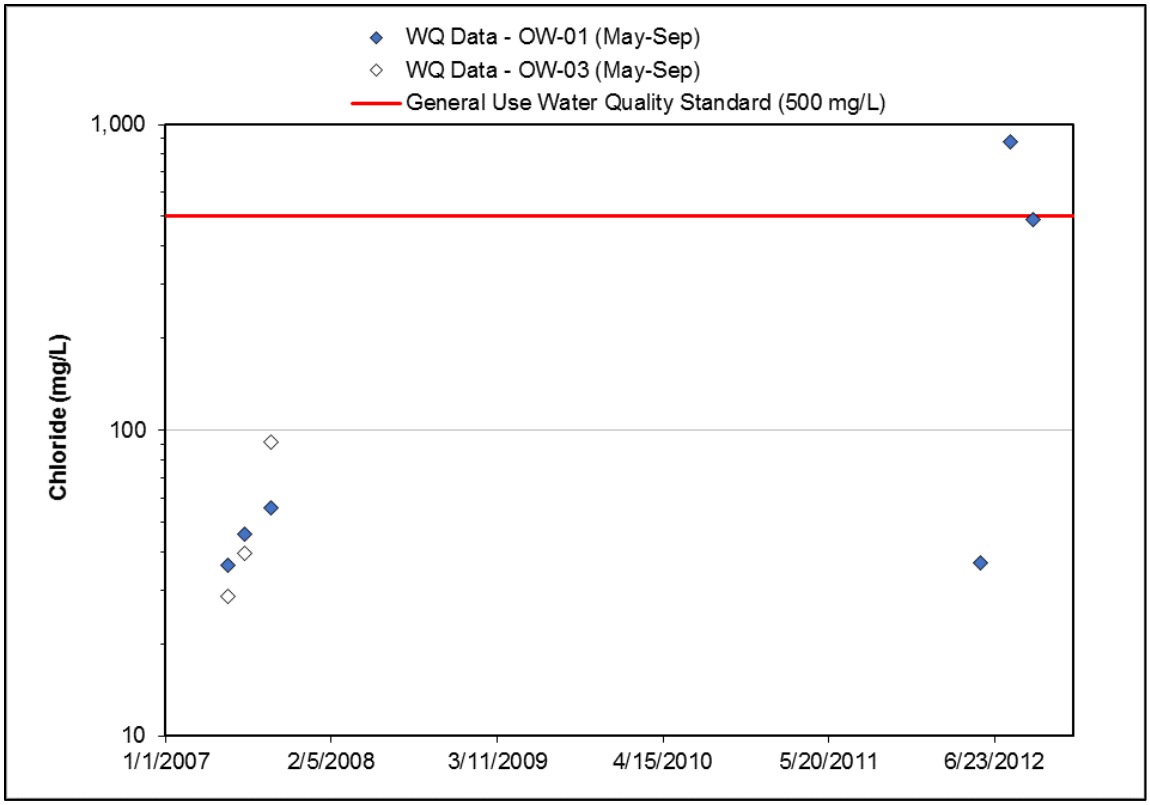

Figure 6. Chloride water quality time series, Lake Fork.

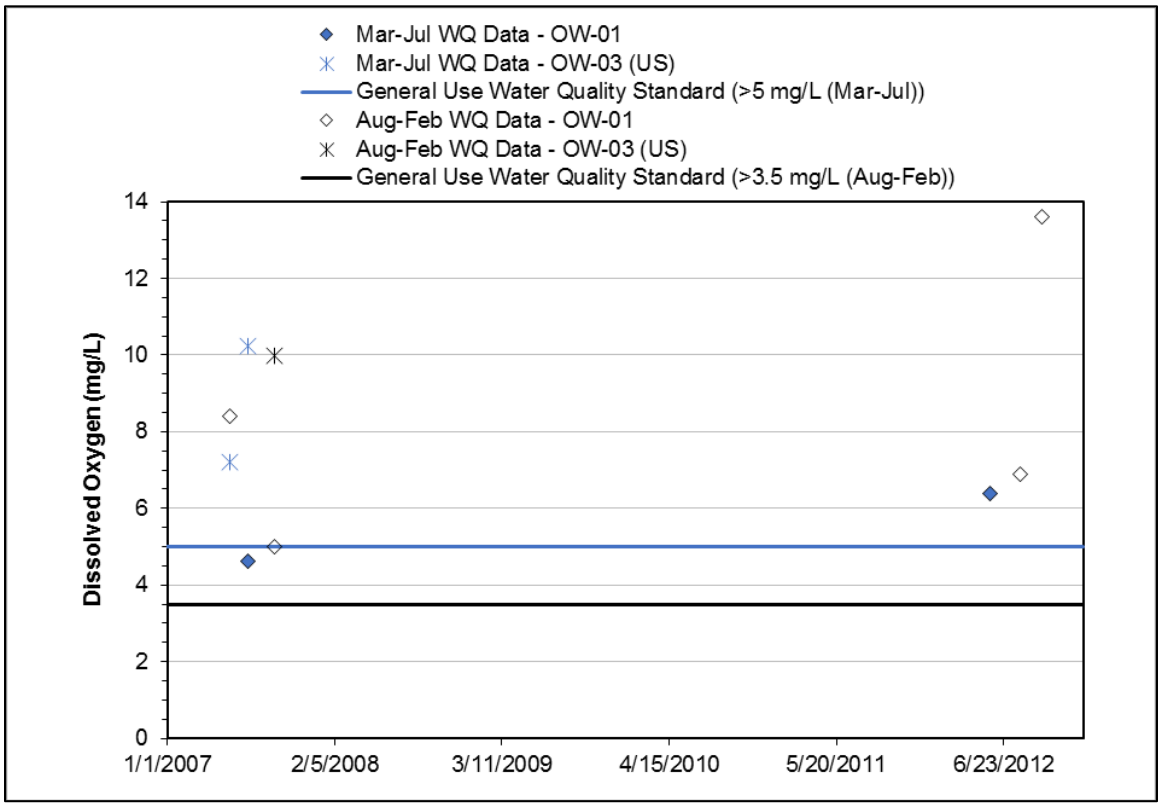

Figure 7. Dissolved oxygen water quality time series, Lake Fork.

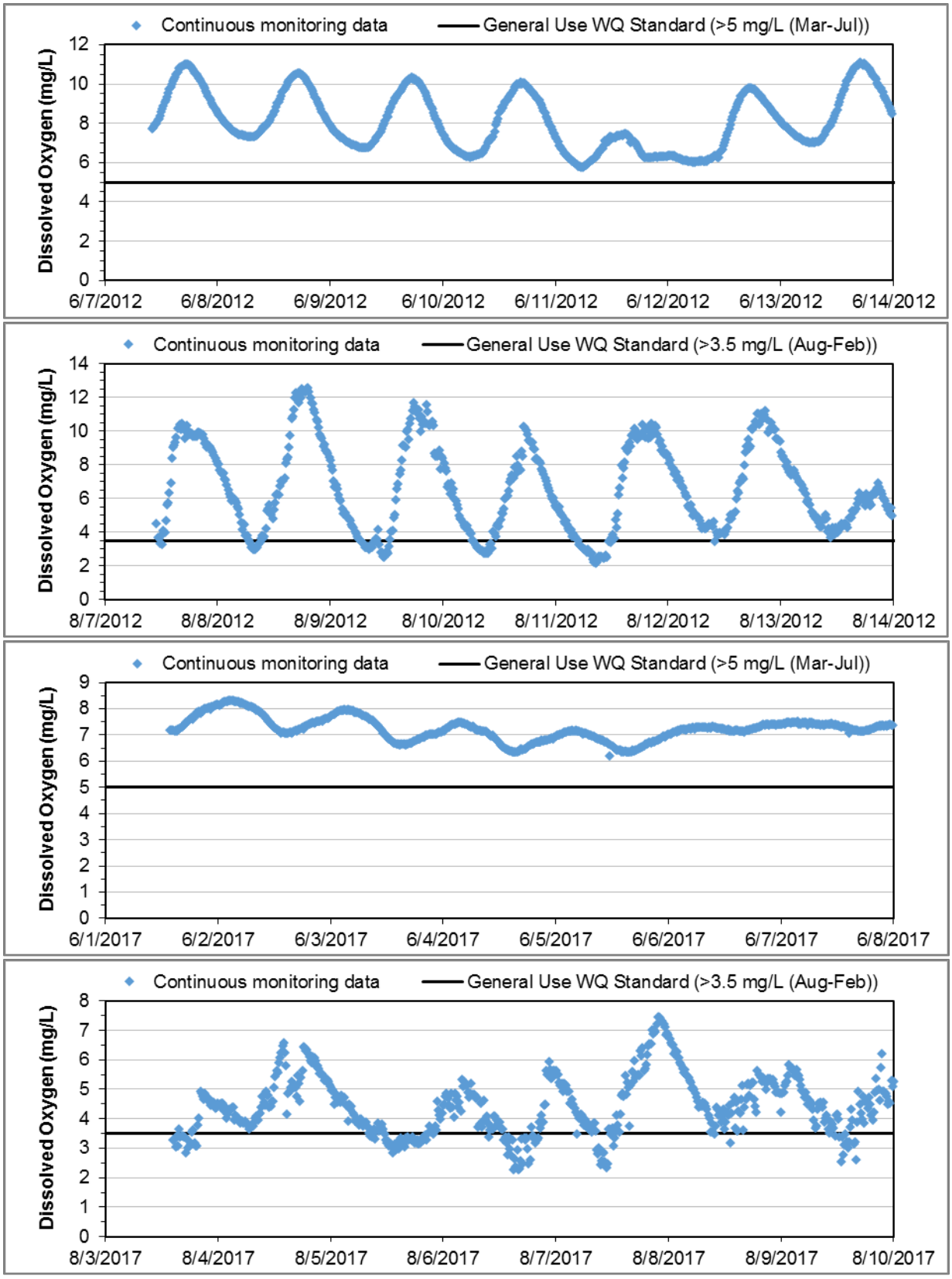

Figure 8. Continuous water quality time series for dissolved oxygen, Lake Fork OW-01 segment.

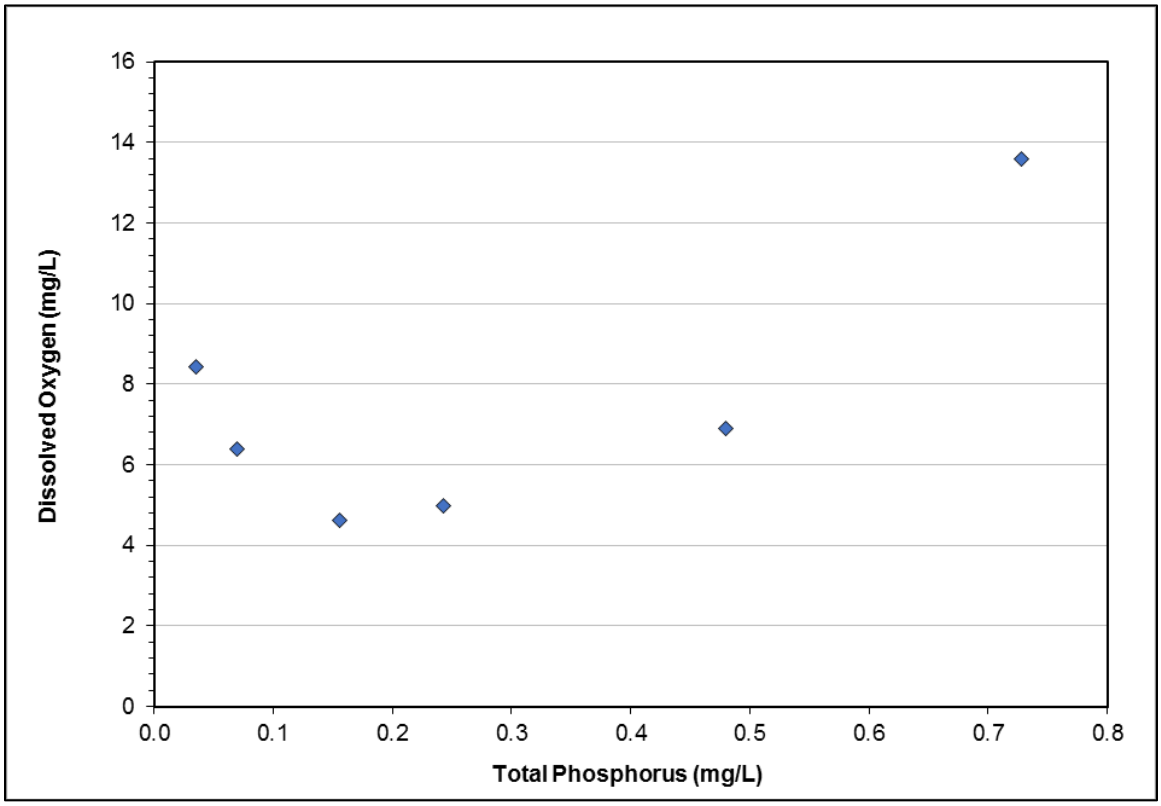

Figure 9. Total phosphorus versus dissolved oxygen, Lake Fork OW-01 segment.

5. TMDL Methods and Data Needs

The first stage of this project assesses of available data followed by evaluation of their credibility. The types of data available, their quantity and quality, and their spatial and temporal coverage relative to impaired segments or watersheds drive the approaches used for TMDL model selection and analysis. Credible data are those that meet specified levels of data quality, with acceptance criteria defined by measurement quality objectives, specifically their precision, accuracy, bias, representativeness, completeness, and reliability. The following sections describe the methods that will be used to derive TMDLs and the additional data needed to develop credible TMDLs.

5.1 Stream Impairments

TMDLs are proposed for segments with verified impairments and known pollutants (Table 8). A duration curve approach is suggested to evaluate the relationships between hydrology and water quality and calculate the TMDLs for chloride impairments. The Qual2K model is proposed to evaluate low dissolved oxygen Lake Fork OW-01, and additional monitoring is needed to verify impairment in Lake Fork OW-02 prior to model selection. Water quality analysis did not identify a pollutant that is causing the low dissolved oxygen impairment in O-35.

Table 8. Proposed Model Summary

Name	Segment ID	Designated Uses	TMDL Parameter(s)	Proposed Model	Proposed Pollutant
Kaskaskia River	O-35	Aquatic life	Dissolved Oxygen	Load duration curve or 4C classification	Phosphorus or non-pollutant
Lake Fork	OW-01	Aquatic life	Chloride	Load duration curve	Chloride
Lake Fork	OW-01	Aquatic life	Dissolved Oxygen	Qual2K	Biochemical oxygen demand, ammonia, total phosphorus
Lake Fork	OW-02	Aquatic life	Chloride	Load duration curve	Chloride
Lake Fork	OW-02	Aquatic life	Dissolved Oxygen	Load duration curve or 4C classification	Phosphorus or non-pollutant

a. Non-pollutant based impairment (see Section 4.1).

5.1.1 Load Duration Curve Approach

The primary benefit of duration curves in TMDL development is to provide insight regarding patterns associated with hydrology and water quality concerns. The duration curve approach is particularly applicable because water quality is often a function of stream flow. For instance, sediment concentrations typically increase with rising flows as a result of factors such as channel scour from higher velocities. Other parameters, such as chloride, may be more concentrated at low flows and more diluted by increased water volumes at higher flows. The use of duration curves in water quality assessment creates a framework that enables data to be characterized by flow conditions. The method provides a visual display of the relationship between stream flow and water quality.

Allowable pollutant loads have been determined through the use of load duration curves. Discussions of load duration curves are presented in *An Approach for Using Load Duration Curves in the Development of TMDLs* (USEPA 2007). This approach involves calculating the allowable loadings over the range of flow conditions expected to occur in the impaired stream by taking the following steps:

1. A flow duration curve for the stream is developed by generating a flow frequency table and plotting the data points to form a curve. The data reflect a range of natural occurrences from extremely high flows to extremely low flows.

2. The flow curve is translated into a load duration (or TMDL) curve by multiplying each flow value (in cubic feet per second) by the water quality standard/target for a contaminant (mg/L), then multiplying by conversion factors to yield results in the proper unit (i.e., pounds per day). The resulting points are plotted to create a load duration curve.

3. Each water quality sample is converted to a load by multiplying the water quality sample concentration by the average daily flow on the day the sample was collected. Then, the individual loads are plotted as points on the TMDL graph and can be compared to the water quality standard/target, or load duration curve.

4. Points plotting above the curve represent deviations from the water quality standard/target and the daily allowable load. Those plotting below the curve represent compliance with standards and the daily allowable load. Further, it can be determined which locations contribute loads above or below the water quality standard/target.

5. The area beneath the TMDL curve is interpreted as the loading capacity of the stream. The difference between this area and the area representing the current loading conditions is the load that must be reduced to meet water quality standards/targets.

6. The final step is to determine where reductions need to occur. Those exceedances at the right side of the graph occur during low flow conditions, and may be derived from sources such as illicit sewer connections. Exceedances on the left side of the graph occur during higher flow events, and may be derived from sources such as runoff. Using the load duration curve approach allows Illinois EPA to determine which implementation practices are most effective for reducing loads on the basis of flow regime.

Water quality duration curves are created using the same steps as those used for load duration curves except that concentrations, rather than loads, are plotted on the vertical axis. Flows are categorized into the following five hydrologic zones (U.S. EPA 2007):

- High flow zone: stream flows that plot in the 0 to 10-percentile range, related to flood flows
- Moist zone: flows in the 10 to 40-percentile range, related to wet weather conditions
- Mid-range zone: flows in the 40 to 60-percentile range, median stream flow conditions
- Dry zone: flows in the 60 to 90-percentile range, related to dry weather flows
- Low flow zone: flows in the 90 to 100-percentile range, related to drought conditions

The duration curve approach helps to identify the issues surrounding the impairment and to roughly differentiate between sources. Table 9 summarizes the general relationship between the five hydrologic zones and potentially contributing source areas (the table is not specific to any individual pollutant). For example, the table indicates that impacts from point sources are usually most pronounced during dry and low flow zones because there is less water in the stream to dilute their loads. In contrast, impacts from stormwater are most pronounced during moist and high flow zones due to increased overland flow from stormwater source areas during rainfall events.

Table 9. Relationship between duration curve zones and contributing sources

Contributing source area	Duration Curve Zone				
	High	Moist	Mid-range	Dry	Low
Point source				M	H
Livestock direct access to streams				M	H
Onsite wastewater systems	M	M-H	H	H	H
Stormwater: Impervious		H	H	H	
Stormwater: Upland	H	H	M		
Field drainage: Natural condition	H	M			
Field drainage: Tile system	H	H	M-H	L-M	

Note: Potential relative importance of source area to contribute loads under given hydrologic condition (H: High; M: Medium; L: Low).

The load reduction approach also considers critical conditions and seasonal variation in the TMDL development as required by the Clean Water Act and U.S. EPA's implementing regulations. Because the approach establishes loads on the basis of a representative flow regime, it inherently considers seasonal variations and critical conditions attributed to flow conditions. An underlying premise of the duration curve approach is correlation of water quality impairments to flow conditions. The duration curve alone does not consider specific fate and transport mechanisms, which may vary depending on watershed or pollutant characteristics.

5.1.2 Qual2K

Qual2K is a steady-state water quality model that simulates eutrophication kinetics and conventional water quality parameters and is maintained by U.S. EPA. Qual2K simulates up to 15 water quality constituents in branching stream systems. A stream reach is divided into a number of computational elements, and for each computational element, a hydrologic balance in terms of stream flow (e.g., m3/s), a heat balance in terms of temperature (e.g., degrees C), and a material balance in terms of concentration (e.g., mg/l) are written. Both advective and dispersive transport processes are considered in the material balance. Mass is gained or lost from the computational element by transport processes, wastewater discharges, and withdrawals. Mass can also be gained or lost by internal processes such as release of mass from benthic sources or biological transformations.

The program simulates changes in flow conditions along the stream by computing a series of steady-state water surface profiles. The calculated stream-flow rate, velocity, cross-sectional area, and water depth serve as a basis for determining the heat and mass fluxes into and out of each computational element due to flow. Mass balance determines the concentrations of constituents at each computational element. In addition to material fluxes, major processes included in the mass balance are transformation of nutrients, algal production, benthic and carbonaceous demand, atmospheric reaeration, and the effect of these processes on the dissolved oxygen balance. The nitrogen cycle is divided into four compartments: organic nitrogen, ammonia nitrogen, nitrite nitrogen, and nitrate nitrogen. The primary internal sink of dissolved oxygen in the model is biochemical oxygen demand (BOD). The major sources of dissolved oxygen are algal photosynthesis and atmospheric reaeration.

The model is applicable to dendritic streams that are well mixed. It assumes that the major transport mechanisms, advection and dispersion, are significant only along the main direction of flow (the longitudinal axis of the stream or canal). It allows for multiple waste discharges, withdrawals, tributary flows, and incremental inflow and outflow.

Hydraulically, Qual2K is limited to the simulation of time periods during which both the stream flow in river basins and input waste loads are essentially constant. Qual2K can operate as either a steady-state or a quasi-dynamic model, making it a very helpful water quality planning tool. When operated as a steady-state model, it can be used to study the impact of waste loads (magnitude, quality, and location) on instream water quality. By operating the model dynamically, the user can study the effects of diurnal variations in meteorological data on water quality (primarily dissolved oxygen and temperature) and also can study diurnal dissolved oxygen variations due to algal growth and respiration. However, the effects of dynamic forcing functions, such as headwater flows or point loads, cannot be modeled in Qual2K. A steady-state model is proposed for all impaired segments.

Qual2K is an appropriate choice for certain types of dissolved oxygen and organic enrichment TMDLs that can be implemented at a moderate level of effort. Use of the Qual2K models in TMDLs is most appropriate when (1) full vertical mixing can be assumed, and (2) water quality excursions are associated with identifiable critical flow conditions. Because these models do not simulate dynamically varying flows, their use is limited to evaluating responses to one or more specific flow conditions. The selected flow condition should reflect critical conditions, which for dissolved oxygen occurs when flows are low and the ambient air temperature is warm, typically in July or August.

5.2 Additional Data Needs

Data satisfy two key objectives for Illinois EPA, enabling the agency to make informed decisions about the resource. These objectives include developing information necessary to:

- Determine if the impaired areas are meeting applicable water quality standards for their respective designated use(s)
- Support modeling and assessment activities required to allocate pollutant loadings for all impaired areas where water quality standards are not being met

Additional data may be needed to verify impairment, understand probable sources, calculate reductions, develop calibrated water quality models, and develop effective implementation plans. Table 10 summarizes the additional data needed for each impaired segment.

Table 10. Additional data needs

Name	Segment ID	Designated Uses	TMDL Parameters	Additional Data Needs
Kaskaskia River	O-35	Aquatic life	Dissolved oxygen	Yes, to determine relationship with eutrophication
Lake Fork	OW-01	Aquatic life	Chloride	None
			Dissolved oxygen	Yes, to support Qual2K model
Lake Fork	OW-02	Aquatic life	Chloride	None
			Dissolved oxygen	Yes, to determine relationship with eutrophication
All	All	All	All	Implementation monitoring

Specific data needs include:

Determine Relationship with Eutrophication (O-35) – A series of DO measurements and chlorophyll-*a* and TP grab samples (two samples per day on three separate sampling days) should be collected from the impaired segment (site O-35) to verify impairment and to determine the role of eutrophication, if any, in the impaired segment. Sampling should occur during the warm summer months and during low flows to ensure that critical conditions are captured.

Determine Relationship with Eutrophication (OW-02) – A series of DO measurements and chlorophyll-*a* and TP grab samples (two samples per day on three separate sampling days) should be collected from the impaired segment to verify impairment and to determine the role of eutrophication, if any, in the impaired segment. Sampling should occur during the warm summer months and during low flows, and one of each paired sample should occur in the early morning to ensure that critical conditions are captured.

Support Qual2K Model Development (OW-01) – A minimum of two monitoring stations are needed on the impaired segment. Ideally, there will be two separate data collection periods, each time period lasting roughly 1 week during critical conditions (low flow, warm conditions). Although two monitoring locations are a minimum, adding more locations along the reach of interest will help determine how heterogeneous the system is and what dynamics are occurring along the reach. Monitoring stations can be located downstream of key tributaries, at road crossings, etc. as deemed necessary.

Recommended monitoring includes:

- Monitoring at two sites: 1) a new station where Lake Fork crosses E 100 N Rd, and 2) a new station where Lake Fork crosses N Co Rd 250 E:
  - Continuous dissolved oxygen, stream temperature, conductivity, and pH monitoring during warm, low flow critical conditions; monitoring should take place over approximately two weeks
  - Flow monitoring (depth and velocity) at least twice during dissolved oxygen monitoring; the number of measurements will be dependent on weather and stream conditions
  - Multiple samples of organic nitrogen, ammonia nitrogen, nitrate nitrogen, organic phosphorus, soluble reactive phosphorus, total inorganic carbon, carbonaceous biochemical oxygen demand (5-day and 20-day if possible), inorganic solids, chlorophyll-*a*, and alkalinity. Depending on the monitoring station, grab samples could be collected twice per day during the first and last days of sonde deployment or throughout the week.
  - Macrophyte and attached algae survey, survey of groundwater and tributary contributions, if any
  - Channel geometry, shade/vegetative survey, cloud cover, and channel substrate and bottom material, both upstream and downstream of the monitoring stations(s)
- A longitudinal/synoptic survey of DO concentrations along the entire reach (hand-sampling by probe on foot or from a row-boat periodically along the entire reach extent)
- Funding permitted: *in-situ* measurements of stream reaeration (via diffusion dome technique) and *in-situ* measurements of sediment oxygen demand (via chambers deployed on the streambed). Sediment bed surveys can be conducted potentially in lieu of SOD sampling (sediment total organic carbon sampling for instance could be a rough proxy for SOD if needed).
- Photo documentation of the system

Implementation Plan Development—Further in-field assessment may be needed to better determine the source of impairments in order to develop an effective TMDL implementation plan. Additional monitoring could include:

- Windshield surveys
- Streambank surveys and stream assessments for all three impaired segments and associated pollutants (phosphorus or non-pollutant for O-35 and OW-02; biochemical oxygen demand, ammonia, and phosphorus for OW-01)
- Farmer/landowner surveys
- Word of mouth and in-person conversations with local stakeholders and landowners

6. Public Participation

A public meeting was held on December 12, 2018 at the Carlyle Lake Visitor Center in Carlyle, IL to present the Stage 1 report and findings. A public notice was placed on the Illinois EPA website. There were many stakeholders present including representatives from the US Army Corps of Engineers, the Kaskaskia Watershed Association, the Original Kaskaskia Area Wilderness, Inc., and others. The public comment period closed on January 12, 2019. A comment provided by the Illinois Department of Transportation and response are below.

Illinois Department of Transportation comment: "…. Six chloride samples were collected between 2007 and 2012 in Lake Fork (IL_OW-01 & IL_OW-02). One sample exceeded the general water quality standard for chloride. I suggest IEPA continue to collect data to see if this exceedance was an anomaly. If a TMDL is developed for chloride, IDOT requests to be included in the TMDL calculations."

Response: IEPA will continue to monitor Lake Fork as part of their Intensive Basin Survey program which is conducted on a five-year rotation. At this time, a chloride TMDL is proposed. Illinois Department of Transportation will be included as a permitted MS4 entity if that applies; IEPA will further communicate with Illinois Department of Transportation during the Stage 3 TMDL development process.

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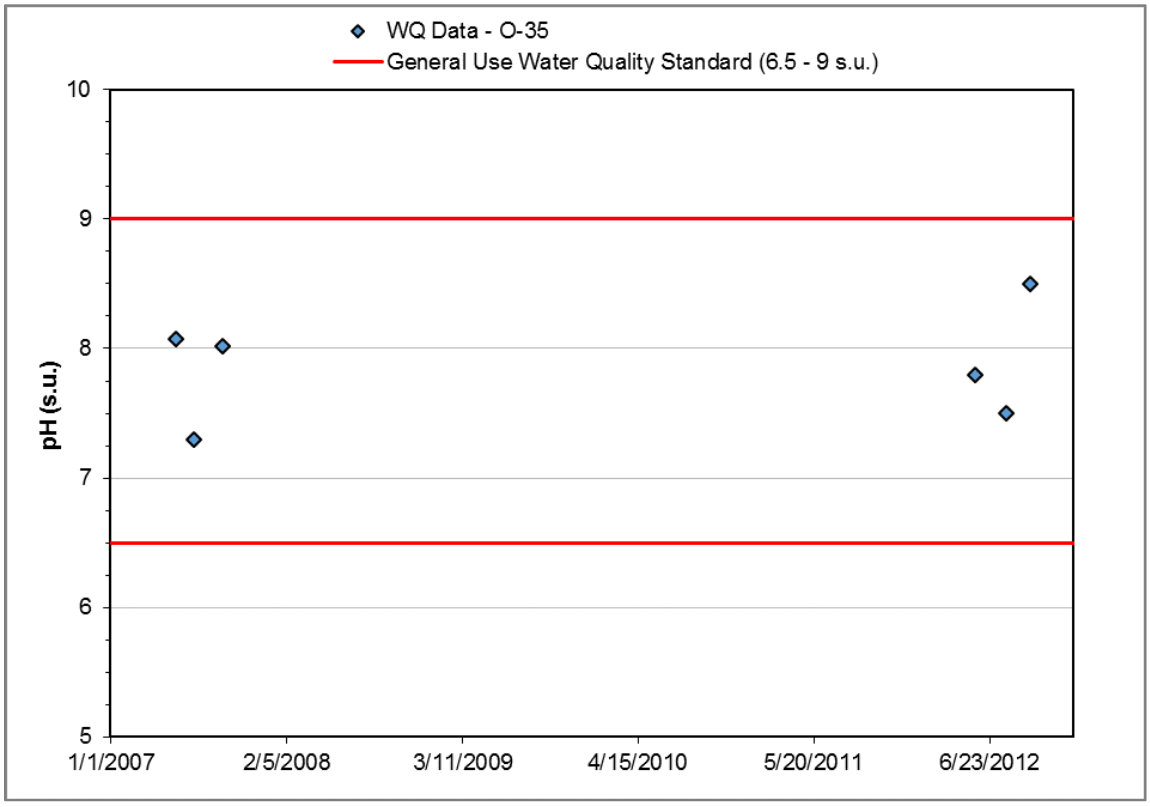
Appendix A – Unimpaired Stream Data Analysis

Kaskaskia River segment O-35 is listed as being impaired for aquatic life use due to pH. One IEPA sampling site was identified on the segment, O-35. No samples during 2007 and 2012 were recorded outside of the general use standard range (6.5> pH >9 s.u.). It is therefore recommended that the segment be delisted for pH and no TMDL be developed.



pH water quality time series, Kaskaskia River O-35 segment.

Appendix B – Stage 2 Data

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by James Stone
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19G0880-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 13:30
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/19/19 09:00
Units: mg/L
Analyzed: 08/20/19 14:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0940**		0.0050	0.0042

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Reported:
08/30/19 16:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by James Stone
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19G0881-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 13:30
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 07/31/19 11:44
Units: ug/L
Analyzed: 08/02/19 10:13

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**1.34**		0.50	
Chlorophyll-A (unco)	**1.18**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/08/19 10:37

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/08/19 10:37

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19G0882-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 13:24
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/19/19 09:00
Units: mg/L
Analyzed: 08/20/19 14:46

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0170**		0.0050	0.0042

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Reported:
08/30/19 16:32

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:32

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19G0883-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 13:24
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/12/19 10:46
Units: ug/L
Analyzed: 08/15/19 10:55

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		0.50	
Chlorophyll-A (unco)	ND		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/16/19 08:19

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/16/19 08:19

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19G0888-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 9:07
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/19/19 09:00
Units: mg/L
Analyzed: 08/20/19 14:48

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0890**		0.0050	0.0042

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Reported:
08/30/19 16:32

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
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Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: O-35
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19G0889-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 9:07
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/12/19 10:46
Units: ug/L
Analyzed: 08/15/19 10:55

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		0.50	
Chlorophyll-A (unco)	**1.19**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/16/19 08:19

Illinois Environmental Protection Agency Laboratory
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LABORATORY RESULTS

Station Code:	O-35			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/16/19 08:19

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19G0890-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 15:17
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/19/19 09:00
Units: mg/L
Analyzed: 08/20/19 14:48

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0990**		0.0050	0.0042

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Reported:
08/30/19 16:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19G0891-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 15:17
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/12/19 10:46
Units: ug/L
Analyzed: 08/15/19 10:55

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		0.50	
Chlorophyll-A (unco)	**1.78**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/16/19 08:18

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/16/19 08:18

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19G0892-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 10:47
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/19/19 09:00
Units: mg/L
Analyzed: 08/20/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0150**		0.0050	0.0042

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Reported:
08/30/19 16:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19G0893-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 10:47
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/12/19 10:46
Units: ug/L
Analyzed: 08/15/19 10:55

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**1.34**		0.50	
Chlorophyll-A (unco)	ND		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/16/19 08:18

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/16/19 08:18

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19G0894-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 10:37
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/19/19 09:00
Units: mg/L
Analyzed: 08/20/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0950**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 07/25/19 16:35 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19G0895-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 10:37
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/12/19 10:46
Units: ug/L
Analyzed: 08/15/19 10:55

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**4.00**		0.50	
Chlorophyll-A (unco)	**2.37**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/16/19 08:18

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 07/25/19 16:35	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190724INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/16/19 08:18

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/01/19 16:30 by James Stone
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19H0044-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 10:35
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 07/31/19 14:46
Units: mg/L
Analyzed: 08/05/19 10:11

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**231**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 08/02/19 10:13
Units: mg/L
Analyzed: 08/07/19 11:09

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	ND		2.00	

Nitrate-Nitrite, Colorimetric, Automated Cadmium by EPA Method 353.2

Method: 353.2
Prepared: 08/06/19 11:03
Units: mg/L
Analyzed: 08/06/19 11:47

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.369**		0.100	0.0247

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Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Waterbody Name: LAKE FORK
County: DOUGLAS
Funding Code: WP06
Trip ID: 20190731INHS
Visit Number: 001
Received : 08/01/19 16:30 by James Stone
Temperature C: 3.00
Monitoring Unit: TMDL
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19H0044-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 10:35
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Nitrogen, Ammonia, Colorimetric, Automated Phenate by EPA Method 350.1

Method: EPA 350.1
Units: mg/L
Prepared: 08/06/19 15:29
Analyzed: 08/08/19 10:58

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.28**		0.10	0.06

Nitrogen, Kjeldahl, Total, Colorimetric, Semi- by EPA Method 351.2

Method: 351.2
Units: mg/L
Prepared: 08/22/19 08:00
Analyzed: 08/27/19 14:35

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.81**		0.50	0.37

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Units: mg/L
Prepared: 08/23/19 09:00
Analyzed: 08/26/19 15:35

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.288**		0.0050	0.0042

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Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/01/19 16:30 by James Stone
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19H0044-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 10:35
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 08/05/19 07:52
Units: mg/L
Analyzed: 08/05/19 07:52

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**35**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 08/05/19 07:54
Units: mg/L
Analyzed: 08/05/19 07:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**7**		4	

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Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received : 08/01/19 16:30	by James Stone
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J	Estimated value. The laboratory cannot support the validity of this number. The result is between the method detection limit and the reporting limit.
ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0045-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 07/31/19 14:46
Units: mg/L
Analyzed: 08/05/19 10:11

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**231**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 08/02/19 10:13
Units: mg/L
Analyzed: 08/07/19 11:09

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	ND		2.00	

Nitrate-Nitrite, Colorimetric, Automated Cadmium by EPA Method 353.2

Method: 353.2
Prepared: 08/06/19 11:03
Units: mg/L
Analyzed: 08/06/19 11:48

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.407**		0.100	0.0247

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Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Waterbody Name: LAKE FORK
County: DOUGLAS
Funding Code: WP06
Trip ID: 20190731INHS
Visit Number: 001
Received : 08/01/19 16:30 by ADAM LUCCHESI
Temperature C: 3.00
Monitoring Unit: TMDL
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0045-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Nitrogen, Ammonia, Colorimetric, Automated Phenate by EPA Method 350.1

Method: EPA 350.1
Units: mg/L
Prepared: 08/06/19 15:29
Analyzed: 08/08/19 10:58

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.26**		0.10	0.06

Nitrogen, Kjeldahl, Total, Colorimetric, Semi- by EPA Method 351.2

Method: 351.2
Units: mg/L
Prepared: 08/22/19 08:00
Analyzed: 08/27/19 14:35

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.82**		0.50	0.37

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Units: mg/L
Prepared: 08/23/19 09:00
Analyzed: 08/26/19 15:36

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.300**		0.0050	0.0042

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Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0045-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 08/05/19 07:52
Units: mg/L
Analyzed: 08/05/19 07:52

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**32**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 08/05/19 07:54
Units: mg/L
Analyzed: 08/05/19 07:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**6**		4	

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Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J	Estimated value. The laboratory cannot support the validity of this number. The result is between the method detection limit and the reporting limit.
ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:28

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0048-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 8:47
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/23/19 09:00
Units: mg/L
Analyzed: 08/26/19 15:36

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.190**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:27

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:27

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0049-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/27/19 10:00
Units: mg/L
Analyzed: 08/27/19 14:47

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.188**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:27

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:27

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0050-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 8:53
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/27/19 10:00
Units: mg/L
Analyzed: 08/27/19 14:48

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0160**		0.0050	0.0042

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Reported:
08/30/19 16:26

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:26

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0051-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:08
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/27/19 10:00
Units: mg/L
Analyzed: 08/27/19 14:48

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0160**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:26

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:26

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0052-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 7:56
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/27/19 10:00
Units: mg/L
Analyzed: 08/27/19 14:50

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.165**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
08/30/19 16:26

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:26

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19H0053-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 14:24
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/27/19 10:00
Units: mg/L
Analyzed: 08/27/19 14:51

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.166**		0.0050	0.0042

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Reported:
08/30/19 16:25

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:25

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19H0054-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 10:35
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/20/19 10:13
Units: ug/L
Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	**0.59**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**0.93**		0.50	

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Reported:
08/30/19 16:25

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:25

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/01/19 16:30 by ADAM LUCCHESI
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0055-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/20/19 10:13
Units: ug/L
Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**1.34**		0.50	
Chlorophyll-A (unco)	**2.88**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**2.40**		0.50	

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Reported:
08/30/19 16:25

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received : 08/01/19 16:30	by ADAM LUCCHESI
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:25

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19H0089-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 8:47
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/20/19 10:13
Units: ug/L
Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**1.34**		0.50	
Chlorophyll-A (unco)	**1.70**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**0.60**		0.50	
Pheophytin-A	**0.53**		0.50	

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Reported:
08/30/19 16:24

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:24

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0090-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:05
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/20/19 10:13
Units: ug/L
Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**1.34**		0.50	
Chlorophyll-A (unco)	**1.19**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:24

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:24

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19H0091-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 8:53
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/20/19 10:13
Units: ug/L
Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	ND		0.50	
Chlorophyll-B	**1.05**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:24

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:24

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/01/19 16:30 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0092-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 13:08
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/20/19 10:13
Units: ug/L
Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	ND		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:23

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/01/19 16:30	by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190731INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:23

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/01/19 16:30 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19H0093-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/31/19 7:56
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/20/19 10:13
Units: ug/L
Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**1.34**		0.50	
Chlorophyll-A (unco)	**0.52**		0.50	
Chlorophyll-B	**0.78**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:23

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/01/19 16:30 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:23

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35 Received : 08/01/19 16:30 by LAUREN AIELLO

Waterbody Name: KASKASKIA RIVER County: CHAMPAIGN Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190731INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: VIT Lab Sample ID: **19H0094-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 07/31/19 14:24

Sample Fraction: Total Chlorophyll volume filtered (ml): 200 Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 08/20/19 10:13

Units: ug/L Analyzed: 08/21/19 10:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		0.50	
Chlorophyll-A (unco)	**2.80**		0.50	
Chlorophyll-B	**0.61**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:23

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/01/19 16:30 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190731INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:23

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/08/19 16:15 by James Stone
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0406-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 9:47
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 08/08/19 15:04
Units: mg/L
Analyzed: 08/09/19 14:27

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**256**		10.0	7.48

Biochemical Oxygen Demand, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 08/09/19 09:27
Units: mg/L
Analyzed: 08/14/19 09:37

Analyte	Result	Qualifier	Reporting Limit	MDL
BOD 5DAY	ND		2.00	

Nitrate-Nitrite, Colorimetric, Automated Cadmium by EPA Method 353.2

Method: 353.2
Prepared: 08/09/19 10:19
Units: mg/L
Analyzed: 08/09/19 11:30

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.639**		0.100	0.0247

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Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Waterbody Name: LAKE FORK
County: DOUGLAS
Funding Code: WP06
Trip ID: 20190807INHS
Visit Number: 001
Received : 08/08/19 16:15 by James Stone
Temperature C: 3.00
Monitoring Unit: TMDL
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0406-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 9:47
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Nitrogen, Ammonia, Colorimetric, Automated Phenate by EPA Method 350.1

Method: EPA 350.1
Units: mg/L
Prepared: 08/13/19 14:05
Analyzed: 08/14/19 14:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.29**		0.10	0.06

Nitrogen, Kjeldahl, Total, Colorimetric, Semi- by EPA Method 351.2

Method: 351.2
Units: mg/L
Prepared: 08/28/19 08:00
Analyzed: 08/29/19 16:18

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.98**		0.50	0.37

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Units: mg/L
Prepared: 08/28/19 09:00
Analyzed: 08/29/19 11:38

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.435**		0.0050	0.0042

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Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/08/19 16:15 by James Stone
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0406-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 9:47
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 08/13/19 07:45
Units: mg/L
Analyzed: 08/13/19 07:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**24**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 08/13/19 07:46
Units: mg/L
Analyzed: 08/13/19 07:46

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**5**		4	

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received :	08/08/19 16:15 by James Stone
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J	Estimated value. The laboratory cannot support the validity of this number. The result is between the method detection limit and the reporting limit.
ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/08/19 16:15 by Scott Clark
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0407-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 9:47
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/21/19 12:09
Units: ug/L
Analyzed: 08/28/19 10:40

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**4.00**		0.50	
Chlorophyll-A (unco)	**5.61**		0.50	
Chlorophyll-B	**1.22**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**2.54**		0.50	

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Reported:
08/30/19 16:18

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received : 08/08/19 16:15	by Scott Clark
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:18

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/08/19 16:15 by Scott Clark
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0408-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 13:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 08/08/19 15:04
Units: mg/L
Analyzed: 08/09/19 14:27

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**256**		10.0	7.48

Biochemical Oxygen Demand, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 08/09/19 09:27
Units: mg/L
Analyzed: 08/14/19 09:37

Analyte	Result	Qualifier	Reporting Limit	MDL
BOD 5DAY	ND		2.00	

Nitrate-Nitrite, Colorimetric, Automated Cadmium by EPA Method 353.2

Method: 353.2
Prepared: 08/09/19 10:19
Units: mg/L
Analyzed: 08/09/19 11:31

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.761**		0.100	0.0247

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Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Waterbody Name: LAKE FORK
County: DOUGLAS
Funding Code: WP06
Trip ID: 20190807INHS
Visit Number: 001
Received : 08/08/19 16:15 by Scott Clark
Temperature C: 3.00
Monitoring Unit: TMDL
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0408-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 13:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Nitrogen, Ammonia, Colorimetric, Automated Phenate by EPA Method 350.1

Method: EPA 350.1
Units: mg/L
Prepared: 08/13/19 14:05
Analyzed: 08/14/19 14:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.23**		0.10	0.06

Nitrogen, Kjeldahl, Total, Colorimetric, Semi- by EPA Method 351.2

Method: 351.2
Units: mg/L
Prepared: 08/28/19 08:00
Analyzed: 08/29/19 16:18

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.95**		0.50	0.37

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Units: mg/L
Prepared: 08/28/19 09:00
Analyzed: 08/29/19 11:38

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.441**		0.0050	0.0042

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Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/08/19 16:15 by Scott Clark
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0408-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 13:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 08/13/19 07:45
Units: mg/L
Analyzed: 08/13/19 07:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**16**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 08/13/19 07:46
Units: mg/L
Analyzed: 08/13/19 07:46

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**4**		4	

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Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received :	08/08/19 16:15 by Scott Clark
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J	Estimated value. The laboratory cannot support the validity of this number. The result is between the method detection limit and the reporting limit.
ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
09/12/19 14:32

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0411-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 8:28
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/28/19 09:00
Units: mg/L
Analyzed: 08/29/19 11:42

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.226**		0.0050	0.0042

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Reported:
09/12/19 14:31

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	08/08/19 16:15 by LAUREN AIELLO
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
09/12/19 14:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0412-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 14:25
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/28/19 09:00
Units: mg/L
Analyzed: 08/29/19 11:42

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.232**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
09/12/19 14:31

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	08/08/19 16:15 by LAUREN AIELLO
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
09/12/19 14:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/09/19 16:15 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0413-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 9:28
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/28/19 09:00
Units: mg/L
Analyzed: 08/29/19 11:43

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.336**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
09/12/19 14:31

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received :	08/09/19 16:15 by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
09/12/19 14:31

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19H0414-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 12:35
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 08/28/19 09:00
Units: mg/L
Analyzed: 08/29/19 11:43

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.328**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
09/12/19 14:30

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received :	08/08/19 16:15 by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
09/12/19 14:30

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0415-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 12:35
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/21/19 12:09
Units: ug/L
Analyzed: 08/28/19 10:40

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	**0.59**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**0.93**		0.50	

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Reported:
08/30/19 16:17

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/08/19 16:15	by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-01
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: DOUGLAS
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0416-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 13:05
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/21/19 12:09
Units: ug/L
Analyzed: 08/28/19 10:40

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**6.68**		0.50	
Chlorophyll-A (unco)	**5.61**		0.50	
Chlorophyll-B	**1.22**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:17

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-01			Received : 08/08/19 16:15	by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	DOUGLAS	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35 Received : 08/08/19 16:15 by LAUREN AIELLO

Waterbody Name: KASKASKIA RIVER County: CHAMPAIGN Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190807INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: MFS Lab Sample ID: **19H0419-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 08/07/19 8:28

Sample Fraction: Total Chlorophyll volume filtered (ml): 200 Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 08/21/19 12:09

Units: ug/L Analyzed: 08/28/19 10:40

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**1.34**		0.50	
Chlorophyll-A (unco)	**1.18**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:16

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0420-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 14:25
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/21/19 12:09
Units: ug/L
Analyzed: 08/28/19 10:40

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		0.50	
Chlorophyll-A (unco)	**2.21**		0.50	
Chlorophyll-B	**0.75**		0.50	
Chlorophyll-C	**1.36**		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:16

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 08/08/19 16:15 by LAUREN AIELLO
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190807INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19H0421-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/07/19 9:28
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 08/21/19 12:09
Units: ug/L
Analyzed: 08/28/19 10:40

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		0.50	
Chlorophyll-A (unco)	**1.62**		0.50	
Chlorophyll-B	**1.16**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
08/30/19 16:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 08/08/19 16:15	by LAUREN AIELLO
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190807INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
08/30/19 16:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 5.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19J0436-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 9:53
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/01/19 11:00
Units: mg/L
Analyzed: 11/01/19 16:03

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.138**		0.0050	0.0042

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Reported:
11/15/19 12:00

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	10/10/19 09:55 by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	5.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191009INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/15/19 12:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 5.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19J0437-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 13:50
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/01/19 11:00
Units: mg/L
Analyzed: 11/01/19 16:03

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.139**		0.0050	0.0042

The results in this report apply to the samples analyzed in accordance with the chain of custody document. This analytical report must be reproduced in its entirety. Test results meet all requirements of NELAC (accredited by Florida DOH #E37645). If you have any questions about this report, please contact Tom Weiss, Laboratory Manager, at 217.782.9780.

Reported:
11/15/19 12:00

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	10/10/19 09:55 by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	5.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191009INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/15/19 12:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 5.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19J0438-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 10:55
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/01/19 11:00
Units: mg/L
Analyzed: 11/01/19 16:04

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.109**		0.0050	0.0042

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Reported:
11/15/19 12:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received :	10/10/19 09:55 by Amber Royster
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	5.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191009INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/15/19 12:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 5.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19J0439-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 14:30
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/01/19 11:00
Units: mg/L
Analyzed: 11/01/19 16:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.111**		0.0050	0.0042

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received :	10/10/19 09:55 by Amber Royster
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	5.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191009INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19J0478-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 9:53
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/16/19 15:08
Units: ug/L
Analyzed: 10/28/19 13:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**78.8**		0.50	
Chlorophyll-A (unco)	**83.5**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**4.02**		0.50	
Pheophytin-A	**2.54**		0.50	

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Reported:
10/31/19 11:49

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
10/31/19 11:49

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19J0479-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 13:50
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/16/19 15:08
Units: ug/L
Analyzed: 10/28/19 13:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**46.7**		0.50	
Chlorophyll-A (unco)	**49.9**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**1.92**		0.50	
Pheophytin-A	**1.87**		0.50	

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Reported:
10/31/19 11:49

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
10/31/19 11:49

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19J0480-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 10:55
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/16/19 15:08
Units: ug/L
Analyzed: 10/28/19 13:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**34.7**		0.50	
Chlorophyll-A (unco)	**40.8**		0.50	
Chlorophyll-B	**10.4**		0.50	
Chlorophyll-C	**4.19**		0.50	
Pheophytin-A	**9.21**		0.50	

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Reported:
10/31/19 11:49

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 10/10/19 09:55	by Amber Royster
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20191009INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
10/31/19 11:49

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/10/19 09:55 by Amber Royster
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191009INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19J0481-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/09/19 14:30
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/16/19 15:08
Units: ug/L
Analyzed: 10/28/19 13:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**21.4**		0.50	
Chlorophyll-A (unco)	**24.2**		0.50	
Chlorophyll-B	**3.82**		0.50	
Chlorophyll-C	**2.59**		0.50	
Pheophytin-A	**3.87**		0.50	

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Reported:
10/31/19 11:48

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received :	10/10/19 09:55 by Amber Royster
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191009INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
10/31/19 11:48

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/17/19 10:15 by Scott Clark
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 1.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19J0656-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/16/19 10:33
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/06/19 08:00
Units: mg/L
Analyzed: 11/06/19 09:28

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.159**		0.0050	0.0042

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	10/17/19 10:15 by Scott Clark
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	1.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191016INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/17/19 10:15 by Scott Clark
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C: 1.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19J0657-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/16/19 14:30
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/06/19 08:00
Units: mg/L
Analyzed: 11/06/19 09:28

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.148**		0.0050	0.0042

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-35			Received :	10/17/19 10:15 by Scott Clark
Waterbody Name:	KASKASKIA RIVER	County:	CHAMPAIGN	Temperature C:	1.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191016INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/17/19 10:15 by Scott Clark
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 1.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19J0658-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/16/19 11:12
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/06/19 08:00
Units: mg/L
Analyzed: 11/06/19 09:29

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0630**		0.0050	0.0042

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received :	10/17/19 10:15 by Scott Clark
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	1.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191016INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/17/19 10:15 by Scott Clark
Waterbody Name: LAKE FORK
County: PIATT
Temperature C: 1.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19J0659-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/16/19 15:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Phosphorus, All Forms, Colorimetric, Automated, by EPA Method 365.1

Method: EPA 365.1
Prepared: 11/06/19 08:00
Units: mg/L
Analyzed: 11/06/19 09:30

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.0620**		0.0050	0.0042

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received :	10/17/19 10:15 by Scott Clark
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	1.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191016INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
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Tom Weiss
Laboratory Manager

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Reported:
11/15/19 11:59

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/17/19 10:10 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19J0715-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/16/19 10:33
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/29/19 08:43
Units: ug/L
Analyzed: 10/31/19 10:10

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	ND		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
11/07/19 15:33

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/17/19 10:10 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/07/19 15:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35 Received : 10/17/19 10:10 by Amber Royster

Waterbody Name: KASKASKIA RIVER County: CHAMPAIGN Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20191016INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: MFS Lab Sample ID: **19J0716-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 10/16/19 14:30

Sample Fraction: Total Chlorophyll volume filtered (ml): 200 Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 10/29/19 08:43

Units: ug/L Analyzed: 10/31/19 10:10

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	**0.52**		0.50	
Chlorophyll-B	**0.78**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**0.93**		0.50	

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Reported:
11/07/19 15:33

Illinois Environmental Protection Agency Laboratory
825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-35
Received : 10/17/19 10:10 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: CHAMPAIGN
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Notes and Definitions

ND Analyte NOT DETECTED at or above the method detection limit

* Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/07/19 15:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/17/19 10:10 by Amber Royster
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19J0718-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/16/19 11:12
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/29/19 08:43
Units: ug/L
Analyzed: 10/31/19 10:10

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	**0.60**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**0.93**		0.50	

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Reported:
11/07/19 15:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 10/17/19 10:10	by Amber Royster
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20191016INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/07/19 15:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OW-02
Received : 10/17/19 10:10 by Amber Royster
Waterbody Name: LAKE FORK
County: PIATT
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191016INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19J0719-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/16/19 15:05
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/29/19 08:43
Units: ug/L
Analyzed: 10/31/19 10:10

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	**1.18**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**1.87**		0.50	

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Reported:
11/07/19 15:32

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OW-02			Received : 10/17/19 10:10	by Amber Royster
Waterbody Name:	LAKE FORK	County:	PIATT	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20191016INHS	Visit Number:	001	Monitoring Program: TMDL	

Notes and Definitions

ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
11/07/19 15:32

Appendix C – Recommendations for Delisting and Recategorization

C.1 Kaskaskia River (IL_O-35)

Kaskaskia River segment IL_O-35 is listed as being impaired for aquatic life use due to pH and low dissolved oxygen (DO). TMDLs were not developed for these impairments. Refer to Section 2.2 for the pH and DO standards.

C.1.1 pH

Kaskaskia River segment IL_O-35 is listed as being impaired for aquatic life use due to pH. One IEPA sampling site was identified on the segment, O-35. No samples during 2007 and 2012 were recorded outside of the general use standard range (6.5> pH >9 standard units.; Figure C - 1). It is therefore recommended that the segment be delisted for pH and no TMDL be developed.

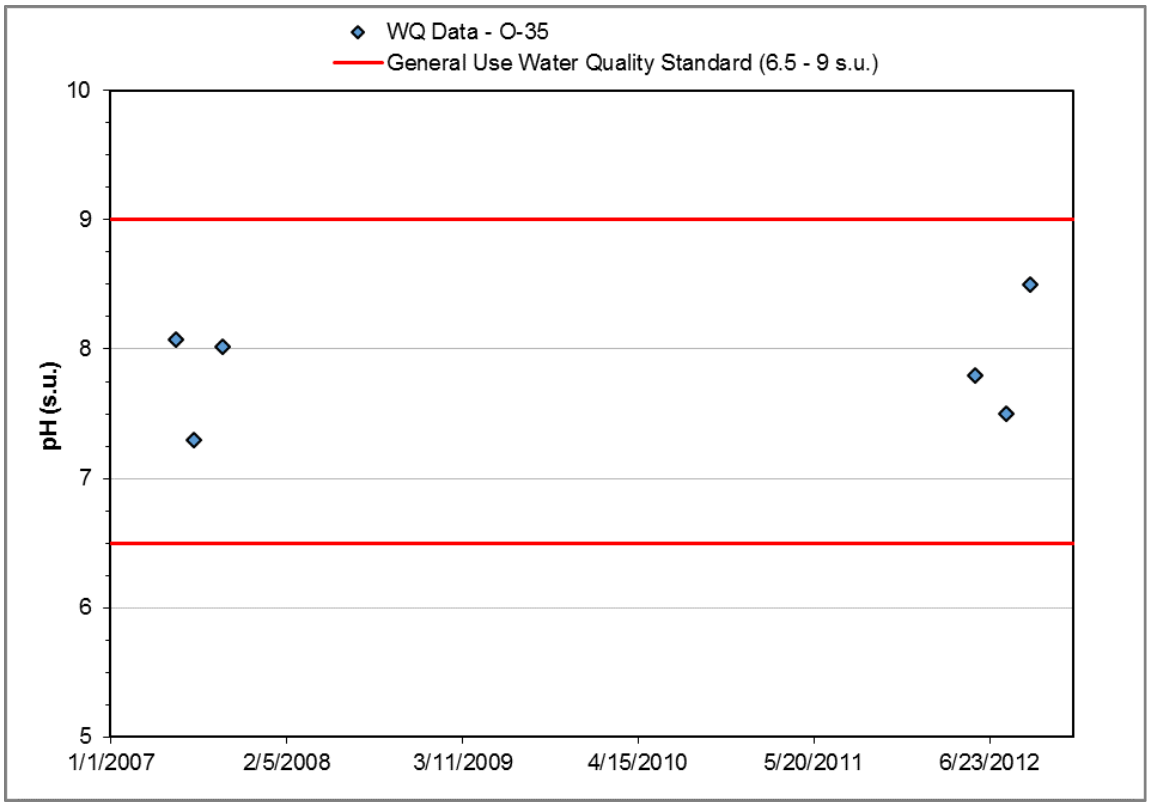


Figure C - 1. pH water quality time series, Kaskaskia River IL_O-35 segment.

C.1.2 Dissolved Oxygen

Kaskaskia River is impaired for aquatic life due to low levels of DO. One IEPA sampling site is present on segment O-35 of the Kaskaskia River (Table C - 1 and Figure C - 2). Six samples were collected at the site from 2007–2012, and continuous data were collected in 2012 and 2017. The violations of the general use water quality standard verify impairment.

Continuous data regularly exceeded standards for two 7-day periods in July and August 2012 (Figure C - 3). In 2017, continuous data never exceeded standards in June, while about 5% of results exceeded in August; these exceedances occurred on two separate days. The 7-day average from August 2017 continuous data was 12.2 mg/L, which meets the 4.0 mg/L 7-day average standard for August through February.

Table C - 1. Data summary, Kaskaskia River O-35

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	CV (standard deviation/ average)	Number of exceedances of general use water quality standard (>5 mg/L (Mar-Jul) and >3.5 mg/L (Aug-Feb))
Dissolved Oxygen						
O-35	6	4.4	7.5	11.4	0.36	1

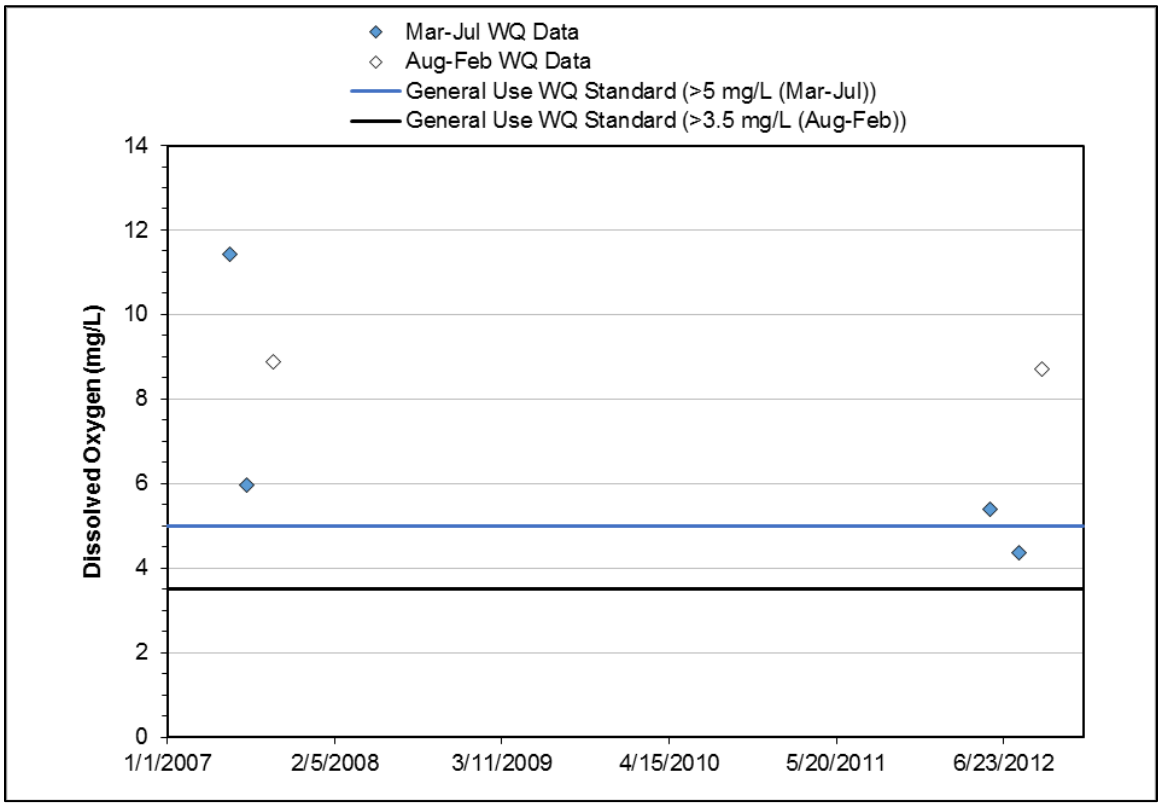
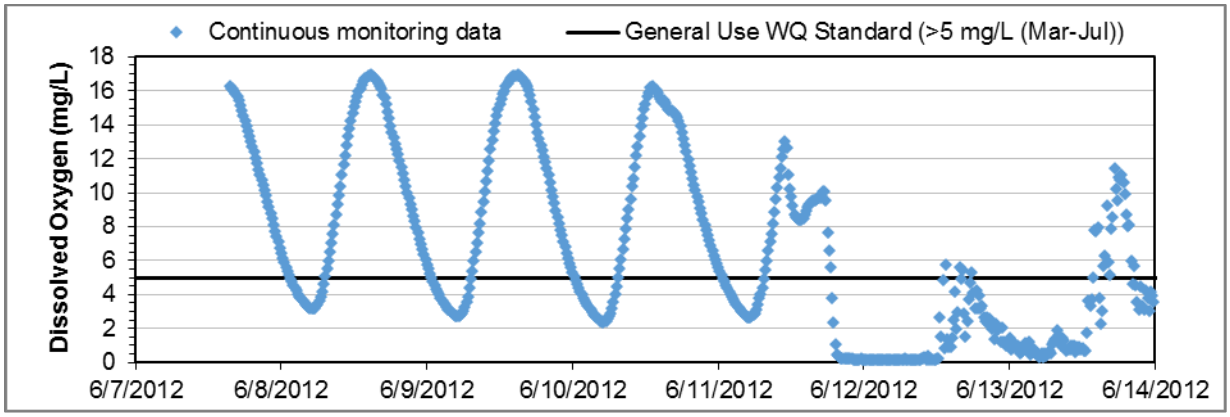
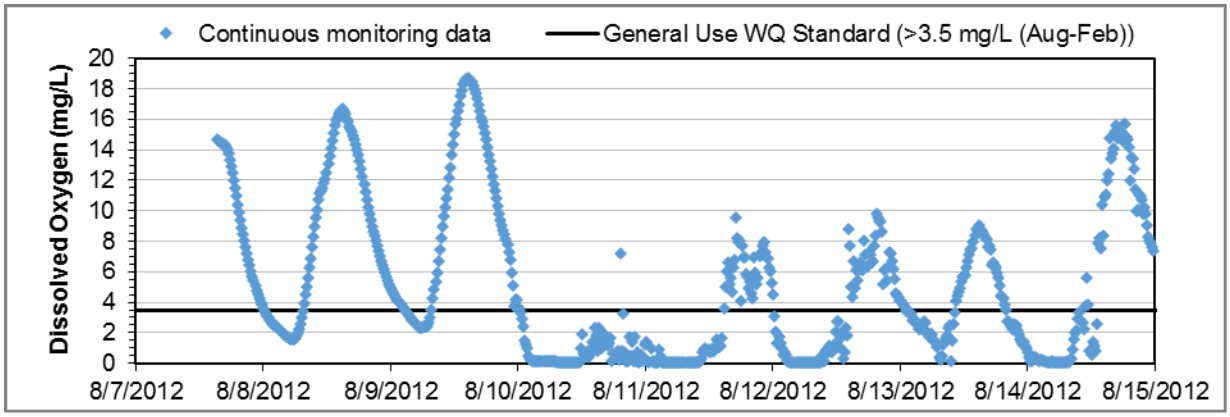
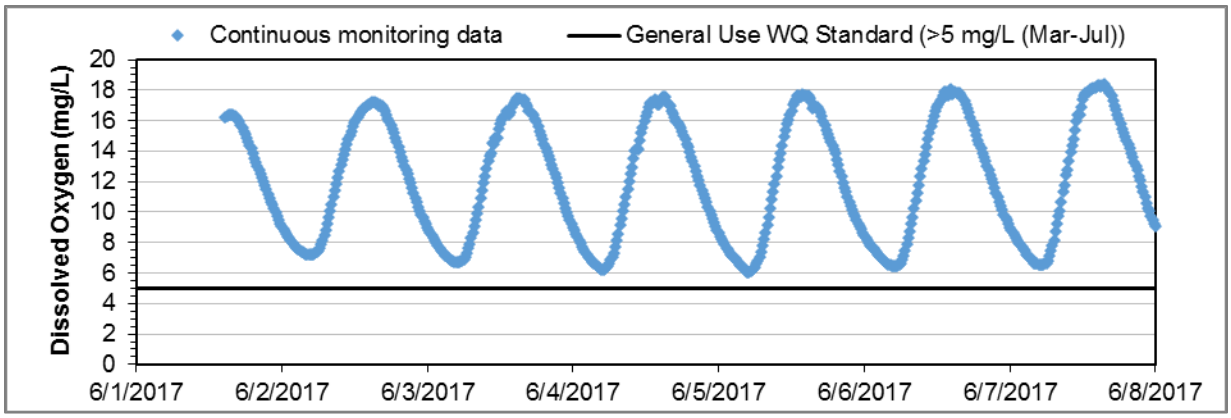


Figure C - 2. Dissolved oxygen water quality time series, Kaskaskia River O-35 segment.


Continuous monitoring data
General Use WQ Standard (>5 mg/L (Mar-Jul))
Dissolved Oxygen (mg/L)
18
16
14
12
10
8
6
4
2
0
6/7/2012
6/8/2012
6/9/2012
6/10/2012
6/11/2012
6/12/2012
6/13/2012
6/14/2012


Continuous monitoring data
General Use WQ Standard (>3.5 mg/L (Aug-Feb))
Dissolved Oxygen (mg/L)
20
18
16
14
12
10
8
6
4
2
0
8/7/2012
8/8/2012
8/9/2012
8/10/2012
8/11/2012
8/12/2012
8/13/2012
8/14/2012
8/15/2012


Continuous monitoring data
General Use WQ Standard (>5 mg/L (Mar-Jul))
Dissolved Oxygen (mg/L)
20
18
16
14
12
10
8
6
4
2
0
6/1/2017
6/2/2017
6/3/2017
6/4/2017
6/5/2017
6/6/2017
6/7/2017
6/8/2017

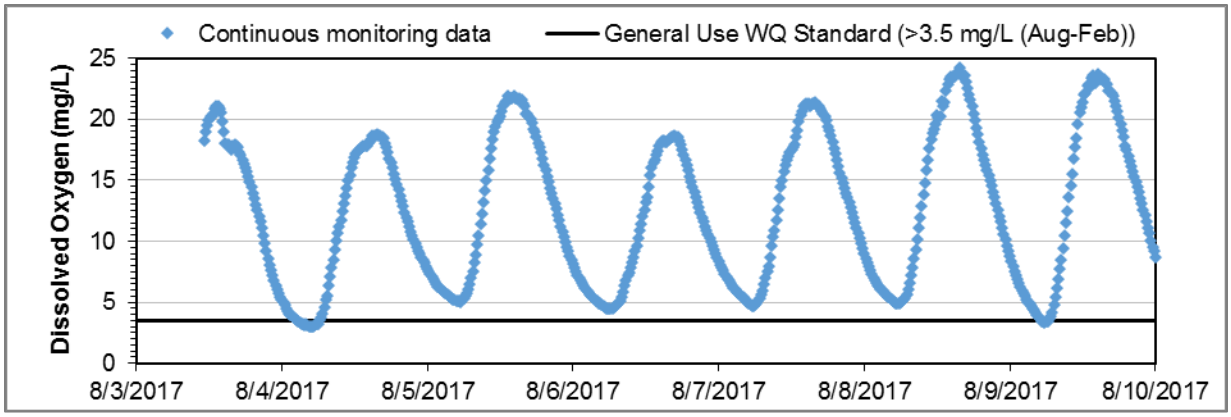


Figure C - 3. Continuous water quality time series for dissolved oxygen, Kaskaskia River IL_O-35 segment.

Further review of available data was conducted to determine the cause of impairment:

- **Point Sources:** There are no point sources contributing to the impaired segment. All point sources are located upstream of the impaired segment and discharge into unimpaired segments based on available data. Point sources are not likely contributing to the segment IL_O-35 low DO impairment.

- **Eutrophication:** DO data was paired with phosphorus and chlorophyll-a data to determine if eutrophication is contributing to low DO conditions. Data older than 10 years were included in the analysis based on the assumption that conditions have not changed along the segment. Phosphorus versus DO data collected from 2002–2012 does not indicate a strong correlation (Figure C - 4). Chlorophyll-*a* and DO data collected from 2002–2007 show a weak correlation, however, chlorophyll-*a* values are very low and do not indicate eutrophic conditions (Figure C - 5).
- **Physical Properties:** There is only one monitoring station on the segment with relevant data, and that station represents the upper part of the stream segment referred to as Kaskaskia Ditch. Kaskaskia Ditch is small and highly ditched and channelized based on review of air photos.

Although the impairment has been verified, a strong link to a pollutant is not present. Additional data were recommended to be collected to further evaluate the cause and extent of impairment.

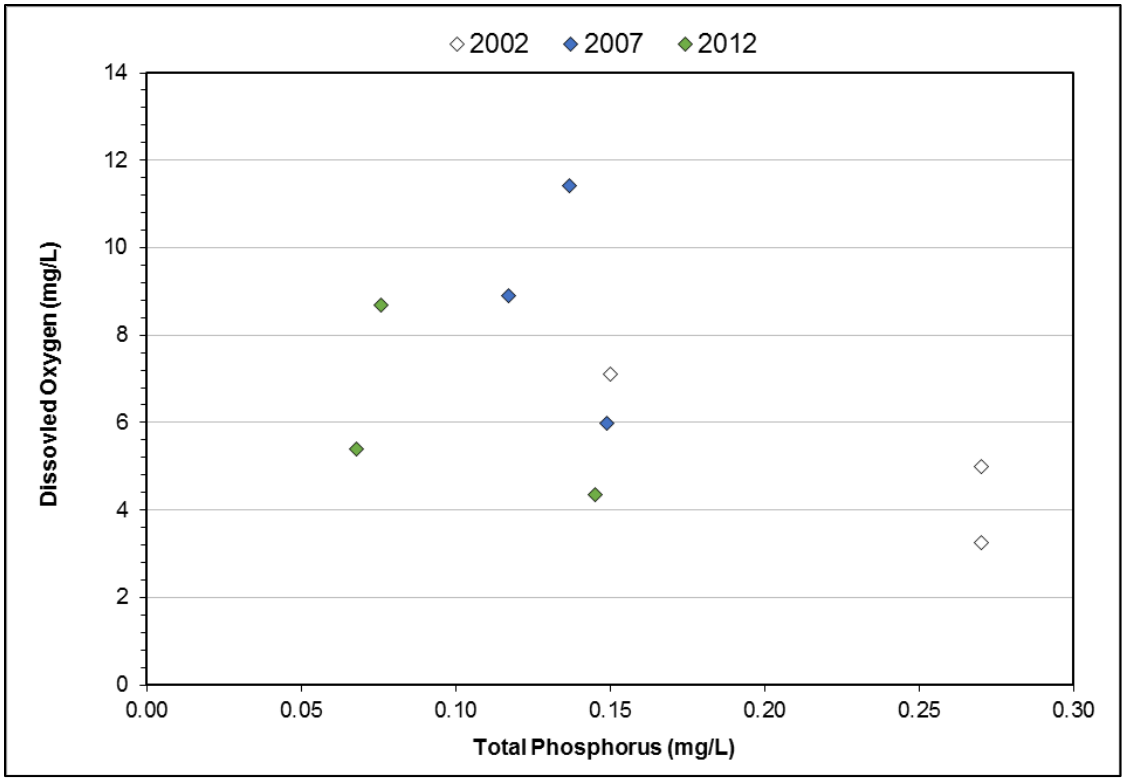


Figure C - 4. Total phosphorus versus dissolved oxygen, 2002–2012, Kaskaskia River IL_O-35 segment.

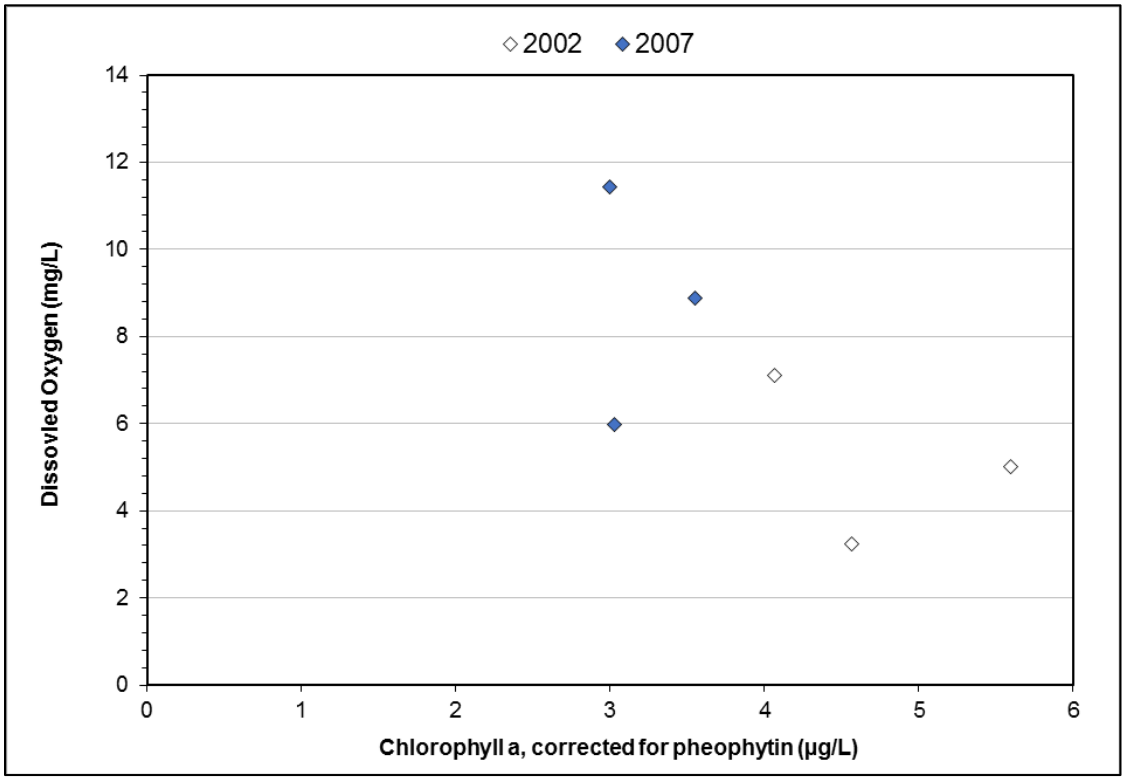


Figure C - 5. Chlorophyll-a versus dissolved oxygen, 2002–2007, Kaskaskia River, IL_O-35 segment.

Recommended monitoring was outlined in the Stage 1 Report (Appendix A) to provide additional data for impairment verification and to support TMDL development. Data were collected by IEPA and the Illinois State Water Survey in 2019 in the Kaskaskia River (IL_O-35) during July, August, and October 2019. Continuously recording data sondes were used to collect DO measurements in the morning and afternoon on each day of sampling. The data were averaged for each morning and each afternoon (Table C - 2).

Table C - 2. Dissolved oxygen data (Kaskaskia River at site O-35)

Date	Time of Day	Dissolved oxygen (mg/L)
7/24/2019	AM	9.60
	PM	16.78
7/31/2019	AM	5.93
	PM	15.51
8/7/2019	AM	6.81
	PM	14.96
10/9/2019	AM	10.98
	PM	17.60
10/16/2019	AM	11.58
	PM	17.39

All the July measurements were greater than the 5.0 mg/L instantaneous minimum standard for March through July, and all the August and October measurements were greater than the 3.5 mg/L instantaneous minimum standard for August through February (refer to the Stage 1 Report for a discussion of standards).

IEPA provided new guidelines in 2020 to assess streams using continuous DO data and recommended that a shorter window of time be considered. Specifically, for assessment in 2020, IEPA considers data collected between 2015 and 2017. With regards to continuous data, IEPA considers a stream to be impaired for DO when both (1) more than 10% of continuous measurements exceed the instantaneous standard and (2) the 7-day average exceeds the 7-day average standard. Thus, the August 2017 continuous data do not indicate impairment because only 5% of the measurements do not meet the instantaneous standard and the 7-day average standard is met. Since the 2017 and 2019 DO data do not exceed standards, the segment is recommended for delisting DO, and no further TMDL work was conducted.

C.2 Lake Fork (IL_OW-01 and IL_OW-02)

Lake Fork (IL_OW-01 and IL_OW-02) is listed as being impaired for aquatic life due to low levels of DO.

C.2.1 Stage 1 Data

Six instantaneous DO samples were collected at site OW-01 between 2007 and 2012, 10 instantaneous samples were collected at site OW-02 in 2019, and 3 instantaneous samples were collected at site OW-03 in 2007 (Table C - 3).

- **OW-01**: Multiple violations of the general use standard for DO were observed at site OW-01 in August of 2012 and 2017, and these data were used to confirm the DO impairments on both segments IL_OW-01 and IL_OW-02.
- **OW-02**: One of the four July measurements did not meet the 5.0 mg/L instantaneous minimum standard for March through July and one of the six August and October measurements did not meet the 3.5 mg/L instantaneous minimum standard for August through February. DO data indicate impairment in segment IL_OW-02.
- **OW-03**: No violations of the standard were observed upstream of the impaired segments at site OW-03; therefore, point sources are not likely contributing to any impairment along IL_OW-02.

Continuous data were collected at site OW-01 in July and August 2012 and July and August 2017. No continuous data were collected at sites OW-02 or OW-03. As shown in the Stage 1 report, at site OW-01, continuous DO data show excursions of the standard in 2012 and 2017 (Figure C - 6).

Recommended monitoring was outlined in the Stage 1 Report (Appendix A) to provide additional data for impairment verification and to support TMDL development. Data were collected by IEPA and the Illinois State Water Survey in 2019 in Lake Fork (IL_OW-01 and IL_OW-02).

Table C - 3. Dissolved oxygen data summary, Lake Fork IL_OW-01 and IL_OW-02 segments

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	CV (standard deviation/ average)	Number of exceedances of general use water quality standard (>5 mg/L (Mar-Jul) and >3.5 mg/L (Aug-Feb))
OW-01	6	4.6	7.5	13.6	0.44	1
OW-02	10	2.1	9.5	14.8	0.42	2
OW-03 (upstream of IL_OW-02)	3	7.2	9.1	10.2	0.18	0

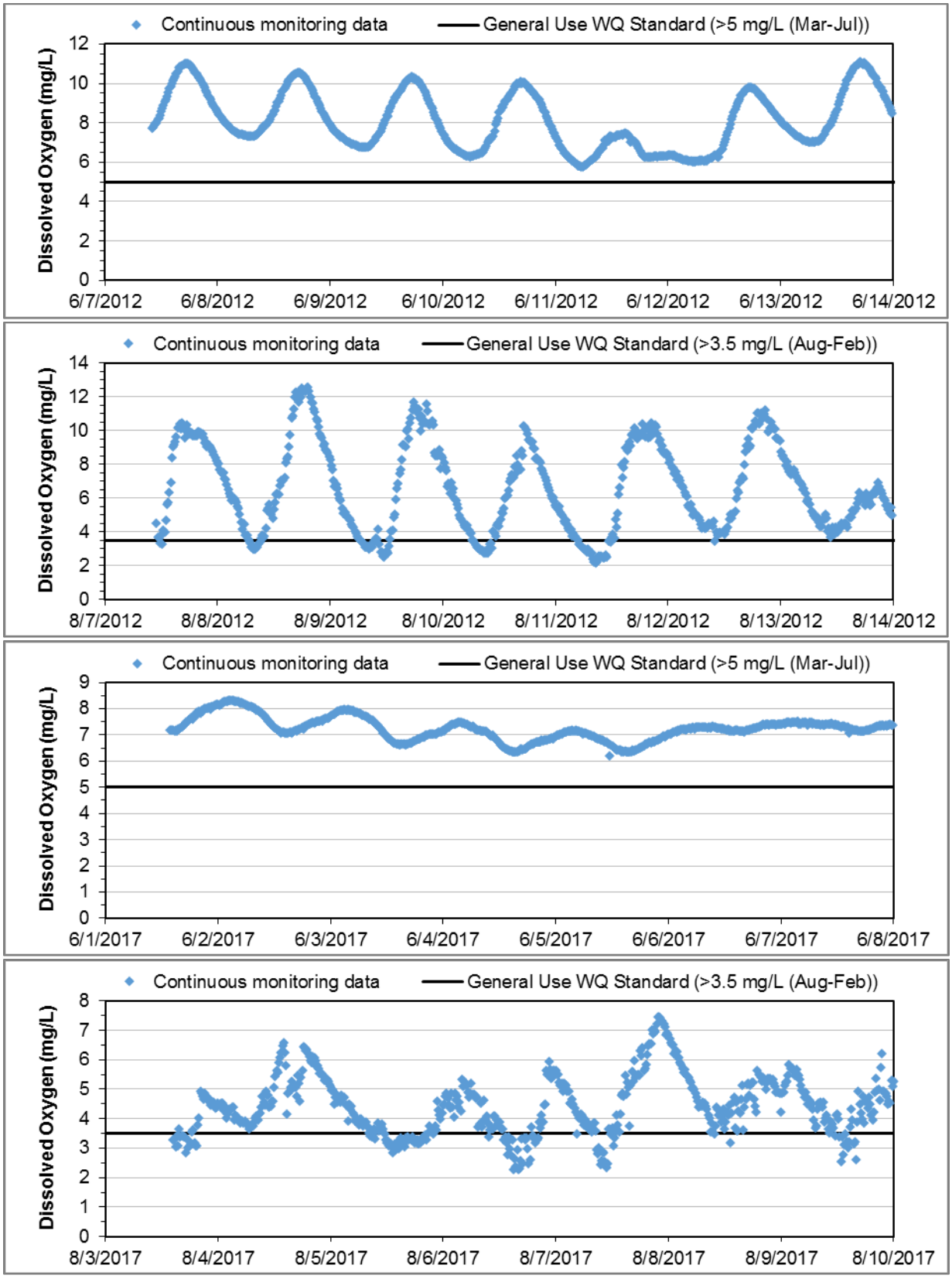


Figure C - 6. Continuous water quality time series for dissolved oxygen, Lake Fork IL_OW-01 segment.

C.2.2 Stage 2 Data

As per the Stage 1 Report recommendations (Appendix A), additional data were collected at both site OW-01 and OW-02. Continuous DO data were collected at site OW-01 for a week in July and August 2019 (Figure C - 7). These data also showed DO concentrations below the water quality standard (i.e., data indicate impairment).

DO were collected from site OW-02 during July, August, and October 2019 to support TMDL development. Continuously recording data sondes were used to collect DO measurements in the morning and afternoon on each day of sampling. The data were averaged for each morning and each afternoon (Table C - 4). Paired total phosphorus data were also collected, to support the potential development of a total phosphorus surrogate TMDL to address the low DO impairment.

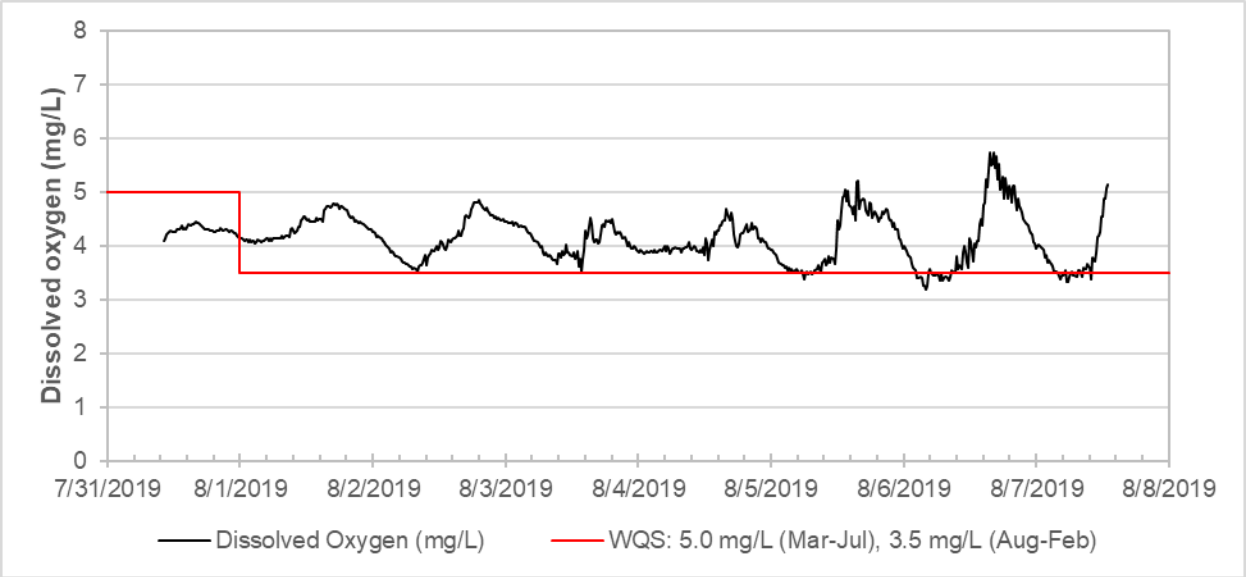


Figure C - 7. Continuous dissolved oxygen—2019, Lake Fork IL_OW-01.

Table C - 4. Dissolved oxygen and total phosphorus data (Lake Fork at site OW-02)

Date	Time of Day	Dissolved oxygen (mg/L)	Total phosphorus (mg/L)
7/24/2019	AM	10.31	0.095
	PM	12.85	0.094
7/31/2019	AM	4.79	0.19
	PM	12.51	0.188
8/7/2019	AM	2.05	0.336
	PM	5.40	0.328
10/9/2019	AM	9.05	0.109
	PM	14.83	0.111
10/16/2019	AM	10.23	0.063
	PM	13.40	0.062

C.2.3 Stage 3 Analysis

Low in-stream DO can be the result of eutrophication due to high phosphorus concentrations. To determine if a relationship exists between DO and phosphorus, paired DO and total phosphorus data are plotted together, and a linear regression is developed.

- **OW-01**: No linear relationship exists between instantaneous DO and TP data collected at site OW-01 in 2012 and 2017.
- **OW-02**: A linear relationship (R^2=0.61) exists between instantaneous DO and total phosphorus data collected at site OW-02 in 2019 (Figure C - 8). Low DO in segment IL_OW-02 may be due to nutrient eutrophication.

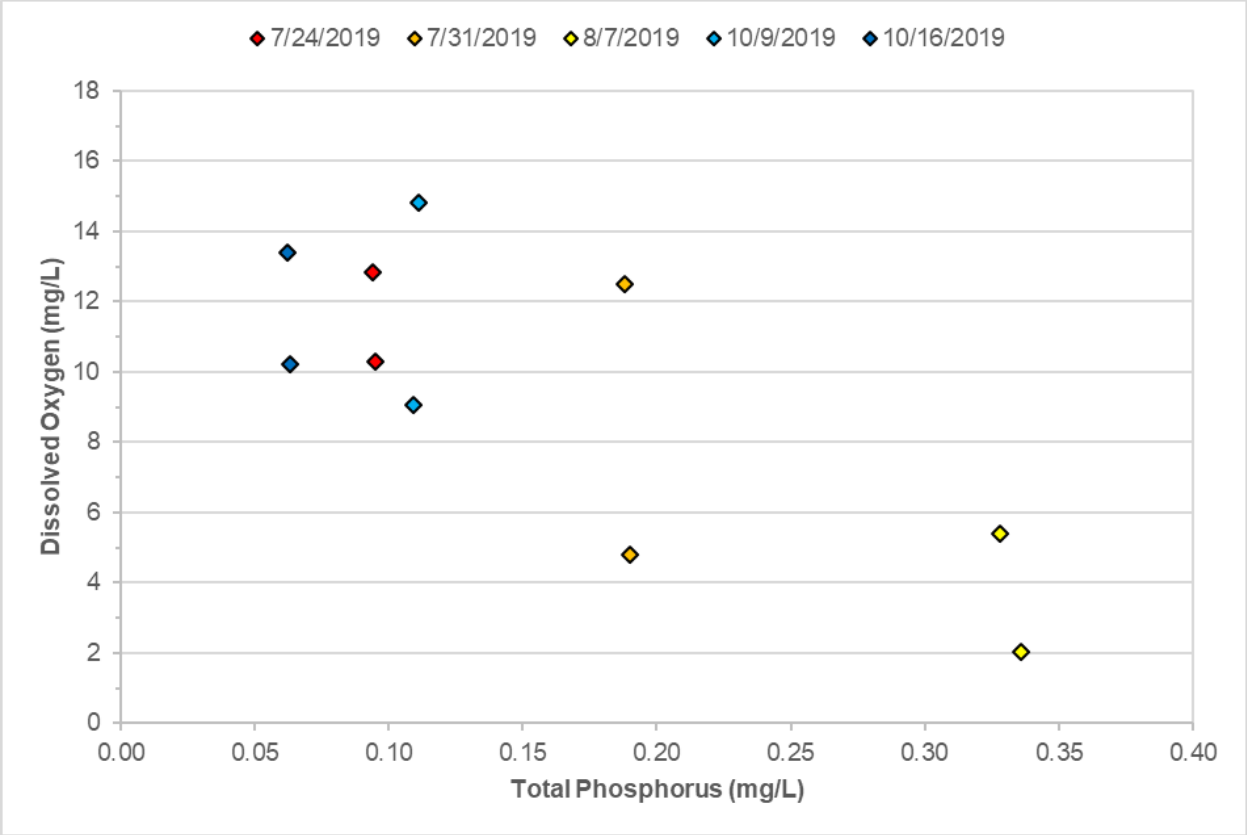


Figure C - 8. Total phosphorus versus dissolved oxygen—2019, Lake Fork IL_OW-02.

A QUAL2K model was scoped for development for segment IL_OW-01 to simulate in-stream processes and support TMDL development. The QUAL2K model was not completed or calibrated for conditions present during August 2019; however, because the critical low-flow condition in the stream, represented as 7Q10 flow[1], is equal to zero. Because there is no flow under critical conditions, there is no amount of load reduction or changes to instream processes that can result in attainment of the DO water quality standard. In this case, flow in the stream is the limiting factor for aquatic life.

Flow in Lake Fork segment IL_OW-02 was evaluated using the Illinois Streamflow Assessment Model (ILSAM; https://www.isws.illinois.edu/data/ilsam/). ILSAM predicted the 7Q10 at river mile 9.2, which

[1] For DO impairments, IEPA considers the critical conditions to be the seven-day low flow at a ten-year recurrence interval (i.e., 7Q10), which is the 7-day average (arithmetic mean) low flow that occurs approximately once every ten years.

is on segment IL_OW-02) to be zero. Similarly, ILSAM predicted the 95th, 98th, and 99th flow duration intervals to also be zero. Thus, segment IL_OW-02 also runs dry during summer low-flow conditions.

Although the impairment was verified in both Lake Fork segments (IL_OW-01 and IL_OW-02), upon further evaluation, it was determined that the stream was impaired due to lack of flow in the stream. The 7Q10 flow condition is zero, and therefore there is insufficient flow to maintain aquatic life in this segment under critical low flow conditions. With regards to segment IL_OW-02, when there is sufficient flow in Lake Fork, nutrient eutrophication may also contribute to low DO concentrations. Since low DO is the result of low flow, both segments IL_OW-01 and IL_OW-02 are recommended to be recategorized as CALM Category 4C, impaired but not due to a pollutant.

Appendix D – Stage 3 Comments and Responses

<to be included once developed>