Lower Kaskaskia River Watershed (II) Watershed Protection Plan

(Waterbody Segments IL_O-20 & IL_O-30) - Iron

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Acronyms and Abbreviations

BMP	best management practice
CAFO	concentrated animal feeding operation
CWA	Clean Water Act
DO	dissolved oxygen
HUC	hydrologic unit code
IEPA	Illinois Environmental Protection Agency
IDNR	Illinois Department of Natural Resources
IDOA	Illinois Department of Agriculture
IPCB	Illinois Pollution Control Board
MCL	maximum contaminant level
MS4	municipal separate storm sewer system
NLRS	Nutrient Loss Reduction Strategy
NPDES	National Pollutant Discharge Elimination System
NRCS	Natural Resources Conservation Service (U.S. Department of Agriculture)
PFPWS	public and food processing water supply
STEPL	Spreadsheet Tool for Estimating Pollutant Loads
STP	sewage treatment plant
TMDL	total maximum daily load
U.S. EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers (U.S. Department of Defense)
USGS	United States Geological Survey (U.S. Department of the Interior)
WQS	water quality standards
WWTP	wastewater treatment plant

Units of Measure

mgd	million gallons per day
mg/L	milligram 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 study addresses approximately 1,610 square miles in the Lower Kaskaskia River watershed located in central Illinois. Iron has been identified as a pollutant of concern in two stream segments of the Kaskaskia River. The sources of pollutants in the watershed include National Pollutant Discharge Elimination System (NPDES) permitted facilities such as wastewater treatment facilities. In addition, nonpoint pollution resulting from several key sources including stormwater runoff, onsite wastewater treatment systems, and animal feeding operations. An implementation plan is provided which includes potential implementation activities to address sources of iron.

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 protection plan represents a compilation of Stage 1 and a protection plan. Appendix B includes the Stage 2 data which are included in this protection plan. Stage 3 was not required as the segments were no longer listed as impaired due to iron in the 2020/2022 Integrated Report. No TMDLs were developed.

1. Introduction

This study addresses the approximately 1,610 square mile Lower Kaskaskia River watershed located in central Illinois (Figure 1). This study addresses four segments along the mainstem of the Lower Kaskaskia River in the Kaskaskia River watershed identified as hydrologic unit code (HUC) 07140204. Two segments are identified as impaired due to low dissolved oxygen (DO) in the Illinois 2020/2022 Integrated Report. In addition, iron has been identified as a pollutant of concern in the watershed. There are no identified iron impairments, therefore a protection plan has been developed to guide implementation of recommended practices to protect the watershed from increases in iron levels and to maintain acceptable levels of iron in the Kaskaskia River in the future.

The State of Illinois typically uses a three-stage approach to develop total maximum daily loads (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 two segments of the Kaskaskia River listed for low DO impairment are recommended for delisting (IL_O-97) and recategorization (IL_O-03). As such, no TMDLs have been developed to address low DO impairments.

Segments within the Lower Kaskaskia River watershed were initially listed as impaired due to iron in Illinois's 2016 303(d) list. The Stage 1 report was completed in 2019 (see Appendix A). The mainstem Kaskaskia River segments were not identified on Illinois's 2020/2022 303(d) list as impaired for iron; therefore, a watershed protection plan was developed in place of a formal Stage 3 TMDL report. No TMDLs have been developed.

The full Stage 1 report is included in Appendix A and includes a summary of the 2016 water quality impairments, watershed characterization, pollutant source summary, and analysis of water quality data. Relevant information from the Stage 1 report has been included in this protection plan. As part of the Stage 2 TMDL development process, additional monitoring data were gathered by Illinois State Water Survey on behalf of the Illinois Environmental Protection Agency (IEPA) in 2019; Appendix B includes data collected as part of Stage 2. This report includes a brief summary of relevant Stage 2 data collection efforts and the outcome of those efforts.

A protection plan is provided which includes potential implementation activities to address sources of iron, a pollutant of concern. IEPA will be working with stakeholders to improve water quality in the watershed. It should be noted that the controls for nonpoint sources (e.g., agriculture) will be strictly voluntary.

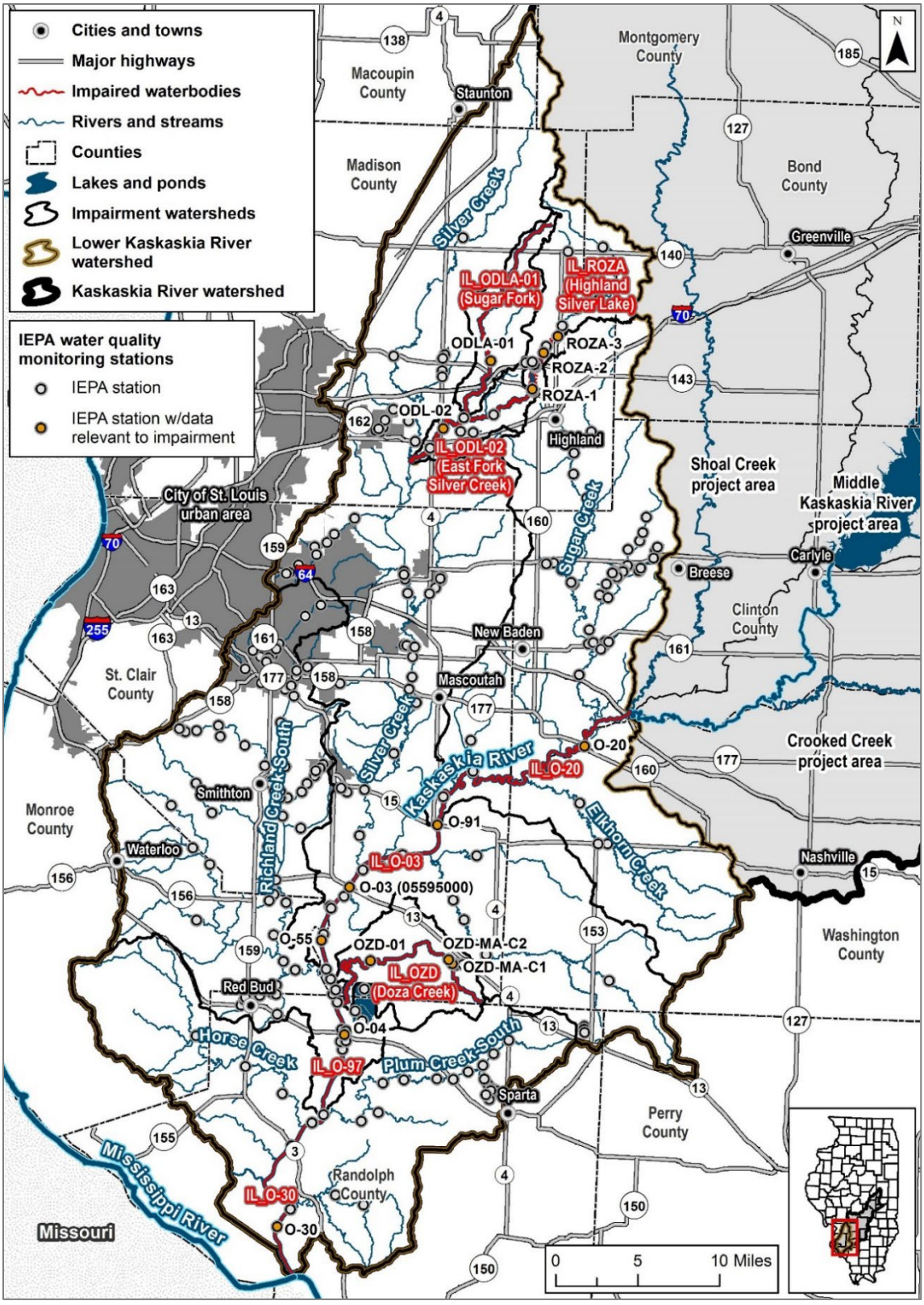


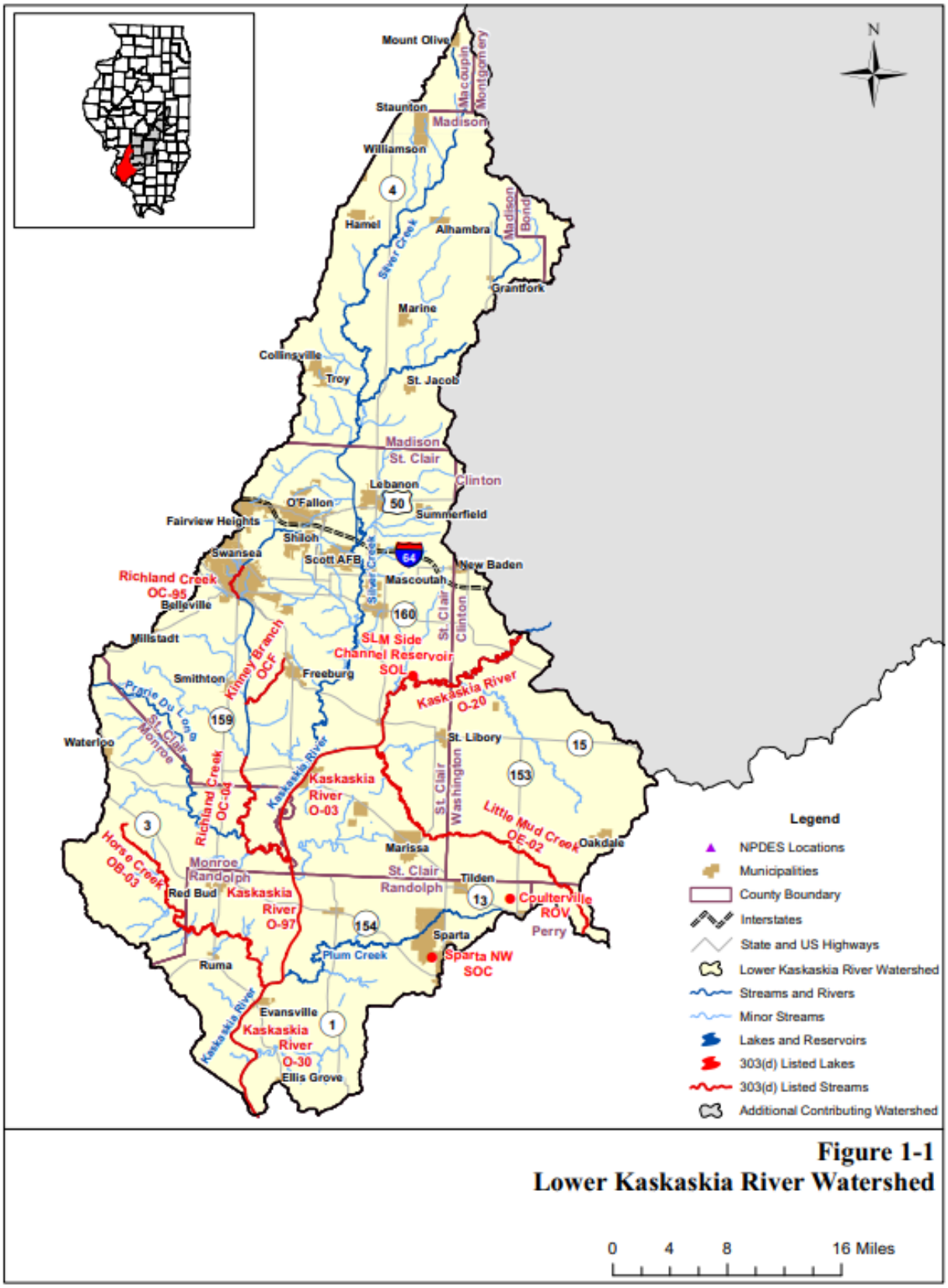
Figure 1. Lower Kaskaskia River watershed (HUC 07140204), project area.
Select monitoring stations are labeled.
Note: IL_ODL-02, IL_ODLA-01, IL_OZD, and IL_ROZA are not addressed in this document.

The *Lower Kaskaskia River Watershed TMDL Report* (IEPA 2012) was approved by the U.S. Environmental Protection Agency (U.S. EPA) in 2012. The 2012 TMDL study addressed atrazine, fecal coliform, manganese, and phosphorus impairments (Table 1, Figure 2).

Table 1. 2012 TMDL Study impaired waters

Name	Segment ID	Size [a]	Designated Uses	TMDL Parameters
Kaskaskia River	IL_O-03	15.18 miles	PFPWS	Atrazine
				Manganese
	IL_O-20	25.25 miles	Primary contact recreation	Fecal coliform
			PFPWS	Manganese
	IL_O-97	8.91 miles	PFPWS	Manganese
	IL_O-30	13.31 miles	Primary contact recreation	Fecal coliform
			PFPWS	Atrazine
				Manganese
SLM Side Channel Reservoir	SOL	7 acres	PFPWS	Atrazine
				Manganese
Mud Creek	IL_OE-02	38.67 miles	Aquatic life	Manganese
Coulterville Reservoir	ROV	38 acres	Aesthetic quality	Phosphorus (Total)
			PFPWS	Atrazine
Kinney Branch	IL_OCF	5.53 miles	Aquatic life	Manganese
Sparta NW Reservoir	SOC	33 acres	Aesthetic quality	Phosphorus (Total)
			PFPWS	Atrazine

PFPWS – Public and food processing water supply
TMDL – total maximum daily load
a. These sizes are from Illinois's 2020/2022 Integrated Report and differ slightly from the sizes reported in the TMDL studies.



Source: *Lower Kaskaskia River Watershed TMDL Report* (IEPA 2012).

Figure 2. 2012 TMDL study area.

2. Water Quality Standards and Select Impairments

Water quality standards (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 Lower Kaskaskia River watershed discussed in this report:

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.

Public and food processing water supply standards—These standards are cumulative with the general use standards and apply to waters of the state at any point at which water is withdrawn for treatment and distribution as a potable supply to the public or for food processing.

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(s) 302 and 611 contain water quality standards promulgated by the IPCB for general use and public and food processing water supply (PFPWS), respectively. This section presents the standards applicable to iron and DO in the study area.

Table 2. Summary of iron water quality standards for the Lower Kaskaskia River watershed

Parameter	Units	Water Quality Standard
General Use		
Iron (dissolved)	mg/L	1.0 mg/L
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
Public and Food Processing Water Supply		
Iron (dissolved)	mg/L	0.3 mg/L (Public and Food Processing Water Supply Standard), 1.0 mg/L Maximum Contaminant Level (MCL) for waters supplies serving ≥ 1,000 people or ≥ 300 connections

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.

2.2.1 General Use Standards

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 (Karr et al. 1986; Smogor 2000, 2005), the macroinvertebrate Index of Biotic Integrity (Tetra Tech 2004), and the Macroinvertebrate Biotic Index (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 2002 and http://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 water quality standard (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/documents/dsweb/Get/Document-12042/).

2.2.2 Public and Food Processing Water Supply Use Standards

Attainment of PFPWS use is assessed only in waters in which the use is currently occurring, as evidenced by the presence of an active public-water supply intake. The assessment of PFPWS use is based on conditions in both untreated and treated water. By incorporating data through programs related to both the federal Clean Water Act (CWA) and the federal Safe Drinking Water Act, IEPA believes that these guidelines provide a comprehensive assessment of PFPWS use. Assessments of PFPWS use recognize that characteristics and concentrations of substances in Illinois surface waters can vary and that a single assessment guideline may not protect sufficiently in all situations. Using multiple assessment guidelines helps improve the reliability of these assessments. When applying these assessment guidelines, IEPA also considers the water-quality substance, the level of treatment available for that substance, and the monitoring frequency of that substance in the untreated water. Table 3 includes the assessment guidelines for waters with PFPWS designated uses.

Table 3. Guidelines for assessing public water supply in waters of the State

Degree of Use Support	Guidelines
Fully Supporting	For each substance in untreated water[1], for the most-recent three years of readily available data or equivalent dataset, a) ≤ 10% of observations exceed an applicable Public and Food Processing Water Supply Standard[2]; and b) for which the concentration is not readily reducible by conventional treatment, i) no observation exceeds by at least fourfold the Maximum Contaminant Level threshold concentration[3] for that substance; and ii) no quarterly average concentration exceeds the Maximum Contaminant Level threshold concentration[3] for that substance; and [4], For each substance in treated water, no violation of an applicable Maximum Contaminant Level[3] occurs during the most recent four years of readily available data.
Not Supporting	For any single substance in untreated water[1],for the most-recent three years of readily available data or equivalent dataset, a) > 10% of observations exceed a Public and Food Processing Water Supply Standard[2]; or b) for which the concentration is not readily reducible by conventional treatment, i) at least one observation exceeds by at least fourfold the Maximum Contaminant Level threshold concentration[3] for that substance; or ii) the quarterly average concentration exceeds the Maximum Contaminant Level threshold concentration[3] for that substance; or, For any single substance in treated water, at least one violation of an applicable Maximum Contaminant Level[3] occurs during the most recent four years of readily available data. or, Closure to use as a drinking-water resource (cannot be treated to allow for use).

Source: IEPA 2021 (Table C-21).
[1]. Includes only the untreated-water results that were available in the primary computer database at the time data were compiled for these assessments
[2]. 35 I11. Adm. Code 302.304, 302.306 (https://pcb.illinois.gov/SLR/IPCBandIEPAEnvironmentalRegulationsTitle35).
[3]. 35 I11. Adm. Code 611.300, 611.301, 611.310, 611.311, 611.325.
[4]. Some waters were assessed as Fully Supporting based on treated-water data only.

One of the assessment guidelines for untreated water relies on a frequency-of-exceedance threshold (10 percent) because this threshold represents the true risk of impairment better than does a single exceedance of a water quality criterion. Assessment guidelines also recognize situations in which water treatment that consists only of "...coagulation, sedimentation, filtration, storage and chlorination, or other equivalent treatment processes" (35 Ill. Adm. Code 302.303; hereafter called "conventional treatment") may be insufficient for reducing potentially harmful levels of some substances. To determine if a Maximum Contaminant Level (MCL) violation in treated water would likely occur if treatment additional to conventional treatment were not applied (see 35 Ill. Adm. Code 302.305), the concentration of the potentially harmful substance in untreated water is examined and compared to the MCL threshold concentration. If the concentration in untreated water exceeds an MCL-related threshold concentration, then an MCL violation could reasonably be expected in the absence of additional treatment.

Compliance with an MCL for treated water is based on a running 4-quarter (i.e., annual) average, calculated quarterly, of samples collected at least once per quarter (Jan.–Mar., Apr.–Jun., Jul.–Sep., and

Oct.–Dec.). However, for some untreated water intake locations, sampling occurs less frequently than once per quarter; therefore, statistics comparable to quarterly averages or running 4-quarter averages cannot be determined for untreated water. Rather, for substances not known to vary regularly in concentration in Illinois surface waters (untreated) throughout the year, a simple arithmetic average concentration of all available results is used to compare to the MCL threshold. For substances known to vary regularly in concentration in surface waters during a typical year (e.g., nitrate), average concentrations within the relevant sub-annual (e.g., quarterly) periods are used.

2.3 Water Quality Impairments

Two segments of the Kaskaskia River are listed as impaired for their aquatic life use by low dissolved oxygen (DO). One segment (IL_O-03) is recommended for recategorization and one segment (IL-O-97) is recommended for delisting. No TMDLs have been developed. There are other impaired waters in the Lower Kaskaskia River watershed that are not being addressed by this study.

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. When the 7Q10 for a DO impairment is zero (i.e., the stream is dry), then lack of flow is the cause of impairment. In such cases, the listing should be recategorized to Consolidated Assessment and Listing Methodology (CALM) Category 4C because lack of flow is a non-pollutant.

2.3.1 IL_O-97 Delisting Recommendation

Kaskaskia River segment IL_O-97 is listed for not supporting aquatic life due to low DO. Continuous DO data were collected in July and September 2012; however, the July data were determined to be unreliable. The DO standard was not violated during 7 days in September (Figure 3). There were eight additional grab samples collected at site O-04 between 2007 and 2012, with one sample that violated the standard (Figure 4). A reach is considered impaired due to low DO if greater than 10% of the samples violate the standard. In this case, less than 10% of the samples violated the standard and therefore it is recommended that the segment be delisted for aquatic life.

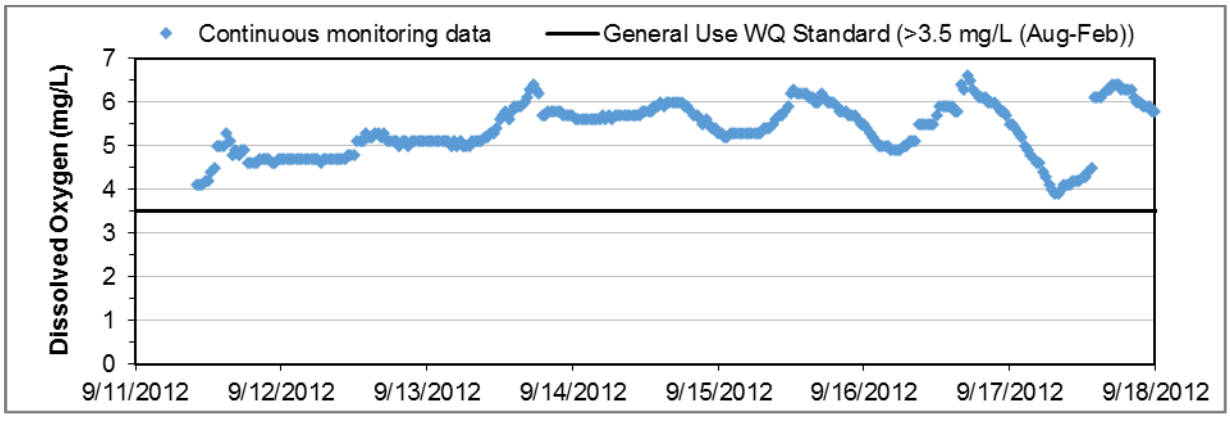


Figure 3. Continuous water quality time series for dissolved oxygen, Kaskaskia River O-97 segment.

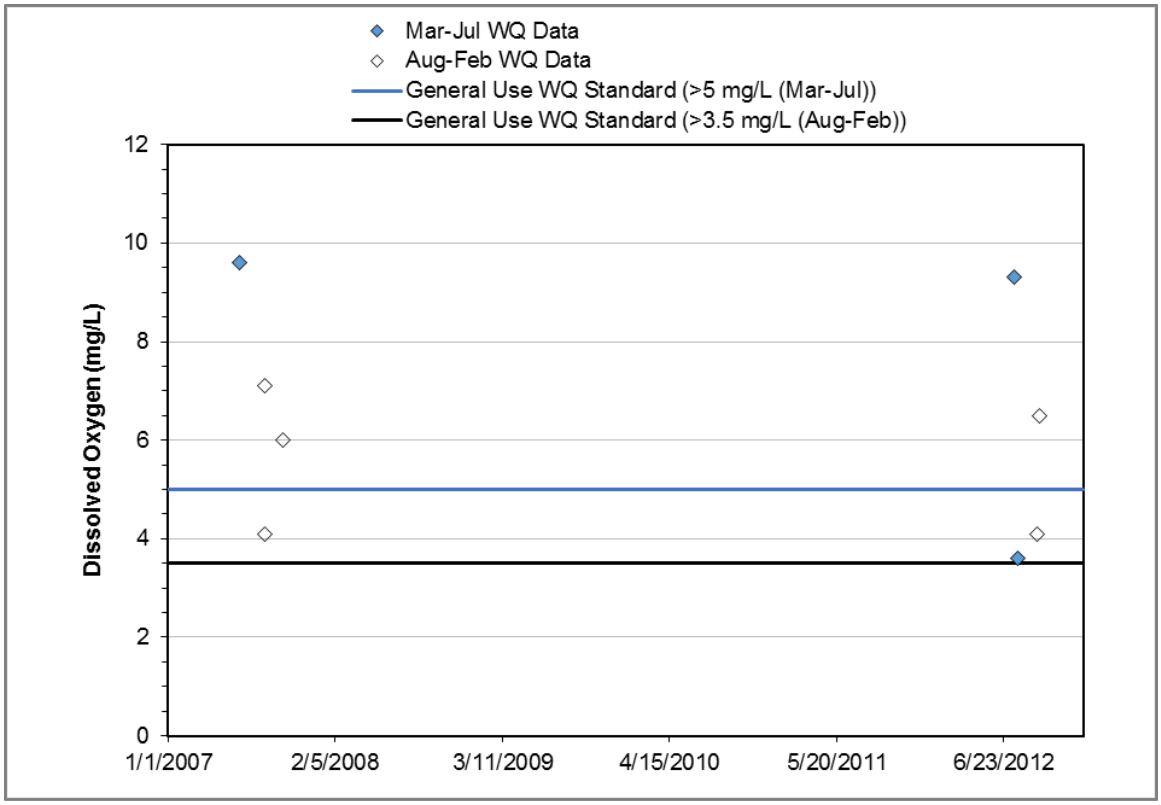


Figure 4. Dissolved oxygen water quality time series, Kaskaskia River O-97 segment.

2.3.2 IL_O-03 Recategorization Recommendation

As discussed in the Stage 1 Report (Appendix A), 457 DO measurements were collected from segment IL_O-03 in 2007-2016 and a sonde was deployed in 2012. Grab and continuous DO monitoring indicated impairment. DO data were paired with total phosphorus and chlorophyll-*a* to determine if the low DO impairment was related to nutrient eutrophication. No strong correlation was identified. Thus, the Stage 1 Report recommended additional sampling and QUAL2K modeling.

In 2019, a sonde was deployed to segment IL_O-03 in September; however, there was no evidence of impairment (Figure 5). The Kaskaskia River (IL_O-03) was further evaluated using the QUAL2K model, as described in the Stage 1 Report (see Appendix A), and as provided in Appendix C. Findings from this modeling exercise included:

- When all nutrient concentrations at the headwaters, tributaries, and point sources were decreased by half, the instream DO concentration improved but only marginally. This suggested that instream DO concentration is not controlled by nutrient concentrations, but by other DO reducing forces instream.
- Further testing revealed that the best solution for improving instream DO to meet the WQS involved increasing reaeration and decreasing sediment oxygen demand.

These modeling results are similar to the findings of the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012) for different portions of the Lower Kaskaskia River. In this case, the role of sediment oxygen demand and lack of reaeration is driving the impairment, not pollutants

in the river. This segment is recommended to be recategorized as Consolidated Assessment and Listing Methodology Category 4C, impaired but not due to a pollutant.

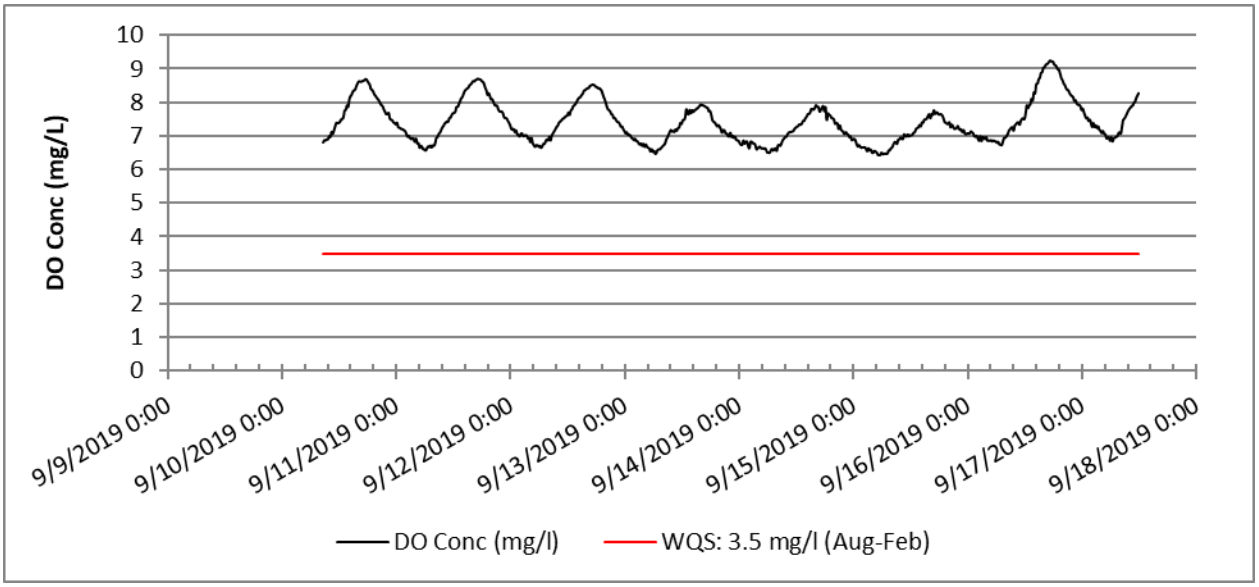


Figure 5. Continuous DO monitoring at O-03: Kaskaskia River (IL_O-03).

3. Watershed Characterization

The Lower Kaskaskia River watershed is in southwestern Illinois (Figure 1). The watershed begins at the confluence of the Kaskaskia River and Shoal Creek and ends where the Kaskaskia River joins the Mississippi River south of St. Louis, Missouri. A TMDL was previously developed for the Lower Kaskaskia River watershed (IEPA 2012), and much of the information presented in that report is applicable to the current project. There have been no known changes in the project area; therefore, the existing Lower Kaskaskia River watershed TMDL provides much of the basis for the watershed characterization and source assessment below.

3.1 Jurisdictions and Population

Relevant information on jurisdictions and population can be found in Sections 2.1 and 2.5 of the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012); Figure 1 in this report also has a map of jurisdictions. The project area is in Bond, Clinton, Macoupin, Madison, Monroe, Montgomery, Perry, Randolph, St. Clair, and Washington counties. The city of St. Louis urban area intersects the western boundary of the watershed.

According to the Illinois State Water Survey, the Summerfield Lebanon Mascoutah Water Commission withdraws water from the Kaskaskia River along segment IL_O-20. The water is pumped from the Kaskaskia River to an off-channel reservoir and later transferred to the Commission's water treatment plant.

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 Sections 2.6.1 and 2.6.2 in the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012); over a century of climate data were summarized in that report and the climate summaries are assumed to be representative of current conditions.

3.3 Land Use and Land Cover

Relevant information on land use and land cover can be found in Section 2.3, Tables 2-1 and 2-2, and Figure 2-2 in the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012). Cultivated crops make up most of the land cover in the Lower Kaskaskia River watershed. There are several small cities in the watershed, with most of the development located in the city of St. Louis urban area. No significant changes in land use are known to have occurred since the approval of the previous TMDL report.

3.4 Topography

Relevant information on topography can be found in Section 2-2 and Figure 2-1 in the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012).

3.5 Soils

Relevant information on soils can be found in Section 2.4 and Figure 2-3 in the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012). Soils are primarily a mixture of silt loam or loam with moderate infiltration rates when thoroughly wetted and sandy clay loams with low infiltration rates when thoroughly wetted. According to the Natural Resources Conservation Service (NRCS) soil surveys for counties in the Lower Kaskaskia River watershed, many of the soil series have "masses of iron and manganese accumulation throughout" (NRCS 2020). Additionally, iron is abundant in the sedimentary rocks of the Pennsylvanian system that are present in the Kaskaskia River watershed.

3.6 Hydrology

Relevant information on hydrologic conditions can be found in Section 2.6.3 and Figure 2-4 in the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012). IEPA considers the hydrology summary from the 2012 TMDL report to be representative of current hydrologic conditions.

Active U.S. Geological Survey (USGS) flow gage sites in the watershed (Figure 6) are located along Kaskaskia River segments IL_O-20 (05594100), IL_O-03 (05595000), and IL_O-97 (05595240), and along Silver Creek (05594500 and 05594800) and Richland Creek (05595200).

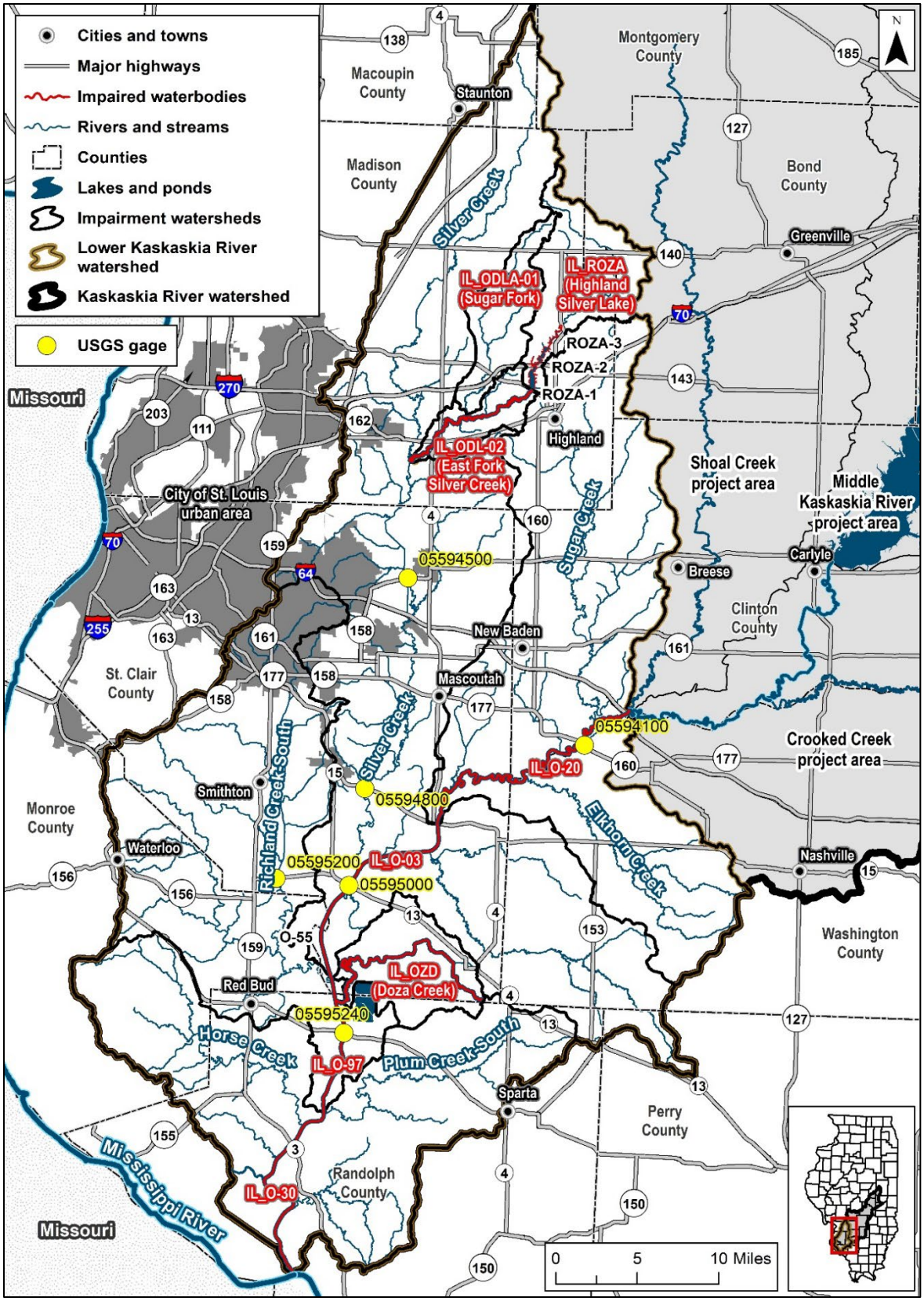


Figure 6. USGS flow gage sites.
Note: IL_ODL-02, IL_ODLA-01, IL_OZD, and IL_ROZA are not addressed in this document.

3.7 Watershed Studies and Information

This section describes several of the studies that have been completed in the watershed:

- **Bank Erosion Study of the Kaskaskia River, Carlyle Lake to New Athens, Illinois** (USACE 2000)

  Study completed by U.S. Army Corps of Engineers (USACE) in partnership with the Original Kaskaskia Area Wilderness, Inc., and Illinois Department of Natural Resources (IDNR) to determine sources of lateral erosion on the Kaskaskia River and to propose remedial actions that can be taken to mitigate erosional processes. Headcutting was identified as a major source of erosion due to the navigation project completed on the Lower Kaskaskia River. Several measures for remediating erosion are proposed, including grade control structures to address headcutting.

- **Kaskaskia River Watershed, An Ecosystem Approach to Issues and Opportunities** (Southwestern Illinois RC&D, Inc. 2002)

  The plan encompasses the larger Kaskaskia River watershed from Champaign County to Randolph County in southwestern Illinois, covering over 10 percent of the state of Illinois. The purpose of the plan was to begin a coordinated restoration process in the Kaskaskia River watershed based on sound ecosystem principles. The plan made recommendations on sustainability, diversity, health, variety, connectivity, and the ecosystem's ability to thrive and reproduce in order to promote the sustainability of the ecosystem and strengthen the economic base and the quality of life of residents in the region.

- **Aerial Assessment Report on Highland Silver Lake and East Fork of Silver Creek** (Limno Tech 2005)

  Report completed to investigate sources of lakeshore and streambank erosion contributing to manganese, total phosphorus, and dissolved oxygen impairments in Highland Silver Lake. Lakeshore and stream channel conditions were investigated upstream, within, and downstream of Highland Silver Lake. Research methods included aerial video mapping, use of topographic maps, and field verification of findings.

- **Highland Silver Lake Watershed Total Maximum Daily Load Report** (IEPA 2006)

  The completed Highland Silver Lake TMDL Report contains TMDL allocations for Highland Silver Lake. Causes of impairments include aldrin, chlordane, dissolved oxygen, manganese, and total phosphorus. Highland Silver Lake is located directly upstream of East Fork Silver Creek (IL_ODL-02), which is addressed in this report.

- **Lower Kaskaskia River Watershed Total Maximum Daily Load Report** (IEPA 2012)

  The completed Lower Kaskaskia River TMDL Report contains relevant information and data for this TMDL. Causes of impairments included atrazine, dissolved oxygen, fecal coliform, manganese, pH, and total phosphorus.

4. Water Quality

Background information on water quality monitoring can be found in the *Lower Kaskaskia River Watershed Total Maximum Daily Load Report* (IEPA 2012). In the Lower Kaskaskia River watershed, water quality data were found for numerous stations that are part of the IEPA Ambient Water Quality Monitoring Network and at USGS gage 05595000 (Kaskaskia River at New Athens, IL). Monitoring stations with data relevant to the segments of interest are presented in Figure 1 and Table 4. 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 evaluated. Data that are greater than 10 years old may also be summarized. Each data point was reviewed to ensure the use of quality data in the analyses below. Data were obtained directly from IEPA and from the USGS National Water Information System.

Table 4. Lower Kaskaskia River watershed water quality data

Waterbody	Segment	AWQMN Sites (USGS Gage)	Location	Period of Record
Kaskaskia River	IL_O-20	O-20	RM 57.2, Route 177 bridge 5 Mi. NW Okawville near Venedy Station	*1999–2006*, 2007–2016
	IL_O-30	O-30	RM 3.3, Roots Rd. bridge 2.7 Mi. W of Ellis Grove	*1999–2006*, 2007–2016

Italics – Data are more than 10 years old
AWQMN - Ambient Water Quality Monitoring Network
DNS – Downstream
RM – River Mile
USGS - U.S. Geological Survey

This section provides a brief review of available water quality information provided by the IEPA and downloaded from USGS National Water Information System.

4.1 Kaskaskia River (IL_O-20) - Iron

From 2014–2016, 22 dissolved iron samples were collected at site O-20 (Table 5 and Figure 7). Greater than 10 percent of samples were recorded above the 0.3 milligram per liter (mg/L) PPFWS numeric standard. A sample in March of 2016 also exceeded the drinking water MCL of 1.0 mg/L.

Additional dissolved iron data that were not presented in the Stage 1 Report were collected in 2016 and 2017 from the Kaskaskia River at site O-20. All 17 samples were less than the 1.0 mg/L dissolved iron.

Table 5. Iron (dissolved) data summary, Kaskaskia River segment IL_O-20

Sample Site	Date	Result (mg/L)	Quarterly Average (mg/L)
Stage 1 Report			
O-20	1/21/2014	0.03	0.21
	2/20/2014	*0.58*	
	3/31/2014	0.01	
	5/14/2014	0.03	0.03
	6/16/2014	0.03	
	8/11/2014	0.04	0.04
	9/8/2014	0.04	
	10/8/2014	0.06	0.28
	12/8/2014	*0.49*	
	1/28/2015	0.05	0.07
	3/18/2015	0.09	
	4/21/2015	0.03	0.19
	5/12/2015	*0.51*	
	6/25/2015	0.03	
	8/10/2015	0.07	0.04
	9/8/2015	0.01	
	10/22/2015	0.04	0.20
	12/2/2015	*0.36*	
	1/6/2016	0.09	0.66
	3/2/2016	***1.22***	
	4/4/2016	0.10	0.21
	5/10/2016	*0.33*	

Red italicized values indicate samples exceeding the PFPWS Standard
Bold red italicized values indicate samples exceeding the PFPWS Standard and above the MCL

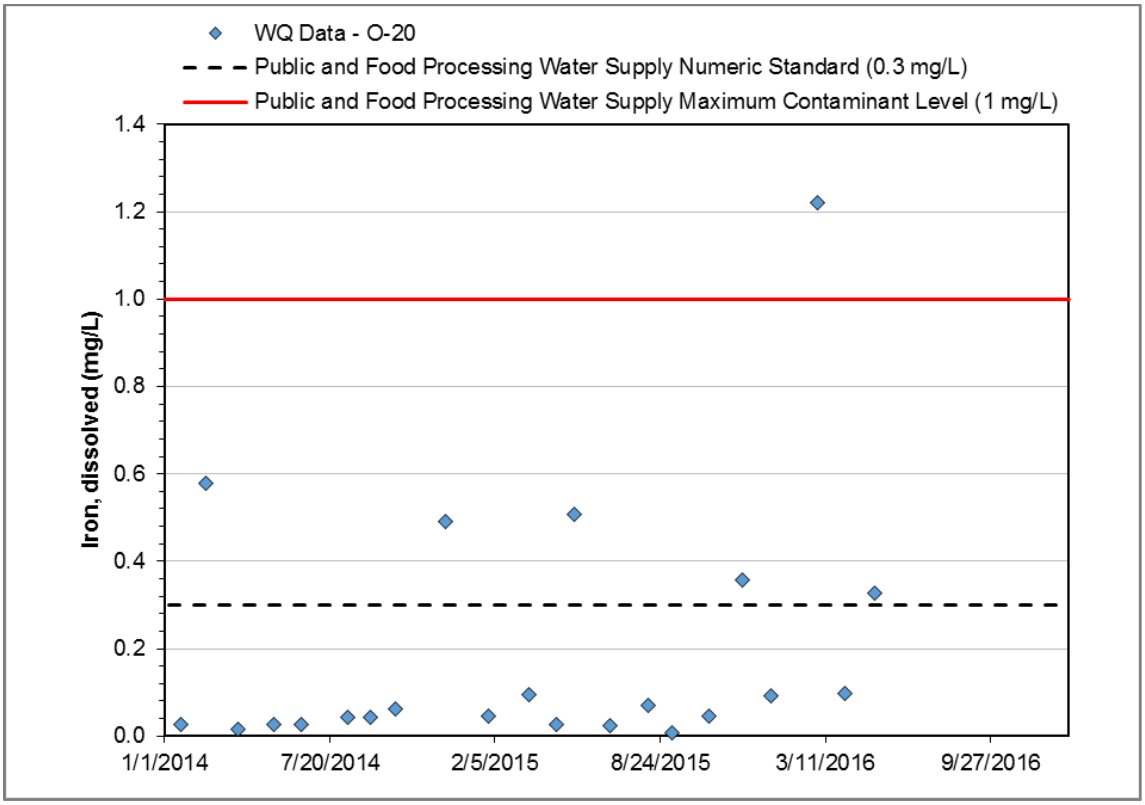


Figure 7. Iron water quality time series, Kaskaskia River site O-20.

4.2 Kaskaskia River (IL_O-30) - Iron

From 2007–2016, 77 dissolved iron samples were collected at site O-30 (Table 6 and Figure 8). Violations of the general use water quality standard were observed in June 2011 and January 2013. Additional dissolved iron data were collected in 2016 and 2017 from the Kaskaskia River at site O-30. All 16 samples were less than the 1.0 mg/L dissolved iron.

Table 6. Iron (dissolved) data summary, Kaskaskia River O-30

Sample Site	No. of Samples	Minimum (µg/L)	Average (µg/L)	Maximum (µg/L)	Number of Exceedances of General Use Water Quality Standard (1,000 µg/L)
O-30	77	2	178	4,780	2

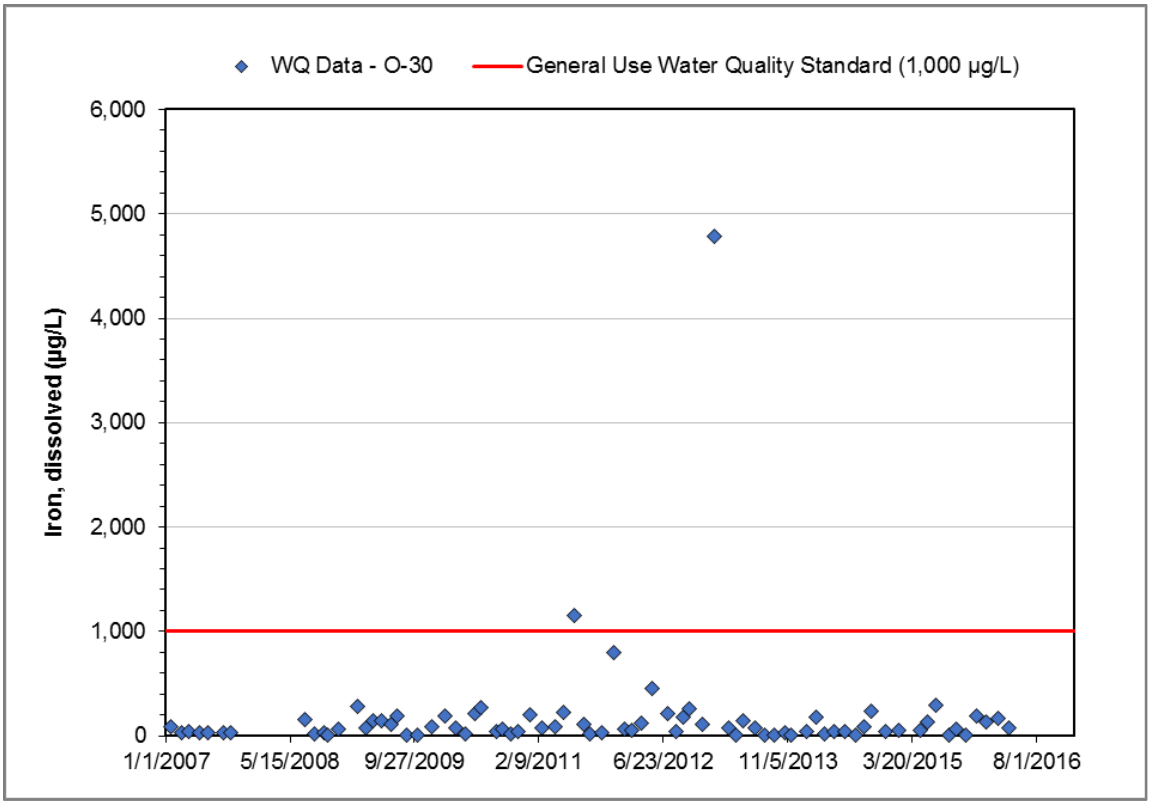


Figure 8. Iron water quality time series, Kaskaskia River site O-30.

5. Watershed Source Assessment

Source assessments are an important component of water quality management plans. This section focuses on sources of iron in the Lower Kaskaskia River watershed, specifically in areas draining to IL_O-20 and IL_O-30. Iron can originate from many 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. The most common sources of iron in surface and groundwater are naturally occurring, for example from weathering of iron-bearing minerals, soils, and rocks. Soil and sediment are typically the dominant nonpoint sources of iron to most surface waters (Munger 2016). During wet-weather events (snowmelt and rainfall), soils can erode and be delivered to downstream waterbodies. High iron concentrations in surfaces waters can occur when natural levels of soil erosion are intensified by anthropogenically altered landscapes.

5.1 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 stormwater including municipal separate storm sewer systems (MS4s).

There are 65 NPDES permitted facilities in the Lower Kaskaskia River watershed. Design average and maximum flows and downstream stream segments are included in the facility summaries. NPDES facilities in the study area include municipal and industrial wastewater treatment. There are also public water supply facilities in the watershed, and associated iron filter backwash may contribute iron.

5.1.1 Individual NPDES for Public Facilities

WWTPs and sewage treatment plants (STPs) covered by individual NPDES permits do not have iron (dissolved) effluent limits, and IEPA does not consider such facilities to be sources of iron. These 33 facilities are summarized in Table 7. As WWTPs and STPs are not sources of iron, they are not further discussed.

Table 7. Individual NPDES permitted sewage treatment plants in the Lower Kaskaskia River watershed

IL Permit ID	Facility Name	Receiving Water	Downstream Segment(s)	DAF (MGD)	DMF (MGD)
IL0020001	Aviston STP	Lake Branch	IL_O-20, IL_O-03, IL_O-30	0.167	0.35
IL0020753	Freeburg East STP	Lemen Creek to Silver Creek	IL_O-03, IL_O-30	0.31	0.775
IL0020834	Smithton STP	Douglas Creek	IL_O-30	0.95	2.85
IL0020893	Fayetteville STP	Kaskaskia River	IL_O-03, IL_O-30	0.05	0.199
IL0021083	Caseyville Township East STP [a]	Ellen Creek	IL_O-03, IL_O-30	4.4	11.39
IL0021181	Swansea STP [a]	Richland Creek	IL_O-30	5.015	11.89
IL0021440	Evansville STP	Kaskaskia River	IL_O-30	0.17	0.425
IL0021636	O'Fallon STP	Silver Creek	IL_O-03, IL_O-30	5.61	13.14
IL0021725	New Athens STP [a]	Kaskaskia River	IL_O-03, IL_O-30	0.3	0.75
IL0021873	Belleville STP #1	Richland Creek	IL_O-30	12.4 [b]	27 [b]
IL0024813	Marissa STP [c]	Unnamed tributary of Doza Creek	IL_OZD, IL_O-30	0.585	2.54
IL0025291	Mascoutah STP	Silver Creek	IL_O-03, IL_O-30	0.965	2.972
IL0025348	Red Bud STP [a]	Black Creek	IL_O-30	0.6	1.2
IL0026701	Trenton STP	Trenton Creek	IL_O-20, IL_O-03, IL_O-30	0.5	1.25
IL0026859	Scott Air Force Base [a]	Unnamed tributary of Silver Creek	IL_O-03, IL_O-30	4 [b]	6 [b]
IL0026948	Adorers of the Blood of Christ	Unnamed tributary to Horse Creek	IL_O-30	0.03	0.114
IL0027219	Baldwin STP	Unnamed tributary to Plum Creek	IL_O-30	0.051	0.128
IL0029173	City of Highland STP [a]	Lidenthal Creek to Sugar Creek	IL_O-20, IL_O-03, IL_O-30	1.6	4
IL0029483	Lebanon STP	Little Silver Creek	IL_O-03, IL_O-30	0.87	1.3
IL0031488	Troy STP [a]	Troy Creek, Wendel Branch	IL_O-03, IL_O-30	1.35	3.902
IL0032310	Freeburg West STP [a]	Kinney Branch of Richland Creek	IL_O-30	0.4	1
IL0032514	Millstadt STP	Douglas Creek	IL_O-30	0.965	1.838
IL0032603	New Baden STP	Unnamed tributary of Sugar Creek	IL_O-20, IL_O-03, IL_O-30	0.78	1.349
IL0046663	Dutch Hollow Village – STP	Unnamed tributary to Schoenburg Creek	IL_O-30	0.08	0.2
IL0048232	St. Clair Township - Lincolnshire STP [a]	Loop Creek	IL_O-03, IL_O-30	1.5	3.75
IL0063282	Ruma WWTP	Ruma Creek	IL_O-30	0.04	0.16
IL0063762	Damiansville STP	Unnamed tributary to Sugar Creek	IL_O-20, IL_O-03, IL_O-30	0.06	0.234
IL0064220	Summerfield STP	Unnamed tributary of Little Silver Creek	IL_O-03, IL_O-30	0.07	0.245
IL0066133	Sparta Northwest STP	Sparta Creek	IL_O-30	0.25	0.62
IL0074993	Manors at Kensington Parque STP	Unnamed tributary of Wendell Branch	IL_O-03, IL_O-30	0.0238	0.0595
IL0075094	Metro-East Airpark STP	Unnamed tributary of Silver Creek	IL_O-03, IL_O-30	0.0042	0.015
IL0075388	Castle Ridge Estates STP	Unnamed tributary to Mill Creek	IL_O-20, IL_O-03, IL_O-30	0.0175	0.0735
IL0076732	New Memphis Sanitary District STP	Unnamed tributary of Queens Lake Branch	IL_O-20, IL_O-03, IL_O-30	0.035	0.14

MGD – Million gallons per day
STP – Sewage treatment plant
WWTP – Wastewater treatment plant.
NPDES permits for some STPs refer to the facilities as WWTPs. The terms “sewage treatment plant” and “wastewater treatment plant” are interchangeable.
[a] Includes an excess flow outfall.
[b.] Flow listed includes multiple outfalls.
[c.] Marissa STP discharges to a small tributary and potentially contributes to low dissolved oxygen on Doza Creek IL_OZD.

5.1.2 Individual NPDES for Industrial Facilities

Four industrial facilities in the Kaskaskia River watershed are (as of 2022) covered by individual NPDES permits (Table 8):

- Dynegy Midwest Generation – Baldwin (IL0000043)
- ExxonMobil Coal USA, Inc. – Mine No. 2 (IL0048691)
- Hillside Recreational Lands, LLC – Randolph Preparation Plant (IL0062740)
- Prairie State Generation Company – Marissa (IL0076996)

Two individual NPDES permits were terminated during the course of this project:

- **Maple Leaf Estates Water Corp** ceased discharging in 2018 and terminated its individual NPDES permit (IL0071579) on August 23, 2018. As the facility was not authorized to discharge iron, nor expected to discharge iron, it is not further discussed.
- **Exxon Mobile Coal USA, Inc.** consolidated individual NPDES permits in 2021, with the termination of permit IL0076317; pertinent requirements in permit IL0076317 were incorporated into the renewal of permit IL0048961.

The four facilities with active NPDES permits are each authorized to discharge iron in their effluent. Their permits set total iron limits of 1, 4 or 7 mg/L on certain waste streams (Table 8), while other waste streams do not have total iron limits. The individual NPDES permit limits are for total iron, and the water quality standards are for dissolved iron (0.3 mg/L for PFPWS, 1.0 mg/L drinking water MCL, and 1.0 mg/L aquatic life).

Discharge monitoring reports for the four active facilities were evaluated for total and dissolved iron; summaries of these data are presented in Table 9. Summaries of the evaluations are presented below:

- **Dynegy Midwest Generation – Baldwin** (IL0000043): Samples were collected semi-annually in 2015-2017 and evaluated for total and dissolved iron. Daily maximum total iron per month was always less than 0.5 mg/L and dissolved iron was typically below detection limit (<0.02 mg/L).
- **ExxonMobil Coal USA, Inc. Mine No. 2** (IL0048691 and IL0076317): IL0048691 outfall 001 (acid mine drainage to Grassy Branch of Sugar Creek) discharged in 11 months of 60 months in 2013-2017. Daily maximum total iron per month was always less than 2 mg/L.

  IL0076317 outfall 001 (acid mine drainage to the Kaskaskia River)[1] discharged in 37 of 60 months in 2013-2017. Daily maximum total iron per month was always less than 1.0 mg/L. Daily maximum total iron loads per month ranged from 0.91 to 6.46 pounds per day.
- **Hillside Recreational Lands, LLC - Randolph Preparation Plant** (IL0062740): Total iron was monitored in both alkaline mine drainage outfalls. Discharges occurred in 48-54 months of 57 months in 2013-2017. Daily maximum total iron per month was often below 1 mg/L but occasionally was significantly higher (e.g., 20 mg/L in December 2013).
- **Prairie State Generation Company – Marissa** (IL0076996): Total iron is only monitored in two of many outfalls that often composed of many waste streams. Only a few discharges occurred in 2014-2017 at two emergency overflow outfalls that must monitor iron. Daily maximum total iron concentrations per month ranged from 0.30 to 4.31 mg/L.

[1] This outfall is now IL0048691 outfall 003 (groundwater remediation pumpage and coal refuse seepage and runoff).

Table 8. Individual NPDES permitted industrial facilities in the Lower Kaskaskia River watershed

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Segment(s)	DAF (MGD)	DMF (MGD)	Total Iron Daily Max. Limits (mg/L)
IL0000043	Dynegy Midwest Generation - Baldwin	Ash pond discharge [a]	Kaskaskia River	IL_O-30	3.27 [c]	5.18 [c]	none
		Overflow from Baldwin Cooling Pond [b]			0.4625 [c]	0.575 [d]	none
		Coal pile runoff	Doza Creek	IL_OZD, IL_O-30	0.6	–	none
		River intake screen backwash	Kaskaskia River	IL_O-30	0.018	--	none
IL0048691	ExxonMobil Coal USA, Inc. Mine No. 2	Acid mine drainage	Grassy Branch of Sugar Creek	IL_O-20, IL_O-03, IL_O-30	2.77 [c]	3.74 [c]	7.0
		Stormwater runoff			no data	no data	none
		Groundwater remediation pumpage and coal refuse seepage and runoff	Kaskaskia River	IL_O-20, IL_O-03, IL_O-30	0.765 [d]	0.831 [d]	4.0
IL0062740	Hillside Recreational Lands, LLC - Randolph Preparation Plant	Alkaline mine drainage	Doza Creek	IL_OZD, IL_O-30	--	1.24 [c]	7.0
		Stormwater			1.55 [c]	4.18 [c]	none
		Alkaline mine drainage	Unnamed tributary to Doze Creek	IL_OZD, IL_O-30	0.349 [c]	0.362 [c]	7.0
		Stormwater			0.702 [c]	2.65 [c]	none
IL0067695	Enable Mississippi River Transmission, LLC - St. Jacob Station	Air compressor condensate, floor washwater, and stormwater	Unnamed ditch tributary to Little Silver Creek	IL_O-03, IL_O-30	0.000118	–	none
IL0071579 [e]	Maple Leaf Estates Water Corp	Common collector outfall	Unnamed tributary to Richland Creek	IL_O-30	0.0127	0.0381	none
IL0076317 [f]	ExxonMobil Coal USA, Inc. - Monterey Coal Company No. 2 Mine	Acid mine drainage	Kaskaskia River	IL_O-20, IL_O-03, IL_O-30	0.765 [d]	0.831 [d]	4.0
IL0076996	Prairie State Generation Company - Marissa	Cooling tower blowdown	Kaskaskia River	IL_O-03, IL_O-30	1.54 [d]	2.19 [d]	none
		Raw water impoundment emergency overflow [g]	Unnamed tributary to Mud Creek		0.02 [d]	0.50 [d]	4
		Coal/limestone basin emergency overflow [h]			no flows	no flows	none
		Plant runoff basins 1A and 1B emergency overflow [i]			0.61 [d]	2.08 [d]	none
		Stormwater runoff pond			no data	no data	none
		West sedimentation pond emergency overflow [j]			0.58 [d]	1.4 [d]	monitor
		Stormwater runoff			no data	no data	none

DAF – design average flow
DMF – design maximum flow
MGD – Million gallons per day

[a] Intermittent ash pond discharge is composed of bottom ash transport water, demineralizer regenerate waste, unit 1 boiler sump, unit 1 boiler lowpoint drains, water treatment system wastes, sewage treatment effluent (combined), oil/water separator (stack no. 1), miscellaneous discharges, chemical and non-chemical metal cleaning wastes, dredge spoils, and low volume SDA sump and other miscellaneous floor drainage.

[b] Intermittent overflow from cooling pond is composed of condenser cooling water, #1 and #2 oil/water separator, cooling pond intake screen backwash, roof drains and area runoff, high pressure header/deaerating heater, flood rains, service water head tank overflow, Unit 1 slag tank overflow cooling jacket, cooling water and ash line drain, Unit 2 boiler room sump, Unit 3 boiler room sump, Unit 2 cyclone jacket cooling water, Unit 2 slag tank overflow, Unit 2 and 3 ash hopper overflows, Units 2 and 3 boiler low point drains, Unit 3 boiler blowdown and floor drains, Unit 3 pyrite transfer tank overflow, Unit 3 economizer storage hopper overflow, Units 1, 2,3 SDA compressor cooling, bottom ash effluent, and aerated lagoon sewage treatment plant (via outfall A01).

[c] Design flow based on average reported flow from 2014–2017 discharge monitoring reports (DMRs).

[d] Special condition #16 of the individual NPDES permit limits the flow from outfall 003 to the Kaskaskia River to 600 gallons per minute (0.864 mgd), except during “extraordinarily high precipitation” when the limit is 800 gallons per minute (1.15 mgd).

[e] Permit IL0071579 was terminated on August 23, 2018, after the discharge was eliminated.

[f] Permit IL0076317 was terminated on December 17, 2021.

[g] Raw water impoundment emergency overflow is composed of treated sanitary water (A01), recycle basin (B03), coal/limestone basin (C03), lant runoff basins 1A and 1B (D03), west sedimentation pond (E03), pumped mine water (F03; IL0077526), and stormwater runoff.

[h] Coal/limestone basin emergency overflow is composed of stormwater runoff and coal combustion waste loading area runoff.

[i] Plant runoff basins 1A and 1B emergency overflow is composed of stormwater runoff, cooling tower basin emergency overflow (A06), and recycle basin emergency overflow (B06).

[j] West sedimentation pond emergency overflow is composed of non-contact stormwater runoff and groundwater seepage.

Table 9. Iron discharge monitoring report results (2013-2017) at key individual NPDES permitted industrial facilities in the Lower Kaskaskia River watershed

IL Permit ID	Facility Name	Type of Discharge [a]	Receiving Water	Total iron (mg/L)			Dissolved iron (mg/L)		
				n	Range	Avg.	n	Range	Avg.
IL0000043	Dynegy Midwest Generation - Baldwin	Ash pond discharge	Kaskaskia River	5	0.078 – 0.252	0.164	5	<0.02 – 0.023	0.021
		Overflow from Baldwin Cooling Pond		3	0.241 – 0.454	0.368	3	<0.02 – 0.028	0.023
		Coal pile runoff	Doza Creek	5	0.043 – 0.333	0.158	5	<0.02	<0.02
IL0048691	ExxonMobil Coal USA, Inc. Mine No. 2	Acid mine drainage	Grassy Branch of Sugar Creek	11	0.515 – 1.69	0.910	0	--	--
		Groundwater remediation pumpage and coal refuse seepage and runoff	Kaskaskia River	37 [b]	0.211 – 0.984	0.546	0	--	--
IL0062740	Hillside Recreational Lands, LLC - Randolph Preparation Plant	Alkaline mine drainage	Doza Creek	54	0.06 – 20	0.660	0	--	--
		Alkaline mine drainage	Unnamed tributary to Doze Creek	48	0.12 – 4.28	0.612	0	--	--
IL0076996	Prairie State Generation Company - Marissa	Raw water impoundment emergency overflow	Unnamed tributary to Mud Creek	2	0.352 – 1.56	0.956	0	--	--
		West sedimentation pond emergency overflow		3	0.298 – 4.31	2.10	0	--	--

DMR – discharge monitoring report
mg/L – milligram per liter
Only facilities and their outfalls that are authorized to discharge iron (via a limit or monitoring requirement) are included in this table.
[a] Refer to Table 8 for a full description of each type of discharge.
[b] Data were reported for permit IL0076317. This permit was later terminated, and the discharge is now covered under permit IL0048961. Loads were reported as 0.91 to 6.46 pounds per day, with an average of 3.38 pounds per day.

5.1.3 Coal Mines Formerly Covered by Individual NPDES Permits

Four coal mines were formerly covered by individual NPDES permits:

- Baldwin Mine (IL0046493)
- St. Libory (IL0052558)
- River King #6 mine (IL0000582)
- Marissa mine (IL0052566)

In areas where iron-bearing materials are naturally occurring in rock and mineral formations, mining operations can be a source of iron to surface and groundwater. Surface-mining processes increase the amount of iron available by exposing more surface area of iron-bearing minerals (pyrite and marcasite) to weathering conditions. During storm events, especially during summer when flow is low, streams can be subjected to large amounts of iron in runoff from previously exposed pyrite and marcasite. A similar process can occur with underground mining when iron-bearing material is brought to the surface and discarded in piles. Seasonal peaks are in spring, when mined area runoff adds iron and high flows cause bottom scour, and in late summer during perennial low flows when runoff events can add significant amounts of iron.

During the previous 2012 TMDL study, sources of impairment related to pH and metals listings included abandoned mines, acid mine drainage, surface mining, and mine tailings. Abandoned mines are typically considered a nonpoint source, while active mining and former mines with ongoing reclamation that are covered by NPDES permits are a point source.

5.1.4 General NPDES Permits

Twenty-six facilities are covered by one of four general NPDES permits:

- ILG551 (non-publicly owned domestic lagoon system, serving a population of <2,500)
- ILG580 (publicly owned domestic lagoon system, serving a population of <2,500)
- ILG640 (public water supply)
- ILG840 (non-coal mines: crushed stone, construction sand and gravel, and industrial sand)

Of the general permits, only the general permit for public waters supply (ILG640) includes limits for iron (iron filter backwash wastewater). These 8 facilities are summarized in Table 10. The general permit limits for total iron are a daily maximum of 4 milligrams per liter (mg/L) and a 30-day average of 2 mg/L; both general permit limits are larger than the PFPWS and aquatic life use iron standards.

Domestic lagoon systems, like WWTPs and STPs do not have iron (dissolved) effluent limits, and IEPA does not consider such systems to be sources of iron. These 17 systems are summarized in Table 11. As domestic lagoon systems are not sources of iron, they are not further discussed.

Non-coal mining operations do not have iron (dissolved) effluent limits, and IEPA does not consider such mining operations to be sources of iron. The single facility is summarized in Table 12.

Table 10.General NPDES permitted public water supplies in the Lower Kaskaskia River watershed

IL Permit ID	Facility Name	Receiving Water	Downstream Segment(s)	Average Flow (MGD) [a]	Total Iron Daily Max. Limits (mg/L)
ILG640029	Alhambra WTP	Unnamed tributary to Silver Creek	IL_O-03, IL_O-30	0.008	4
ILG640032	Summerfield, Lebanon, and Mascoutah WTP	Kaskaskia River	IL_O-20, IL_O-03, IL_O-30	0.16	4
ILG640033	Troy WTP	Troy Creek, Wendel Branch	IL_O-03, IL_O-30	0.11	4
ILG640044	Highland WTP	Highland Silver Lake	IL_ODL-02, IL_O-03, IL_O-30	0.03	4
ILG640056	Coulterville WTP	Unnamed tributary to South Fork Mud Creek	IL_O-03, IL_O-30	0.02	4
ILG640077	Kaskaskia Water District WTP	Kaskaskia River	IL_O-03, IL_O-30	0.84	4
ILG640083	St. Rose WTP	Bull Branch	IL_O-20, IL_O-03, IL_O-30	0.004	4
ILG640162	St. Libory WTP	Unnamed tributary to Little Mud Creek	IL_O-03, IL_O-30	0.004	4

MGD – Million gallons per day
PWS – Public water supply
WTP – Water treatment plant
a. Average flow based on average reported flow from 2014–2016 discharge monitoring reports (DMRs).

Table 11.General NPDES permitted non-publicly and publicly owned lagoon systems (ILG551 and ILG580) in the Lower Kaskaskia River watershed

IL Permit ID	Facility Name	Receiving Water	Downstream Segment(s)	DAF (MGD)	DMF (MGD)
ILG551011	Wesclin High School District 3 STP	Unnamed tributary to Sugar Creek	IL_O-20, IL_O-03, IL_O-30	0.02	0.05
ILG551025	Triad High School District 2 STP	Silver Creek	IL_O-03, IL_O-30	0.0195	0.048
ILG551027	Illinois DOT-I70 Madison County Rest Area	Unnamed tributary to Sugar Creek	IL_O-20, IL_O-03, IL_O-30	0.028	0.072
ILG551050	Timber Lakes Mobile Home Park STP	Rockhouse Creek	IL_O-30	0.0068	0.017
ILG580002	St. Rose Sanitary District STP	Unnamed tributary to Lake Branch-East	IL_O-20, IL_O-03, IL_O-30	0.039	0.53
ILG580004	Alhambra STP	Unnamed tributary to Silver Creek	IL_O-03, IL_O-30	0.0725	0.288
ILG580011	Hamel STP	Unnamed tributary to Silver Creek	IL_O-03, IL_O-30	0.105	0.263
ILG580013	Lenzburg STP	Unnamed tributary of Doza Creek	IL_OZD, IL_O-30	0.0825	0.165
ILG580014	St. Libory WWTP	Little Mud Creek	IL_O-03, IL_O-30	0.09	0.225
ILG580017	Albers STP	Albers Creek	IL_O-20, IL_O-03, IL_O-30	0.0907	0.227
ILG580115	Livingston STP	Unnamed tributary to Silver Creek	IL_O-03, IL_O-30	0.148	0.667
ILG580107	Tilden STP	Unnamed tributary to Plum Creek-South	IL_O-30	0.111	0.275
ILG580137	Pierron West STP	Unnamed tributary to Sugar Creek	IL_O-20, IL_O-03, IL_O-30	0.0429	0.172
ILG580145	Ellis Grove STP	Unnamed tributary to Little Ninemile Creek	IL_O-30	0.0247	0.041
ILG580212	St. Jacob STP [a]	St. Jacob Creek	IL_ODL-02, IL_O-03, IL_O-30	0.14	0.35
ILG580228	Marine STP	Marine Effluent Creek	IL_O-03, IL_O-30	0.24	0.66
ILG580235	Hecker STP	Unnamed tributary to Hecker Creek	IL_O-30	0.08	0.12

DAF – design average flow
DMF – design maximum flow
MGD – Million gallons per day
STP – Sewage treatment plant
WWTP – Wastewater treatment plant.
NPDES permits for some STPs refer to the facilities as WWTPs. The terms “sewage treatment plant” and “wastewater treatment plant” are interchangeable.
a. St. Jacob STP discharges to a small tributary and potentially contributes to low dissolved oxygen on East Fork Silver Creek IL_ODL-02.

Table 12.General NPDES permitted non-coal mines: crushed stone, construction sand and gravel, and industrial sand (ILG584) in the Lower Kaskaskia River watershed

IL Permit ID	Facility Name	Receiving Water	Downstream Segment(s)	DAF (MGD) [a]
ILG840004	Columbia Quarry Company - Waterloo Pit 7	Rockhouse Creek	IL_O-30	0.61

DAF – design average flow
MGD – million gallons per day
Authorized discharges of pit pumpage and stormwater.
a. Design average flow based on average reported flow from 2014–2016 discharge monitoring records (DMRs).

5.1.5 Municipal Separate Storm Sewer Systems

Regulated stormwater runoff can contribute to iron pollution in the project area. As development increases in the watershed, additional pressure will be placed on receiving waters due to stormwater. Impervious areas associated with developed land uses can result in higher peak flow rates, higher runoff volumes, and larger pollutant loads. Stormwater runoff often contains sediment, among other pollutants. In areas where iron-bearing materials are naturally occurring soils, erosion and sedimentation are a common source of iron.

Under the NPDES program, municipalities serving populations over 100,000 people are considered Phase I MS4 communities. Municipalities serving populations under 100,000 people are considered Phase II communities. In Illinois, Phase II communities are allowed to operate under the statewide General Storm Water Permit (ILR40), which requires dischargers to file a Notice of Intent acknowledging that discharges shall not cause or contribute to a violation of water quality standards.

To assure pollution is controlled to the maximum extent practical, regulated entities operating under the General Storm Water Permit (ILR40) are required to implement six control measures including public education, public involvement, illicit discharge and detection programs, control of construction site runoff, post construction stormwater management in new development and redevelopment, and pollution prevention/good housekeeping for municipal operations. Regulated entities operating under the General Storm Water Permit in the watersheds of interest are identified in Table 13.

Table 13. Permitted MS4s in Lower Kaskaskia River watershed

Permit ID	Regulated Entity	Downstream Receiving Waters
ILR400290	Belleville City MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400527	Belleville Township MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400024	Caseyville Township MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400318	Columbia City MS4	Kaskaskia River (IL_O-30)
ILR400186	Edwardsville City MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400045	Edwardsville Township MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400190	Fairview Heights City MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400197	Glen Carbon Village MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400070	Jarvis Township MS4	East Fork Silver Creek (IL_ODL-02) and Kaskaskia River (IL_O-03 and IL_O-30)
ILR400549	Lebanon City MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400587	Lebanon Township MS4	Kaskaskia River (IL_O-20, IL_O-03, and IL_O-30)
ILR400263	Madison County MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400522	Marine Township MS4	Sugar Fork (IL_ODLA-01), East Fork Silver Creek (IL_ODL-02) and Kaskaskia River (IL_O-03 and IL_O-30)
ILR400488	Mascoutah City MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400591	Mascoutah Township MS4	Kaskaskia River (IL_O-20, IL_O-03, and IL_O-30)
ILR400110	Pin Oak Township MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400124	Shiloh Valley Township MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400275	Shiloh Village MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400270	St Clair County MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400135	Stookey Township MS4	Kaskaskia River (IL_O-30)
ILR400137	Sugar Loaf Township MS4	Kaskaskia River (IL_O-30)
ILR400458	Swansea Village MS4	Kaskaskia River (IL_O-30)
ILR400461	Troy City MS4	Kaskaskia River (IL_O-03 and IL_O-30)
ILR400493	Illinois Department of Transportation (road authority)	Kaskaskia River (IL_O-03 and IL_O-30)

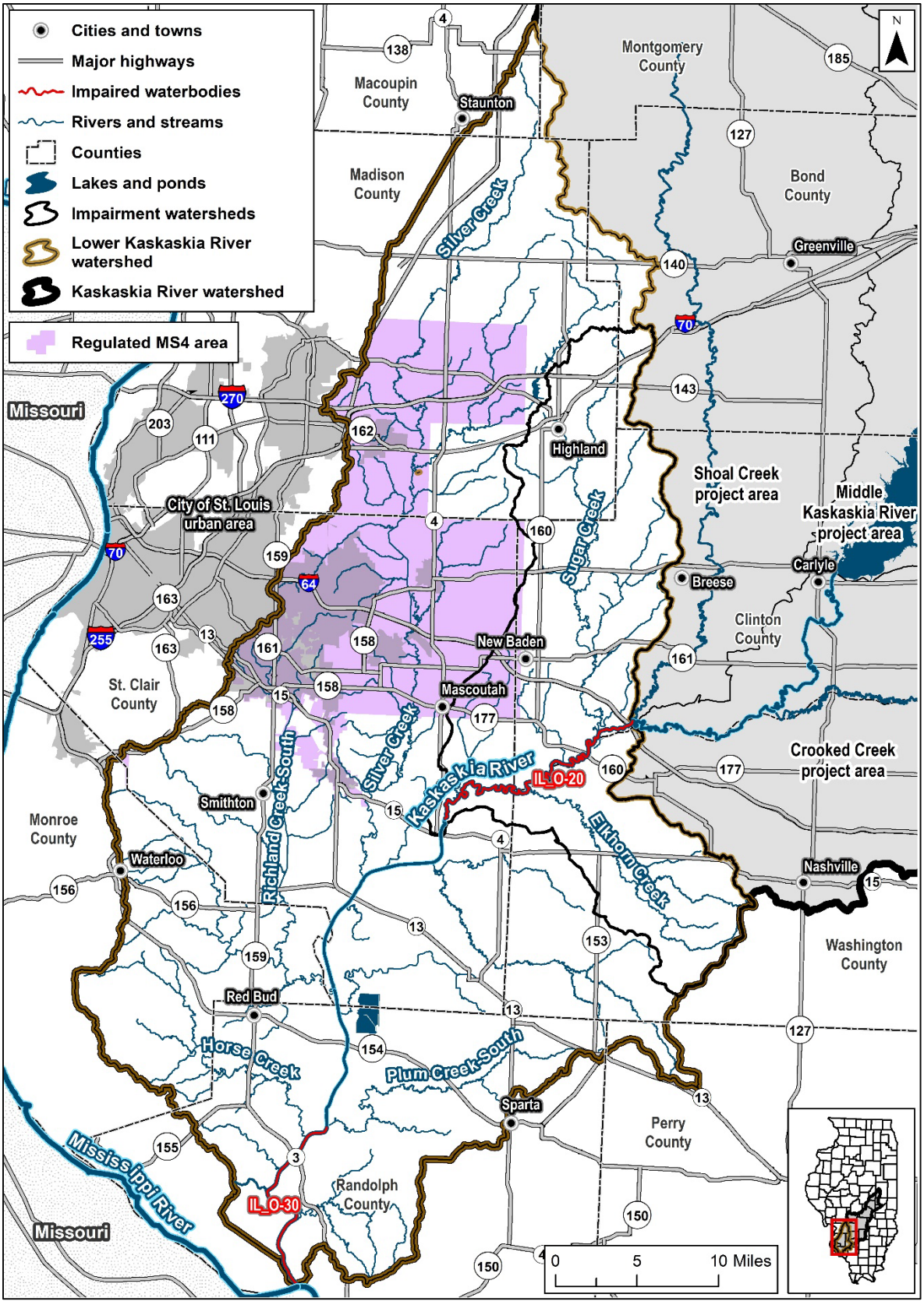


Figure 9. Regulated MS4 area within the Lower Kaskaskia River watershed.

5.1.6 CAFOs

The area that produces manure, litter, or processed wastewater as the result of CAFOs is considered a point source that is regulated through the NPDES Program. In Illinois, the CAFO program is administered by the IEPA through general permit number ILA01 (refer to https://www2.illinois.gov/epa/topics/water-quality/watershed-management/cafos/Pages/default.aspx for more details). The federal regulations for all CAFOs can be found in 40 CFR Parts 9, 122, and 412. CAFOs are not considered to be a source of iron; as such, CAFOs are not further discussed after this subsection.

There are five CAFOs in the Lower Kaskaskia River watershed (Table 14); NPDES permits for three of the CAFOs were terminated in 2018 or 2019. All facilities drain to tributaries upstream of segments of interest.

Table 14. CAFOs

Permit ID	Regulated Entity	Receiving Waters
ILA010072 [a]	Westridge Dairy, LLC	Kaskaskia River (IL_O-30)
ILA010077 [a]	CD & R Farms Inc.	Kaskaskia River (IL_O-20, IL_O-03, and IL_O-30)
ILA010089	Robert Mondt Dairy	
ILA010097	Elm Farms, Inc.	
ILA010102 [a]	KJMM Range Farm	Kaskaskia River (IL_O-03 and IL_O-30)

a. NPDES permits were terminated for these CAFOs in 2018 or 2019.

5.2 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. Additionally, the active coalmining and reclamation operations are also considered controllable point sources since they are covered by NPDES permits.

In the past, surface and underground coalmining, oil and gas production, and agricultural activities have been the primary land uses affecting water quality in the Kaskaskia River watershed. Nonpoint sources potentially contributing to high iron concentrations include stormwater runoff, agricultural runoff, and stream channel erosion. These sources are briefly introduced below and are further evaluated in protection plan presented in Section 6. For development of the plan, iron loads were estimated using the *Spreadsheet Tool for the Estimation of Pollutant Load* (STEPL) model and published literature. IEPA has made the policy decision to summarize the nonpoint source here in Section 5.2 and to present loading estimates in the protection plan in Section 6.

5.2.1 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, mining, and developed areas can have significant effects on water quality if proper best management practices (BMPs) are not in place to reduce overland flow and runoff that can erode iron-bearing surficial soils and rocks. Depending on the surrounding land cover, the condition of stormwater infrastructure, and the existence of stormwater management practices, stormwater can be contaminated with oil, grease, chlorides, pesticides, herbicides, nutrients, viruses, bacteria, metals, and sediment. In areas with high iron content in surficial geology, soils, and sediment, erosion (and downstream sedimentation) caused by or increased by stormwater runoff can contribute to in-stream iron loading. While coal mining is conserved a point source, the fate and transport of iron

eroded from rocks at mining operations (e.g., spoil piles) is similar to fate and transport of iron eroded from soils at agricultural operations.

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.

5.2.2 Stream Channel and Shoreline Erosion

Erosion may contribute to higher iron levels because iron is often sorbed[2] to sediment. In areas where iron-bearing materials are naturally occurring in rock and mineral formations, erosion and sedimentation are a common source of iron in surface and groundwater. Surface-mining processes increase the amount of iron available by exposing more surface area of iron-bearing minerals to weathering conditions. Erosion of iron bearing materials and the resulting sedimentation in surface waters can be exacerbated by agricultural practices and development activities. Specific information on channel alteration and erosional processes along the Kaskaskia River can be found in the *Bank Erosion Study of the Kaskaskia River, Carlyle Lake to New Athens, Illinois* (USACE 2000).

6. Protection Plan

The following protection plan includes recommended activities that could be used to protect the watershed from increases in iron levels. Not only will these activities help to maintain iron levels below water quality standards, but these activities will also result in a cleaner, healthier watershed. This protection plan incorporates adaptive management to provide flexibility for watershed stakeholders to adjust the protection plan to align with their priorities. Adaptive management is also necessary because factors unique to specific localities may yield better or worse results for a certain best management practice (BMP) (or suite of BMPs) and the plan will need to be modified to account for such results.

6.1 Critical Areas for Implementation

Successful implementation begins with identifying and focusing resources in critical areas. Critical areas represent those locations where project funding will provide the greatest environmental benefit. Upon identification of critical areas, BMPs can be selected to address the needs of each area.

6.1.1 Estimate Relative Contributions

Estimating the relative pollutant contributions from sources 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 approach used to estimate the relative contribution of pollutants can vary depending on the size of the contributing area, type of pollutant, and amount of available information. Note that the following load analyses are for nonpoint sources of iron; permitted point sources also discharge iron in their effluent but are not discussed in the plan.

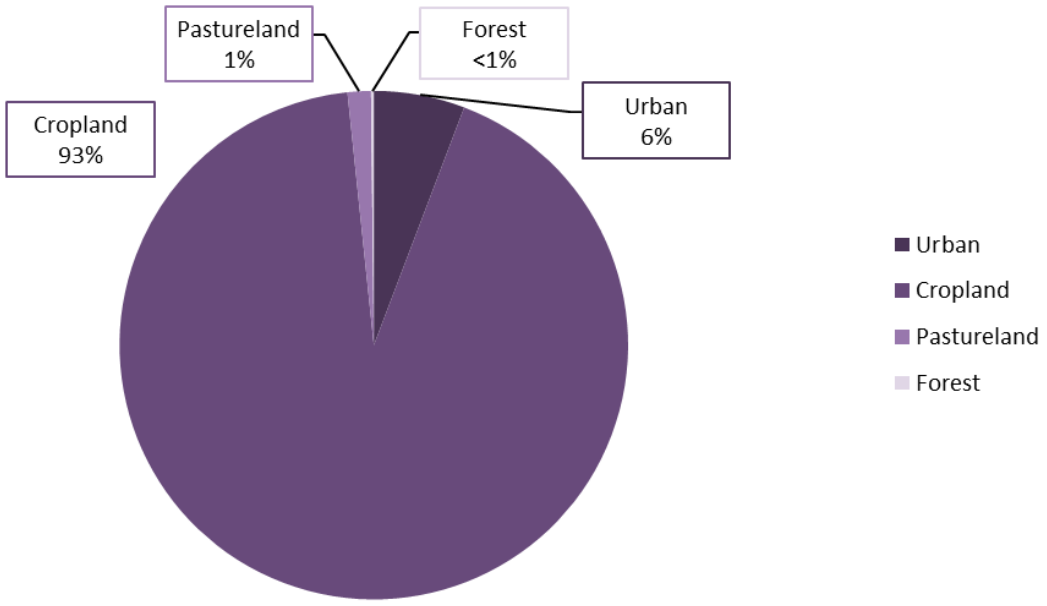
The primary nonpoint source of iron loading to the Kaskaskia River segments IL_O-20 and IL_O-30 is the contribution of iron-rich sediment. As such, sediment loading in the watershed is assumed to serve as a proxy for iron loading. The relative contribution of sediment from different types of land cover was

[2] To 'sorb' means to gather on the surface by absorption, adsorption, or a combination of these two processes.

estimated using the *Spreadsheet Tool for the Estimation of Pollutant Load* (STEPL) model. STEPL provides a simplified simulation of precipitation-driven runoff and nutrient delivery. STEPL has been used extensively in U.S. EPA Region 5 for watershed plan development and in support of watershed studies. Insufficient information on abandoned mine locations was available to model. A discussion of near-channel sources including streambank erosion and channelization is provided following the STEPL modeling results.

Annual sediment loading rates are summarized for Kaskaskia River IL_O-20 in Figure 10 and for Kaskaskia River IL_O-30 in Figure 11. The STEPL model was also used to estimate yields (load divided by area) across the subwatersheds. Drainage areas were delineated within each subwatershed using USGS topography and National Hydrology Dataset flowlines. Estimated sediment loading rates for each drainage area are provided in Figure 12 and Figure 13.

Based upon STEPL estimates, most sediment contributions are from cropland. Additionally, the greatest sediment yields are contributed by drainage areas with low levels of urban development. In Kaskaskia River IL_O-20, upstream drainage areas have significantly higher yields than downstream drainage areas. In Kaskaskia River IL_O-30, the greatest sediment yield is from drainage areas near the upstream portion of the stream segment, but yields are relatively low in the drainage areas around smaller, upstream tributaries. Contributions from urban land uses are minimal for both watersheds, though they provide a greater relative sediment contribution to IL_O-20 than to IL_O-30. Developed land uses within the subwatersheds include a portion of the St. Louis urban area, as well as development around the cities of New Baden, Mascoutah, Red Bud, Sparta, and Highland.



Note: Percentages were rounded to the nearest whole number. The summation exceeds 100% due to rounding.

Figure 10. STEPL relative sediment loading by source category to Kaskaskia River (IL_O-20) (%)

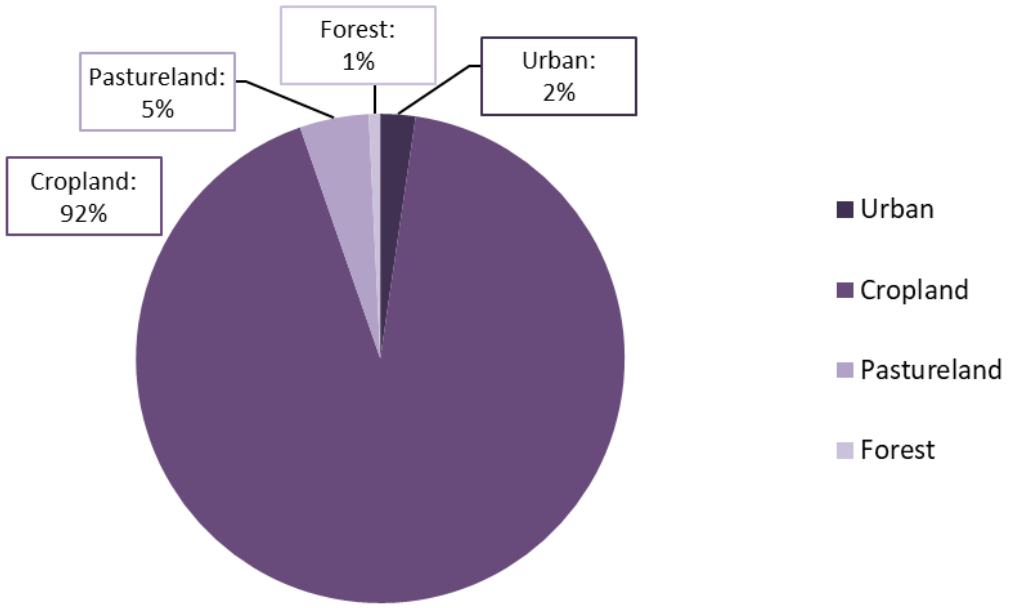


Figure 11. STEPL relative sediment loading by source category to Kaskaskia River (IL_O-30) (%)

Near-channel sources of sediment include banks, gullies, and headcuts along the mainstem of the Kaskaskia River and in smaller tributaries.

Kaskaskia River segment IL_O-30 is part of the USACE's navigation project along the Lower Kaskaskia River and was channelized in 1976. Since then, the USACE has maintained the navigation channel through maintenance and dredging activities. Sediment continues to deposit in the upper part of the navigation channel, a result of erosion and headcutting upstream of Fayetteville. Near channel sources are not expected to be significant along the navigation channel, however, upstream in segment IL_O-20, the effect of headcutting has had a significant effect on near-channel sediment loading. A study was conducted to evaluate bank erosion and sedimentation within the lower reaches of the Kaskaskia River (downstream of Carlyle Lake) (USACE 2000). Upstream of Fayetteville (i.e., segment IL_O-20) was identified as a headcutting reach; remedial actions that included grade control structures and a rock headcut abatement structure were recommended to address the significant sediment loss occurring along this reach. The USACE continued to study and monitor the effects of the dredging downstream of Fayetteville, and in 2007 the Water Resources Development Act Section 5073, authorized a project that would "the study and design of necessary measures to reduce ongoing headcutting and restore the aquatic environment of the Basin that has been degraded by the headcutting that has occurred above the existing grade control structure." High levels of erosion, channel widening, channel downcutting, loss of bottomland trees have been noted by the USACE since this time in the river upstream of Fayetteville. In addition, some natural healing has also been identified along the lowest part of IL_O-20; this is a result of the headcut moving upstream and away from this segment. The Illinois Nutrient Loss Reduction Strategy (NLRS) notes that severely eroding stream banks can contribute as much as 30-50% of the sediment entering waterways from all sources (IEPA and Illinois Department of Agriculture [IDOA] 2015).

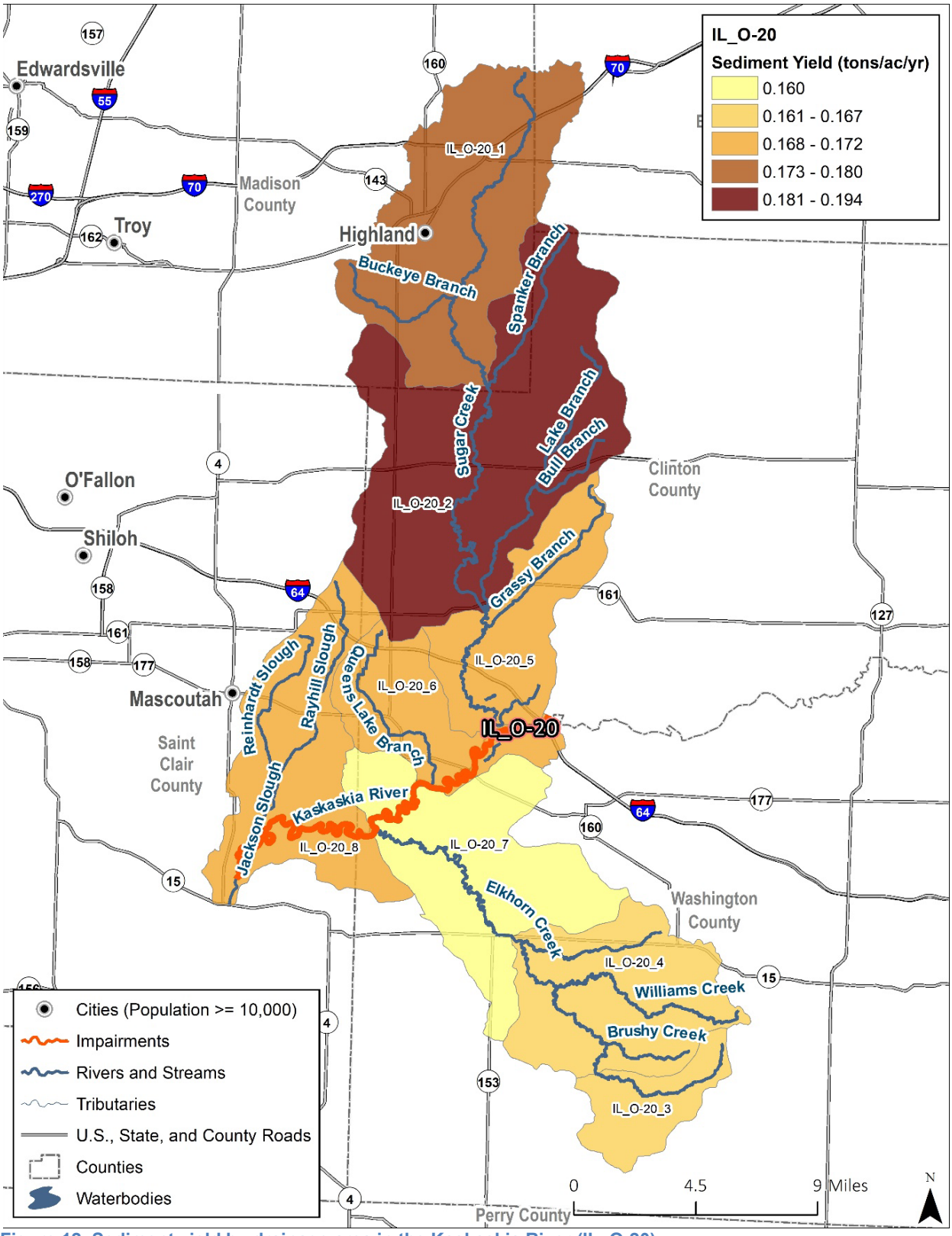


Figure 12. Sediment yield by drainage area in the Kaskaskia River (IL_O-20).

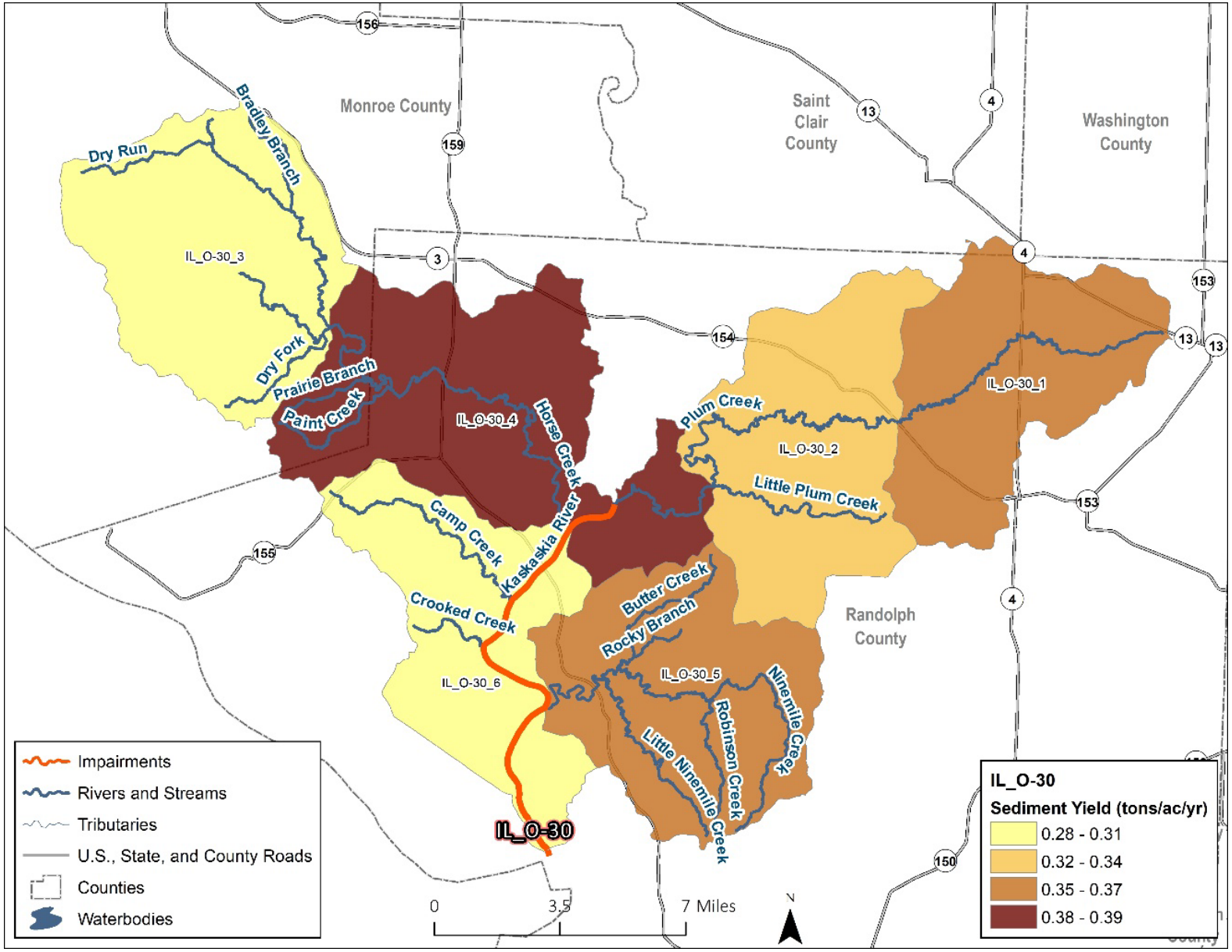


Figure 13. Sediment yield by drainage area in the Kaskaskia River (IL_O-30).

6.1.2 Critical Source Areas

Critical source 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 streams, areas with local support and participation, etc.). Sources and pathways of pollutants, their relative contribution, as well as any information obtained from local partners were used to determine critical areas. Critical area selection is an iterative process. 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.

In the Lower Kaskaskia River watershed, iron loading is primarily from erosion. Watershed critical areas for the Kaskaskia River (IL_O-20 and IL_O-30) are delineated as the drainage areas with the highest sediment yield and provided in Figure 14 and Figure 15. In addition, IL_O-20 is also identified as a critical area to address near-channel sources of sediment due to erosion.

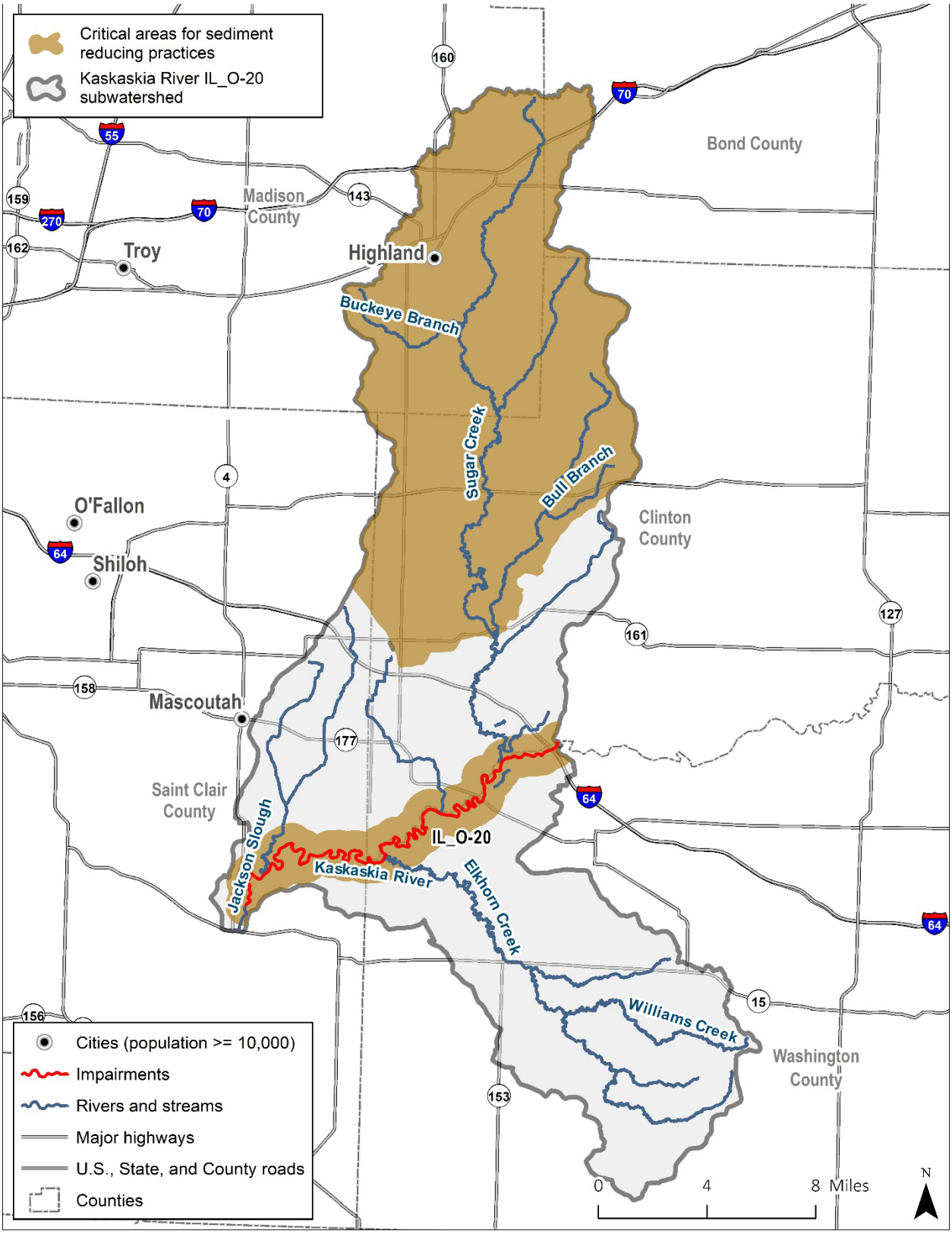


Figure 14. Critical areas for Kaskaskia River IL_O-20.

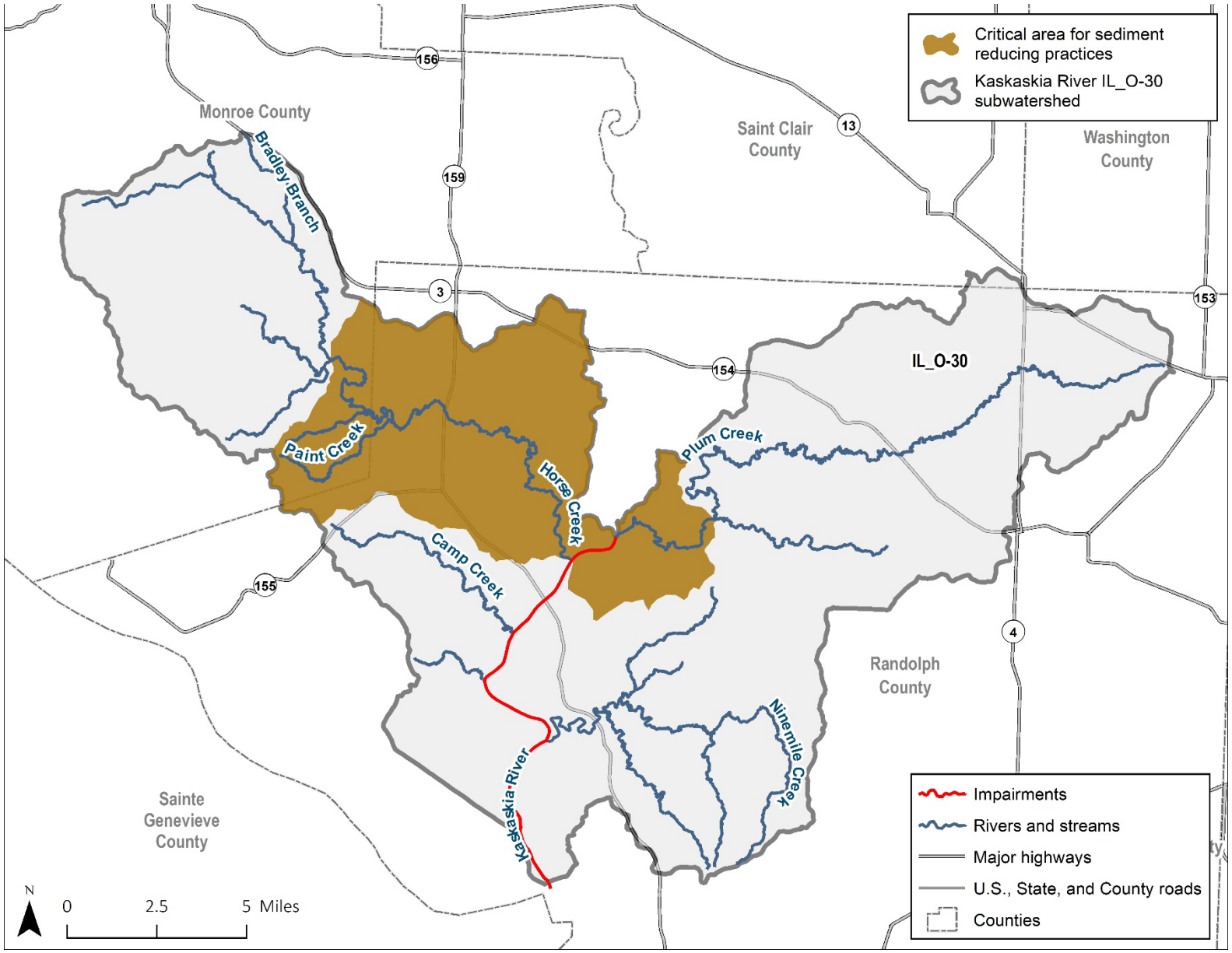


Figure 15. Critical areas for Kaskaskia River IL_O-30.

6.2 Recommended Protection Activities

In the Lower Kaskaskia River watershed, sediment is linked to iron levels, therefore reducing sediment loading will correlate to reduced iron loading. Cropland runoff has been identified as the highest sediment loading source, although near-channel sources resulting from erosion are also a high priority for IL_O-20. Table 15 includes a suite of BMPs that could be used to address iron levels in the watershed. Descriptions of each BMP are provided in the following sections. Sediment removal efficiencies are used as a proxy for iron removal efficiencies, as provided in STEPL v4.4.

Table 15. Removal efficiencies

Source	BMP	Removal Efficiency
Agricultural runoff	Conservation tillage	40-77% [a]
	Cover crops	10-20%
	Vegetated buffers and filter strips	53-73%
Streambank erosion and channelization	Streambank BMPs	75%

a. Removal efficiency depends on the percent residue remaining

6.2.1 Agricultural Runoff BMPs

Agricultural runoff is an important source of sediment, and therefore iron, loading to stream segments in the Lower Kaskaskia River watershed. Example BMPs to address loading are presented in the following subsections and estimated reductions are summarized in Table 15. A subset of the management practices provided in the Illinois Nutrient Loss Reduction Strategy (NLRS) are included. Other management practices can also be used such as wetland restoration. The Illinois Council on Best Management Practices provides additional information on these and other BMPs (http://illinoiscbmp.com/). Many of these practices have the added benefit of improving soil health.

Conservation Tillage

The Illinois NLRS identifies reduced or conservation tillage as a primary BMP to control pollutant loading to waters. The Illinois Agronomy Handbook defines conservation tillage as any tillage practice that results in at least 30% coverage of the soil surface by crop residuals after planting (University of Illinois Extension 2009). Several practices are commonly used to maintain the suggested 30% cover:

- **No-till** systems disturb only a small row of soil during planting, and typically use a drill or knife to plant seeds below the soil surface.
- **Strip till** operations leave the areas between rows undisturbed but remove residual cover above the seed to allow for proper moisture and temperature conditions for seed germination.
- **Ridge till** systems leave the soil undisturbed between harvest and planting: cultivation during the growing season is used to form ridges around growing plants. During or prior to the next planting, the top half to two inches of soil, residuals, and weed seeds are removed, leaving a relatively moist seed bed.
- **Mulch till** systems are practices that results in at least 30% residual surface cover, excluding no-till and ridge till systems.

Corn residues are more durable and capable of sustaining the required 30% cover required for conservation tillage. Soybeans generate less residue, the residue degrades more quickly, and supplemental measures or special care may be necessary to meet the 30% cover requirement. Based on 2018 satellite imagery, less than half of the cropland acres in the Lower Kaskaskia River major watershed (HUC 07140204) had residue greater than 30% (Applied Geosolutions LLC et al. 2019).

Cover Crops

Winter cover crops are also identified in the Illinois NLRS as an important management practice (IEPA and IDOA 2015). According to the NRCS, cover crops "have the potential to provide multiple benefits in a cropping system. They can prevent soil and wind erosion, improve soil's physical and biological properties, supply nutrients, suppress weeds, improve the availability of soil water, and break pest cycles along with various other benefits. The species of cover crop selected along with its management determine the benefits and returns" (NRCS 2020). There are many different types of crops being used for cover crops including various grasses and legumes. Based on 2018 satellite imagery, approximately 10% of the cropland acres in the Lower Kaskaskia River major watershed (HUC 07140204) were using winter cover crops (Applied Geosolutions LLC et al. 2019).

Vegetated Buffers and Filter Strips

Vegetated buffers and filter strips provide many benefits and can effectively address water quality degradation. Riparian buffers that include perennial vegetation and trees can filter runoff from adjacent cropland (as well as from other land uses such as urban, pasture, and forested areas) and the root structure of the vegetation in a buffer enhances subsequent trapping of pollutants. However, buffers are only effective in this manner when the runoff enters the buffer as a slow moving, shallow "sheet"; concentrated flow in a ditch or gully and quickly passes through the buffer offering minimal opportunity for retention and uptake of pollutants. The Illinois NRCS electronic Field Office Technical Guide (eFOTG) recommends the minimum width of a riparian buffer should be 2.5 times the width of the stream (at bank-full elevation) or 35 feet for water bodies to achieve additional water quality improvements (NRCS 2013).

Filter strips are a strip of permanent vegetation located between disturbed land (cropland or pasture) and environmentally sensitive areas that can effectively address water quality degradation from nutrient loading while also enhancing habitat (NRCS 2017). Filter strips provide many of the same benefits as vegetated buffers but are also subject to the same design considerations. Determining adequate filter strip widths depends on the slope of the land. Table 16 summarizes the minimum and maximum flow lengths for filter strips according to Illinois NRCS standards.

Table 16. Minimum and maximum filter strip length for land slope (NRCS 2017)

Slope (%)	0.5	1.0	2.0	3.0	4.0	5.0 or greater
Minimum (feet)	36	54	72	90	108	117
Maximum (feet)	72	108	144	180	216	234

6.2.2 Streambank BMPs

Streambanks along the Kaskaskia River and tributary streams are impacted by channelization, erosion, and streambank destabilization. The timing of streambank BMP implementation is important; these activities should only be conducted once the effect of head headcutting in the Kaskaskia River has been mitigated. The USACE (2000) recommended the use of grade control structures and head cut abatement structure to stabilize the river. This work was not completed, however, over time, segment IL_O-20 and upstream segments will continue to stabilize and achieve a new equilibrium.

The following BMPs are appropriate to restore these areas:

- **Stream channel natural design methods** that establish meanders and natural flow complexity and connect the stream channel with the floodplain.
- **Engineering controls** include armoring with materials, deflection of the water course with rock or log structures, removal of debris to restore flows, and mitigating head cuts (e.g., grade control structures and head cut abatement structure).

- **Vegetative stabilization and restoration of riparian areas** can reduce flows from runoff areas and channel velocities. Using vegetative controls also enhances infiltration, which reduces high flows that cause erosion.

6.3 Partners and Assistance

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

6.3.1 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 17. 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 17. 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	Wetland 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	Wetland 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 county 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. Projects that meet requirements of a NPDES permit are not eligible for 319 funding.	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/watershed/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

Funding Program	Type of Funding	Entity	Eligible Projects	Eligible Applicants	Available Funding	Website
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	1. 10-year restoration cost-share agreement: up to 50% of average cost of approved conservation practices 2. 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 3. 30-year contract on acreage owned by Indian Tribes 4. 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: 1. Short term funding to leverage larger financing for targeted watershed protection 2. Funds to help build the capacity of local organizations for sustainable, long term watershed protection 3. 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						
Open Space Lands Acquisition and Development (OSLAD) Grant/Land and Water Conservation Fund Grant	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 IDNR.*	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
Green Infrastructure Grant Opportunities	Grant	IEPA	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
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.

6.3.2 Partners

Several watershed groups are already active in the watershed and have projects and on-going programming that will support implementation. 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 basin, as well as development of a comprehensive watershed management strategy. The Kaskaskia Watershed Association also hosts an Annual Summit where regional leaders and stakeholders share knowledge and information about ongoing and future water quality concerns.
- **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 Kaskaskia Watershed Association'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 major Kaskaskia River basin. More information on this project is available on their website (https://publish.illinois.edu/kaskaskia/).

In addition, there are many partners within the Lower Kaskaskia River watershed that may provide technical or financial assistance to promote successful implementation and watershed management:

- Central Illinois Crappie Club
- County Forest Preserve Districts
- Farm Service Agency, NRCS
- Heartlands Conservatory
- IDOA, IDNR, IEPA
- Illinois Certified Crop Advisor Program
- Illinois Farm Bureau
- Illinois Rural Water Association
- Illinois State Water Survey
- Kaskaskia Watershed Association
- Kaskaskia Regional Port District
- Kaskia-Kaw Rivers Conservancy
- Local and regional governments
- Local school districts
- Original Kaskaskia Area Wilderness
- Soil and Water Conservation Districts
- Southern Till Prairie Reserve
- Southwestern Illinois RC&D
- University of Illinois Extension
- USACE
- U.S. EPA Region 5

6.3.3 Public Education and Outreach

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

The first step to a successful information and education strategy is to identify target audiences and to determine how to best reach these audiences. Potential audiences in the Lower Kaskaskia River watershed may include riparian landowners, row crop producers, and crop advisors. 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.

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 can 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 plan.

Potential targeted audiences, concerns, and communication channels are outlined in Table 18.

Table 18. Potential audience concerns and communication channels

Key Target Audiences	Potential Audience Concerns	Potential Communication Channels
Riparian landowners	• Streambank and shoreland erosion • Surface water issues (safety, aesthetics) • Property values • Flooding • Drinking water quality • Recreation	• Newspapers and local media • Social media • Local governments • SWDCs and watershed groups • Informational meetings • Brochures and other handouts • County and state health departments • Existing community, waterfront, and neighborhood associations
Row crop producers	• Agricultural practice to implement • Costs and programmatic requirements of funding programs • Costs, savings, and techniques for different BMPs • Water quality issues (safety, aesthetics, quality) • Loss of cropland acreages and yield • Flooding	• Commodity groups • Agricultural associations • 4-H groups • SWDCs and watershed groups • Watershed groups • Field days and demonstration farms • Newspapers and local media • Informational meetings, on-site visits
Certified crop advisors	• Areas and practices to target for implementation • Costs and programmatic requirements for funding programs	• Training sessions • Outreach and distributed information from research institutions • Informational meetings

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. Training and education programs for crop and livestock producers are also effective methods of increasing adoption and long-term maintenance of agricultural BMPs.

The University of Illinois Extension has several units within the Lower Kaskaskia River 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.

- Bond-Clinton-Jefferson-Marian-Washington Extension Unit
  - https://web.extension.illinois.edu/bcjmw/
- Madison-Monroe-St. Clair Extension Unit
  - https://extension.illinois.edu/mms
- Franklin-Jackson-Perry-Randolph-Williamson Extension Unit
  - https://extension.illinois.edu/fjprw
- Christian-Jersey-Macoupin-Montgomery Extension Unit
  - https://extension.illinois.edu/cjmm

6.4 Adaptive Management

Adaptive management is a commonly used 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 process, adaptive management offers the flexibility for responsible parties to monitor actions, determine the success of such actions and ultimately, base management decisions upon the measured results of completed actions and the current state of the system. This process, depicted in Figure 16, 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.

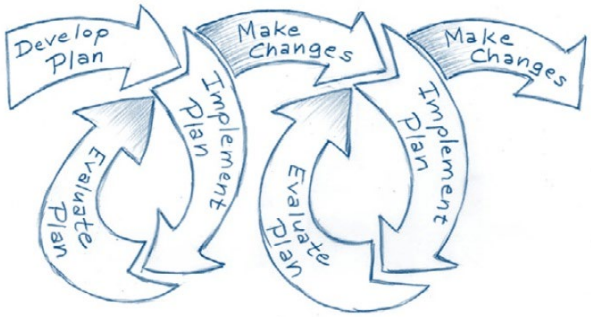


Figure 16. Adaptive management iterative process (U.S. EPA 2008).

6.5 Monitoring

The ultimate measure of success will be maintained or improved water quality over time. In addition, long-term monitoring of the overall health and quality of the watershed is important. Monitoring will help determine whether the 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.

6.5.1 Water Quality Monitoring

Iron levels will be determined through ambient monitoring by IEPA. The state conducts studies of ambient conditions across the state by evaluating watersheds on a rotating basis, collecting measurements of physical, chemical, and biological parameters. The USACE also conducts routine monitoring and maintenance of the navigation channel, including dredging downstream of IL_O-20. As sediment reduction activities are implemented in IL_O-20, USACE data may be used to quantify the effects of those activities. Water quality monitoring efforts may also be supported through volunteer citizen monitoring efforts.

Sampling during different flow regimes is also critical to understanding sources. Monitoring flow is also recommended for each stream site when water quality samples are taken. The Illinois NLRS (IEPA and IDOA 2019) Biennial Report also recommends increasing the frequency of sampling practices, especially during high flow conditions.

6.5.2 Sediment Source Monitoring

Further evaluation of the sources of sediment in IL_O-20 and IL_O-30 would help to focus implementation activities. Sediment sources can be determined with additional monitoring of tributaries and near-channel sources in combination with sediment budget development including:

- Flow and sediment measurements in tributaries and mainstem
- Flow and sediment measurements above and below the knick zones of active headcuts
- Radiometric analysis of sediment samples to aid in partitioning field- versus channel-derived sediment

Additional monitoring of natural healing occurring along IL_O-20 could also inform selection of the most cost-effective sediment reduction practices within this reach.

7. 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 IEPA website. There were many stakeholders present including representatives from the Army Corps of Engineers, the Kaskaskia Watershed Association, and the Original Kaskaskia Area Wilderness, Inc. The public comment period closed on January 12, 2019. Comments and response to comments are provided in the Stage 1 document provided in Appendix A.

A second virtual public meeting was held on xxxxx to present this protection plan. A public notice was placed on the IEPA 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

Lower Kaskaskia River Watershed (II) Total Maximum Daily Load

Final Stage 1 Report

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Report Prepared by:

TETRA TECH

March 2019

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Acronyms and Abbreviations

AFO	animal feeding operation
AWQMN	Ambient Water Quality Monitoring Network
BOD	biochemical oxygen demand
CAFO	confined animal feeding operation
COD	chemical oxygen demand
CWA	Clean Water Act
IBI	index of biotic integrity
Illinois DNR	Illinois Department of Natural Resources
Illinois EPA	Illinois Environmental Protection Agency
IPCB	Illinois Pollution Control Board
MBI	macroinvertebrate biotic index
MCL	maximum contaminant level
MGD	millions of gallons per day
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
NWIS	National Water Information System
SOD	sediment oxygen demand
STP	sewage treatment plant
TMDL	total maximum daily load
TSS	total suspended solids
U.S. EPA	United States Environmental Protection Agency
USACE	United States Army Corps of Engineers
USGS	United States Geological Survey
WQS	water quality standards
WTP	water treatment plant
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 the 1,608 square mile Lower Kaskaskia River watershed located in southwestern Illinois (Figure 1). The Shoal Creek watershed and Crooked Creek watershed drain to the Lower Kaskaskia River watershed, but are being addressed in separate TMDL studies. Several waters in the Lower Kaskaskia River watershed have been placed on the State of Illinois 303(d) list, and require the development of a TMDL. Two previous TMDL studies have been completed in the Lower Kaskaskia River major watershed: the Lower Kaskaskia River watershed TMDL (IEPA 2012) and the Highland Silver Lake watershed TMDL (IEPA 2006). Relevant information from each study is included herein where applicable.

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. The controls for nonpoint sources (e.g., agriculture) will be strictly voluntary.

1.1 Water Quality Impairments

This project addresses several waters on the State of Illinois §303(d) list including four impaired segments along the mainstem of the Kaskaskia River and impairments on Doza Creek, Sugar Fork, East Fork Silver Creek, and Highland Silver Lake (Table 1 and Figure 1). There are other impaired waters in the Lower Kaskaskia River watershed that are not being addressed by the TMDL study, including dissolved oxygen impairments in Prairie du Long Creek (OCB-99) and Little Mud Creek (OEA), dissolved oxygen and iron impairments in Silver Creek (OD-06), and dissolved oxygen and endrin impairments in Sugar Creek (OH-05). Of the waters being addressed by this TMDL study, four waterbody-pollutant combinations were found to be unimpaired (see italics in Table 1 and Appendix A—Unimpaired Stream Data Analysis).

In addition, several pollutants including sedimentation/siltation, sludge, temperature, total phosphorus, and total suspended solids are not being addressed as part of this project. These parameters do not have numeric water quality standards, and therefore TMDLs are not developed.

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

Name	Segment ID	Segment Length (Miles)	Watershed Area (Sq. Miles)	Designated Uses	Cause of Impairment
Kaskaskia River	IL_O-03	15.18	5,219 [a]	Aquatic Life	**Dissolved Oxygen**, Sedimentation/Siltation [b]
Kaskaskia River	IL_O-20	25.25	4,549 [a]	Aquatic Life	Phosphorus (Total) [b], Total Suspended Solids (TSS) [b], Temperature [b]
				Public and Food Processing Water Supply	**Iron**
Kaskaskia River	IL_O-30	13.3	5,811 [a]	Aquatic Life	**Iron**, Phosphorus (Total) [b], Sedimentation/Siltation [b] Total Suspended Solids (TSS) [b], Temperature [b]
				Public and Food Processing Water Supply	*Iron*
Kaskaskia River	IL_O-97	8.91	5,538 [a]	Aquatic Life	*Dissolved Oxygen*, Sedimentation/Siltation [b]
East Fork Silver Creek	IL_ODL-02	14.97	98	Aquatic Life	**Dissolved Oxygen**
Sugar Fork	IL_ODLA-01	18.56	31	Aquatic Life	**Dissolved Oxygen,** Manganese [c]
Doza Creek	IL_OZD	20.07	44	Aquatic Life	**Dissolved Oxygen,** Manganese [c]**,** Phosphorus (Total) [b], Sedimentation/Siltation [b], Sludge [b]
Highland Silver Lake	IL_ROZA	600 ac (surface area)	48	Aquatic Life	pH [d]

Italics – Based on evaluation of the last ten years of available data (2007–2016), it was determined that these segment(s) are not impaired (see Appendix A—Unimpaired Stream Data Analysis). No TMDLs are provided for these causes of impairment.
a. Watershed area includes Upper Kaskaskia River watershed (1,568 sq. miles), Middle Kaskaskia River watershed (946 sq. miles), East Fork Kaskaskia River watershed (207 sq. miles), Crooked Creek watershed (563 sq. miles), and Shoal Creek watershed (917 sq. miles).
b. These causes of impairment are not being addressed as part of this project.
c. Additional data are needed to verify impairment.
d. Impairment was removed from the 2018 draft 303(d) list and is not addressed further in this report.
BOLD – TMDLs are addressed in this Stage 1 report

1.2 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.

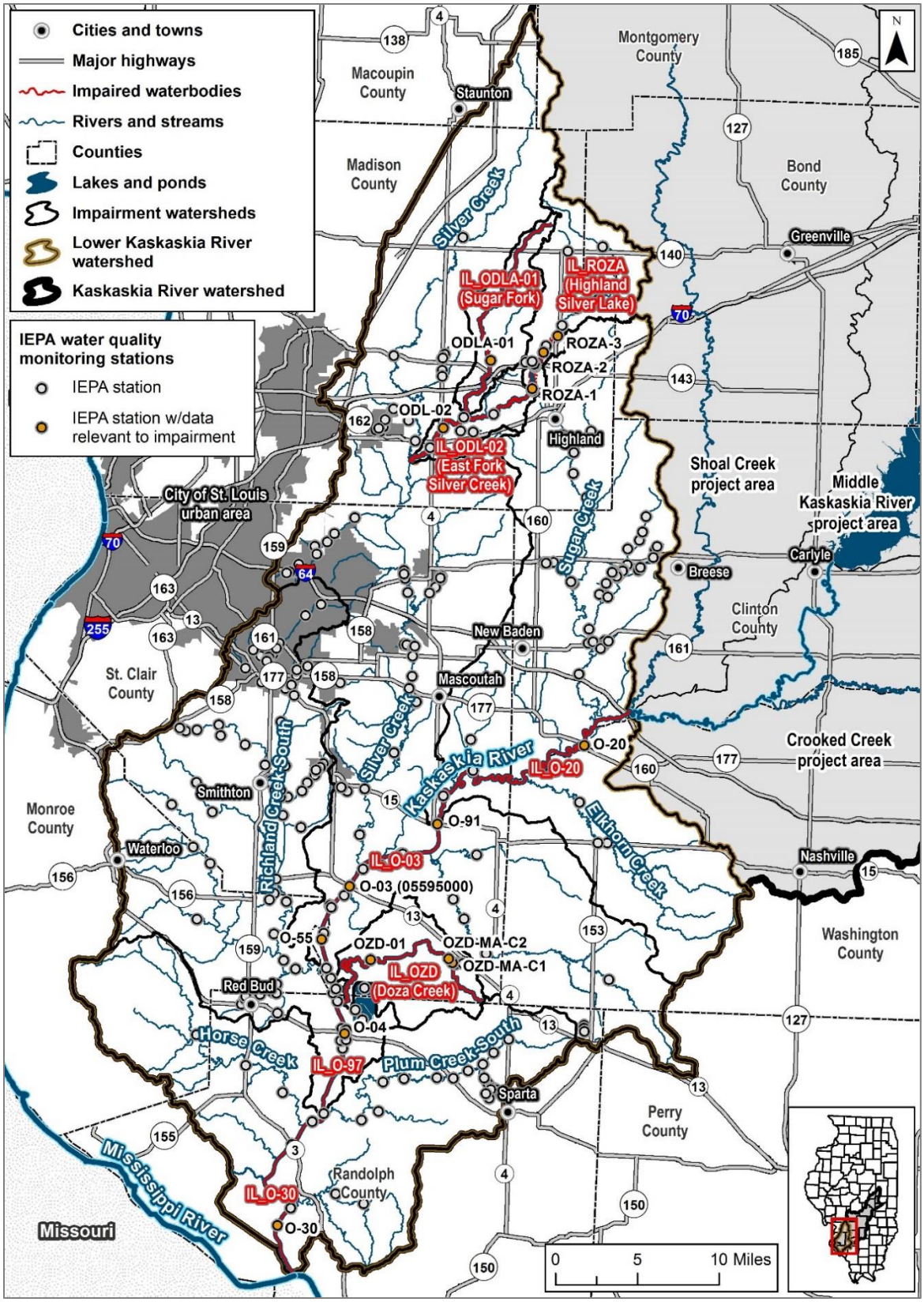

Figure 1. Lower Kaskaskia River watershed, TMDL project area.
Monitoring stations on impaired waterbodies with water quality data used in impairment assessment are labeled.

1.2.1 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 Lower Kaskaskia River 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.

Public and food processing water supply standards—These standards are cumulative with the general use standards and apply to waters of the state at any point at which water is withdrawn for treatment and distribution as a potable supply to the public or for food processing.

1.2.2 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(s) 302 and 611 contain water quality standards promulgated by the IPCB for general use and public and food processing water supply, respectively. This section presents the standards applicable to impairments in the study area. Water quality standards and TMDL endpoints to be used for TMDL development are listed in Table 2.

Table 2. Summary of water quality standards for the Lower Kaskaskia River watershed

Parameter	Units	Water Quality Standard
General Use		
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
Iron (dissolved)	mg/L	1.0 mg/L
Manganese (dissolved)	µg/L	Acute standard: $e^{A+Bln(H)} \times 0.9812$, where A=4.9187 and B=0.7467; H=hardness Chronic standard: $e^{A+Bln(H)} \times 0.9812$, where A=4.0635 and B=0.7467; H=hardness
Public and Food Processing Water Supply		
Iron (dissolved)	mg/L	0.3 mg/L (Public and Food Processing Water Supply Standard), 1.0 mg/L Maximum Contaminant Level (MCL) for waters supplies serving ≥ 1,000 people or ≥ 300 connections

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.

General Use Standards

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., dissolved oxygen, pH, and temperature), priority pollutants, non-priority pollutants, and other pollutants (U.S. EPA 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 water quality standard (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 http://www.ipcb.state.il.us/ecll/environmentalregister.asp).

Public and Food Processing Water Supply Use Standards

Attainment of public and food processing water supply use is assessed only in waters in which the use is currently occurring, as evidenced by the presence of an active public-water supply intake. The assessment of public and food processing water supply use is based on conditions in both untreated and treated water. By incorporating data through programs related to both the federal Clean Water Act and the federal Safe Drinking Water Act, Illinois EPA believes that these guidelines provide a comprehensive assessment of public and food processing water supply use. Assessments of public and food processing water supply use recognize that characteristics and concentrations of substances in Illinois surface waters can vary and that a single assessment guideline may not protect sufficiently in all situations. Using multiple assessment guidelines helps improve the reliability of these assessments. When applying these assessment guidelines, Illinois EPA also considers the water-quality substance, the level of treatment available for that substance, and the monitoring frequency of that substance in the untreated water. Table 3 includes the assessment guidelines for waters with public and food processing water supply designated uses.

Table 3. Guidelines for assessing public water supply in waters of the State (IEPA 2016)

Degree of Use Support	Guidelines
Fully Supporting (Good)	For each substance in untreated water[a], for the most recent three years of readily available data or equivalent dataset, a) < 10% of observations exceed an applicable Public and Food Processing Water Supply Standard[b]; and b) for which the concentration is not readily reducible by conventional treatment, i) no observation exceeds by at least fourfold the treated-water Maximum Contaminant Level threshold concentration[c] for that substance; and ii) no quarterly average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[c] for that substance; and iii) no running annual average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[d] for that substance; and[d] For each substance in treated water, no violation of an applicable Maximum Contaminant Level[c] occurs during the most recent three years of readily available data.
Not Supporting (Fair)	For any single substance in untreated water[a], for the most recent three years of readily available data or equivalent dataset, a) > 10% of observations exceed a Public and Food Processing Water Supply Standard[b]; or b) for which the concentration is not readily reducible by conventional treatment, i) at least one observation exceeds by at least fourfold the treated-water Maximum Contaminant Level threshold concentration[c] for that substance; or ii) the quarterly average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[c] for that substance; or iii) the running annual average concentration exceeds the treated-water Maximum Contaminant Level threshold concentration[c] for that substance. or, For any single substance in treated water, at least one violation of an applicable Maximum Contaminant Level[3] occurs during the most recent three years of readily available data.
Not Supporting (Poor)	Closure to use as a drinking-water resource (cannot be treated to allow for use).

a. Includes only the untreated-water results that were available in the primary computer database at the time data were compiled for these assessments
b. 35 I11. Adm. Code 302.304, 302.306 (http://www.ipcb.state.il.us/SLR/IPCBandIEPAEnvironmentalRegulations-Title35.aspx)
c. 35 I11. Adm. Code 611.300, 611.301, 611.310, 611.311, 611.325.
d. Some waters were assessed as Fully Supporting based on treated-water data only.

One of the assessment guidelines for untreated water relies on a frequency-of-exceedance threshold (10 percent) because this threshold represents the true risk of impairment better than does a single exceedance of a water quality criterion. Assessment guidelines also recognize situations in which water treatment that consists only of "...coagulation, sedimentation, filtration, storage and chlorination, or other equivalent treatment processes" (35 Ill. Adm. Code 302.303; hereafter called "conventional treatment") may be insufficient for reducing potentially harmful levels of some substances. To determine if a Maximum Contaminant Level (MCL) violation in treated water would likely occur if treatment additional to conventional treatment were not applied (see 35 Ill. Adm. Code 302.305), the concentration of the potentially harmful substance in untreated water is examined and compared to the MCL threshold concentration. If the concentration in untreated water exceeds an MCL-related threshold concentration, then an MCL violation could reasonably be expected in the absence of additional treatment.

Compliance with an MCL for treated water is based on a running 4-quarter (i.e., annual) average, calculated quarterly, of samples collected at least once per quarter (Jan.–Mar., Apr.–Jun., Jul.–Sep., and

Oct.–Dec.). However, for some untreated water intake locations, sampling occurs less frequently than once per quarter; therefore, statistics comparable to quarterly averages or running 4-quarter averages cannot be determined for untreated water. Rather, for substances not known to vary regularly in concentration in Illinois surface waters (untreated) throughout the year, a simple arithmetic average concentration of all available results is used to compare to the MCL threshold. For substances known to vary regularly in concentration in surface waters during a typical year (e.g., nitrate), average concentrations within the relevant sub-annual (e.g., quarterly) periods are used.

2. Watershed Characterization

The Lower Kaskaskia River watershed is located in southwestern Illinois (Figure 1). The watershed begins at the confluence of the Kaskaskia River and Shoal Creek and ends where the Kaskaskia River joins the Mississippi River south of St. Louis, Missouri. A TMDL was previously developed for the Lower Kaskaskia River watershed (IEPA 2012), and much of the information presented in that report is applicable to the current TMDL project. There have been no known changes in the project area; therefore, the existing Lower Kaskaskia River watershed TMDL provides much of the basis for the watershed characterization and source assessment below.

2.1 Jurisdictions and Population

Relevant information on jurisdictions and population can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012). The project area is located in Bond, Clinton, Macoupin, Madison, Monroe, Montgomery, Perry, Randolph, St. Clair, and Washington counties. The city of St. Louis urban area intersects the western boundary of the watershed.

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 Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012).

2.3 Land Use and Land Cover

Relevant information on land use and land cover can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012). Cultivated crops make up the majority of the land cover in the Lower Kaskaskia River watershed. There are several small cities in the watershed, with the majority of development located in the city of St. Louis urban area.

2.4 Topography

Relevant information on topography can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012).

2.5 Soils

Relevant information on soils can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012). Soils are primarily a mixture of silt loam or loam with moderate infiltration rates when thoroughly wetted and sandy clay loams with low infiltration rates when thoroughly wetted.

2.6 Hydrology

Relevant information on hydrologic conditions can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012). Active U.S. Geological Survey (USGS) flow gage sites in the watershed are located along Kaskaskia River impaired segments O-20 (05594100), O-03 (05595000), and O-97 (05595240), and along Silver Creek (055944500 and 05594800) and Richland Creek (05595200).

2.7 Watershed Studies and Information

This section describes several of the studies that have been completed in the watershed:

- **Bank Erosion Study of the Kaskaskia River, Carlyle Lake to New Athens, Illinois** (USACE 2000)

  Study completed by U.S. Army Corps of Engineers (USACE) in partnership with the Original Kaskaskia Area Wilderness, Inc. and Illinois Department of Natural Resources (Illinois DNR) to determine sources of lateral erosion on the Kaskaskia River and to propose remedial actions that can be taken to mitigate erosional processes. Headcutting was identified as a major source of erosion due to the navigation project completed on the Lower Kaskaskia River. Several measures for remediating erosion are proposed, including grade control structures to address headcutting.

- **Kaskaskia River Watershed, An Ecosystem Approach to Issues and Opportunities** (Southwestern Illinois RC&D, Inc. 2002)

  The plan encompasses the larger Kaskaskia River watershed from Champaign County to Randolph County in southwestern Illinois, covering over 10 percent of the state of Illinois. The purpose of the plan was to begin a coordinated restoration process in the Kaskaskia River watershed based on sound ecosystem principles. The plan made recommendations on sustainability, diversity, health, variety, connectivity, and the ecosystem's ability to thrive and reproduce in order to promote the sustainability of the ecosystem and strengthen the economic base and the quality of life of residents in the region.

- **Aerial Assessment Report on Highland Silver Lake and East Fork of Silver Creek** (Limno Tech 2005)

  Report completed to investigate sources of lakeshore and streambank erosion contributing to manganese, total phosphorus, and dissolved oxygen impairments in Highland Silver Lake. Lakeshore and stream channel conditions were investigated upstream, within, and downstream of Highland Silver Lake. Research methods included aerial video mapping, use of topographic maps, and field verification of findings.

- **Highland Silver Lake Watershed Total Maximum Daily Load Report** (IEPA 2006)

  The completed Highland Silver Lake TMDL Report contains TMDL allocations for Highland Silver Lake. Causes of impairments include aldrin, chlordane, dissolved oxygen, manganese, and total phosphorus. Highland Silver Lake is located directly upstream of East Fork Silver Creek (ODL-02), which is addressed in this report.

- **Lower Kaskaskia River Watershed Total Maximum Daily Load Report** (IEPA 2012)

> The completed Lower Kaskaskia River TMDL Report contains relevant information and data for this TMDL. Causes of impairments included atrazine, dissolved oxygen, fecal coliform, manganese, pH, and total phosphorus.

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 Lower Kaskaskia River watershed.

3.1 Pollutants of Concern

Pollutants of concern evaluated in this source assessment include iron and parameters influencing dissolved oxygen. Dissolved oxygen in streams can be affected by biochemical oxygen demand, phosphorus, ammonia, and sediment oxygen demand in addition to non-pollutant causes such as lack of reaeration. 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 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 stormwater including municipal separate storm sewer systems (MS4s).

3.2.1 NPDES Facilities (Non-CAFO or stormwater)

NPDES facilities in the study area include municipal and industrial wastewater treatment. Nutrients and oxygen-demanding substances can be found in these discharges and may contribute to low dissolved oxygen impairments. There are also public water supply facilities in the watershed, and associated iron filter backwash may contribute to iron impairments.

There are 65 individual NPDES permitted facilities in the Lower Kaskaskia River watershed (Table 4). Average and maximum design flows and downstream impairments are included in the facility summaries. Nine facilities drain directly to impaired segments, and two discharge to small tributaries of impaired segments that are close to the impaired segment. The majority of the remaining facilities discharge to

upstream unimpaired tributaries and likely do not contribute to project impairments. Relevant facilities include five municipal wastewater, four industrial wastewater, and two public water supply facilities.

Industrial facilities discharging to impaired segments include active coal mining facilities: Dynegy Midwest Generation – Baldwin (IL0000043), ExxonMobil Coal USA, Inc. – Monterey Coal Company No. 2 Mine (IL0076317), Hillside Recreational Lands, LLC – Randolph Preparation Plant (IL0062740), and Prairie State Generation Company – Marissa (IL0076996). All facilities have permitted limits for iron that are higher than the general use water quality standard and potentially may contribute to project impairments.

Table 4. Individual NPDES permitted facilities in impairment watersheds

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Impairment(s)	Average Design Flow (MGD)	Maximum Design Flow (MGD)
IL0026948	*Adorers of the Blood of Christ*	*STP*	*Unnamed tributary to Horse Creek*	*O-30*	*0.03*	*0.114*
ILG580017	*Albers STP*	*STP*	*Albers Creek*	*O-20, O-03, O-30*	*0.0907*	*0.227*
ILG580004	*Alhambra STP*	*STP*	*Unnamed tributary to Silver Creek*	*O-03, O-30*	*0.0725*	*0.288*
ILG640029	*Alhambra WTP*	*Public water supply*	*Unnamed tributary to Silver Creek*	*O-03, O-30*	*0.008* [a]	–
IL0020001	*Aviston STP*	*STP*	*Lake Branch*	*O-20, O-03, O-30*	*0.167*	*0.35*
IL0027219	*Baldwin STP*	*STP*	*Unnamed tributary to Plum Creek*	*O-30*	*0.051*	*0.128*
IL0021873	*Belleville STP #1*	*STP*	*Richland Creek*	*O-30*	*12.4* [b]	*27* [b]
IL0021083	*Caseyville Township East STP*	*STP (excess flow outfall)*	*Ellen Creek*	*O-03, O-30*	*4.4*	*11.39*
IL0075388	*Castle Ridge Estates STP*	*STP*	*Unnamed tributary to Mill Creek*	*O-20, O-03, O-30*	*0.0175*	*0.0735*
IL0029173	*City of Highland STP*	*STP (excess flow outfall)*	*Lidenthal Creek to Sugar Creek*	*O-20, O-03, O-30*	*1.6*	*4*
ILG840004	*Columbia Quarry Company - Waterloo Pit 7*	*Pit pumpage and stormwater*	*Rockhouse Creek*	*O-30*	*0.61* [a]	–
ILG640056	*Coulterville WTP*	*Public water supply*	*Unnamed tributary to South Fork Mud Creek*	*O-03, O-30*	*0.02* [a]	–
IL0063762	*Damiansville STP*	*STP*	*Unnamed tributary to Sugar Creek*	*O-20, O-03, O-30*	*0.06*	*0.234*
IL0046663	*Dutch Hollow Village - STP*	*STP*	*Unnamed tributary to Schoenburg Creek*	*O-30*	*0.08*	*0.2*
IL0000043	**Dynegy Midwest Generation - Baldwin**	*Ash pond discharge and overflow from cooling pond*	*Kaskaskia River*	*O-30*	–	*1,760* [b]
		Coal pile runoff	**Doza Creek**	**OZD, O-30**	**0.6**	**–**
ILG580145	*Ellis Grove STP*	*STP*	*Unnamed tributary to Little Ninemile Creek*	*O-30*	*0.0247*	*0.041*
IL0067695	*Enable Mississippi River Transmission, LLC - St. Jacob Station*	*Compressor and turbine building pit pumpage and stormwater*	*Unnamed ditch tributary to Little Silver Creek*	*O-03, O-30*	*0.000118*	–
IL0021440	**Evansville STP**	**STP**	**Kaskaskia River**	**O-30**	**0.17**	**0.425**
IL0076317	**ExxonMobil Coal USA, Inc. - Monterey Coal Company No. 2 Mine**	**Acid mine drainage**	**Kaskaskia River**	**O-20, O-03, O-30**	**1.4** [a]	**–**

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Impairment(s)	Average Design Flow (MGD)	Maximum Design Flow (MGD)
IL0020893	**Fayetteville STP**	**STP**	**Kaskaskia River**	**O-03, O-30**	**0.05**	**0.199**
IL0020753	*Freeburg East STP*	*STP*	*Lemen Creek to Silver Creek*	*O-03, O-30*	*0.31*	*0.775*
IL0032310	*Freeburg West STP*	*STP (excess flow outfall)*	*Kinney Branch of Richland Creek*	*O-30*	*0.4*	*1*
ILG580011	*Hamel STP*	*STP*	*Unnamed tributary to Silver Creek*	*O-03, O-30*	*0.105*	*0.263*
ILG580235	*Hecker STP*	*STP*	*Unnamed tributary to Hecker Creek*	*O-30*	*0.08*	*0.12*
ILG640044	*Highland WTP*	*Public water supply*	*Highland Silver Lake*	*ODL-02, O-03, O-30*	*0.03* [a]	–
IL0062740	**Hillside Recreational Lands, LLC - Randolph Preparation Plant**	**Acid and alkaline mine drainage and stormwater**	**Doza Creek**	**OZD, O-30**	**0.85** [a]	**–**
ILG551027	*Illinois DOT-I70 Madison County Rest Area*	*STP*	*Unnamed tributary to Sugar Creek*	*O-20, O-03, O-30*	*0.028*	*0.072*
ILG640077	**Kaskaskia Water District WTP**	**Public water supply**	**Kaskaskia River**	**O-03, O-30**	**0.84** [a]	**–**
IL0029483	*Lebanon STP*	*STP*	*Little Silver Creek*	*O-03, O-30*	*0.87*	*1.3*
ILG580013	*Lenzburg STP*	*STP*	*Unnamed tributary of Doza Creek*	*OZD, O-30*	*0.0825*	*0.165*
ILG580115	*Livingston STP*	*STP*	*Unnamed tributary to Silver Creek*	*O-03, O-30*	*0.148*	*0.667*
IL0074993	*Manors at Kensington Parque STP*	*STP*	*Unnamed tributary of Wendell Branch*	*O-03, O-30*	*0.0238*	*0.0595*
IL0071579	*Maple Leaf Estates Water Corp*	*Common collector outfall*	*Unnamed tributary to Richland Creek*	*O-30*	*0.0127*	*0.0381*
ILG580228	*Marine STP*	*STP*	*Marine Effluent Creek*	*O-03, O-30*	*0.24*	*0.66*
IL0024813	**Marissa STP** [c]	**STP**	**Unnamed tributary of Doza Creek**	**OZD, O-30**	**0.585**	**2.54**
IL0025291	*Mascoutah STP*	*STP*	*Silver Creek*	*O-03, O-30*	*0.965*	*2.972*
IL0075094	*Metro-East Airpark STP*	*STP*	*Unnamed tributary of Silver Creek*	*O-03, O-30*	*0.0042*	*0.015*
IL0032514	*Millstadt STP*	*STP*	*Douglas Creek*	*O-30*	*0.965*	*1.838*
IL0021725	**New Athens STP**	**STP (excess flow outfall)**	**Kaskaskia River**	**O-03, O-30**	**0.3**	**0.75**
IL0032603	*New Baden STP*	*STP*	*Unnamed tributary of Sugar Creek*	*O-20, O-03, O-30*	*0.78*	*1.349*
IL0076732	*New Memphis Sanitary District STP*	*STP*	*Unnamed tributary of Queens Lake Branch*	*O-20, O-03, O-30*	*0.035*	*0.14*
IL0021636	*O'Fallon STP*	*STP*	*Silver Creek*	*O-03, O-30*	*5.61*	*13.14*

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Impairment(s)	Average Design Flow (MGD)	Maximum Design Flow (MGD)
ILG580137	*Pierron West STP*	*STP*	*Unnamed tributary to Sugar Creek*	*O-20, O-03, O-30*	*0.0429*	*0.172*
IL0076996	**Prairie State Generation Company - Marissa**	**Cooling tower blowdown and runoff/sedimentation pond outfall (emergency overflow)**	**Kaskaskia River**	**O-03, O-30**	**3.158 [b]**	**–**
IL0025348	*Red Bud STP*	*STP (excess flow outfall)*	*Black Creek*	*O-30*	*0.6*	*1.2*
IL0063282	*Ruma WWTP*	*STP*	*Ruma Creek*	*O-30*	*0.04*	*0.16*
IL0026859	*Scott Air Force Base*	*STP (excess flow outfall)*	*Unnamed tributary of Silver Creek*	*O-03, O-30*	*4 [b]*	*6 [b]*
IL0020834	*Smithton STP*	*STP*	*Douglas Creek*	*O-30*	*0.95*	*2.85*
IL0066133	*Sparta NW STP*	*STP*	*Sparta Creek*	*O-30*	*0.25*	*0.62*
IL0048232	*St. Clair Township - Lincolnshire STP*	*STP (excess flow outfall)*	*Loop Creek*	*O-03, O-30*	*1.5*	*3.75*
ILG580212	**St. Jacob STP [c]**	**STP**	**St. Jacob Creek**	**ODL-02, O-03, O-30**	**0.14**	**0.35**
ILG640162	*St. Libory WTP*	*Public water supply*	*Unnamed tributary to Little Mud Creek*	*O-03, O-30*	*0.004 [a]*	*–*
ILG580014	*St. Libory WWTP*	*STP*	*Little Mud Creek*	*O-03, O-30*	*0.09*	*0.225*
ILG580002	*St. Rose Sanitary District STP*	*STP*	*Unnamed tributary to Lake Branch-East*	*O-20, O-03, O-30*	*0.039*	*0.53*
ILG640083	*St. Rose WTP*	*Public water supply*	*Bull Branch*	*O-20, O-03, O-30*	*0.004 [a]*	*–*
IL0064220	*Summerfield STP*	*STP*	*Unnamed tributary of Little Silver Creek*	*O-03, O-30*	*0.07*	*0.245*
ILG640032	**Summerfield, Lebanon, and Mascoutah WTP**	**Public water supply**	**Kaskaskia River**	***O-20, O-03, O-30***	**0.16 [a]**	**–**
IL0021181	*Swansea STP*	*STP (excess flow outfall)*	*Richland Creek*	*O-30*	*5.015*	*11.89*
ILG580107	*Tilden STP*	*STP*	*Unnamed tributary to Plum Creek-South*	*O-30*	*0.111*	*0.275*
ILG551050	*Timber Lakes Mobile Home Park STP*	*STP*	*Rockhouse Creek*	*O-30*	*0.0068*	*0.017*
IL0026701	*Trenton STP*	*STP*	*Trenton Creek*	*O-20, O-03, O-30*	*0.5*	*1.25*
ILG551025	*Triad High School District 2 STP*	*STP*	*Silver Creek*	*O-03, O-30*	*0.0195*	*0.048*

IL Permit ID	Facility Name	Type of Discharge	Receiving Water	Downstream Impairment(s)	Average Design Flow (MGD)	Maximum Design Flow (MGD)
IL0031488	*Troy STP*	*STP (excess flow outfall)*	*Troy Creek, Wendel Branch*	*O-03, O-30*	*1.35*	*3.902*
ILG640033	*Troy WTP*	*Public water supply*	*Troy Creek, Wendel Branch*	*O-03, O-30*	*0.11* [a]	–
ILG551011	*Wesclin High School District 3 STP*	*STP*	*Unnamed tributary to Sugar Creek*	*O-20, O-03, O-30*	*0.02*	*0.05*

Italics – NPDES facility draining to unimpaired segment.
BOLD – NPDES facility draining to impaired segment.
MGD – Million gallons per day
STP – Sewage treatment plant
WTP – Water treatment plant
WWTP – Wastewater treatment plant
a. Average design flow based on average reported flow from 2014–2016 discharge monitoring records (DMRs).
b. Flow listed includes multiple outfalls.
c. Although Marissa STP and St. Jacob STP do not discharge directly to an impaired segment, they discharge to small tributaries of impaired segments and could potentially contribute to the low dissolved oxygen impairments on Doza Creek OZD and East Fork Silver Creek ODL-02, respectively.

3.2.2 Municipal Separate Storm Sewer Systems

Regulated stormwater runoff can contribute to impairments in the project area. As development increases in the watershed, additional pressure will be placed on receiving waters due to stormwater. Impervious areas associated with developed land uses can result in higher peak flow rates, higher runoff volumes, and larger pollutant loads. Stormwater runoff often contains sediment and nutrients, among other pollutants.

Under the NPDES program, municipalities serving populations over 100,000 people are considered Phase I MS4 communities. In the impairment watersheds, there are no Phase I communities. Municipalities serving populations under 100,000 people are considered Phase II communities. In Illinois, Phase II communities are allowed to operate under the statewide General Storm Water Permit (ILR40), which requires dischargers to file a Notice of Intent acknowledging that discharges shall not cause or contribute to a violation of water quality standards.

To assure pollution is controlled to the maximum extent practical, regulated entities operating under the General Storm Water Permit (ILR40) are required to implement six control measures including public education, public involvement, illicit discharge and detection programs, control of construction site runoff, post construction stormwater management in new development and redevelopment, and pollution prevention/good housekeeping for municipal operations. Regulated entities operating under the General Storm Water Permit in the impairment watersheds are identified in Table 5.

Table 5. Permitted MS4s in impairment watersheds

Permit ID	Regulated Entity	Downstream Receiving Waters
ILR400290	Belleville City MS4	Kaskaskia River (O-03 and O-30)
ILR400527	Belleville Township MS4	Kaskaskia River (O-03 and O-30)
ILR400024	Caseyville Township MS4	Kaskaskia River (O-03 and O-30)
ILR400318	Columbia City MS4	Kaskaskia River (O-30)
ILR400186	Edwardsville City MS4	Kaskaskia River (O-03 and O-30)
ILR400045	Edwardsville Township MS4	Kaskaskia River (O-03 and O-30)
ILR400190	Fairview Heights City MS4	Kaskaskia River (O-03 and O-30)
ILR400197	Glen Carbon Village MS4	Kaskaskia River (O-03 and O-30)
ILR400070	Jarvis Township MS4	East Fork Silver Creek (ODL-02) and Kaskaskia River (O-03 and O-30)
ILR400549	Lebanon City MS4	Kaskaskia River (O-03 and O-30)
ILR400587	Lebanon Township MS4	Kaskaskia River (O-20, O-03, and O-30)
ILR400263	Madison County MS4	Kaskaskia River (O-03 and O-30)
ILR400522	Marine Township MS4	Sugar Fork (ODLA-01), East Fork Silver Creek (ODL-02) and Kaskaskia River (O-03 and O-30)
ILR400488	Mascoutah City MS4	Kaskaskia River (O-03 and O-30)
ILR400591	Mascoutah Township MS4	Kaskaskia River (O-20, O-03, and O-30)
ILR400110	Pin Oak Township MS4	Kaskaskia River (O-03 and O-30)
ILR400124	Shiloh Valley Township MS4	Kaskaskia River (O-03 and O-30)
ILR400275	Shiloh Village MS4	Kaskaskia River (O-03 and O-30)
ILR400270	St Clair County MS4	Kaskaskia River (O-03 and O-30)
ILR400135	Stookey Township MS4	Kaskaskia River (O-30)
ILR400137	Sugar Loaf Township MS4	Kaskaskia River (O-30)
ILR400458	Swansea Village MS4	Kaskaskia River (O-30)

Permit ID	Regulated Entity	Downstream Receiving Waters
ILR400461	Troy City MS4	Kaskaskia River (O-03 and O-30)
ILR400493	Illinois Department of Transportation (road authority)	Kaskaskia River (O-03 and O-30)

3.2.3 CAFOs

The area that produces manure, litter, or processed wastewater as the result of CAFOs is considered a point source that is regulated through the NPDES Program. In Illinois, the CAFO program is administered by the Illinois EPA through general permit number ILA01 (refer to http://www.epa.state.il.us/water/cafo/ for more details). The federal regulations for all CAFOs can be found in 40 CFR Parts 9, 122, and 412. U.S. EPA requires that CAFOs receive a wasteload allocation as part of the TMDL development process; the wasteload allocation is typically set at zero for all pollutants. There are five CAFOs in the Lower Kaskaskia River watershed (Table 6). All facilities drain to unimpaired tributaries upstream of impaired segments.

Table 6. CAFOs

Permit ID	Regulated Entity	Receiving Waters
ILA010072	Westridge Dairy, LLC	Kaskaskia River (O-30)
ILA010077	CD & R Farms Inc.	Kaskaskia River (O-20, O-03, and O-30)
ILA010089	Robert Mondt Dairy	
ILA010097	Elm Farms, Inc.	
ILA010102	KHMM Range Farm	Kaskaskia River (O-03 and O-30)

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 identified several sources as contributing to the Middle Kaskaskia River watershed impairments (Table 7).

Table 7. Potential sources in project area based on the draft 2016 305(b) list

Watershed	Segment	Sources
Kaskaskia River	IL_O-03	Channelization, dredging (e.g. for navigation channels), animal feeding operations and livestock grazing, municipal point source discharges, drainage/filling/loss of wetlands, crop production (crop land or dry land), agriculture and source unknown
	IL_O-20	Animal feeding operations, loss of riparian habitat, crop production (crop land or dry land), agriculture, urban runoff/storm sewers and source unknown
	IL_O-30	Crop production (crop land or dry land) and source unknown
East Fork Silver Creek	IL_ODL-02	Crop production (crop land or dry land) and agriculture
Sugar Fork	IL_ODLA-01	Animal feeding operations and livestock grazing, irrigated crop production, agriculture and petroleum/natural gas activities
Doza Creek	IL_OZD	Impacts from abandoned mine lands (inactive), municipal point source discharges, drainage/filling/loss of wetlands and crop production (crop land or dry land)

A summary of the potential nonpoint sources of pollutants is provided below, and additional information on the primary pollutant sources follows.

- Nonpoint sources potentially contributing to low dissolved oxygen conditions include stormwater and agricultural runoff (including runoff from abandoned mine lands), onsite wastewater treatment systems, animal agriculture activities, sediment oxygen demand, channelization, and hydrologic modification (dam or impoundment). Typical pollutants of concern include phosphorus (leading to eutrophication), ammonia, and carbonaceous biochemical oxygen demand. Sediment oxygen demand, often a result of decaying organic matter, can significantly contribute to low dissolved oxygen conditions. Channelization and hydrologic modification are non-pollutant sources. Channelization can result in low dissolved oxygen conditions due to lack of in-stream structures that would reaerate the water column.
- Nonpoint sources potentially contributing to high iron concentrations include stormwater runoff, agricultural runoff, and stream channel erosion.
- Nonpoint sources potentially contributing to high manganese concentrations include erosion potentially from agriculture and abandoned mine lands.

3.3.1 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 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 113,528 animals are in the project area.

Additional relevant information for this section can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012).

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 that 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, Inc. 1996). Septic systems contain all the water discharged from homes and business

and can be significant sources of pollutants. County health departments were contacted for information on septic systems and unsewered communities. Responses were received from Bond, Montgomery, Randolph, and St. Clair counties. St. Clair county estimates that 10,000–12,000 installed septic systems are present in the county. Montgomery county reported 14,061 new septic systems installed since 2007. Bond and Randolph counties reported that inspections of newly installed septic systems are required, but the counties do not have a total count of installed systems or unsewered communities. Information was not provided on failure rates or results of compliance testing.

Additional relevant information for this section can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012).

3.3.3 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.

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.

3.3.4 Stream Channel and Shoreline Erosion

Various forms of erosion are a common source of sediment and associated pollutants. Erosion may contribute to impairments because iron and nutrients are often sorbed to sediment. Bank and channel erosion refers to the wearing away of the banks and channel of a stream or river. High rates of bank and channel erosion can often be associated with water flow and sediment dynamics that are out of balance. This can result from land use activities that either alter flow regimes, adversely affect the floodplain and streamside riparian areas, or a combination of both. Specific information on channel alteration and erosional processes in the East Fork Silver Creek watershed and along the Kaskaskia River can be found in the Aerial Assessment Report on Highland Silver Lake and East Fork of Silver Creek (Limno Tech 2005) and the Bank Erosion Study of the Kaskaskia River, Carlyle Lake to New Athens, Illinois (USACE 2000), respectively.

4. Water Quality

Background information on water quality monitoring can be found in the Lower Kaskaskia River Watershed Total Maximum Daily Load report (IEPA 2012). In the Lower Kaskaskia River watershed, water quality data were found for numerous stations that are part of the Illinois EPA Ambient Water Quality Monitoring Network (AWQMN) and at USGS gage 05595000 (Kaskaskia River at New Athens, IL). Monitoring stations with data relevant to the impaired segments are presented in Figure 1 and Table 8. 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 only included for impairments that were not verified with data from

2007–2016. Each data point was reviewed to ensure the use of quality data in the analyses below. Data were obtained directly from Illinois EPA and from the USGS National Water Information System (NWIS).

Table 8. Lower Kaskaskia River watershed water quality data

Waterbody	Impaired Segment	AWQMN Sites (USGS Gage)	Location	Period of Record
Kaskaskia River	O-03	O-03 (05595000)	RM 29.2, Route 13 bridge New Athens	*2002*, 2007, 2012–2016
		O-91	RM 36.5, Route 15 bridge Fayetteville	2007
		O-55	Pike Sawmill Rd. 4 Mi. SW of New Athens	*2005*
	O-20	O-20	RM 57.2, Route 177 bridge 5 Mi. NW Okawville near Venedy Station	*1999–2006*, 2007–2016
	O-30	O-30	RM 3.3, Roots Rd. bridge 2.7 Mi. W of Ellis Grove	*1999–2006*, 2007–2016
East Fork Silver Creek	ODL-02	ODL-02	1.5 Mi. NW St. Jacob	*2002*, 2007, 2012
Sugar Fork	ODLA-01	ODLA-01	1 Mi. E Marine	2007
Doza Creek	OZD	OZD-01	4 Mi. S New Athens	2007
		OZD-MA-C1	NW edge of Marissa, 0.2 Mi. DNS Marissa WWTP outfall	2007
		OZD-MA-C2	1 Mi. W Marissa along railroad	2007

Italics – Data are more than 10 years old
DNS – Downstream
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 and downloaded from USGS NWIS.

4.1 Kaskaskia River

The Kaskaskia River is listed as being impaired along three segments: O-20, O-03, and O-30 (listed from upstream to downstream). Segment O-03 is impaired for aquatic life due to low levels of dissolved oxygen. The upstream-most segment (O-20) is impaired for public and food processing water supply use due to high levels of iron, and the downstream-most segment (O-30) is impaired for aquatic life use, also due to high iron. Three Illinois EPA sampling sites are located along segment O-03, and there is one sampling site with relevant data along each of the remaining impaired reaches.

4.1.1 O-03

From 2007–2016, 456 dissolved oxygen measurements were collected at site O-03 (05595000), and one measurement was taken at O-91 (Table 9 and Figure 2). Violations of the general use water quality standard were observed during June 2007, July 2012, October 2015, and June through September 2016. Continuous dissolved oxygen data were collected at site O-03 in July 2012, during which time multiple

violations of the standard were observed (Figure 3). Dissolved oxygen data were collected at site O-55 prior to 2007 and were not evaluated. Aquatic life use impairment is verified on this segment.

Dissolved oxygen data were 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. Strong correlations between phosphorus or chlorophyll-*a* and dissolved oxygen were not observed (Figure 4, Figure 5).

Table 9. Data summary, Kaskaskia River O-03

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	Number of exceedances of general use water quality standard (>5 mg/L (Mar-Jul) and >3.5 mg/L (Aug-Feb))
Dissolved Oxygen					
O-03 (05595000)	456 [a]	2.1	9.0	15.2	17
O-91	1	8.1	8.1	8.1	0

a. Daily measurements from September 2015 through December 2016.

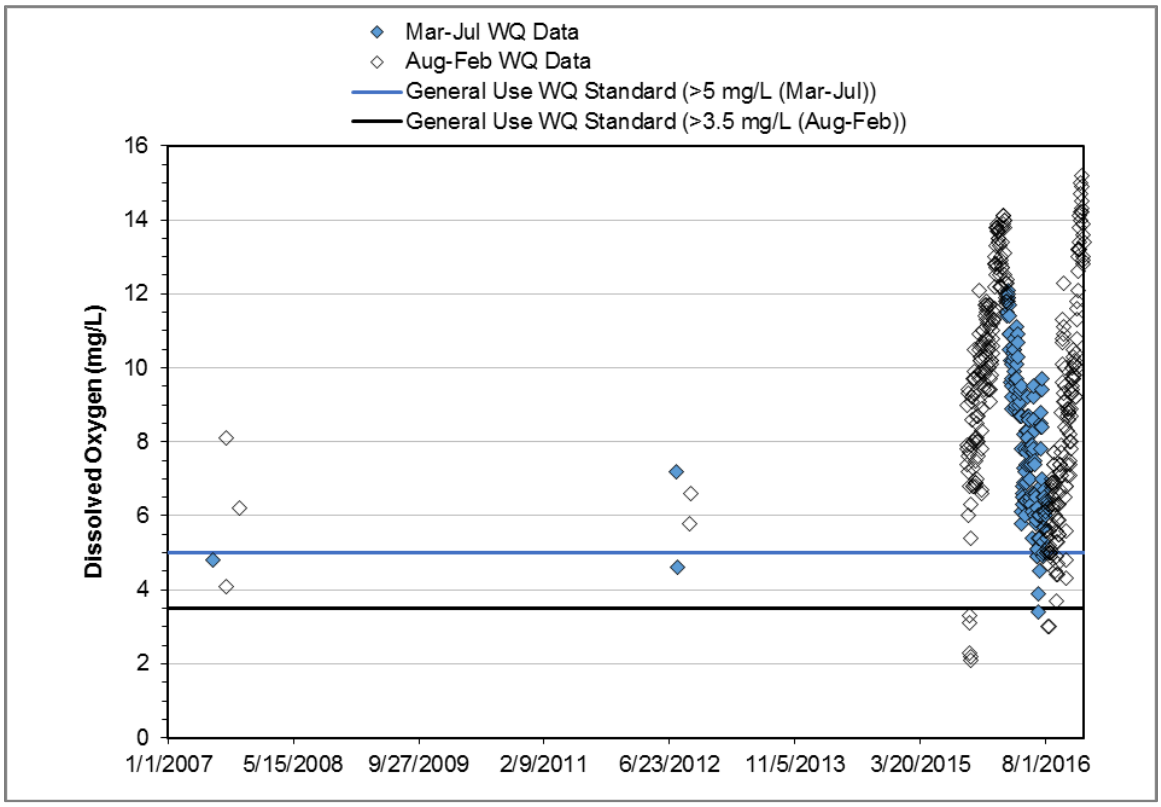

Figure 2. Dissolved oxygen water quality time series, Kaskaskia River O-03 segment.

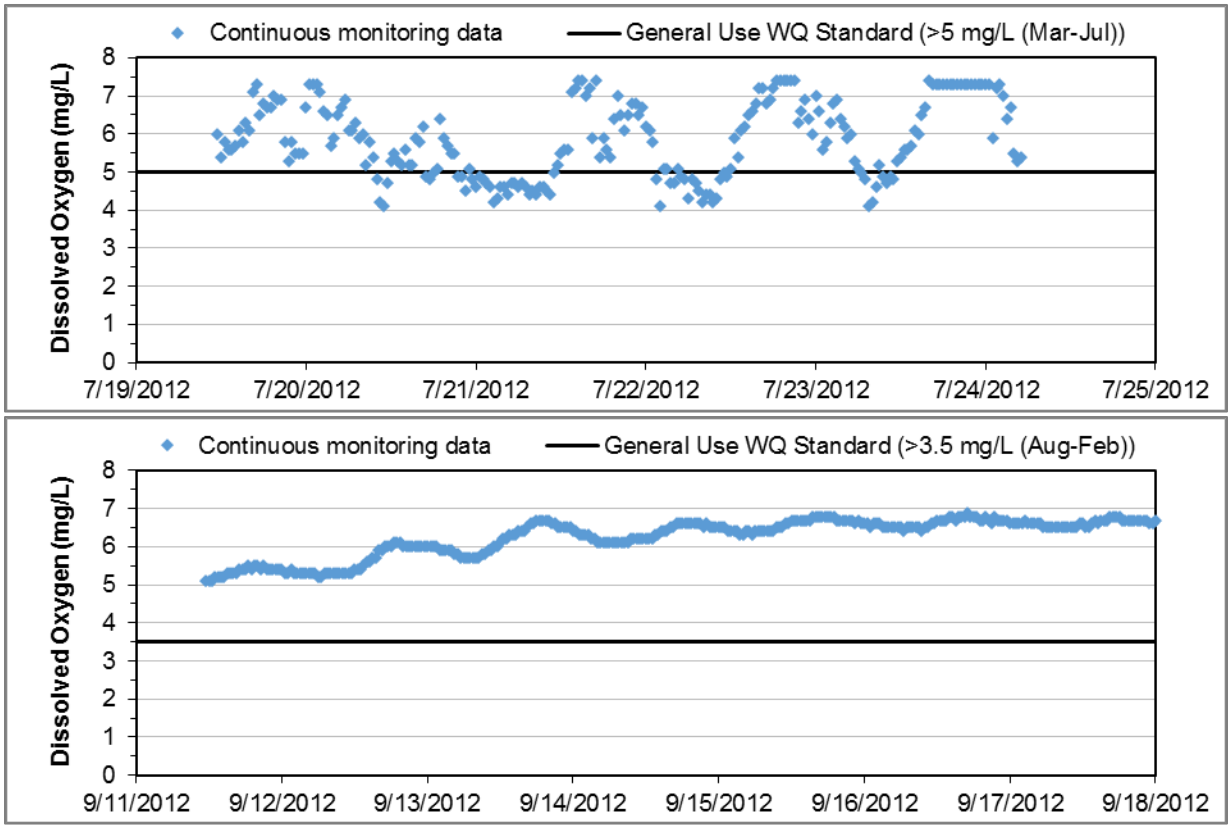

Figure 3. Continuous water quality time series for dissolved oxygen, Kaskaskia River O-03 segment (site O-03).

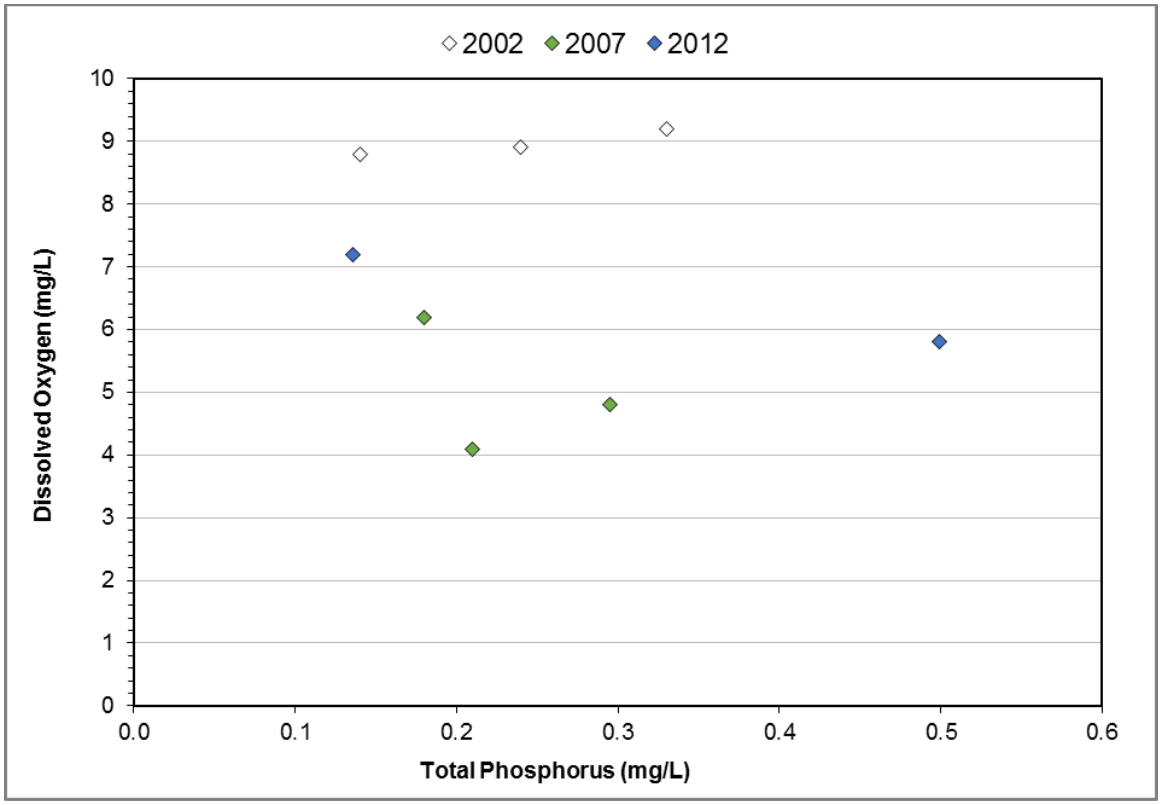

Figure 4. Total phosphorus versus dissolved oxygen, 2002–2012, Kaskaskia River O-03 segment.

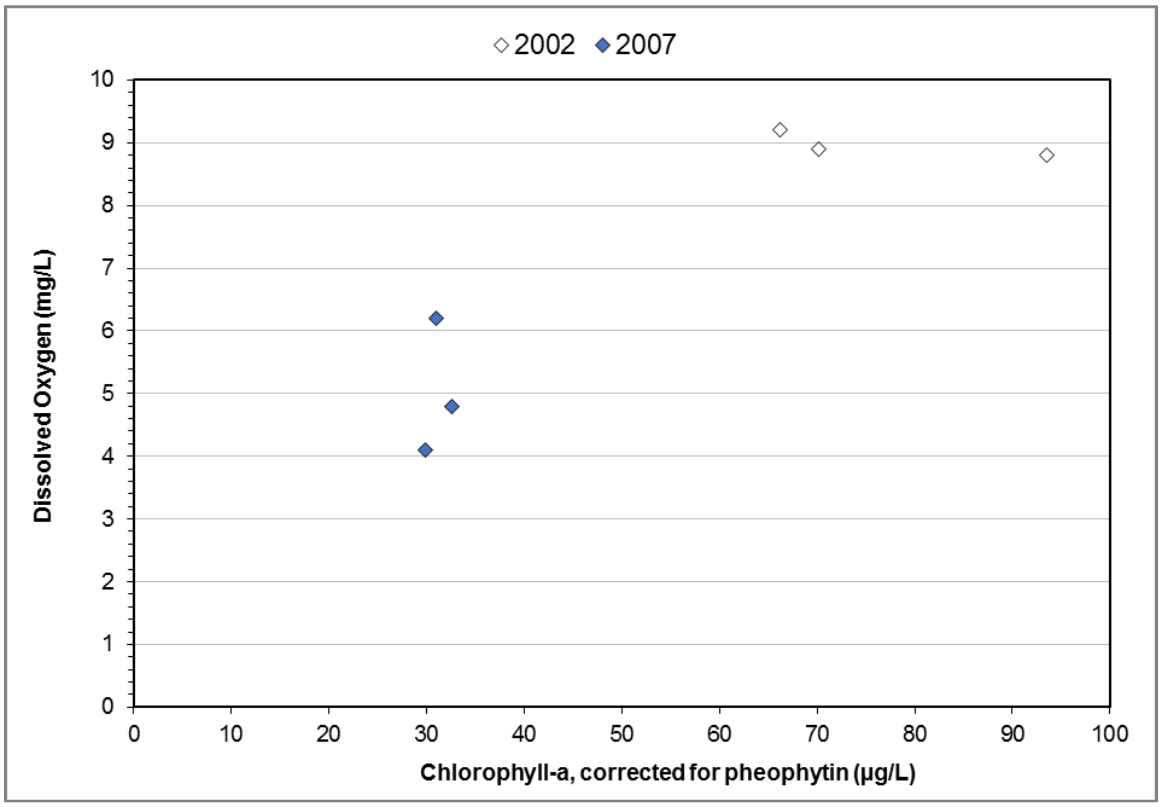

Figure 5. Chlorophyll-*a* versus dissolved oxygen, 2002–2007, Kaskaskia River O-03 segment.

4.1.2 O-20

From 2014–2016, 22 dissolved iron samples were collected at O-20 (Table 10 and Figure 6). Greater than 10 percent of samples were recorded above the 0.3 mg/L drinking water protection numeric standard. A sample in March of 2016 also exceeded the MCL of 1 mg/L. Public and food processing water supply use impairment is verified on this segment.

Table 10. Iron data summary, Kaskaskia River O-20

Sample Site	Date	Result (mg/L)	Quarterly Average (mg/L)
Iron, dissolved			
O-20	1/21/2014	0.03	0.21
	2/20/2014	0.58	
	3/31/2014	0.01	
	5/14/2014	0.03	0.03
	6/16/2014	0.03	
	8/11/2014	0.04	0.04
	9/8/2014	0.04	
	10/8/2014	0.06	0.28
	12/8/2014	0.49	
	1/28/2015	0.05	0.07
	3/18/2015	0.09	
	4/21/2015	0.03	0.19
	5/12/2015	0.51	
	6/25/2015	0.03	
	8/10/2015	0.07	0.04
	9/8/2015	0.01	
	10/22/2015	0.04	0.20
	12/2/2015	0.36	
	1/6/2016	0.09	0.66
	3/2/2016	**1.22**	
	4/4/2016	0.10	0.21
	5/10/2016	0.33	

Red values indicate samples exceeding the Public and Food Processing Water Supply Standard
Bold red values indicate samples exceeding the Public and Food Processing Water Supply Standard and above the MCL

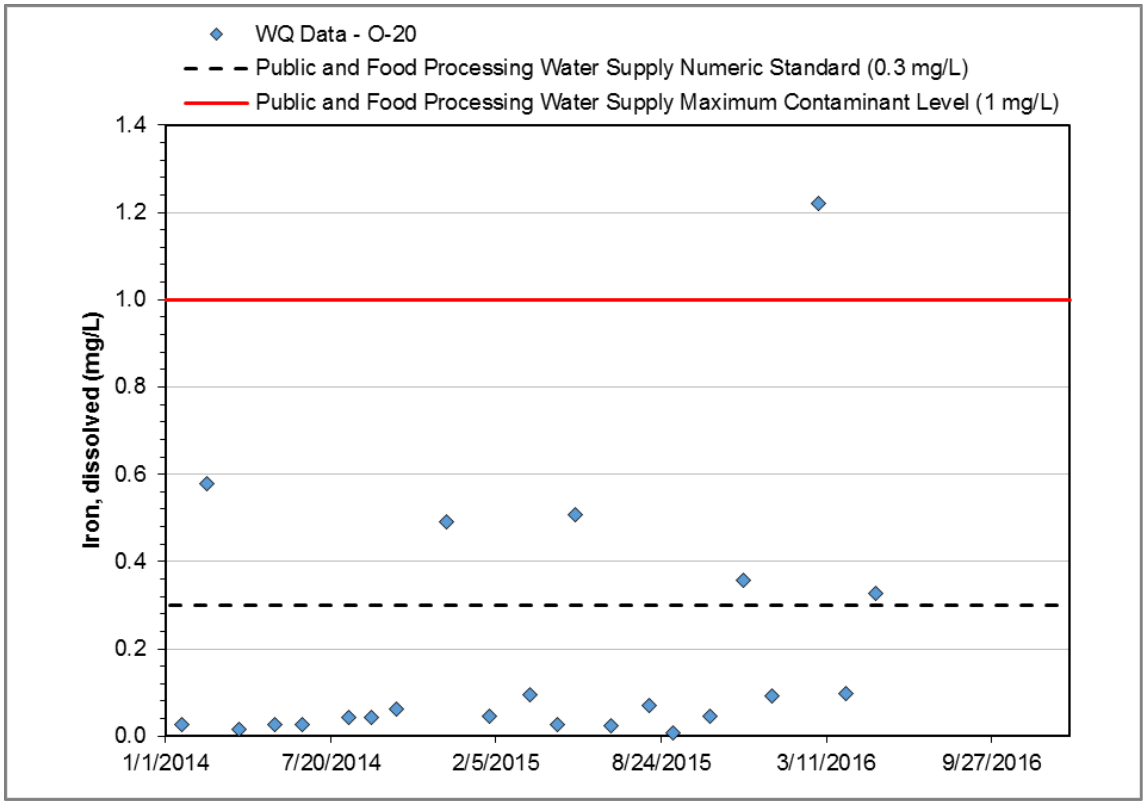

Figure 6. Iron water quality time series, Kaskaskia River O-20 segment.

4.1.3 O-30

From 2007–2016, 77 dissolved iron samples were collected at O-30 (Table 11 and Figure 7). Violations of the general use water quality standard were observed in June 2011 and January 2013. Aquatic life use impairment is verified on this segment.

Table 11. Data summary, Kaskaskia River O-30

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	Number of exceedances of general use water quality standard (1,000 µg/L)
Iron, dissolved					
O-30	77	2	178	4,780	2

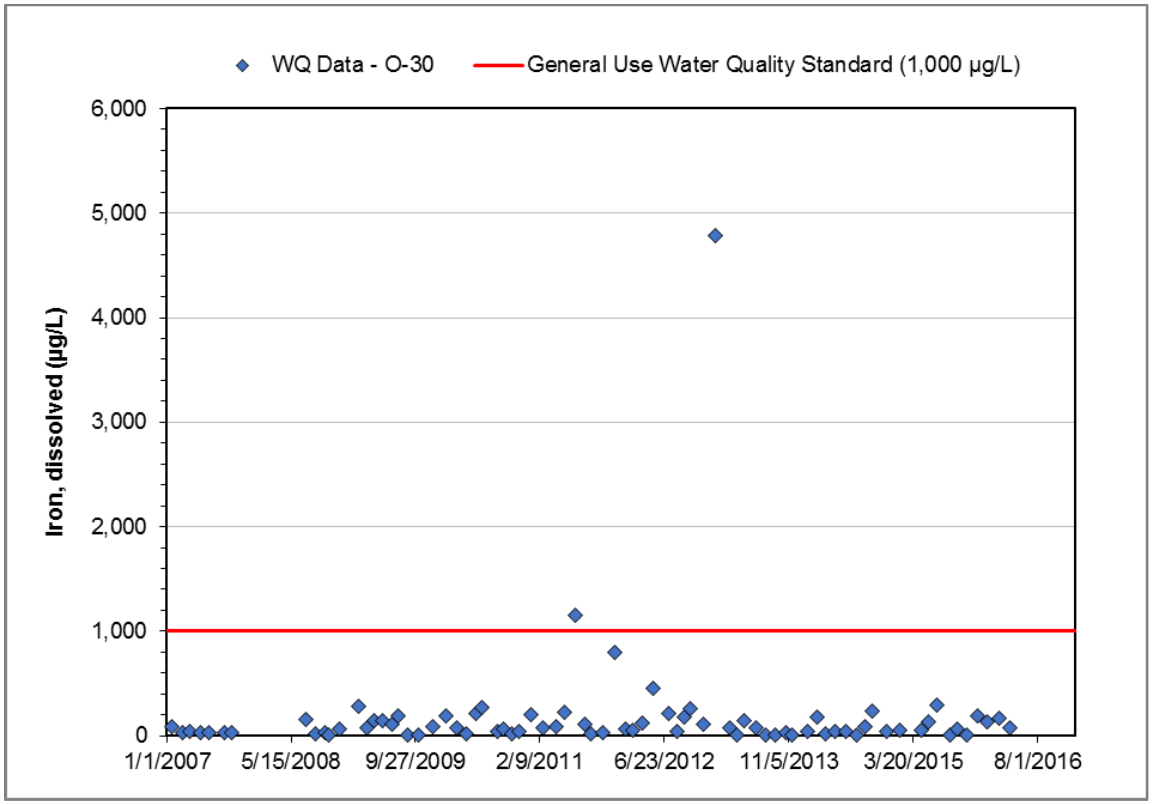

Figure 7. Iron water quality time series, Kaskaskia River O-30 segment.

4.2 East Fork Silver Creek (ODL-02)

East Fork Silver Creek ODL-02 is listed as impaired for aquatic life due to low dissolved oxygen. One Illinois EPA sampling site with relevant data was identified on East Fork Silver Creek, ODL-02. Seven discrete samples were collected from 2007–2012 (Table 12 and Figure 8). Continuous monitoring data were collected in 2012 and 2017 (Figure 9). Violations of the general use water quality standard were observed in June 2007, May 2012, July 2012, June 2017, and September 2017. Aquatic life use impairment is verified on this segment.

Table 12. Summary of discrete data collection, East Fork Silver Creek ODL-02

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	Number of exceedances of general use water quality standard (>5 mg/L (Mar-Jul) and >3.5 mg/L (Aug-Feb))
Dissolved Oxygen					
ODL-02	7	1.6	4.8	8.3	5

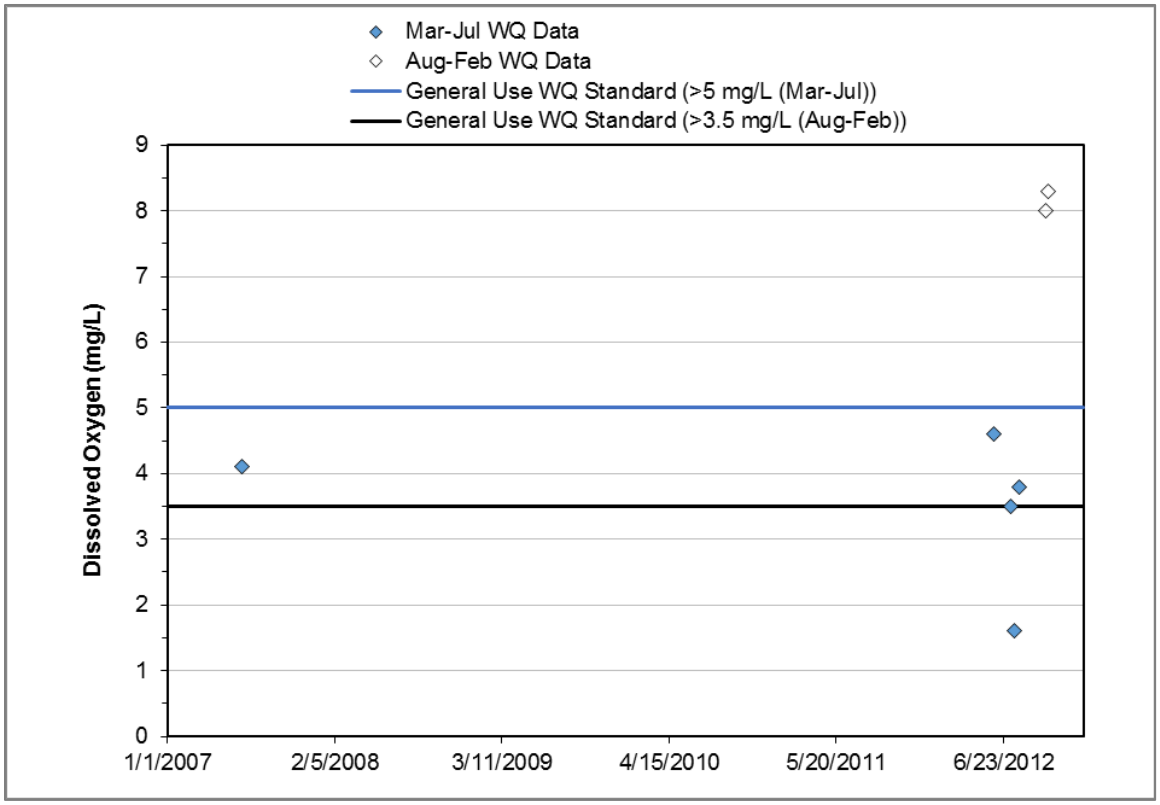

Figure 8. Dissolved oxygen water quality time series, East Fork Silver Creek ODL-02.

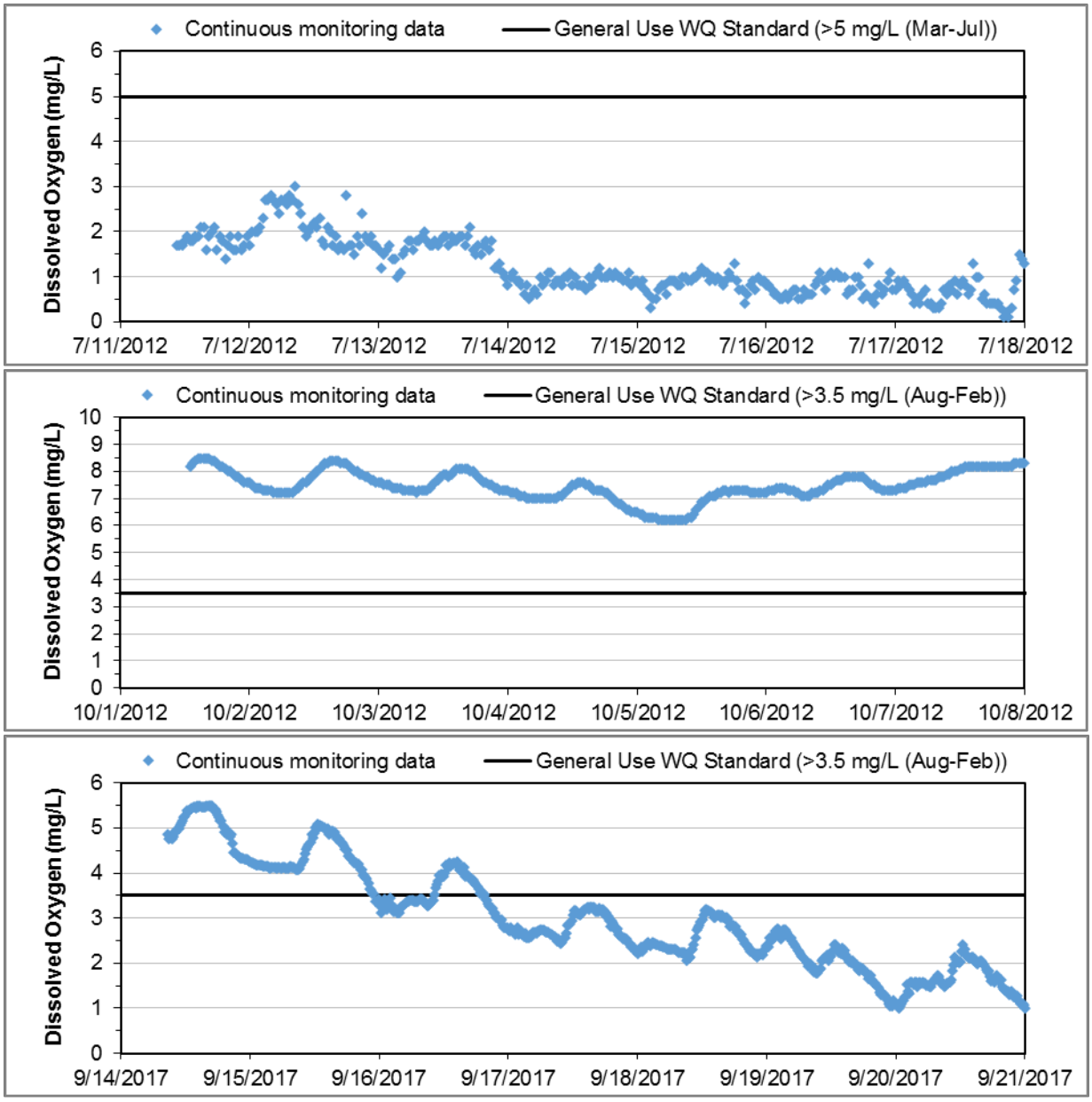

Figure 9. Continuous water quality time series for dissolved oxygen, East Fork Silver Creek ODL-02. Continuous data were also provided for this site from June 21 through June 28, 2017. The data are not presented here because it appears that the sensor malfunctioned.

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

- **Point Sources:** There are no point sources that directly contribute to the impaired segment. All point sources are located upstream of the impaired segment and discharge into unimpaired segments based on available data. However, St. Jacob STP (ILG580212) discharges to a small tributary of East Fork Silver Creek and could potentially contribute to the ODL-02 low dissolved oxygen impairment.

- **Eutrophication:** Dissolved oxygen data were 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. As phosphorus concentrations increase, DO concentration decreases (Figure 10), suggesting that eutrophication might contribute to impairment. However, chlorophyll-*a* concentrations are not correlated with DO and are low, indicating that the segment is not eutrophic (Figure 11).

- **Physical Properties:** East Fork Silver Creek receives flow from Sugar Fork (ODLA-01) and Highland Silver Lake (ROZA). There is only one monitoring station on the segment with relevant data, downstream of the confluence with ODLA-01. Dissolved oxygen conditions at the outlet of both waterbodies could influence East Fork Silver Creek, and future monitoring should include a station upstream of the confluence of ODLA-01. Based on a review of aerial photos, much of the length of the creek has also been channelized and is surrounded by agriculture.

A strong link to a pollutant is not present. Additional data could be collected to further evaluate the cause and extent of impairment.

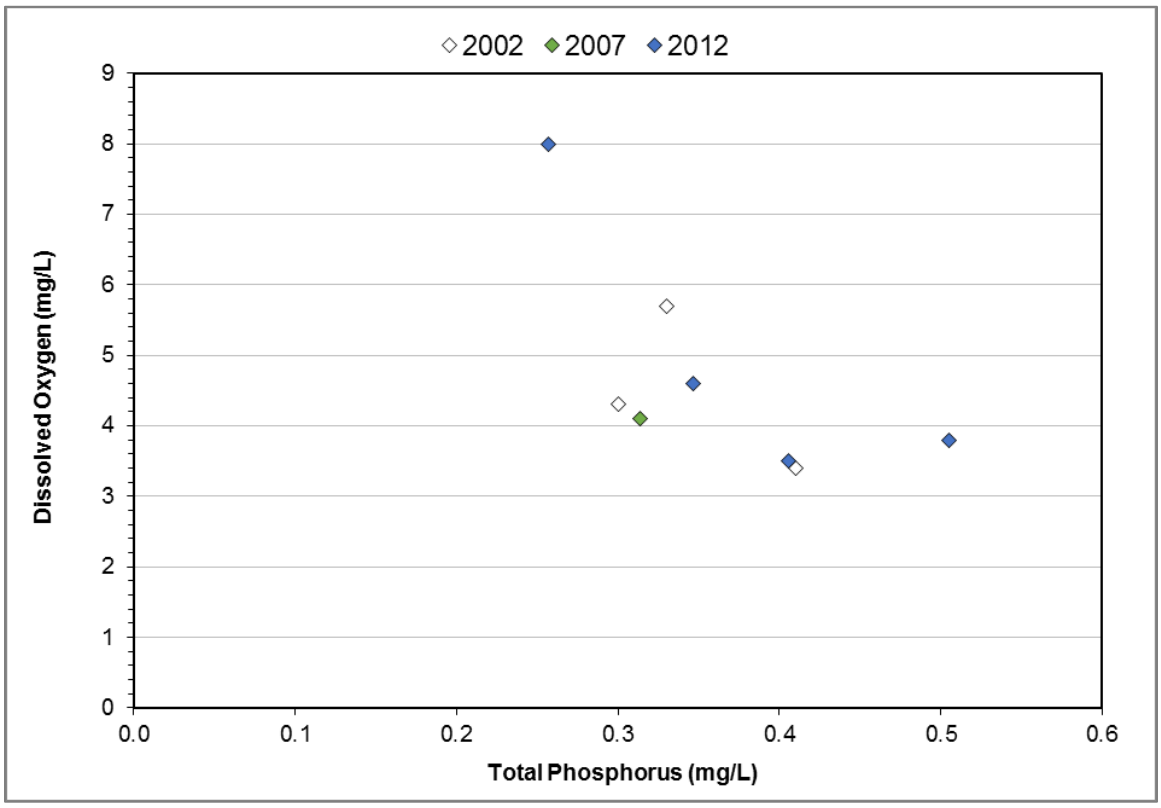

Figure 10. Total phosphorus versus dissolved oxygen, 2002–2012, East Fork Silver Creek ODL-02.

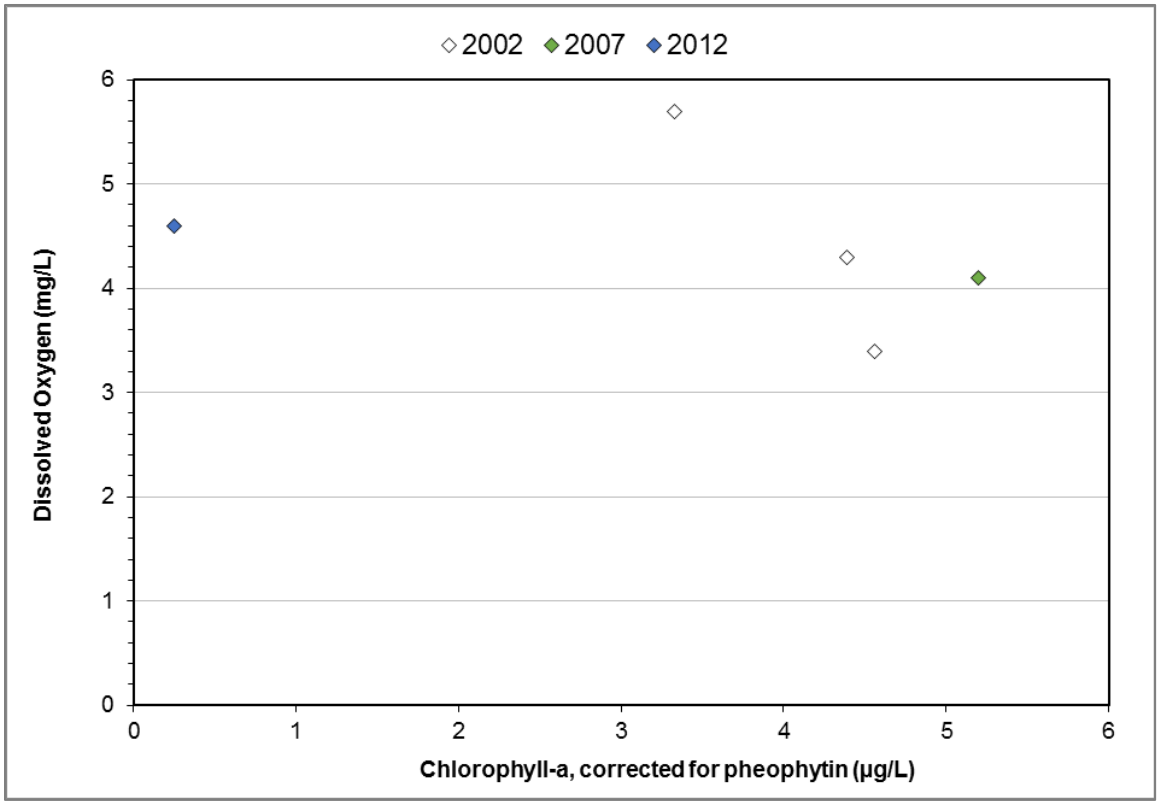

Figure 11. Chlorophyll-*a* versus dissolved oxygen, 2002–2012, East Fork Silver Creek ODL-02.

4.3 Sugar Fork (ODLA-01)

Sugar Fork ODLA-01 is listed as impaired for aquatic life due to low dissolved oxygen. One Illinois EPA sampling site with relevant data was identified on Sugar Fork, ODLA-01. Continuous monitoring data were collected in 2017, with multiple violations of the standard (Figure 12). Two samples were collected at ODLA-01 in 2007 (Figure 13). One violation of the general use water quality standard was observed in July 2007. Aquatic life use impairment is verified on this segment.

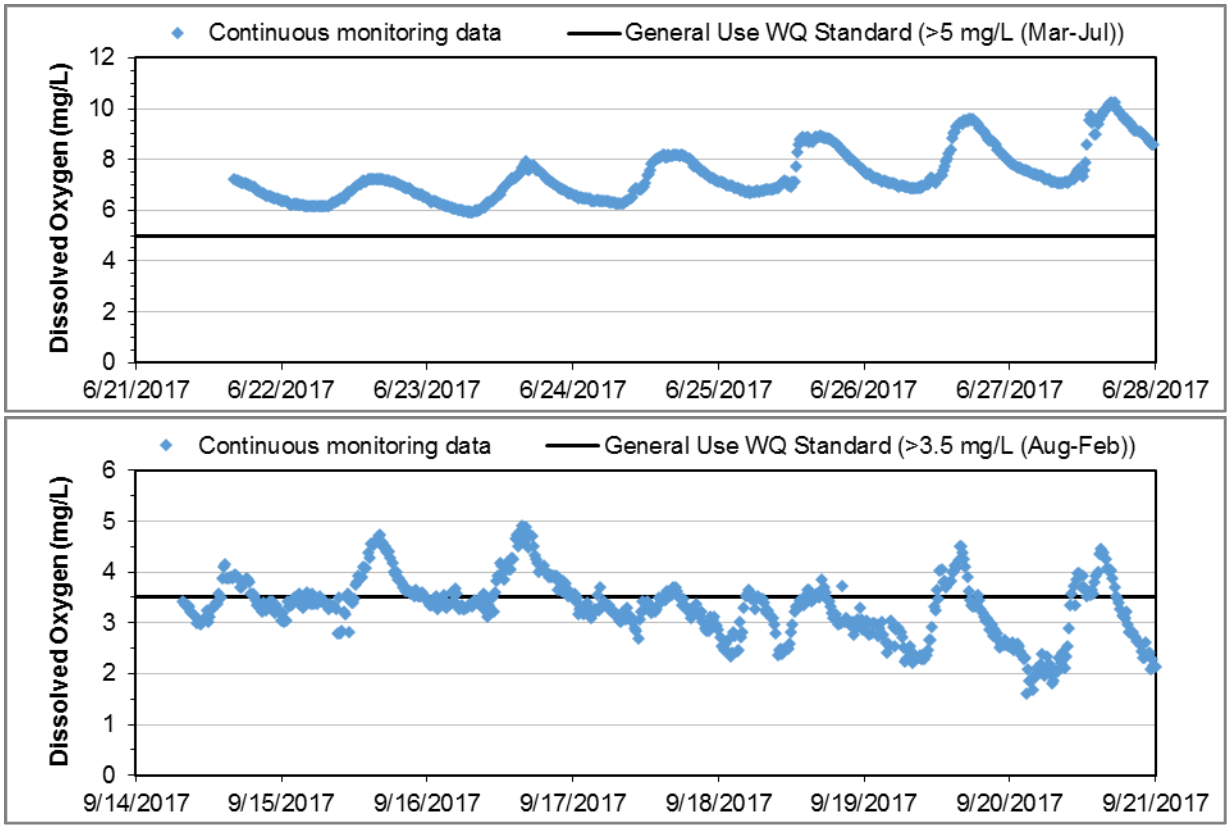

Figure 12. Continuous water quality time series for dissolved oxygen, Sugar Fork ODLA-01.

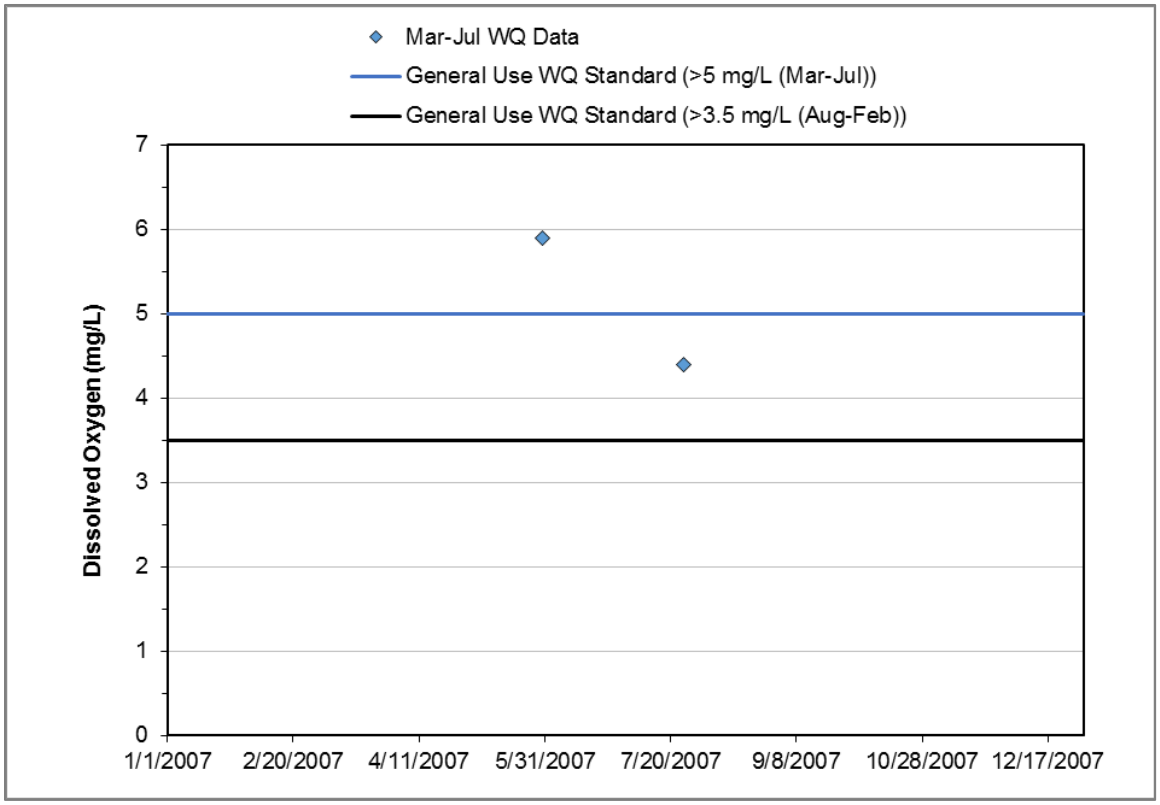

Figure 13. Dissolved oxygen water quality time series, Sugar Fork ODLA-01.

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.

- **Eutrophication:** Limited phosphorus and chlorophyll-*a* data were available to determine if eutrophication is contributing to low dissolved oxygen conditions. In two samples collected in 2007, an average total phosphorus concentration of 0.31 mg/L and an average chlorophyll-*a* concentration of 10.6 µg/L was observed. Additional data collection could include paired phosphorus and chlorophyll-*a* to determine if eutrophication is contributing to the ODLA-01 low dissolved oxygen impairment.

- **Physical Properties:** Based on review of aerial photos, Sugar Fork is highly ditched and channelized and surrounded by agricultural fields.

Sugar Fork ODLA-01 is also listed as impaired for aquatic life use due to high manganese. One IEPA sampling site was identified on the stream, ODLA-01. No samples during data collection in 2007 were recorded above the general use chronic standard for manganese (Figure 14). It is recommended that additional manganese data be collected to verify impairment.

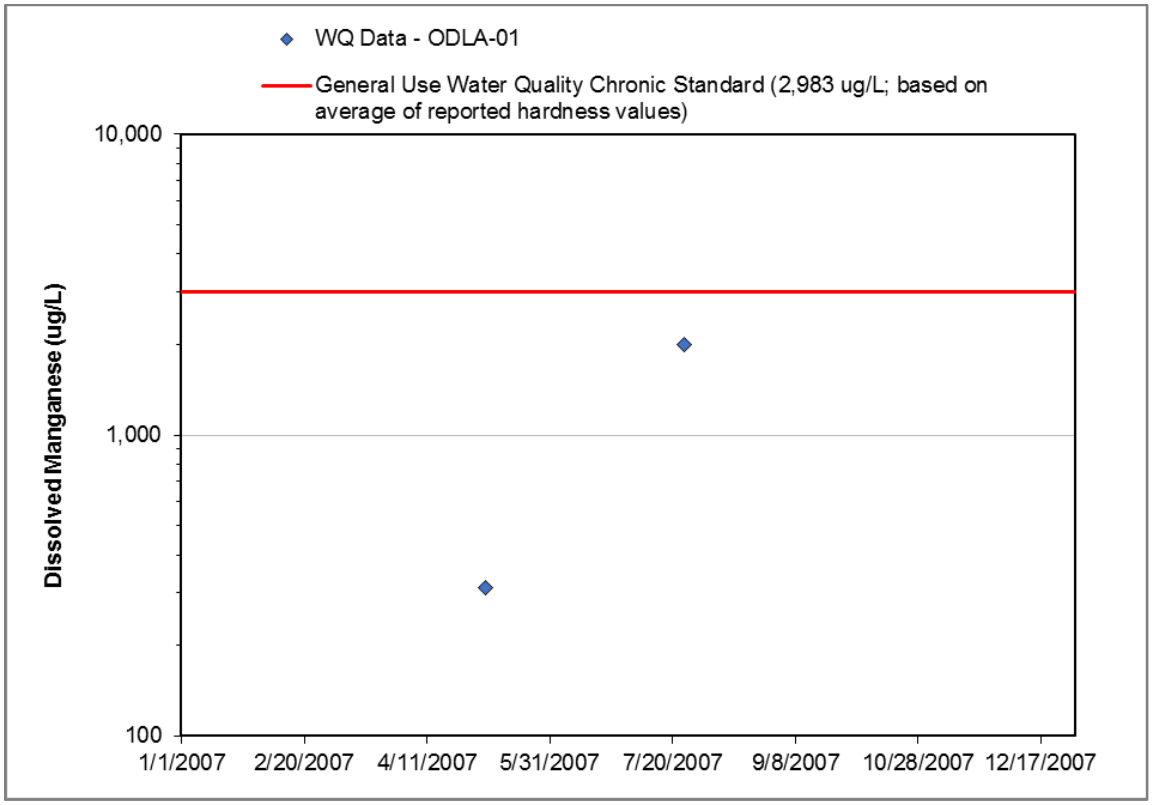

Figure 14. Manganese water quality time series, Sugar Fork ODLA-01.

4.4 Doza Creek (OZD)

Doza Creek OZD is listed as impaired for aquatic life due to low dissolved oxygen. Three Illinois EPA sampling sites with relevant data were identified on Doza Creek: OZD-01, OZD-MA-C1, and OZD-MA-C2. Four samples were collected at the sampling sites in 2007 (Table 13 and Figure 15). One violation of the general use water quality standard was observed at OZD-01 in July 2007. Continuous monitoring data were collected in 2017, with multiple violations of the standard (Figure 16). Aquatic life use impairment is verified on this segment.

Table 13. Data summary, Doza Creek OZD

Sample Site	No. of samples	Minimum (mg/L)	Average (mg/L)	Maximum (mg/L)	Number of exceedances of general use water quality standard (>5 mg/L (Mar-Jul) and >3.5 mg/L (Aug-Feb))
Dissolved Oxygen					
OZD-01	2	3.4	4.3	5.1	1
OZD-MA-C1	1	5.3	5.3	5.3	0
OZD-MA-C2	1	5.8	5.8	5.8	0

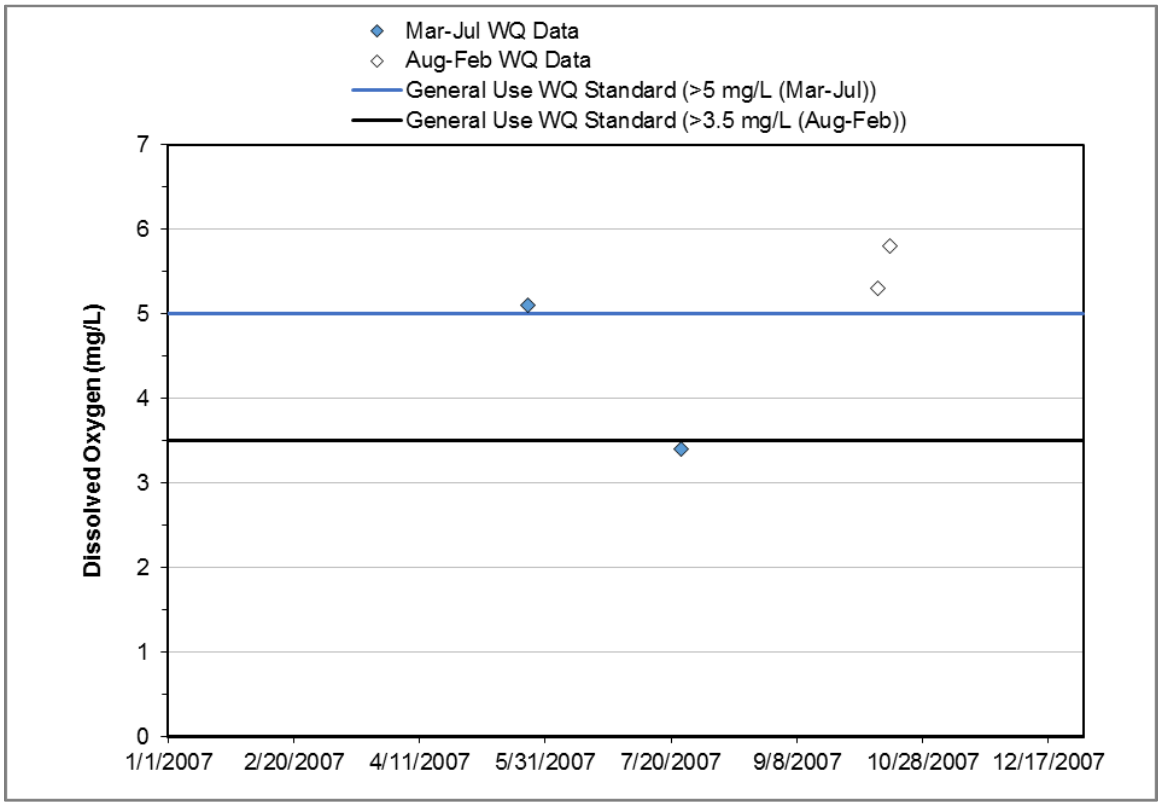

Figure 15. Dissolved oxygen water quality time series, Doza Creek OZD.

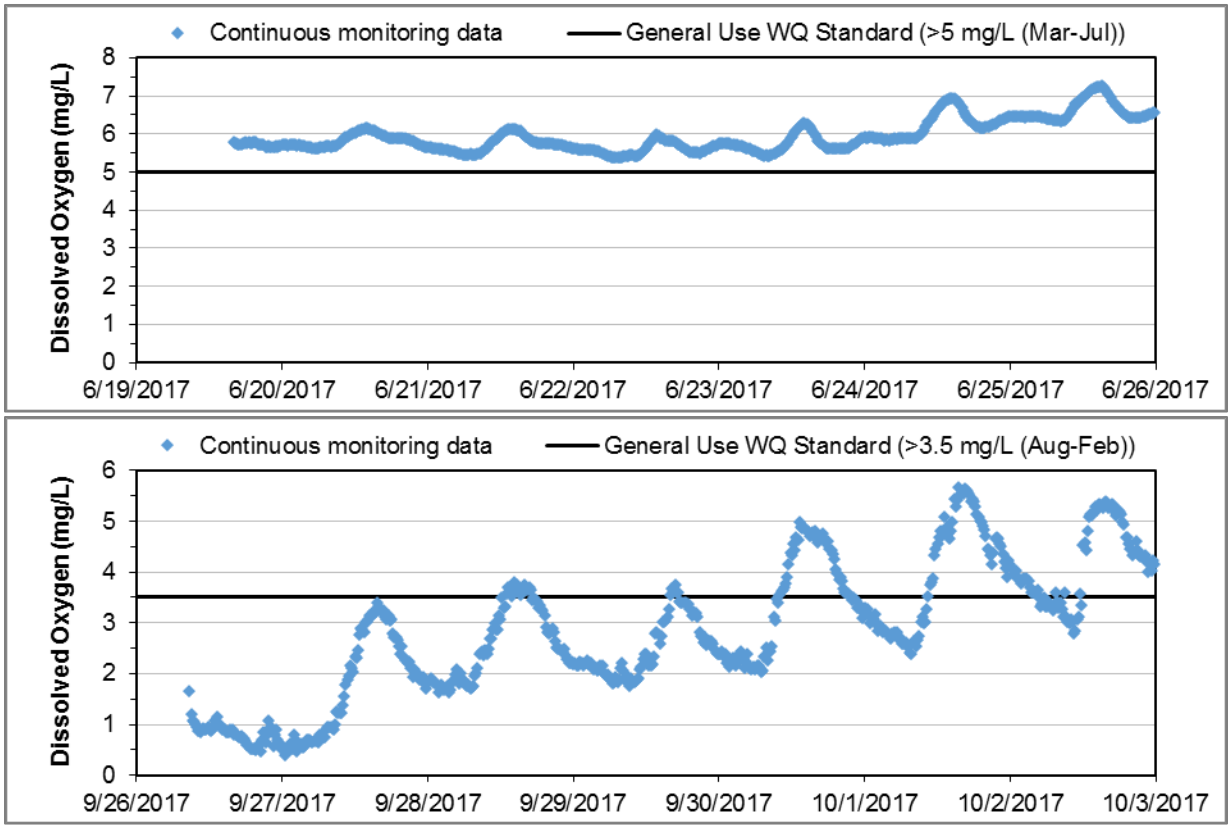

Figure 16. Continuous water quality time series for dissolved oxygen, Doza Creek OZD (site OZD-01)

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

- **Point Sources:** There are several point sources that, according to their permits, discharge to Doza Creek: Dynegy Midwest Generation–Baldwin (IL0000043) coal pile runoff and Hillside Recreational Lands, LLC–Randolph Preparation Plant (IL0062740) acid and alkaline mine drainage and stormwater. Additionally, Marissa STP (IL0024813) discharges to an unnamed tributary of Doza Creek approximately 0.65 miles upstream of Doza Creek. Monitoring data from October 2007 show high phosphorus concentrations in the unnamed tributary and in Doza Creek just below the confluence with the tributary. Lenzburg STP (ILG580013) also discharges to an unnamed tributary of Doza Creek. Point sources may contribute to the OZD low dissolved oxygen impairment.

- **Eutrophication:** Available phosphorus and chlorophyll-*a* data were reviewed to determine if eutrophication contributes to low dissolved oxygen conditions. Phosphorus versus dissolved oxygen data collected from 2007 do not indicate a strong correlation (Figure 17). Chlorophyll-*a* values are low with an average concentration from two samples of 4.7 µg/L, which does not indicate eutrophic conditions. Additional data collection should include paired phosphorus and chlorophyll-*a* to further investigate if eutrophication contributes to the OZD low dissolved oxygen impairment.

- **Physical Properties:** Based on review of aerial photos, Doza Creek is highly ditched and channelized and surrounded by agricultural practices.

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.

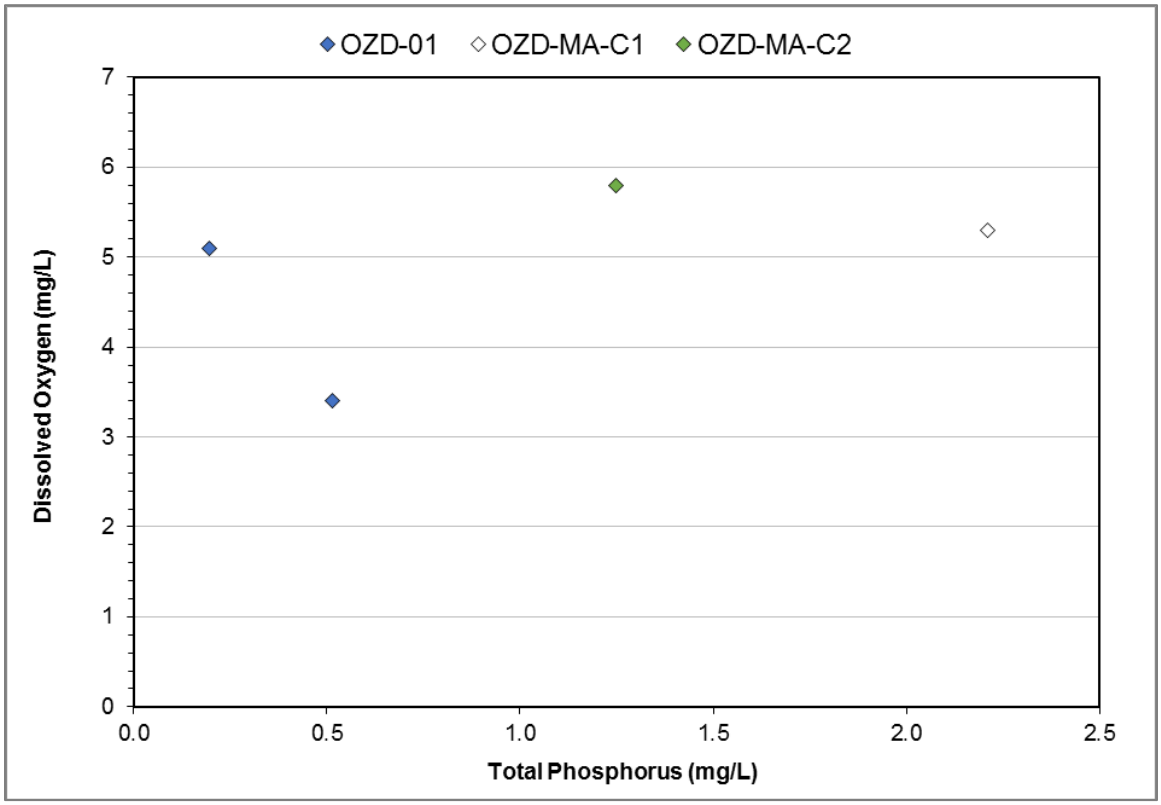

Figure 17. Total phosphorus versus dissolved oxygen, 2007, Doza Creek OZD.

Doza Creek OZD is also listed as impaired for aquatic life use due to high manganese. One IEPA sampling site was identified on the stream, OZD-01. No samples during data collection in 2007 were recorded above the general use chronic standard for manganese (Figure 18). It is recommended that additional manganese data be collected to verify impairment.

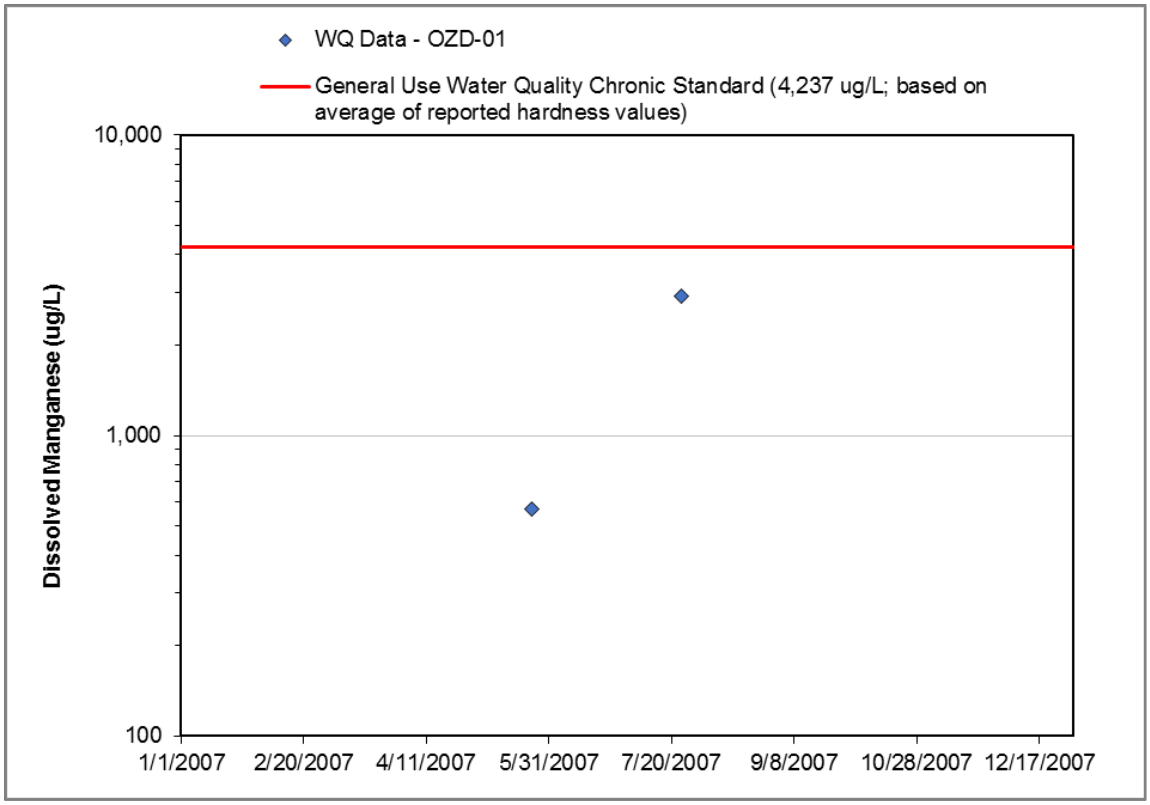

Figure 18. Manganese water quality time series, Doza Creek OZD-01.

5. TMDL Methods and Data Needs

The first stage of this project is an assessment 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 are proposed to derive TMDLs and the additional data needed to develop credible TMDLs.

TMDLs are proposed for segments with verified impairments and known pollutants (Table 14). A duration curve approach is suggested to evaluate the relationships between hydrology and water quality and to calculate the TMDLs for iron impairments.

The Qual2K model is proposed to evaluate the confirmed low dissolved oxygen impairments where point sources are present. If point sources are not present and if there is a correlation with eutrophication (i.e., phosphorus concentration or high levels of algae and/or plant growth), a duration curve approach is suggested to develop a phosphorus TMDL. The phosphorus target will be derived from the relationship between phosphorus and dissolved oxygen in the impaired stream. TMDLs are not proposed for dissolved oxygen impairments that are not affected by point sources and do not show a correlation with eutrophication. In these cases, it is assumed that the cause of impairment is non-pollutant based (e.g., the effect of lack of re-aeration in low-gradient streams or the effect of hydromodification).

Table 14. Proposed Model Summary

Name	Segment ID	Designated Uses	TMDL Parameter(s)	Proposed Model	Proposed Pollutant
Kaskaskia River	IL_O-03	Aquatic Life	Dissolved Oxygen	Qual2K	Biochemical oxygen demand, ammonia, total phosphorus
	IL_O-20	Public and Food Processing Water Supply	Iron	Load duration curve	Iron
	IL_O-30	Aquatic Life	Iron	Load duration curve	Iron
East Fork Silver Creek	IL_ODL-02	Aquatic Life	Dissolved Oxygen	Qual2K	Biochemical oxygen demand, ammonia, total phosphorus
Sugar Fork	IL_ODLA-01	Aquatic Life	Dissolved Oxygen	Load duration curve or 4C classification	Phosphorus or non-pollutant
			Manganese	Load duration curve, pending impairment verification	Manganese
Doza Creek	IL_OZD	Aquatic Life	Dissolved Oxygen	Qual2K	Biochemical oxygen demand, ammonia, total phosphorus
			Manganese	Load duration curve, pending impairment verification	Manganese

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* (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 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 among sources. Table 15 summarizes the general relationship among the five hydrologic zones and potentially contributing source areas (the table is not specific to an 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 15. 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
On-site 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., m^3/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 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 understand probable sources, calculate reductions, develop calibrated water quality models, and develop effective implementation plans. Table 16 summarizes the additional data needed for each impaired segment.

Table 16. Additional data needs

Name	Segment ID	Designated Uses	TMDL Parameters	Additional Data Needs
Kaskaskia River	IL_O-03	Aquatic Life	Dissolved Oxygen	Yes, to support Qual2K model
	IL_O-20	Public and Food Processing Water Supply	Iron	None
	IL_O-30	Aquatic Life	Iron	None
East Fork Silver Creek	IL_ODL-02	Aquatic Life	Dissolved Oxygen	Yes, to support Qual2K model
Sugar Fork	IL_ODLA-01	Aquatic Life	Dissolved Oxygen	Yes, to determine relationship with eutrophication
			Manganese	Yes, to verify impairment
Doza Creek	IL_OZD	Aquatic Life	Dissolved Oxygen	Yes, to support Qual2K model
			Manganese	Yes, to verify impairment
All	All	All	All	Implementation plan development

Specific data needs include:

Support Qual2K Model Development on Kaskaskia River O-03—Due to the size of the river and its drainage area, a total of five monitoring stations are needed. Ideally, there would be two separate data collection periods, each time period lasting roughly one week during critical conditions (low flow, warm conditions). Although the five monitoring stations 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:

- Sites O-91, O-03 (work with USGS to collect additional samples needed at O-03/USGS 05595000), and O-55:
  - Continuous dissolved oxygen, stream temperature, conductivity, and pH monitoring during a warm, low flow period in July; monitoring should take place over approximately two weeks.
  - Multiple samples of organic nitrogen, ammonia nitrogen, nitrate nitrogen, TKN, organic phosphorus, soluble reactive phosphorus, total inorganic carbon, total organic carbon, carbonaceous biochemical oxygen demand (5-day and 20-day if possible), chemical oxygen demand (COD), 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 (in addition to Mud Creek and Silver Creek listed below), if any.
  - Survey of channel substrate and bottom material.
- Sites on Mud Creek (OE-02) and Silver Creek (OD-04):
  - Continuous dissolved oxygen, stream temperature, conductivity, and pH monitoring during the same period as data collected on the main stem sites.
  - Multiple samples of organic nitrogen, ammonia nitrogen, nitrate nitrogen, TKN, organic phosphorus, soluble reactive phosphorus, total inorganic carbon, total organic carbon, carbonaceous biochemical oxygen demand (5-day and 20-day if possible), chemical oxygen demand (COD), 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.
- A longitudinal/synoptic survey of DO concentrations along the entire reach.
- 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 sediment oxygen demand (SOD) sampling (sediment total organic carbon sampling for instance could be a rough proxy for SOD if needed).
- Photo documentation of the system.

Support Qual2K Model Development on East Fork Silver Creek ODL-02—Although there are continuous DO data from 2017, there are no known water quality data from the same time period. A minimum of two monitoring stations are needed on the impaired segment, in addition to a station on Sugar Branch near the confluence with East Fork Silver Creek. Ideally, there would be two separate data collection periods, each time period lasting roughly one week during critical conditions (low flow, warm conditions). Although two monitoring locations on the impaired segment 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:

- Station ODL-02, new monitoring station on IL ODLA-01 located at County Road 600 N road crossing, and at the Highland Silver Lake dam:
  - Continuous dissolved oxygen, stream temperature, conductivity, and pH monitoring during a warm, low flow period in July; monitoring should take place over approximately two weeks.
  - Flow monitoring (depth and velocity) during dissolved oxygen monitoring at least twice; the number of measurements will be dependent on weather and stream conditions.
  - Multiple samples of organic nitrogen, ammonia nitrogen, nitrate nitrogen, TKN, organic phosphorus, soluble reactive phosphorus, total inorganic carbon, total organic 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 sediment oxygen demand (SOD) sampling (sediment total organic carbon sampling for instance could be a rough proxy for SOD if needed).
- Photo documentation of the system.

Confirm Impairment and Determine Relationship with Eutrophication on IL_ODLA-01—Collect DO, chlorophyll-*a*, and TP grab samples at station ODLA-01; two samples per day (one per day in the early morning) on three separate sampling days, during the warm summer months (July–August) and during low flows.

Verify Manganese Impairment on Sugar Fork IL_ODLA-01—Three samples should be analyzed for manganese and for hardness at station ODLA-01.

Support Qual2K Model Development on Doza Creek OZD—A minimum of two monitoring stations are needed on the impaired segment, in addition to a station on each of the major tributaries (one station on the tributary that enters from the south where it intersects with Waeltz Road; another station on the tributary that enters from the north where it intersects with Schmoll Road), for a total of four sites. Ideally, there would be two separate data collection periods, each time period lasting roughly one week during critical conditions (low flow, warm conditions). Adding more locations along the reach of interest would 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:

- Station OZD-MA-C1, OZD-01:
  - Continuous dissolved oxygen, stream temperature, conductivity, and pH monitoring during a warm, low flow period in July; monitoring should take place over approximately two weeks at a minimum of two locations.
  - Flow monitoring (depth and velocity) during dissolved oxygen monitoring at least twice at two locations, the number of measurements will be dependent on weather and stream conditions.
  - Multiple samples of organic nitrogen, ammonia nitrogen, nitrate nitrogen, TKN, organic phosphorus, soluble reactive phosphorus, total inorganic carbon, total organic carbon, carbonaceous biochemical oxygen demand (5-day and 20-day if possible), chemical oxygen demand (COD), inorganic solids, chlorophyll-*a*, alkalinity, dissolved iron, and total iron. 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, observations of iron precipitates, channel substrate and bottom material, both upstream and downstream of the monitoring stations(s).
- Tributaries—one station on the tributary that enters from the south where it intersects with Waeltz Road; another station on the tributary that enters from the north where it intersects with Schmoll Road:
  - Continuous dissolved oxygen, stream temperature, conductivity, and pH monitoring during the same period as data collected on the main stem sites.
  - Multiple samples of organic nitrogen, ammonia nitrogen, nitrate nitrogen, TKN, organic phosphorus, soluble reactive phosphorus, total inorganic carbon, total organic carbon, carbonaceous biochemical oxygen demand (5-day and 20-day if possible), chemical oxygen demand (COD), inorganic solids, chlorophyll-*a*, alkalinity, dissolved iron, and total iron. 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.
- A longitudinal/synoptic survey of DO concentrations along the entire reach.
- 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 sediment oxygen demand (SOD) sampling (sediment total organic carbon sampling for instance could be a rough proxy for SOD if needed).
- Photo documentation of the system.

Verify Manganese Impairment on Doza Creek OZD—Three samples should be analyzed for manganese and for hardness at station OZD-01.

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
- Lakeshore assessment
- 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 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. Comments and response to comments are provided in Appendix B.

7. References

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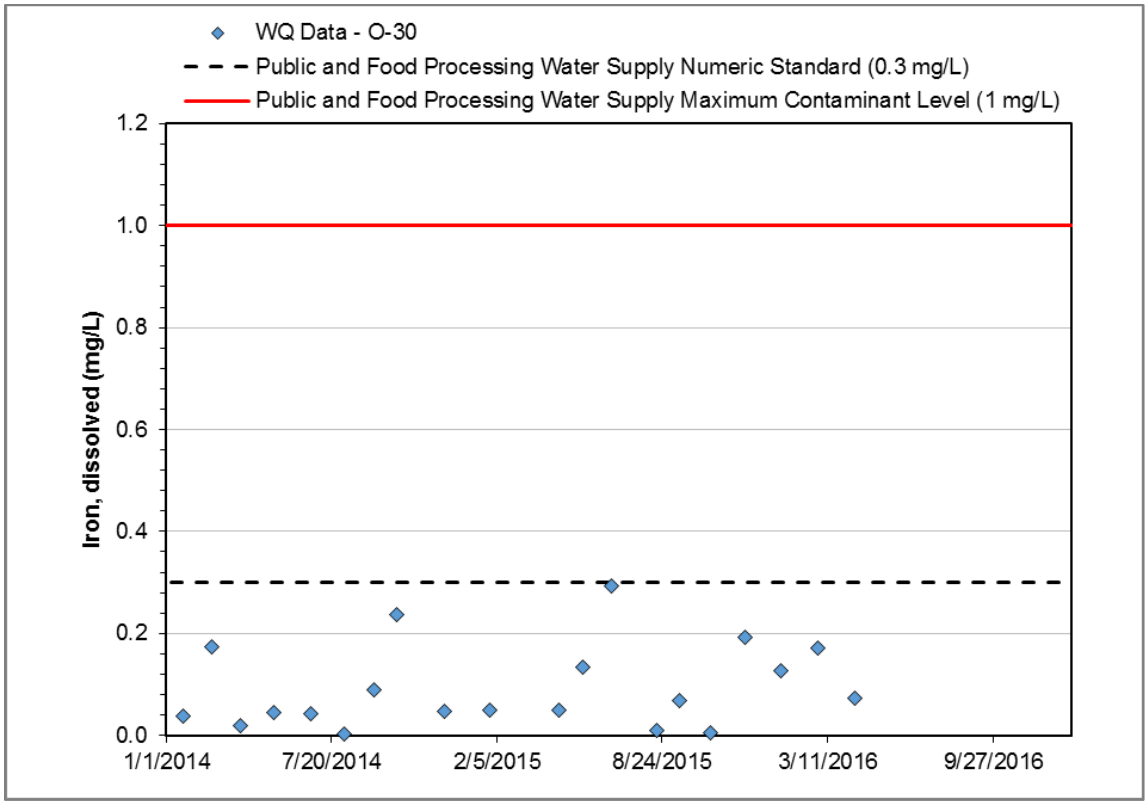
Appendix A—Unimpaired Stream Data Analysis

Kaskaskia River (O-30)

Kaskaskia River O-30 is listed for not supporting Public and Food Processing Water Supplies due to elevated levels of iron (dissolved). One IEPA sampling site was identified on the segment, O-30. No samples over the last three years of data collection (2014–2016) were recorded above the 0.3 mg/L drinking water protection numeric standard or 1 mg/L MCL. It is therefore recommended that the segment be delisted for Public and Food Processing Water Supplies use.

Iron data summary, Kaskaskia River O-30

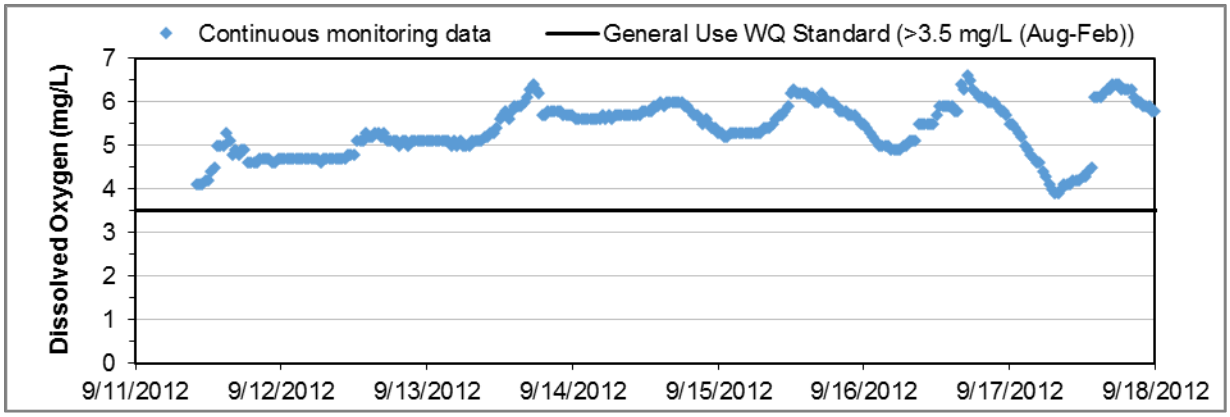
Sample Site	Date	Result (mg/L)	Quarterly Average (mg/L)
Iron, dissolved			
O-30	1/22/2014	0.04	0.11
	2/26/2014	0.17	
	4/1/2014	0.02	0.04
	5/12/2014	0.04	
	6/25/2014	0.04	
	8/5/2014	0.00	0.05
	9/9/2014	0.09	
	10/7/2014	0.24	0.14
	12/3/2014	0.05	
	1/27/2015	0.05	0.049
	4/21/2015	0.05	
	5/20/2015	0.13	0.16
	6/23/2015	0.29	
	8/17/2015	0.01	0.04
	9/14/2015	0.07	
	10/21/2015	0.01	0.10
	12/3/2015	0.19	
	1/14/2016	0.13	0.15
	2/29/2016	0.17	
	4/13/2016	0.07	0.07



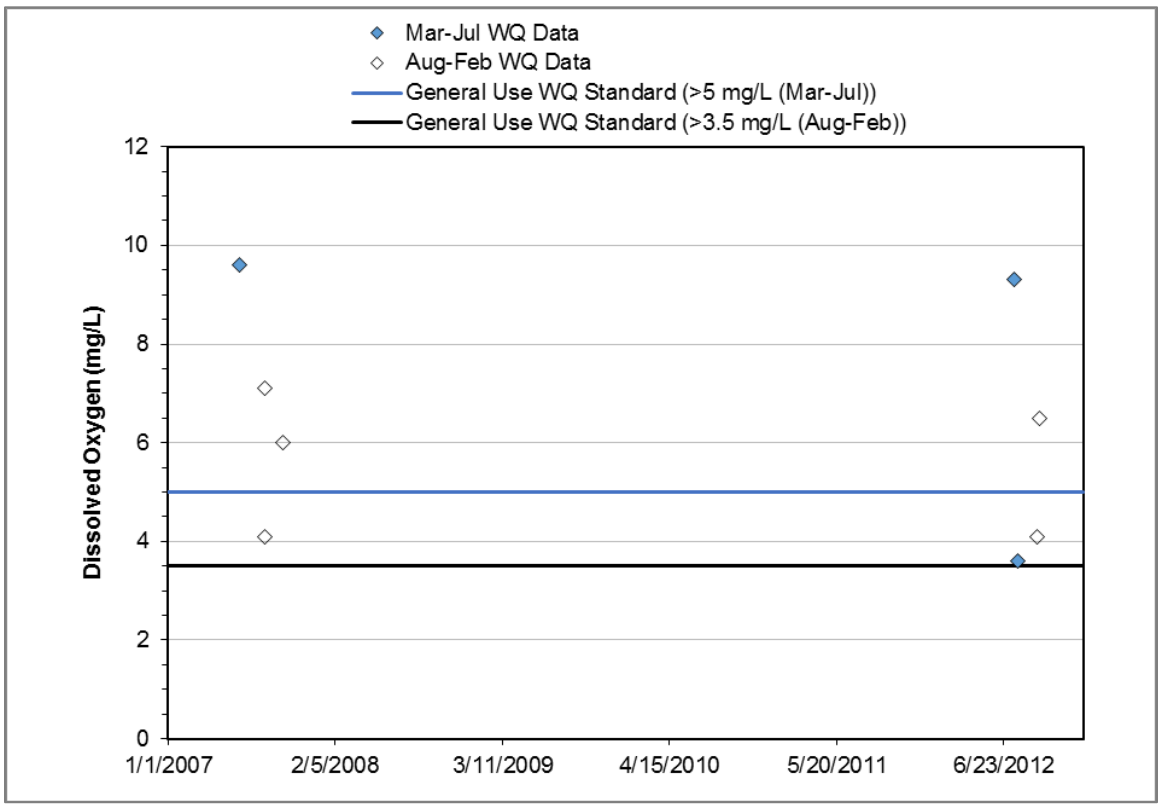
Iron water quality time series, Kaskaskia River O-30 segment.

Kaskaskia River (O-97)

Kaskaskia River O-97 is listed for not supporting aquatic life due to low dissolved oxygen. Continuous dissolved oxygen data were collected in July and September 2012, however the July data were determined to be unreliable. The dissolved oxygen standard was not violated during 7 days in September (see figure below). There were eight additional grab samples collected at O-04 between 2007 and 2012, with one that violated the standard (see figure below). A reach is considered impaired due to dissolved oxygen if greater than 10 percent of the samples violate the standard. In this case, less than 10 percent of the samples violated the standard and therefore it is recommended that the segment be delisted for aquatic life.



Continuous water quality time series for dissolved oxygen, Kaskaskia River O-97 segment.



Dissolved oxygen water quality time series, Kaskaskia River O-97 segment.

Appendix B—Response to Comment

Comments on Stage 1 Report

Dear Ms Ristau,

I am a KWA (Kaskaskia Watershed Assoc) Board member and Secretary to OKAW, Inc. (Original Kaskaskia Area Wilderness, Inc., Land Trust).

I have been director of the KWA 6-year (2010-2017) Heavy Metal Water Sampling Project in section IL_0-20 & IL_0-30 (from North boat ramp at Fayetteville to North Boat Access Lot at Evansville, IL).

Dr. Karl W.J. Williard, (Forest Hydrology & Watershed Management, SIU-C and Director of the Universities Council on Water Resources) managed the sampling and data processing. He has provided a 3-year Update and 6-year Final Report for the project. I could snail mail these to you.

All six years indicate above MCL readings for: Aluminum (never within MCL), Iron (never within the MCL), and Manganese (only at/below MCL once, May 25, 2011 during flood event). Manganese has a Primary MCL in Illinois. It is expensive to remove in water treatment. It has numerous documented, serious health concerns (learning disability in young - whose bodies do not efficiently excrete Mn; aggression in adults ingesting high levels - see Grote, Australia -Manganese Madness).

I respectfully request that IEPA re-open monitoring of IL_0-20, IL_0-30, and thoroughly monitor IL_OZD for Manganese. Our records are showing that Mn is a serious threat to watersheds carrying runoff from coal mine residue, and that Mn is a health threat as well as expensive to remove (requiring raising iron levels and lowering pH in order to release the Mn).

These sections of the Kaskaskia River Watershed SHOULD NOT BE REMOVED FROM 303d IMPAIRED LISTING.

Coal Energy has a hidden cost being carried by our water system. Users of Coal for Energy should be held accountable for this cost, so that they will seek to decrease the amount of waste runoff they are sending downstream.

Regards, Jennifer Malacarne (OKAW, Inc., KWA, Riverwatch)

Response to comments on Stage 1 Report

An iron TMDL is being developed to address aquatic life on segment IL_O-30, however IEPA's monitoring data do not show impairment of the drinking water standards on this reach. IEPA requested the additional information noted in the comments from Ms. Malacarne on January 24, 2019 and will consider that information as part of TMDL development when provided and if applicable.

IEPA will continue to monitor segments IL_O-20, IL_O-30, and IL_OZD as part of their Intensive Basin Survey program which is conducted on a five-year rotation.

The removal of pH from the impaired water list is addressed through a separate process, see https://www2.illinois.gov/epa/topics/water-quality/watershed-management/tmdls/Pages/303d-list.aspx for more information.

Appendix B – Stage 2 Data

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 10/08/19 16:20 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191007INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19J0367-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/08/19 10:25
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/16/19 08:09
Units: ug/L
Analyzed: 10/17/19 10:18

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**4.00**		0.50	
Chlorophyll-A (unco)	**3.82**		0.50	
Chlorophyll-B	**1.77**		0.50	
Chlorophyll-C	**2.80**		0.50	
Pheophytin-A	ND		0.50	

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:
10/29/19 14:54

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	ODLA-01			Received : 10/08/19 16:20	by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20191007INHS	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:
10/29/19 14:54

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 07/24/19 14:40 by ADAM LUCCHESI
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724TMDL
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: DISSOLVED
Collected By: MARK WEBER
Lab Sample ID: **19G0785-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 11:50
Sample Fraction: Dissolved
Chlorophyll volume filtered (ml):
Sample Depth:

Metals by EPA 200 Series Methods ICP/MS

Method: 200.8
Prepared: 08/16/19 08:53
Units: ug/L
Analyzed: 08/19/19 16:03

Analyte	Result	Qualifier	Reporting Limit	MDL
Aluminum	**73.8**		50.0	19.8
Arsenic	**2.04**		2.00	0.13
Barium	**60.7**		5.00	0.20
Beryllium	ND		1.00	0.68
Boron	**20.8**		10.0	2.27
Cadmium	ND		3.00	0.23
Calcium	**21900**		300	57.2
Chromium	ND		5.00	0.21
Cobalt	ND		5.00	0.16
Copper	**1.18**	J	5.00	0.27
Iron	**213**		50.0	3.38
Lead	ND		5.00	0.17
Magnesium	**7210**		300	23.8
Manganese	**74.2**		5.00	0.13
Nickel	**1.36**	J	5.00	0.56
Potassium	**5010**		1400	23.6
Selenium	ND		5.00	1.18
Silver	ND		3.00	0.04
Sodium	**9040**		300	42.7
Strontium	**79.8**		5.00	0.21
Vanadium	**3.19**	J	5.00	0.17
Zinc	ND		5.00	4.33

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:	ODLA-01			Received :	07/24/19 14:40 by ADAM LUCCHESI
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724TMDL	Visit Number:	001	Monitoring Program:	TMDL

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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:	ODLA-01			Received : 07/24/19 14:40	by ADAM LUCCHESI
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724TMDL	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

Hardness = 84,450 ug/L

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: OZD-01
Received : 07/24/19 14:40 by ADAM LUCCHESI
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190724TMDL
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: DISSOLVED
Collected By: MARK WEBER
Lab Sample ID: **19G0786-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 07/24/19 10:30
Sample Fraction: Dissolved
Chlorophyll volume filtered (ml):
Sample Depth:

Metals by EPA 200 Series Methods ICP/MS

Method: 200.8
Prepared: 08/16/19 08:53
Units: ug/L
Analyzed: 08/19/19 16:08

Analyte	Result	Qualifier	Reporting Limit	MDL
Aluminum	**78.1**		50.0	19.8
Arsenic	**2.77**		2.00	0.13
Barium	**64.3**		5.00	0.20
Beryllium	ND		1.00	0.68
Boron	**107**		10.0	2.27
Cadmium	ND		3.00	0.23
Calcium	**40000**		300	57.2
Chromium	ND		5.00	0.21
Cobalt	**0.33**	J	5.00	0.16
Copper	**1.06**	J	5.00	0.27
Iron	**98.5**		50.0	3.38
Lead	ND		5.00	0.17
Magnesium	**17100**		300	23.8
Manganese	**183**		5.00	0.13
Nickel	**2.95**	J	5.00	0.56
Potassium	**6580**		1400	23.6
Selenium	ND		5.00	1.18
Silver	ND		3.00	0.04
Sodium	**42800**		300	42.7
Strontium	**268**		5.00	0.21
Vanadium	**3.04**	J	5.00	0.17
Zinc	ND		5.00	4.33

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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:	OZD-01			Received :	07/24/19 14:40 by ADAM LUCCHESI
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724TMDL	Visit Number:	001	Monitoring Program:	TMDL

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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:	OZD-01			Received : 07/24/19 14:40	by ADAM LUCCHESI
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190724TMDL	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

Hardness = 170,320 ug/L

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: ODLA-01
Received : 08/01/19 15:20 by LAUREN AIELLO
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190801TMDL
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: DISSOLVED
Collected By: MARK WEBER
Lab Sample ID: **19H0042-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/01/19 9:50
Sample Fraction: Dissolved
Chlorophyll volume filtered (ml):
Sample Depth:

Metals by EPA 200 Series Methods ICP/MS

Method: 200.8
Prepared: 08/27/19 10:46
Units: ug/L
Analyzed: 08/27/19 12:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Aluminum	**41.4**	J	50.0	19.8
Arsenic	**2.24**		2.00	0.13
Barium	**57.4**		5.00	0.20
Beryllium	ND		1.00	0.68
Boron	**23.6**		10.0	2.27
Cadmium	ND		3.00	0.23
Calcium	**23100**		300	57.2
Chromium	ND		5.00	0.21
Cobalt	**0.38**	J	5.00	0.16
Copper	**1.49**	J	5.00	0.27
Iron	**82.4**		50.0	3.38
Lead	ND		5.00	0.17
Magnesium	**7730**		300	23.8
Manganese	**82.6**		5.00	0.13
Nickel	**1.29**	J	5.00	0.56
Potassium	**5410**		1400	23.6
Selenium	ND		5.00	1.18
Silver	ND		3.00	0.04
Sodium	**11400**		300	42.7
Strontium	**80.8**		5.00	0.21
Vanadium	**2.74**	J	5.00	0.17
Zinc	ND		5.00	4.33

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Reported:
09/12/19 14:33

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

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	08/01/19 15:20 by LAUREN AIELLO
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190801TMDL	Visit Number:	001	Monitoring Program:	TMDL

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Reported:
09/12/19 14:33

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

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	08/01/19 15:20 by LAUREN AIELLO
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190801TMDL	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

Hardness result = 89,502 ug/L

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
09/12/19 14:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OZD-01
Received : 08/01/19 15:20 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190801TMDL
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: DISSOLVED
Collected By: MARK WEBER
Lab Sample ID: **19H0043-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/01/19 11:30
Sample Fraction: Dissolved
Chlorophyll volume filtered (ml):
Sample Depth:

Metals by EPA 200 Series Methods ICP/MS

Method: 200.8
Prepared: 08/27/19 10:46
Units: ug/L
Analyzed: 08/27/19 12:10

Analyte	Result	Qualifier	Reporting Limit	MDL
Aluminum	**58.9**		50.0	19.8
Arsenic	**2.63**		2.00	0.13
Barium	**61.3**		5.00	0.20
Beryllium	ND		1.00	0.68
Boron	**119**		10.0	2.27
Cadmium	ND		3.00	0.23
Calcium	**42300**		300	57.2
Chromium	ND		5.00	0.21
Cobalt	**0.41**	J	5.00	0.16
Copper	**1.21**	J	5.00	0.27
Iron	**65.6**		50.0	3.38
Lead	**0.17**	J	5.00	0.17
Magnesium	**18200**		300	23.8
Manganese	**209**		5.00	0.13
Nickel	**2.65**	J	5.00	0.56
Potassium	**5500**		1400	23.6
Selenium	ND		5.00	1.18
Silver	ND		3.00	0.04
Sodium	**55200**		300	42.7
Strontium	**270**		5.00	0.21
Vanadium	**3.15**	J	5.00	0.17
Zinc	**7.97**		5.00	4.33

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Reported:
09/12/19 14:33

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

LABORATORY RESULTS

Station Code:	OZD-01			Received :	08/01/19 15:20 by LAUREN AIELLO
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190801TMDL	Visit Number:	001	Monitoring Program:	TMDL

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Reported:
09/12/19 14:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OZD-01			Received : 08/01/19 15:20	by LAUREN AIELLO
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190801TMDL	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

Hardness result = 180,689 ug/L

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
09/12/19 14:33

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OZD-01
Received : 08/08/19 15:15 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190808TMDL
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: DISSOLVED
Collected By: MARK WEBER
Lab Sample ID: **19H0402-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/08/19 10:35
Sample Fraction: Dissolved
Chlorophyll volume filtered (ml):
Sample Depth:

Metals by EPA 200 Series Methods ICP/MS

Method: 200.8
Prepared: 08/27/19 10:46
Units: ug/L
Analyzed: 08/27/19 16:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Aluminum	**26.5**	J	50.0	19.8
Arsenic	**2.72**		2.00	0.13
Barium	**62.1**		5.00	0.20
Beryllium	ND		1.00	0.68
Boron	**119**		10.0	2.27
Cadmium	ND		3.00	0.23
Calcium	**43500**		300	57.2
Chromium	ND		5.00	0.21
Cobalt	**0.45**	J	5.00	0.16
Copper	**0.83**	J	5.00	0.27
Iron	**23.3**	J	50.0	3.38
Lead	ND		5.00	0.17
Magnesium	**19400**		300	23.8
Manganese	**259**		5.00	0.13
Nickel	**2.74**	J	5.00	0.56
Potassium	**5430**		1400	23.6
Selenium	ND		5.00	1.18
Silver	ND		3.00	0.04
Sodium	**60400**		300	42.7
Strontium	**274**		5.00	0.21
Vanadium	**2.96**	J	5.00	0.17
Zinc	**4.79**	J	5.00	4.33

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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:	OZD-01			Received :	08/08/19 15:15 by LAUREN AIELLO
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190808TMDL	Visit Number:	001	Monitoring Program:	TMDL

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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:	OZD-01			Received : 08/08/19 15:15	by LAUREN AIELLO
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190808TMDL	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

Hardness result = 188,506 ug/L

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: ODLA-01
Received : 08/08/19 15:15 by LAUREN AIELLO
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190808TMDL
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: DISSOLVED
Collected By: MARK WEBER
Lab Sample ID: **19H0404-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 08/08/19 9:25
Sample Fraction: Dissolved
Chlorophyll volume filtered (ml):
Sample Depth:

Metals by EPA 200 Series Methods ICP/MS

Method: 200.8
Prepared: 08/27/19 10:46
Units: ug/L
Analyzed: 08/27/19 16:37

Analyte	Result	Qualifier	Reporting Limit	MDL
Aluminum	ND		50.0	19.8
Arsenic	**2.17**		2.00	0.13
Barium	**80.4**		5.00	0.20
Beryllium	ND		1.00	0.68
Boron	**25.4**		10.0	2.27
Cadmium	ND		3.00	0.23
Calcium	**38600**		300	57.2
Chromium	ND		5.00	0.21
Cobalt	**0.39**	J	5.00	0.16
Copper	**1.13**	J	5.00	0.27
Iron	**24.0**	J	50.0	3.38
Lead	ND		5.00	0.17
Magnesium	**14000**		300	23.8
Manganese	**201**		5.00	0.13
Nickel	**1.56**	J	5.00	0.56
Potassium	**5480**		1400	23.6
Selenium	ND		5.00	1.18
Silver	ND		3.00	0.04
Sodium	**22200**		300	42.7
Strontium	**142**		5.00	0.21
Vanadium	**2.08**	J	5.00	0.17
Zinc	**6.36**		5.00	4.33

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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:	ODLA-01			Received :	08/08/19 15:15 by LAUREN AIELLO
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190808TMDL	Visit Number:	001	Monitoring Program:	TMDL

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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:	ODLA-01			Received : 08/08/19 15:15	by LAUREN AIELLO
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190808TMDL	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

Hardness result = 154,079 ug/L

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-03
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0315-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 7:50
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**112**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**3.00**	J5	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:08

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.112**		0.100	0.0247

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:
10/15/19 11:26

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

LABORATORY RESULTS

Station Code: O-03
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: MFS
Lab Sample ID: **19I0315-01**
Sample Medium: Water PWS Intake:
Date/Time Collected: 09/10/19 7:50
Sample Fraction: Total Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/13/19 15:42
Units: mg/L
Analyzed: 09/16/19 14:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	ND		0.10	0.06

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:06

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.18**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/01/19 16:33

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.356**		0.0050	0.0042

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Reported:
10/15/19 11:26

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

LABORATORY RESULTS

Station Code: O-03
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0315-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 7:50
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**57**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**12**		4	

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Reported:
10/15/19 11:26

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

LABORATORY RESULTS

Station Code:	O-03			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190910INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
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:
10/15/19 11:26

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: O-03
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0317-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 12:20
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**123**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**3.40**	J5	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:09

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.131**		0.100	0.0247

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Reported:
10/15/19 11:26

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

LABORATORY RESULTS

Station Code: O-03
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: VIT
Lab Sample ID: **19I0317-01**
Sample Medium: Water PWS Intake:
Date/Time Collected: 09/10/19 12:20
Sample Fraction: Total Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/13/19 15:42
Units: mg/L
Analyzed: 09/16/19 14:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.08**	J	0.10	0.06

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:06

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.51**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/01/19 16:33

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.553**		0.0050	0.0042

Reported:
10/15/19 11:26

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

LABORATORY RESULTS

Station Code: O-03
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0317-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 12:20
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**251**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**28**		4	

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Reported:
10/15/19 11:26

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

LABORATORY RESULTS

Station Code:	O-03			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190910INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
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:
10/15/19 11:26

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: OE-02
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0319-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 10:18
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**124**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	ND	J5, Q	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:11

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.139**		0.100	0.0247

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Reported:
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LABORATORY RESULTS

Station Code: OE-02
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0319-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 10:18
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/13/19 15:42
Units: mg/L
Analyzed: 09/16/19 14:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.21**		0.10	0.06

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:08

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
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/02/19 09:37

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.297**		0.0050	0.0042

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Reported:
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LABORATORY RESULTS

Station Code: OE-02
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0319-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 10:18
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**33**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**6**	J3	4	

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Reported:
10/15/19 11:26

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

LABORATORY RESULTS

Station Code:	OE-02			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	MUD CREEK	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190909INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

Q	Maximum holding time exceeded.
J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
J3	The reported value failed to meet the established quality control criteria for either precision or accuracy possibly due to matrix effects.
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:
10/15/19 11:26

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: OE-02
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0321-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 14:15
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**128**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	ND	J5	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:12

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.125**		0.100	0.0247

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Reported:
10/15/19 11:25

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

LABORATORY RESULTS

Station Code: OE-02
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0321-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 14:15
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/13/19 15:42
Units: mg/L
Analyzed: 09/16/19 14:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.22**		0.10	0.06

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:08

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.83**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/02/19 09:38

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.271**		0.0050	0.0042

Reported:
10/15/19 11:25

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

LABORATORY RESULTS

Station Code: OE-02
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0321-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 14:15
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**36**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

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

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Reported:
10/15/19 11:25

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

LABORATORY RESULTS

Station Code:	OE-02			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	MUD CREEK	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190909INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
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:
10/15/19 11:25

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: OZD-01
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0323-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 11:23
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**100**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	ND	J5, Q	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:13

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.162**		0.100	0.0247

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:
10/15/19 11:25

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

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0323-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 11:23
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/13/19 15:42
Units: mg/L
Analyzed: 09/16/19 14:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.08**	J	0.10	0.06

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:11

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.66**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/02/19 09:39

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.183**		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:
10/15/19 11:25

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

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0323-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 11:23
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

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

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

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

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Reported:
10/15/19 11:25

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

LABORATORY RESULTS

Station Code:	OZD-01			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190909INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

Q	Maximum holding time exceeded.
J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
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:
10/15/19 11:25

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: OZD-01
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0325-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 15:45
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**97.9**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	ND	J5	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:14

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.181**		0.100	0.0247

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Reported:
10/15/19 11:25

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LABORATORY RESULTS

Station Code: OZD-01
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0325-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 15:45
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/13/19 15:42
Units: mg/L
Analyzed: 09/16/19 14:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.08**	J	0.10	0.06

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:11

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.60**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/01/19 16:35

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.187**		0.0050	0.0042

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Reported:
10/15/19 11:25

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LABORATORY RESULTS

Station Code: OZD-01
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0325-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/09/19 15:45
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**15**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

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

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Reported:
10/15/19 11:25

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LABORATORY RESULTS

Station Code:	OZD-01			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190909INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
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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10/15/19 11:25

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LABORATORY RESULTS

Station Code: O-91
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0327-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 9:50
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**101**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**3.00**	J5	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:15

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.105**		0.100	0.0247

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LABORATORY RESULTS

Station Code: O-91
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0327-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 9:50
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/13/19 15:42
Units: mg/L
Analyzed: 09/16/19 14:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.14**		0.10	0.06

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:13

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.15**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/01/19 16:35

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.452**		0.0050	0.0042

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Reported:
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LABORATORY RESULTS

Station Code: O-91
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0327-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 9:50
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**171**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**19**		4	

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Reported:
10/15/19 11:25

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LABORATORY RESULTS

Station Code:	O-91			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190910INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
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:
10/15/19 11:25

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: O-91
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190910INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19I0328-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 9:50
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/19/19 09:09
Units: ug/L
Analyzed: 09/26/19 09:50

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**46.7**		0.50	
Chlorophyll-A (unco)	**58.8**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**5.28**		0.50	
Pheophytin-A	**16.8**		0.50	

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Reported:
10/04/19 09:20

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code:	O-91			Received : 09/11/19 09:15	by LAUREN AIELLO
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190910INHS	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:
10/04/19 09:20

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: O-91
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0329-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/12/19 14:32
Units: mg/L
Analyzed: 09/13/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**107**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/11/19 12:19
Units: mg/L
Analyzed: 09/16/19 08:40

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**2.70**	J5	2.00	

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

Method: 353.2
Prepared: 09/11/19 13:25
Units: mg/L
Analyzed: 09/11/19 16:17

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.130**		0.100	0.0247

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Reported:
10/15/19 11:24

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

LABORATORY RESULTS

Station Code: O-91
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0329-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 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
Prepared: 09/16/19 14:28
Units: mg/L
Analyzed: 09/18/19 14:41

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

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

Method: 351.2
Prepared: 10/03/19 08:00
Units: mg/L
Analyzed: 10/03/19 16:13

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.20**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/01/19 09:00
Units: mg/L
Analyzed: 10/01/19 16:36

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.398**		0.0050	0.0042

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Reported:
10/15/19 11:24

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-91
Received : 09/11/19 09:15 by LAUREN AIELLO
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190909INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0329-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/10/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/12/19 08:21
Units: mg/L
Analyzed: 09/12/19 08:21

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**83**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/12/19 08:22
Units: mg/L
Analyzed: 09/12/19 08:22

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**12**		4	

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Reported:
10/15/19 11:24

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

LABORATORY RESULTS

Station Code:	O-91			Received :	09/11/19 09:15 by LAUREN AIELLO
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190909INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J5	Blank spike failed high, result was less than the reporting limit - impact on data may be minimal.
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:
10/15/19 11:24

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code: O-91 Received : 09/11/19 09:15 by LAUREN AIELLO

Waterbody Name: KASKASKIA RIVER County: ST CLAIR Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190909INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: VIT Lab Sample ID: **19I0330-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 09/10/19 13:40

Sample Fraction: Total Chlorophyll volume filtered (ml): 100 Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 09/19/19 09:09

Units: ug/L Analyzed: 09/26/19 09:50

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**34.7**		0.50	
Chlorophyll-A (unco)	**49.2**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**4.08**		0.50	
Pheophytin-A	**21.4**		0.50	

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Reported:
10/04/19 09:19

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-91

Received : 09/11/19 09:15 by LAUREN AIELLO

Waterbody Name: KASKASKIA RIVER County: ST CLAIR

Temperature C:

Funding Code: WP06

Monitoring Unit: TMDL

Trip ID: 20190909INHS 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:
10/04/19 09:19

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0643-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 8:15
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**110**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**2.30**		2.00	

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

Method: 353.2
Prepared: 09/23/19 11:36
Units: mg/L
Analyzed: 09/24/19 11:57

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.143**		0.100	0.0247

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Reported:
10/31/19 11:55

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

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER County: ST CLAIR Temperature C: 4.00
Funding Code: WP06 Monitoring Unit: TMDL
Trip ID: 20190916INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: MFS Lab Sample ID: **19I0643-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 09/17/19 8:15
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

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

Method: EPA 350.1 Prepared: 09/27/19 14:57
Units: mg/L Analyzed: 10/01/19 11:30

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.12**		0.10	0.06

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

Method: 351.2 Prepared: 10/11/19 08:00
Units: mg/L Analyzed: 10/11/19 16:04

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.11**		0.50	0.37

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

Method: EPA 365.1 Prepared: 10/11/19 10:00
Units: mg/L Analyzed: 10/11/19 15:18

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.342**		0.0050	0.0042

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Reported:
10/31/19 11:55

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0643-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 8:15
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**60**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**12**		4	

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Reported:
10/31/19 11:55

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

LABORATORY RESULTS

Station Code:	O-03			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	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:
10/31/19 11:55

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0644-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 11:45
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**111**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**3.30**		2.00	

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

Method: 353.2
Prepared: 09/23/19 11:36
Units: mg/L
Analyzed: 09/24/19 11:58

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.123**		0.100	0.0247

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Reported:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER County: ST CLAIR Temperature C: 4.00
Funding Code: WP06 Monitoring Unit: TMDL
Trip ID: 20190916INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: VIT Lab Sample ID: **19I0644-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 09/17/19 11:45
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

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

Method: EPA 350.1 Prepared: 09/27/19 14:57
Units: mg/L Analyzed: 10/01/19 11:30

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.11**	J3	0.10	0.06

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

Method: 351.2 Prepared: 10/11/19 08:00
Units: mg/L Analyzed: 10/11/19 16:08

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.12**		0.50	0.37

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

Method: EPA 365.1 Prepared: 10/11/19 10:00
Units: mg/L Analyzed: 10/11/19 15:19

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.348**		0.0050	0.0042

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Reported:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0644-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 11:45
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**47**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**12**		4	

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Reported:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code:	O-03			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

J3	The reported value failed to meet the established quality control criteria for either precision or accuracy possibly due to matrix effects.
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:
10/31/19 11:54

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OE-02
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0645-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 11:31
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**144**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

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

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

Method: 353.2
Prepared: 09/23/19 11:36
Units: mg/L
Analyzed: 09/24/19 11:59

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.0930**	J	0.100	0.0247

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Reported:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code: OE-02
Waterbody Name: MUD CREEK
County: ST CLAIR
Funding Code: WP06
Trip ID: 20190916INHS
Visit Number: 001
Received : 09/18/19 09:05 by Amber Royster
Temperature C: 4.00
Monitoring Unit: TMDL
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0645-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 11:31
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: 09/26/19 15:20
Analyzed: 09/30/19 13:37

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.25**		0.10	0.06

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

Method: 351.2
Units: mg/L
Prepared: 10/11/19 08:00
Analyzed: 10/11/19 15:35

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.00**		0.50	0.37

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

Method: EPA 365.1
Units: mg/L
Prepared: 10/11/19 10:00
Analyzed: 10/11/19 14:52

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.272**		0.0050	0.0042

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Reported:
10/31/19 11:54

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OE-02
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0645-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 11:31
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**10**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

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

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Reported:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code:	OE-02			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	MUD CREEK	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

Q	Maximum holding time exceeded.
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:
10/31/19 11:54

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OE-02
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS/VIT
Lab Sample ID: **19I0646-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 15:24
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**142**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

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: 09/23/19 11:36
Units: mg/L
Analyzed: 09/24/19 12:01

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.0830**	J	0.100	0.0247

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:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code: OE-02
Waterbody Name: MUD CREEK
County: ST CLAIR
Funding Code: WP06
Trip ID: 20190916INHS
Visit Number: 001
Received : 09/18/19 09:05 by Amber Royster
Temperature C: 4.00
Monitoring Unit: TMDL
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS/VIT
Lab Sample ID: **19I0646-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 15:24
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: 09/26/19 15:20
Analyzed: 09/30/19 13:37

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.30**		0.10	0.06

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

Method: 351.2
Units: mg/L
Prepared: 10/11/19 08:00
Analyzed: 10/11/19 15:35

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**1.11**		0.50	0.37

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

Method: EPA 365.1
Units: mg/L
Prepared: 10/11/19 10:00
Analyzed: 10/11/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.277**		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:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code: OE-02
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS/VIT
Lab Sample ID: **19I0646-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 15:24
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**59**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**8**		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:
10/31/19 11:54

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

LABORATORY RESULTS

Station Code:	OE-02			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	MUD CREEK	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	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:
10/31/19 11:54

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-91
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0647-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 9:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**107**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**2.10**		2.00	

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

Method: 353.2
Prepared: 09/18/19 15:24
Units: mg/L
Analyzed: 09/18/19 16:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.136**		0.100	0.0247

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Reported:
10/31/19 11:53

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

LABORATORY RESULTS

Station Code: O-91
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0647-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 9:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/27/19 14:57
Units: mg/L
Analyzed: 10/01/19 11:30

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

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

Method: 351.2
Prepared: 10/11/19 08:00
Units: mg/L
Analyzed: 10/11/19 16:08

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.90**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/11/19 10:00
Units: mg/L
Analyzed: 10/11/19 15:20

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.343**		0.0050	0.0042

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Reported:
10/31/19 11:53

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

LABORATORY RESULTS

Station Code: O-91
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0647-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 9:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**80**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**12**		4	

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Reported:
10/31/19 11:53

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-91			Received : 09/18/19 09:05	by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	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:
10/31/19 11:53

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-91
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0648-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 14:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**108**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

Analyte	Result	Qualifier	Reporting Limit	MDL
CBOD, 5 day	**2.80**		2.00	

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

Method: 353.2
Prepared: 09/18/19 15:24
Units: mg/L
Analyzed: 09/18/19 16:46

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.147**		0.100	0.0247

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Reported:
10/31/19 11:53

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

LABORATORY RESULTS

Station Code: O-91
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0648-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 14:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/27/19 14:57
Units: mg/L
Analyzed: 10/01/19 11:30

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	ND		0.10	0.06

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

Method: 351.2
Prepared: 10/11/19 08:00
Units: mg/L
Analyzed: 10/11/19 16:11

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.91**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/11/19 10:00
Units: mg/L
Analyzed: 10/11/19 15:20

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.360**		0.0050	0.0042

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Illinois Environmental Protection Agency Laboratory
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LABORATORY RESULTS

Station Code: O-91
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0648-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 14:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**84**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	**12**		4	

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Reported:
10/31/19 11:53

Illinois Environmental Protection Agency Laboratory

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LABORATORY RESULTS

Station Code:	O-91			Received : 09/18/19 09:05	by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	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:
10/31/19 11:53

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0651-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 10:54
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**104**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

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

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

Method: 353.2
Prepared: 09/18/19 15:24
Units: mg/L
Analyzed: 09/18/19 16:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.206**		0.100	0.0247

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Reported:
10/31/19 11:52

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

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0651-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 10:54
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 350.1
Prepared: 09/27/19 14:57
Units: mg/L
Analyzed: 10/01/19 11:30

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

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

Method: 351.2
Prepared: 10/11/19 08:00
Units: mg/L
Analyzed: 10/11/19 15:39

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.70**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/11/19 10:00
Units: mg/L
Analyzed: 10/11/19 14:54

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.204**		0.0050	0.0042

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Reported:
10/31/19 11:52

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

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0651-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 10:54
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**19**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

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

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Reported:
10/31/19 11:52

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

LABORATORY RESULTS

Station Code:	OZD-01			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	Visit Number:	001	Monitoring Program:	TMDL

Notes and Definitions

Q	Maximum holding time exceeded.
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:
10/31/19 11:52

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS/VIT
Lab Sample ID: **19I0652-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 09/18/19 14:52
Units: mg/L
Analyzed: 09/23/19 14:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**105**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/18/19 13:02
Units: mg/L
Analyzed: 09/23/19 09:44

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: 09/18/19 15:24
Units: mg/L
Analyzed: 09/18/19 16:51

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.210**		0.100	0.0247

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:
10/31/19 11:51

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

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS/VIT
Lab Sample ID: **19I0652-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 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
Prepared: 09/27/19 14:57
Units: mg/L
Analyzed: 10/01/19 11:30

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

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

Method: 351.2
Prepared: 10/11/19 08:00
Units: mg/L
Analyzed: 10/11/19 15:40

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.78**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/11/19 10:00
Units: mg/L
Analyzed: 10/11/19 14:55

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.192**		0.0050	0.0042

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Reported:
10/31/19 11:51

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C: 4.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS/VIT
Lab Sample ID: **19I0652-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/19/19 09:05
Units: mg/L
Analyzed: 09/19/19 09:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	**14**		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/19/19 09:06
Units: mg/L
Analyzed: 09/19/19 09:06

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

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Reported:
10/31/19 11:51

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

LABORATORY RESULTS

Station Code:	OZD-01			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	4.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	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:
10/31/19 11:51

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-03 Received : 09/18/19 09:05 by Amber Royster

Waterbody Name: KASKASKIA RIVER County: ST CLAIR Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190916INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: MFS Lab Sample ID: **19I0727-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 09/17/19 8:15

Sample Fraction: Total Chlorophyll volume filtered (ml): 162 Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 09/26/19 13:00

Units: ug/L Analyzed: 09/30/19 13:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**62.6**		0.50	
Chlorophyll-A (unco)	**69.9**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**4.84**		0.50	
Pheophytin-A	**7.75**		0.50	

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Reported:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
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:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19I0728-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 11:45
Sample Fraction: Total
Chlorophyll volume filtered (ml): 100
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/26/19 13:00
Units: ug/L
Analyzed: 09/30/19 13:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	**27.8**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**49.4**		0.50	

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Reported:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-03
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
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:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OE-02
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19I0729-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 11:31
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/26/19 13:00
Units: ug/L
Analyzed: 09/30/19 13:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**5.34**		0.50	
Chlorophyll-A (unco)	**5.09**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**0.56**		0.50	
Pheophytin-A	ND		0.50	

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Reported:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OE-02			Received : 09/18/19 09:05	by Amber Royster
Waterbody Name:	MUD CREEK	County:	ST CLAIR	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190916INHS	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:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OE-02
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: MUD CREEK
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS/VIT
Lab Sample ID: **19I0730-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 15:24
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/26/19 13:00
Units: ug/L
Analyzed: 09/30/19 13:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**5.34**		0.50	
Chlorophyll-A (unco)	**3.40**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OE-02			Received : 09/18/19 09:05	by Amber Royster
Waterbody Name:	MUD CREEK	County:	ST CLAIR	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190916INHS	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:
10/04/19 09:17

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19I0734-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 10:54
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/26/19 13:00
Units: ug/L
Analyzed: 09/30/19 13:45

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:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OZD-01			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	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:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-91
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: KASKASKIA RIVER
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19I0735-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/17/19 9:05
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/26/19 13:00
Units: ug/L
Analyzed: 09/30/19 13:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**36.0**		0.50	
Chlorophyll-A (unco)	**39.5**		0.50	
Chlorophyll-B	**3.57**		0.50	
Chlorophyll-C	**9.56**		0.50	
Pheophytin-A	**4.14**		0.50	

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Reported:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-91			Received : 09/18/19 09:05	by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190916INHS	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:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: O-91 Received : 09/18/19 09:05 by Amber Royster

Waterbody Name: KASKASKIA RIVER County: ST CLAIR Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190916INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: MFS Lab Sample ID: **19I0736-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 09/17/19 14:40

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

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 09/26/19 13:00

Units: ug/L Analyzed: 09/30/19 13:45

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**65.4**		0.50	
Chlorophyll-A (unco)	**71.4**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**5.22**		0.50	
Pheophytin-A	**5.61**		0.50	

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Reported:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	O-91			Received : 09/18/19 09:05	by Amber Royster
Waterbody Name:	KASKASKIA RIVER	County:	ST CLAIR	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190916INHS	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:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: OZD-01
Received : 09/18/19 09:05 by Amber Royster
Waterbody Name: DOZA CREEK
County: ST CLAIR
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190916INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS/VIT
Lab Sample ID: **19I0737-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/16/19 13:40
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/26/19 13:00
Units: ug/L
Analyzed: 09/30/19 13:45

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:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	OZD-01			Received :	09/18/19 09:05 by Amber Royster
Waterbody Name:	DOZA CREEK	County:	ST CLAIR	Temperature C:	
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190916INHS	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:
10/04/19 09:16

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0963-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 9:50
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 10/01/19 12:30
Units: mg/L
Analyzed: 10/02/19 14:23

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**192**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/25/19 12:00
Units: mg/L
Analyzed: 09/30/19 09:04

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

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

Method: 353.2
Prepared: 09/25/19 14:13
Units: mg/L
Analyzed: 09/25/19 14:56

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.253**		0.100	0.0247

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Reported:
10/31/19 11:50

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: VIT Lab Sample ID: **19I0963-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 09/24/19 9:50
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

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

Method: EPA 350.1
Prepared: 10/01/19 15:33
Units: mg/L
Analyzed: 10/04/19 14:33

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.07**	J	0.10	0.06

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

Method: 351.2
Prepared: 10/16/19 08:00
Units: mg/L
Analyzed: 10/17/19 14:20

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	ND		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/21/19 10:00
Units: mg/L
Analyzed: 10/22/19 10:12

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.219**		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:
10/31/19 11:50

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: VIT Lab Sample ID: **19I0963-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 09/24/19 9:50
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/26/19 08:56
Units: mg/L
Analyzed: 09/26/19 08:56

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

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/26/19 08:57
Units: mg/L
Analyzed: 09/26/19 08:57

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

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Reported:
10/31/19 11:50

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

LABORATORY RESULTS

Station Code:	ODL-02			Received : 09/25/19 08:45	by Amber Royster
Waterbody Name:	EAST FORK SILVER CREEK	County:	MADISON	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190923INHS	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.
I	See Case Narrative for more information.
ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

A power outage caused an incubator temperature malfunction during incubation period.

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
10/31/19 11:50

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0964-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 13:25
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 10/01/19 12:30
Units: mg/L
Analyzed: 10/02/19 14:23

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**192**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 09/25/19 12:00
Units: mg/L
Analyzed: 09/30/19 09:04

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

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

Method: 353.2
Prepared: 09/25/19 14:13
Units: mg/L
Analyzed: 09/25/19 14:57

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.240**		0.100	0.0247

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:
10/31/19 11:50

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: VIT Lab Sample ID: **19I0964-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 09/24/19 13:25
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

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

Method: EPA 350.1
Prepared: 10/01/19 15:33
Units: mg/L
Analyzed: 10/04/19 14:33

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	**0.08**	J	0.10	0.06

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

Method: 351.2
Prepared: 10/16/19 08:00
Units: mg/L
Analyzed: 10/17/19 14:20

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.38**	J	0.50	0.37

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

Method: EPA 365.1
Prepared: 10/21/19 10:00
Units: mg/L
Analyzed: 10/22/19 10:13

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.214**		0.0050	0.0042

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Reported:
10/31/19 11:50

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0964-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 13:25
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 09/26/19 08:56
Units: mg/L
Analyzed: 09/26/19 08:56

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	ND		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 09/26/19 08:57
Units: mg/L
Analyzed: 09/26/19 08:57

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

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Reported:
10/31/19 11:50

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

LABORATORY RESULTS

Station Code:	ODL-02			Received : 09/25/19 08:45	by Amber Royster
Waterbody Name:	EAST FORK SILVER CREEK	County:	MADISON	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190923INHS	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.
I	See Case Narrative for more information.
ND	Analyte NOT DETECTED at or above the method detection limit
*	Non-NELAP accredited

A power outage caused an incubator temperature malfunction during incubation period.

Report Authorized by:

Tom Weiss
Laboratory Manager

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Reported:
10/31/19 11:50

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19I0965-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 11:40
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 365.1
Prepared: 10/21/19 10:00
Units: mg/L
Analyzed: 10/22/19 11:04

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.168**		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:
10/29/19 15:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	09/25/19 08:45 by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190923INHS	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:
10/29/19 15:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C: 3.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19I0966-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 14:05
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: EPA 365.1
Prepared: 10/21/19 10:00
Units: mg/L
Analyzed: 10/22/19 11:05

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.171**		0.0050	0.0042

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Reported:
10/29/19 15:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	09/25/19 08:45 by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	3.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190923INHS	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:
10/29/19 15:00

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02 Received : 09/25/19 08:45 by Amber Royster

Waterbody Name: EAST FORK SILVER CREEK County: MADISON Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190923INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: MFS Lab Sample ID: **19I0991-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 09/24/19 13:25

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

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 09/30/19 12:01

Units: ug/L Analyzed: 10/03/19 10:31

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:
10/15/19 11:21

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02 Received : 09/25/19 08:45 by Amber Royster

Waterbody Name: EAST FORK SILVER CREEK County: MADISON Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190923INHS 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:
10/15/19 11:21

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19I0993-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 11:40
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/30/19 12:01
Units: ug/L
Analyzed: 10/03/19 10:31

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**4.00**		0.50	
Chlorophyll-A (unco)	**4.58**		0.50	
Chlorophyll-B	ND		0.50	
Chlorophyll-C	**1.02**		0.50	
Pheophytin-A	**0.67**		0.50	

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Reported:
10/15/19 11:21

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	ODLA-01			Received : 09/25/19 08:45	by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190923INHS	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:
10/15/19 11:21

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK
County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19I0998-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 9:50
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 09/30/19 12:01
Units: ug/L
Analyzed: 10/03/19 10:31

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		0.50	
Chlorophyll-A (unco)	**1.11**		0.50	
Chlorophyll-B	**0.51**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	ND		0.50	

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Reported:
10/15/19 11:20

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS 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:
10/15/19 11:20

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 09/25/19 08:45 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190923INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19I0999-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 09/24/19 14:05
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/02/19 14:30
Units: ug/L
Analyzed: 10/04/19 11:14

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	ND		0.50	
Chlorophyll-A (unco)	**1.03**		0.50	
Chlorophyll-B	**1.43**		0.50	
Chlorophyll-C	ND		0.50	
Pheophytin-A	**1.87**		0.50	

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Reported:
10/15/19 11:20

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

LABORATORY RESULTS

Station Code:	ODLA-01			Received : 09/25/19 08:45	by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20190923INHS	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:
10/15/19 11:20

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: MFS
Lab Sample ID: **19J0063-01**
Sample Medium: Water PWS Intake:
Date/Time Collected: 10/01/19 8:45
Sample Fraction: Total Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 10/01/19 12:30
Units: mg/L
Analyzed: 10/02/19 14:23

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**198**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 10/02/19 14:22
Units: mg/L
Analyzed: 10/07/19 08:35

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: 10/02/19 13:33
Units: mg/L
Analyzed: 10/02/19 15:49

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.146**		0.100	0.0247

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:
11/07/19 15:35

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: MFS Lab Sample ID: **19J0063-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 10/01/19 8:45
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

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

Method: EPA 350.1
Prepared: 10/07/19 15:20
Units: mg/L
Analyzed: 10/08/19 14:32

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	ND		0.10	0.06

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

Method: 351.2
Prepared: 10/21/19 08:00
Units: mg/L
Analyzed: 10/22/19 12:46

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.67**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/24/19 11:00
Units: mg/L
Analyzed: 10/24/19 14:57

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.152**		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:
11/07/19 15:35

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: MFS Lab Sample ID: **19J0063-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 10/01/19 8:45
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 10/04/19 14:07
Units: mg/L
Analyzed: 10/04/19 14:07

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

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 10/04/19 14:32
Units: mg/L
Analyzed: 10/04/19 14:32

Analyte	Result	Qualifier	Reporting Limit	MDL
Volatile Suspended Solids *	ND		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:
11/07/19 15:35

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

LABORATORY RESULTS

Station Code:	ODL-02			Received :	10/02/19 11:00 by Amber Royster
Waterbody Name:	EAST FORK SILVER CREEK	County:	MADISON	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190930INHS	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:
11/07/19 15:35

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19J0064-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/01/19 13:15
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

Alkalinity by Standard Method 310.2

Method: 310.2
Prepared: 10/02/19 12:00
Units: mg/L
Analyzed: 10/02/19 14:23

Analyte	Result	Qualifier	Reporting Limit	MDL
Alkalinity	**198**		10.0	7.48

Carbonaceous BOD, 5 day, by Standard Method 5210B

Method: 5210B
Prepared: 10/02/19 14:22
Units: mg/L
Analyzed: 10/07/19 08:35

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: 10/02/19 13:33
Units: mg/L
Analyzed: 10/02/19 15:51

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Nitrite (NO2) + Nitrate (NO3) as N	**0.140**		0.100	0.0247

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Reported:
11/07/19 15:35

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: VIT Lab Sample ID: **19J0064-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 10/01/19 13:15
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

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

Method: EPA 350.1
Prepared: 10/07/19 15:20
Units: mg/L
Analyzed: 10/08/19 14:32

Analyte	Result	Qualifier	Reporting Limit	MDL
Ammonia as N	ND		0.10	0.06

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

Method: 351.2
Prepared: 10/21/19 08:00
Units: mg/L
Analyzed: 10/22/19 12:48

Analyte	Result	Qualifier	Reporting Limit	MDL
Nitrogen, Kjeldahl	**0.71**		0.50	0.37

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

Method: EPA 365.1
Prepared: 10/24/19 11:00
Units: mg/L
Analyzed: 10/24/19 14:58

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

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Reported:
11/07/19 15:35

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

LABORATORY RESULTS

Station Code: ODL-02
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: EAST FORK SILVER CREEK County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL Collected By: VIT Lab Sample ID: **19J0064-01**
Sample Medium: Water PWS Intake: Date/Time Collected: 10/01/19 13:15
Sample Fraction: Total Chlorophyll volume filtered (ml): Sample Depth:

Total Suspended Solids by Standard Method 2540D

Method: SM 2540D
Prepared: 10/04/19 14:07
Units: mg/L
Analyzed: 10/04/19 14:07

Analyte	Result	Qualifier	Reporting Limit	MDL
Total Suspended Solids	ND		4	

Volatile Suspended Solids by Standard Method 2540E

Method: SM 2540E
Prepared: 10/04/19 14:32
Units: mg/L
Analyzed: 10/04/19 14:32

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

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Reported:
11/07/19 15:35

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

LABORATORY RESULTS

Station Code:	ODL-02			Received :	10/02/19 11:00 by Amber Royster
Waterbody Name:	EAST FORK SILVER CREEK	County:	MADISON	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190930INHS	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:
11/07/19 15:35

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 10/02/19 11:00 by Scott Clark
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: VIT
Lab Sample ID: **19J0093-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/01/19 9:35
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: 365.1
Prepared: 10/28/19 08:00
Units: mg/L
Analyzed: 10/28/19 14:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.167**		0.0050	0.0042

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Reported:
11/07/19 15:34

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	10/02/19 11:00 by Scott Clark
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190930INHS	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 15:34

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 10/02/19 11:00 by Scott Clark
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C: 2.00
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: TOTAL
Collected By: MFS
Lab Sample ID: **19J0094-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/01/19 15:45
Sample Fraction: Total
Chlorophyll volume filtered (ml):
Sample Depth:

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

Method: 365.1
Prepared: 10/28/19 08:00
Units: mg/L
Analyzed: 10/28/19 14:41

Analyte	Result	Qualifier	Reporting Limit	MDL
Phosphorus as P	**0.152**		0.0050	0.0042

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Reported:
11/07/19 15:34

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	10/02/19 11:00 by Scott Clark
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	2.00
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190930INHS	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 15:34

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: VIT
Lab Sample ID: **19J0108-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/01/19 9:35
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/07/19 14:15
Units: ug/L
Analyzed: 10/10/19 10:23

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:
10/16/19 14:35

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

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	10/02/19 11:00 by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190930INHS	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:
10/16/19 14:35

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 10/02/19 11:00 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20190930INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19J0109-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/01/19 15:45
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/07/19 14:15
Units: ug/L
Analyzed: 10/10/19 10:23

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:
10/16/19 14:34

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

LABORATORY RESULTS

Station Code:	ODLA-01			Received :	10/02/19 11:00 by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	
Funding Code:	WP06			Monitoring Unit:	TMDL
Trip ID:	20190930INHS	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:
10/16/19 14:34

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02 Received : 10/02/19 11:00 by Amber Royster

Waterbody Name: EAST FORK SILVER CREEK County: MADISON Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190930INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: MFS Lab Sample ID: **19J0110-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 10/01/19 8:45

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

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 10/07/19 14:15

Units: ug/L Analyzed: 10/10/19 10:23

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:
10/16/19 14:34

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

LABORATORY RESULTS

Station Code: ODL-02 Received : 10/02/19 11:00 by Amber Royster

Waterbody Name: EAST FORK SILVER CREEK County: MADISON Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190930INHS 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:
10/16/19 14:34

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODL-02 Received : 10/02/19 11:00 by Amber Royster

Waterbody Name: EAST FORK SILVER CREEK County: MADISON Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190930INHS Visit Number: 001 Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL Collected By: VIT Lab Sample ID: **19J0111-01**

Sample Medium: Water PWS Intake: Date/Time Collected: 10/01/19 13:15

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

Chlorophyll by Standard Method 10200 H

Method: 10200 H Prepared: 10/07/19 14:15

Units: ug/L Analyzed: 10/10/19 10:23

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:
10/16/19 14:34

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

LABORATORY RESULTS

Station Code: ODL-02 Received : 10/02/19 11:00 by Amber Royster

Waterbody Name: EAST FORK SILVER CREEK County: MADISON Temperature C:

Funding Code: WP06 Monitoring Unit: TMDL

Trip ID: 20190930INHS 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:
10/16/19 14:34

Illinois Environmental Protection Agency Laboratory

825 N. Rutledge Springfield, Illinois 62702 217.782.9780

LABORATORY RESULTS

Station Code: ODLA-01
Received : 10/08/19 16:20 by Amber Royster
Waterbody Name: SUGAR FORK
County: MADISON
Temperature C:
Funding Code: WP06
Monitoring Unit: TMDL
Trip ID: 20191007INHS
Visit Number: 001
Monitoring Program: TMDL

Client Sample ID: CHLOROPHYLL
Collected By: MFS
Lab Sample ID: **19J0366-01**
Sample Medium: Water
PWS Intake:
Date/Time Collected: 10/08/19 14:40
Sample Fraction: Total
Chlorophyll volume filtered (ml): 200
Sample Depth:

Chlorophyll by Standard Method 10200 H

Method: 10200 H
Prepared: 10/16/19 08:09
Units: ug/L
Analyzed: 10/17/19 10:18

Analyte	Result	Qualifier	Reporting Limit	MDL
Chlorophyll-A (corr)	**2.67**		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:
10/29/19 14:55

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

LABORATORY RESULTS

Station Code:	ODLA-01			Received : 10/08/19 16:20	by Amber Royster
Waterbody Name:	SUGAR FORK	County:	MADISON	Temperature C:	
Funding Code:	WP06			Monitoring Unit: TMDL	
Trip ID:	20191007INHS	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:
10/29/19 14:55

Appendix C – Lower Kaskaskia River (IL_O-03) QUAL2K Model Documentation

TETRA TECH

MEMORANDUM

To:	File	**Date:**	October 12, 2020
From:	Hillary Yonce and Jennifer Olson	**Subject:**	Lower Kaskaskia Watershed TMDLs: QUAL2K Model for Kaskaskia River (IL_O-03)

This memorandum summarizes inputs and analyses conducted using the QUAL2K model in the Lower Kaskaskia River watershed for Reach IL_O-03 of the Kaskaskia River. This QUAL2K models was constructed based on the best available data associated with Illinois EPA water quality sample sites, Illinois Discharge Monitoring Report (DMR) data, and USGS flow data. Setup and documentation are included below.

For detailed information on QUAL2K parameters and how they are used in the model, please refer to the QUAL2K user's manual available online.

1.1 KASKASKIA RIVER (IL_O-03)

Model Segmentation and Simulation Date

The extent of the QUAL2K model for reach IL_O-03 is from just north of the city of Fayetteville, past the city of New Athens, and ending at the confluence with Richland Creek. Two major tributaries flow into reach O-03, Mud Creek and Silver Creek. This reach of the Lower Kaskaskia River is characterized by a wide, deep, stable stream channel with very low slope. There are a large number of oxbow lakes along the model reach as well. This reach has a drainage area of 5,219 square miles.

Two reach segments were identified for simulation based on a key breakpoint where US13 crosses the Lower Kaskaskia River. The upstream reach is 14.17 kilometers long, and the downstream reach is 10.27 kilometers long.

Phase 2 water quality sampling occurred during September 2019, with sonde deployment near the headwaters at site O-91 and halfway down the reach at site O-03, both deployed from September 10 – 17, 2019. Water quality grab sampling was conducted at both O-03 and O-91 on September 10 and 17, 2019, and at site OE-02 on Mud Creek on September 9 and 16, 2019, and site OD-04 on Silver Creek on September 10 and 17, 2019.

The date selected for the QUAL2K simulation was 9/14/2019, the midway point of the sonde deployment period. During this date, the water quality standard for dissolved oxygen (DO) is 3.5 mg/L, and data collected during the Phase 2 sampling effort indicates that the reach was not impaired during this period.

Flow Balance

Flow measurements observed upstream on tributary Silver Creek at USGS gage 05594800 (Silver Creek near Freeburg, IL; drainage area 464 mi2) were used to approximate area-weighted flows entering the mainstem model reach from both Silver Creek (total drainage area 480 mi2) and Mud Creek (drainage area 137 mi2). These flows on 9/14/2019 for Silver Creek and Mud Creek respectively were 60.9 cfs and 17.3 cfs.

Flow measurements observed at USGS gage 05595000 (drainage area 5,189 mi2) along the mainstem were area-weighted to approximate flow conditions at the headwaters (drainage area 4,549 mi2). During the model calibration period on September 14, 2019, flow at the gage was 4,200.0 cfs, and headwaters flow was approximated as 3,682.0 cfs. Using the same approach, the downstream end of the model (drainage area 5,220 mi2) had an approximate flow on the simulation date of 4,224.8 cfs. A simple water balance calculation reveals that approximately 464.6 cfs enter the stream through either small tributaries or diffuse groundwater inflows between the headwaters and downstream end of reach IL_O-03.

Note that flows from point sources along the reach were not considered in the flow balance as total flows from all four present point sources sum to 1.78 cfs (0.04% of streamflow on 9/14/2019).

Reach Hydraulics

Although there is limited data available to parameterize reach hydraulics, field observations at USGS gage 05595000 (Kaskaskia River at New Athens, IL) located midway down the impaired reach may be used for approximating channel geometry and informing mode calibration.

Reach hydraulics were simulated using Manning formula with identical inputs for both reaches. Channel slope was set to 0.00001 (approximated using elevation data and refined with velocity data to this value during calibration), roughness coefficient set to 0.03 (typical value for natural naturals), and channel bottom width of 86 meters based on field observations.

Meteorological Inputs

Hourly inputs for air and dew point temperature were developed based on historical observations from station KSTL (St. Louis Lambert International Airport Station) via Weather.com. The mean air and dew point temperatures observed on 9/14/2019 were 23.8 and 13.3 deg C respectively. Conservative assumptions were made for hourly wind speed and cloud cover to be null for the simulation period in the absence of reliable localized data. Hourly shade was also approximated as 0% for both reaches based on review of aerial imagery and ground-level photography.

Water Quality Parameterization for Boundary Conditions

The water quality parameterization for the headwaters, tributaries, and diffuse inflows were based on monitoring stations O-91, OD-09, and OE-04. Model inputs for the headwaters were based on weekly average hourly inputs from sonde O-91 near the headwaters. Grab sampling conducted at site O-91 were also used to approximate headwater chemistry. Model inputs for tributaries Mud Creek and Silver Creek were based on grab sample sites OE-02 and OD-04 respectively (Table 1). For parameters not measured and not listed in Table 1, boundary condition inputs were set equal to those parameterized for the headwaters. Water quality inputs for diffuse inflows were parameterized as the average of Mud Creek and Silver Creek inputs.

When simulating carbonaceous biochemical oxygen demand (CBOD), QUAL2K models $CBOD_{ultimate}$ which can be determined using the relationship between $CBOD_5$ and $CBOD_{20}$ if both are sampled. For the Lower Kaskaskia River, only $CBOD_5$ sampling was conducted, so $CBOD_{ultimate}$ was approximated based

on literature as: $CBOD_5$ x 2=$CBOD_{ultimate}$ based on generalized literature values[1]. CBOD was simulated in the model as two pools: fast CBOD which is rapidly oxidized and labile in nature which applies to effluent sources, and slow CBOD which is slowly oxidized and more refractory in nature which applies to boundary conditions.

Reaeration was simulated in QUAL2K using the model's internal formula[2] which calculates reaeration as a function of velocity and depth. Reach parameterization for sediment oxygen demand (SOD) were estimated as 100% coverage and rate approximated as 2.15 g/m^2/d based on the median of observed SOD rates from an Illinois study[3]. Model parameterization associated with light and heat and internal rates were held at default values in the absence of additional data to refine them.

Table 1. Boundary condition inputs for Lower Kaskaskia River (Reach O-03).

QUAL2K Parameter	Headwaters	Mud Creek	Silver Creek	Diffuse Inflows
Temperature (deg C)	Hourly (mean 25.81)	25.81	25.81	25.81
Conductivity (µmhos)	Hourly (mean 275.34)	275.34	275.34	275.34
DO (mg/l)	Hourly (mean 7.72)	7.72	7.72	7.72
slowCBOD (mg/l)	5.30	2.0	2.0	2.0
Organic N (µg/l)	952.50	735.00	477.50	606.25
Ammonia (µg/l)	87.50	245.00	110.00	177.50
Nitrate+Nitrite (µg/l)	129.50	110.00	2145.00	1127.50
Organic P (µg/l)	194.13	139.63	174.13	156.88
Inorganic P (µg/l)	194.13	139.63	174.13	156.88
Phytoplankton (µg/l)	45.70	5.34	4.00	4.67
Alkalinity (mg/l)	105.75	134.50	184.25	159.38
pH (s.u.)	Hourly (mean 7.95)	7.95	7.95	7.95

[1] Leo, WM, RV Thomann, TW Gallaher. 1984. Before and after case studies: comparisons of water quality following municipal treatment plant improvements. EPA 430/9-007. Office of Water, Program Operations, U.S. Environmental Protection Agency, Washington, DC.; Thomann and Mueller. 1987. Principles of Surface Water Quality Modeling and Control. Harper & Row New York.

[2] Covar, A. P. 1976. "Selecting the Proper Reaeration Coefficient for Use in Water Quality Models." Presented at the U.S. EPA Conference on Environmental Simulation and Modeling, April 19-22, 1976, Cincinnati, OH.

[3] Butts, Thomas A. Measurements of Sediment Oxygen Demand Characteristics of the Upper Illinois Waterway. Illinois State Water Survey, Urbana, Report of Investigation 76, 1974.

Point Sources

There are 4 NPDES point sources which discharge into IL_O-03 of the Lower Kaskaskia River, and they are simulated explicitly within the QUAL2K model (Table 2). Discharge monitoring report (DMR) data was used to parameterize model inputs for these facilities to the extent possible, although where parameters were not monitored, reasonable assumptions for model inputs were made based on literature for point source type and treatment level (Table 3). Based on DMR data from September 2019, point source discharge accounted for 0.04% of streamflow during the model calibration period.

Table 2. NPDES Point Sources discharging to Lower Kaskaskia River IL_O-03.

IL Permit ID	Facility Name	Discharge Type	Average Design Flow (MGD)	Maximum Design Flow (MGD)
IL0020893	Fayetteville STP	Sewage treatment plant	0.05	0.199
ILG640077	Kaskaskia Water District WTP	Public water supply	0.84[a]	–
IL0021725	New Athens STP	Sewage treatment plant (excess flow outfall)	0.3	0.75
IL0076996	Prairie State Generation Company - Marissa	Cooling tower blowdown and runoff/ sedimentation pond outfall (emergency overflow)	3.158[b]	–

a: average design flow based on average reported flow from 2014-2016 discharge monitoring records (DMRs)
b: flow listed includes multiple outfalls

Table 3. Point source inputs for Lower Kaskaskia River (IL_O-03).

QUAL2K Parameter	Fayetteville STP	Kaskaskia WTP	New Athens STP	Cooling Tower
Temperature (deg C)	25.81	25.81	25.81	25.81
Conductivity (µmhos)	275.34	275.34	275.34	275.34
DO (mg/l)	6.0	6.3	6.6	6.3
fastCBOD (mg/l)	7.50	11.75	16.00	2.00
Organic N (µg/l)	3000	3000	3000	0
Ammonia (µg/l)	4000	4000	12500	430
Nitrate+Nitrite (µg/l)	10000	10000	10000	0
Organic P (µg/l)	376.72	376.72	376.72	0
Inorganic P (µg/l)	983.28	983.28	983.28	0
Alkalinity (mg/l)	100	100	100	100
pH (s.u.)	7.0	7.0	7.0	7.0

Model Calibration

The QUAL2K model was calibrated based on observed data from sampling site O-03, which is near USGS site 05595000 (Kaskaskia River at New Athens, IL), approximately halfway down the impaired segment. Simulated dissolved oxygen is largely controlled by the positive and negative forcings of reaeration, sediment oxygen demand, aquatic organisms (phytoplankton and bottom algae), and oxygen-demanding kinetics. The key calibration parameters which constrained the diel DO swing and average DO concentrations to the observed data at site O-03 was the respiration and death rates associated with phytoplankton.

The QUAL2K model was calibrated to existing conditions simulated for September 14, 2019. The QUAL2K model performs well when simulating observed hydraulics, water temperature, nutrients, and DO. The observed DO range at sonde O-03 was captured well by the simulation.

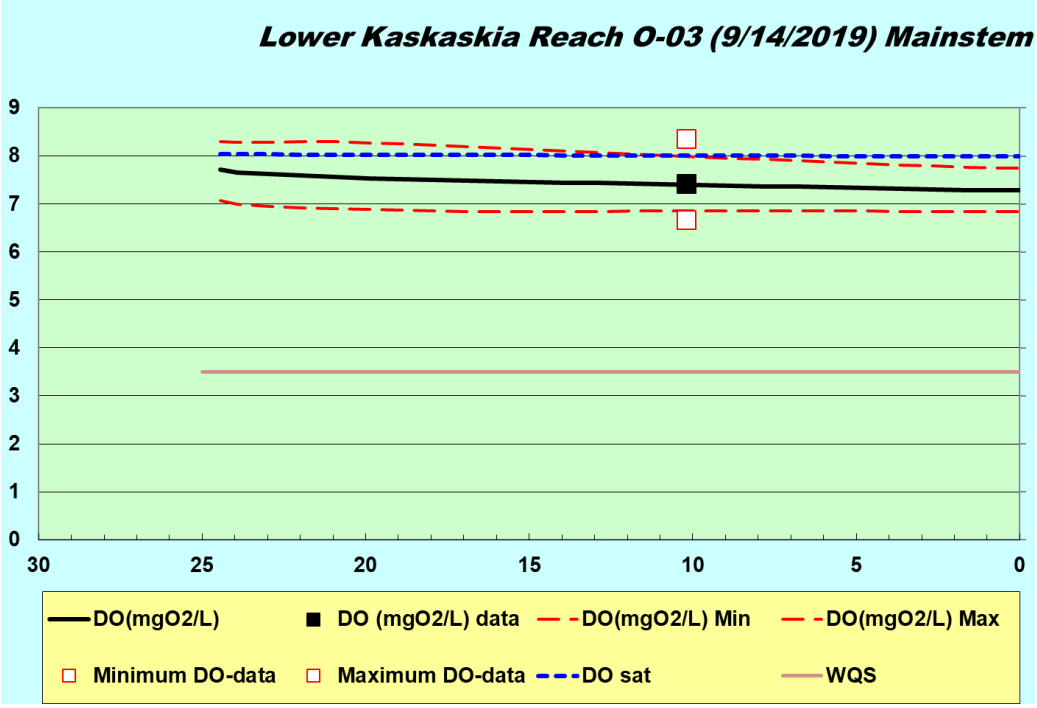

Figure 1. Simulated dissolved oxygen concentration relative to observed data from September 14, 2019.

TMDL Application

For TMDL application, the QUAL2K model must be modified to simulate critical low-flow conditions. A simulation date of 7/30/2019 was selected as it is during summer and is representative of the seasonally conservative DO water quality standard (daily minimum 5.0 mg/l). The critical low-flow condition is typically defined as the lowest seven-day average flow that occurs every 10 years (7Q10). Headwater flow conditions during the calibration model were 3,682.0 cfs, however the 7Q10 flow as defined by the Illinois State Water Survey[4] for this reach is 81 cfs, therefore a critical conditions version of the QUAL2K

[4] https://www.ideals.illinois.edu/bitstream/handle/2142/100104/Map-7-Kaskaskia-Region-200210.pdf?sequence=2&isAllowed=y

model must be generated. 7Q10 flows for Mud and Silver Creeks from the Illinois State Water Survey are 0 cfs and 3.1 cfs respectively, so a simple water balance indicates that diffuse flow to reach is approximately 9.9 cfs.

The Manning formula for reach hydraulics was held constant relative to channel slope, however the roughness coefficient was increased to 0.7 and the channel bottom width was decreased to 60 meters, both based on best approximating low-flow USGS field observations related to channel geometry and velocity.

The point sources for the critical conditions model were set to permitted flow and water quality conditions. Each point source was increased in flow to their respective design average flow, which in total accounts for 7.18% of total 7Q10 streamflow. The New Athens STP and Fayetteville STP have monthly average permit limits for $CBOD_5$ of 25 mg/l, but the other point sources do not have limits. No other water quality permit limits are present for constituents related to instream dissolved oxygen response (e.g. ammonia, total phosphorus, etc.). For the TMDL application simulation in QUAL2K, DO inputs for tributaries, headwaters, diffuse sources, and point sources were all set to the seasonal water quality standard of 5.0 mg/l. $CBOD_{ultimate}$ inputs for all point sources were set to 50 mg/l ($CBOD_5$ limit multiplied by two), with the exception of the cooling tower which was held at the same level as the calibration model. All other model inputs were held consistent with the calibration model for September 2019 without additional data to inform whether, for example, headwater water quality concentrations should vary under 7Q10 conditions.

TMDL Model Results

Although no impairment was observed during the calibration period in September 2019, the QUAL2K model simulation for critically low flow conditions did produce impairment relative to the seasonal DO water quality standard of 5.0 mg/l.

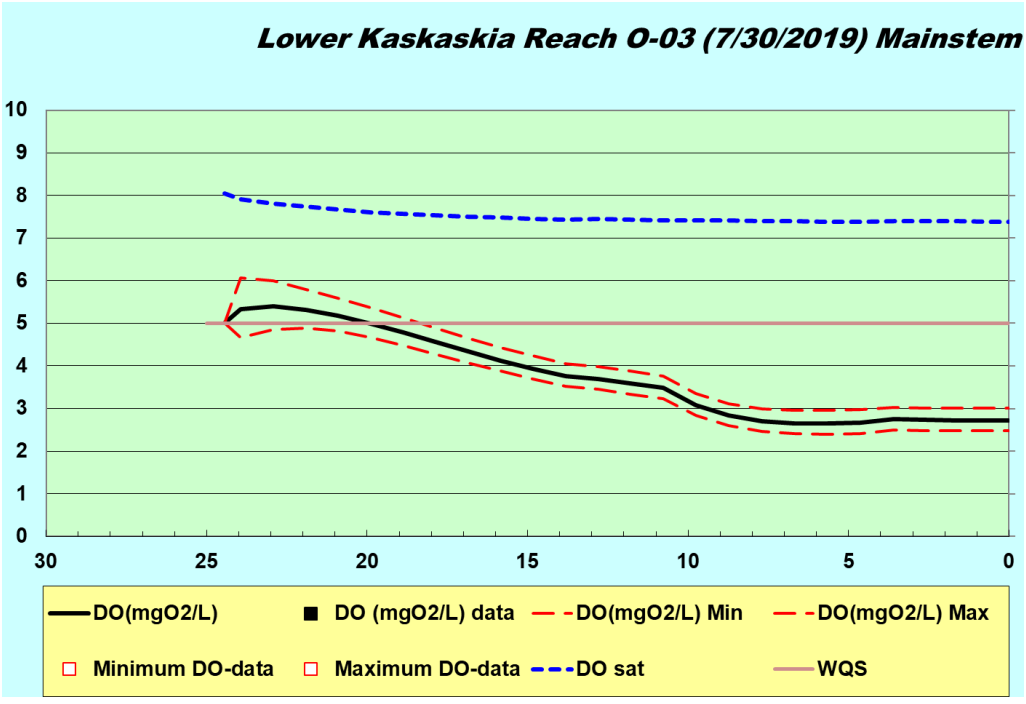

Figure 2. Simulated dissolved oxygen concentration for critically low flow conditions (July 30, 2019).

To understand potential management scenarios that could improve instream DO conditions, it is important to test potential changes (such as decreases in boundary condition nutrients), as well as analyzing the potential relationships between flow, nutrients, and DO.

Water Quality and Flow Analysis

An analysis was conducted to assess the potential relationships between phosphorus, flow, and dissolved oxygen along IL_O-03 to better understand instream dynamics and controls over DO in the water column.

First, the relationship between observed phosphorus and DO concentrations was analyzed for potential correlation. Grab sampling data from September 2019 suggest that TP was approximately 0.4 mg/l at both the headwaters (site O-91) and halfway down the impaired reach (site O-03). During this period, the stream was not observed to be impaired for DO. Long-term water quality records at USGS site 05595000 suggest that increased PO4 concentrations are correlated with decreased DO concentrations (Figure 3).

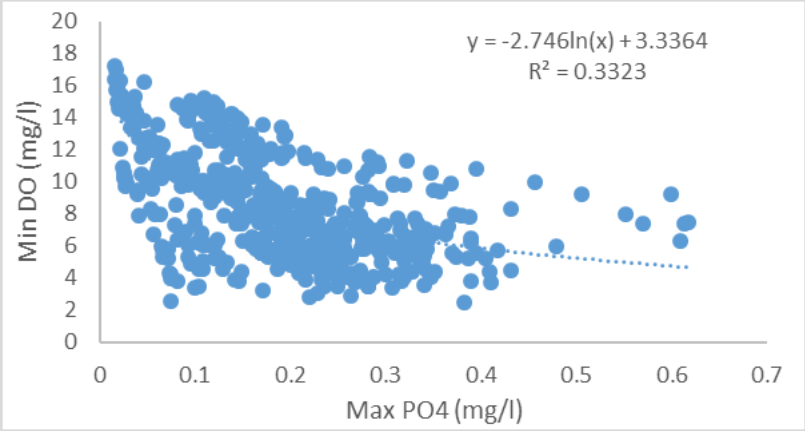

Figure 3. Paired maximum PO4 and minimum DO from USGS site 05595000 (2015-2019).

This correlation appears to indicate that high PO4 concentrations may be related to observed decreases in DO. However, there is not a clear relationship observed between PO4 concentration and flow (Figure 4). In fact, a closer examination of PO4 concentrations observed under the lowest flow conditions suggest that the phosphorus/DO relationship is unrelated to 7Q10 flow conditions (Figure 5). Note that there are no field samples available at the USGS site for PO4 concentrations when flows are as low as 7Q10 (81 cfs).

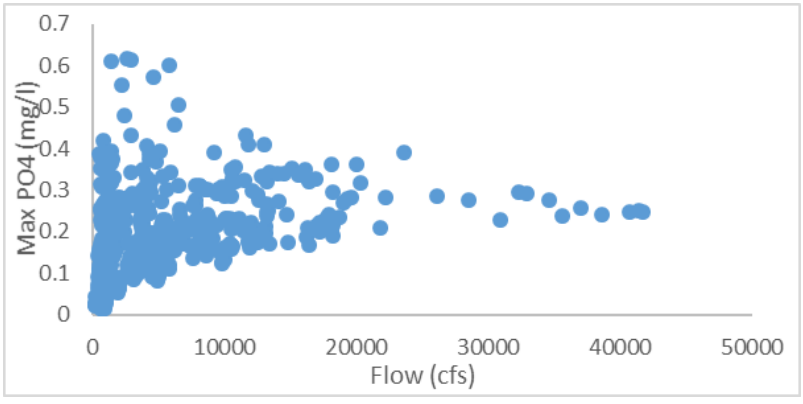

Figure 4. Paired flow and maximum PO4 from USGS site 05595000 (2015-2019) for all flow regimes.

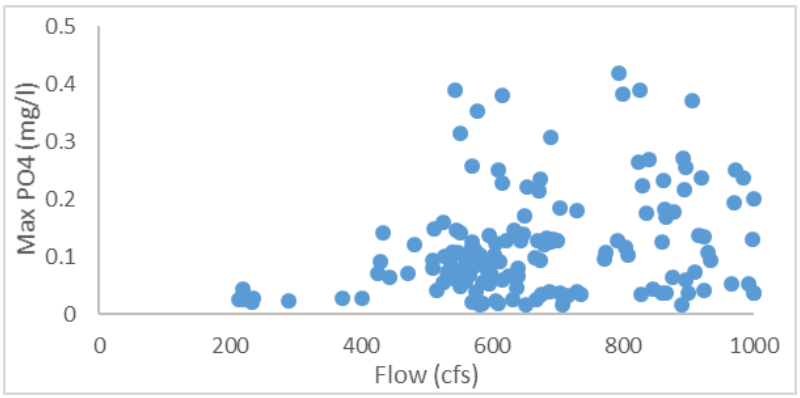

Figure 5. Paired maximum PO4 and flow from USGS site 05595000 (2015-2019) for low flows only.

Improving Instream Water Quality

When all nutrient concentrations at the headwaters, tributaries, and point sources are decreased by half, the instream DO concentration improves but only marginally. This suggests that instream DO concentration is not controlled by nutrient concentrations, but by other DO-reducing forces instream.

Further testing reveals that the best solution for improving instream DO to meet the WQS involves increasing reaeration and decreasing SOD by approximately two.

These results are similar to the findings of the 2012 TMDL[5] for different portions of the Lower Kaskaskia River. The findings of this report stated for IL_O-30 (the most downstream portion of the Lower Kaskaskia River), "a TMDL cannot be developed for reaeration or SOD," therefore "no TMDL allocations were developed." These results were also reflected in this QUAL2K modeling analysis and investigation of best available instream data conditions for IL_O-03.

[5] CDM Smith. 2012. Lower Kaskaskia River Watershed Total Maximum Daily Load Report. Illinois Environmental Protection Agency.

Appendix D – Protection Plan Comments and Responses

<to be added following public meeting>