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Addendum 2
Solicitation 23-99029
RFP for Engineering Svcs for Irving Park Bio-Filtration Basin

This addendum serves to notify all bidders of the following changes to the solicitation documents:

1. The pre-proposal sign-in sheet is attached.

2. The following documents are supporting information that were requested of multiple interested bidders at the Pre-Proposal Conference on 1/17/23.

    a. Attached is an additional Appendix E, *Duluth Streams Bacteria Source ID Study – Final Report – 08-19-20,* which includes supporting bacteria source study information related to the impaired watershed, Keene Creek. The proposed project location lies within the Keene Creek watershed, and is focused to provide stormwater quality treatment in the impaired reaches.

    b. Attached is an additional Appendix F, *GLSNRP2022 Grantee Contract – City of Duluth,* which includes the Great Lakes Commission Grant documents, workplan and agreements. The proposed project is partially funded through the Great Lakes Commission, Great Lakes Sediment and Nutrient Reduction Program.

    c. Attached is an additional Appendix G, *Irving Park Bio-Filtration Map Packet,* which includes several maps, photos and other supporting information that was provided at the Pre-Proposal Conference on 1/17/2023. Also included in the packet is the Irving Park Mini Master Plan, which was shown to illustrate some of the originally proposed and built program infrastructure in Irving Park.

Please acknowledge receipt of this Addendum by including a copy of this page with your proposal. The page included will not count toward any page limitation, if any, identified in the RFP.

Posted: **January 19, 2023**

THE CITY OF DULUTH MINNESOTA

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Irving Park Bio-Filtration Basin RFP for Eng Services

Pre-Proposal Conference 01/17/2023

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APPENDIX E – DULUTH STREAMS BACTERIA SOURCE ID STUDY – FINAL REPORT – 08-19-20

CITY OF DULUTH

RFP# 23-99029

Duluth Streams Bacterial Source Identification Study Final Report

City of Duluth, Public Works and Utilities

Duluth Streams Bacterial Source Identification Study
Project No. 118320

8/19/2020

Duluth Streams Bacterial Source Identification Study
Final Report

prepared for

City of Duluth, Public Works
Duluth Streams Bacterial Source Identification Study
Duluth, MN

Project No. 118320

8/19/2020

prepared by

Burns & McDonnell Engineering Company, Inc.
San Diego, CA

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LIST OF ABBREVIATIONS

Abbreviation	Term/Phrase/Name
°C	degrees Celsius
BMP	best management practice
City	City of Duluth
cfs	cubic feet per second
CFU	colony forming unit
cm	centimeter
COC	chain of custody
Ct	cycle threshold
DNA	deoxyribonucleic acid
E. coli	*Escherichia coli*
EPA	U.S. Environmental Protection Agency
g	gram
gpm	gallons per minute
m	meter
MCA	microbial community analysis
mL	milliliter
mm	millimeter
MPN	most probable number
MS4	municipal separate storm sewer system
NPDES	National Pollutant Discharge Elimination System
Pace Laboratory	Pace Analytical Services, Inc.

Abbreviation	Term/Phrase/Name
PBS	phosphate buffer solution
PCR	polymerase chain reaction
SE	standard error
SWMP	Stormwater Management Plan
TMDL	total maximum daily load
TSS	total suspended solids
µL	microliter
µm	micrometer
Weston Laboratory	Weston Solutions
UMN	University of Minnesota, Saint Paul, Minnesota
UMD	University of Minnesota, Duluth, Minnesota

1.0 INTRODUCTION

The Duluth Urban Area Streams Total Maximum Daily Load (TMDL) (MPCA, 2018) addresses stream impairments in the Duluth Urban Area in northeastern Minnesota including a portion of the St. Louis River major watershed (Hydrologic Unit Code [HUC] 04010201) and a portion of the Lake Superior South Watershed (HUC 04010102). The TMDL includes all of the developed areas in the Duluth area and surrounding communities. There are eleven streams assessed in the Duluth Urban Area Streams TMDL, including Keene Creek and Tischer Creek (Figure 1-1). Water quality monitoring data indicate that water quality standards for recreational uses are not being attained in Keene Creek and Tischer Creek, based on exceedances of numeric criteria for *E. coli*, which is a common fecal indictor bacteria.

The applicable water quality standards for *E. coli* are described in amendments to Minnesota's Rule 7050 and are summarized in Table 1-1. There are two standards established by the rule for *E. coli*: the single sample water quality standard of 1,260 most probable number (MPN)/100 milliliters (mL) and the geometric mean water quality standard of 126 MPN/100 mL.

Table 1-1: Applicable Water Quality Standards for *E. coli* in Keene Creek and Tischer Creek

Parameter	Units	Water Quality Standard[(a)]	
E. coli[b]	#/100 mL	Single Sample	1,260 in < 10% of samples[c]
		Geometric Mean	< 126[d]

Source: Amendments to Minnesota Rule 7050
(a) The standard applies only between April 1 and October 31.
(b) *E. coli* standards apply only between April 1 and October 31
(c) Standard shall not be exceeded by more than 10% of the samples taken within any calendar month
(d) Geometric mean based on minimum of five samples taken within any calendar month

The City of Duluth has a National Pollutant Discharge Elimination System (NPDES) permit for the municipal separate storm sewer system (MS4) within its jurisdictional boundaries (MS400086) and is responsible for identifying the sources of *E. coli* in the watersheds and meeting the regulatory goals of the TMDL. In an effort to address the impairment and better understand the sources of *E. coli* causing exceedances, the City and its partner, the Minnesota Pollution Control Agency (MPCA) (through a Clean Water Fund grant), has initiated this Duluth Streams Bacterial Source Identification Study for Keene Creek and Tischer Creek (Study). The Study is focused on identifying the sources of *E. coli* within those portions of the Keene Creek and Tischer Creek watersheds within the jurisdictional boundary of the City. The study areas within each of the two watersheds are identified in Figure 1-2 and Figure 1-3 for Keene and Tischer Creek, respectively.

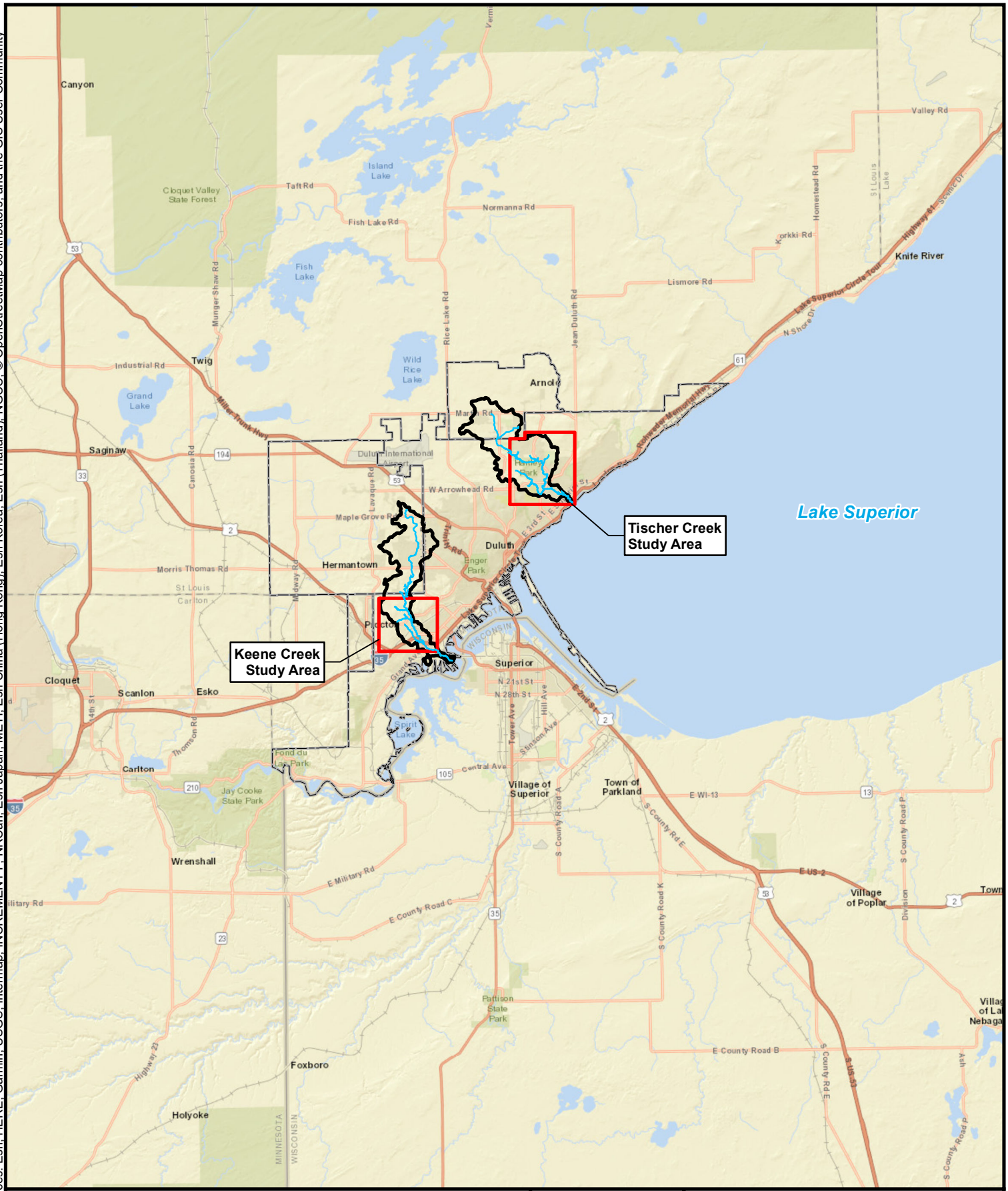

Figure 1-1: Locations of the Keene Creek and Tischer Creek Watersheds and Study Areas

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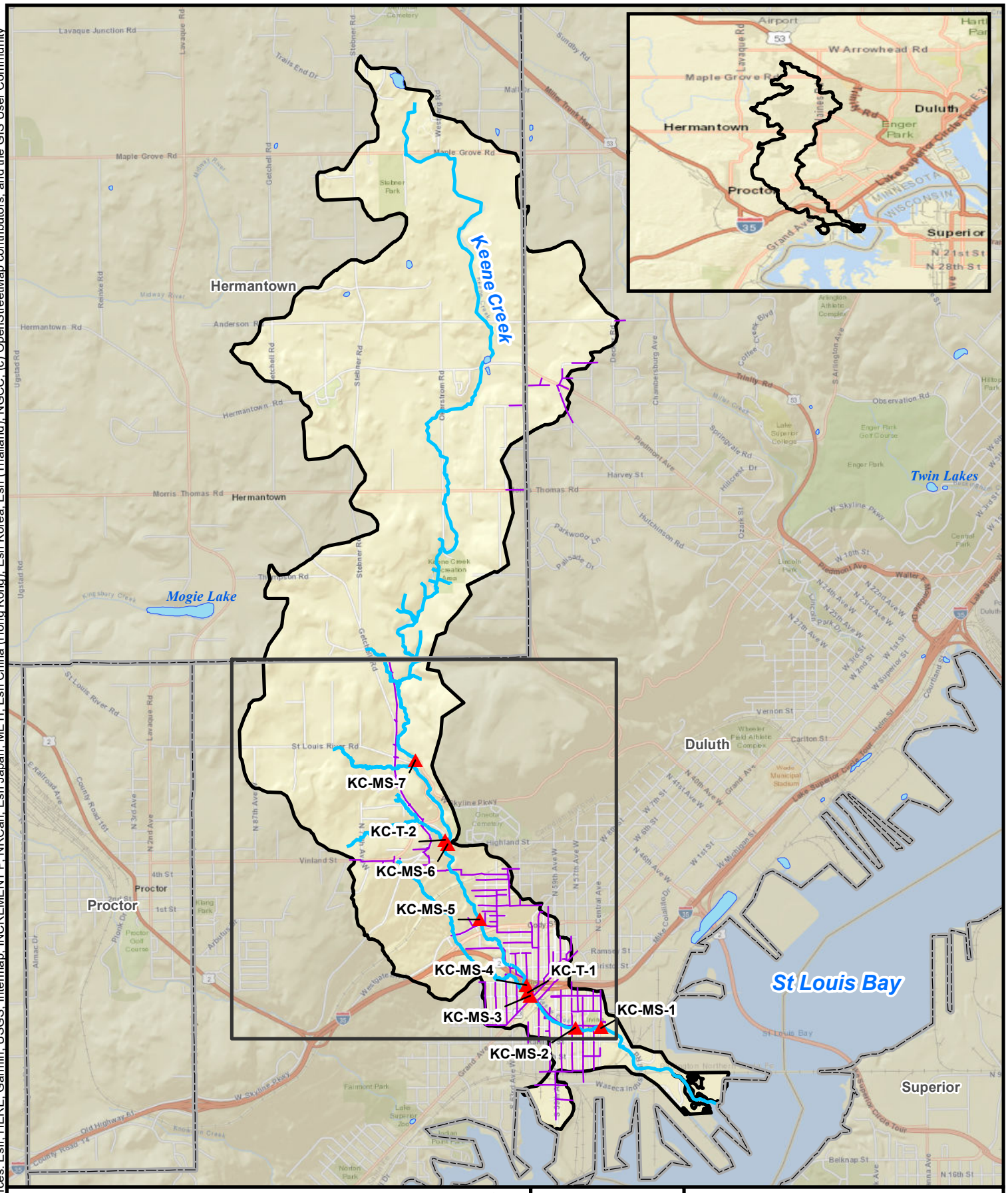

Figure 1-2:
Keene Creek Watershed
and Study Area

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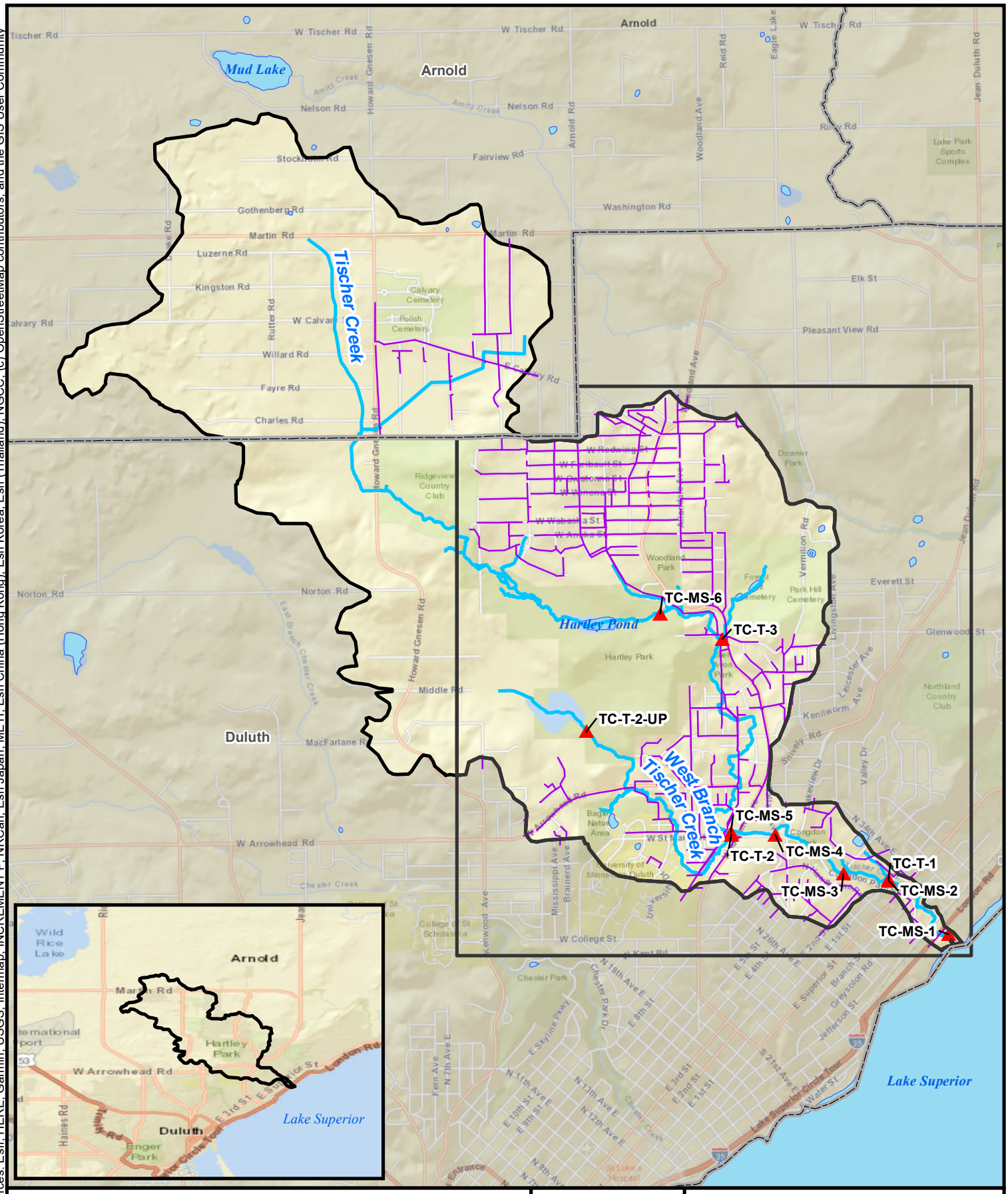

Figure 1-3:
Tischer Creek Watershed
and Study Area

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1.1 Study Objectives

The overall objective of the Study is to provide the City with information on the sources of *E. coli* bacteria that may be causing exceedances of state water quality standards in Keene Creek and Tischer Creek receiving waters and to use the information gathered from the Study to provide recommendations on best management practices (BMPs) that can be used to achieve the TMDL reduction targets. All monitoring, sample collection, and assessments for the Study were conducted during periods of dry weather only, at least 48 hours after a storm event, from August through October 2019.

1.1.1 Dry Weather Study Questions

Based on a review of existing data, the study design for this dry weather assessment was developed to answer the following study questions:

1. What are the potential sources of *E. coli* in Keene Creek and Tischer Creek (e.g., local wildlife, domestic animals, leaking sewer or septic lines, other human sources, natural, etc.)?
2. How does bacteria survival, propagation, or re-growth contribute to *E. coli* levels in the storm drain system (e.g., leaf litter and grass clippings along curb lines or ditches) and discharge to surface waters of the creek?
3. Does the *E. coli* in the Study Areas originate from human sources?
4. How can the City adapt current management practices to reduce levels of *E. coli?*

1.2 Description of Study Areas

E. coli concentrations in creeks are often heavily influenced by land use practices. Land use in the Keene Watershed (4,029 acres) and Tischer Watershed (4,767 acres) (depicted in Figure 1-4 and Figure 1-5, respectively) consists primarily of forest and other natural land covers (71 and 63 percent, respectively) with smaller urbanized portions of the watersheds consisting of developed/disturbed land cover (29 and 37 percent, respectively) (MPCA, 2018). Areas of land use transition in a watershed (e.g., rural to urban, pervious to impervious) are often key drivers for establishing monitoring locations for microbial source tracking studies.

In Tischer Creek, the reach impaired by *E. coli* is relatively short (approximately Woodland Avenue to Lake Superior) and consists primarily of an urbanized land use. In contrast, Keene Creek is impaired from the headwaters to the St. Louis River; however, only a small portion of the creek (primarily downstream of the railroad crossing just upstream of Cody Street) is urbanized. These differences in land use characteristics and degree of impairment were important factors in the design of the Study to understand the sources of *E. coli* in the Keene Creek and Tischer Creek watersheds.

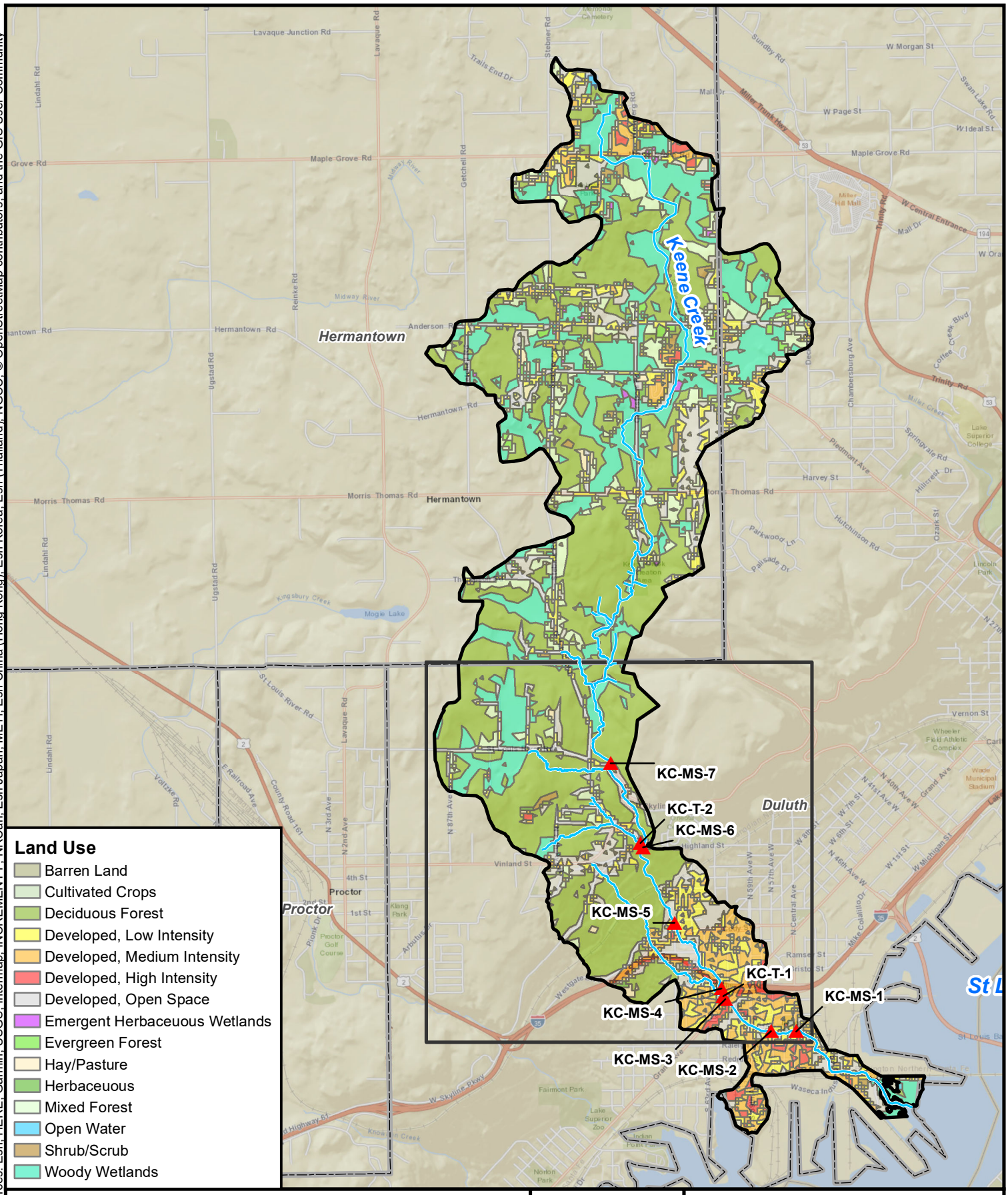

Figure 1-4:
Land Use in the Keene Creek Watershed and Study Area

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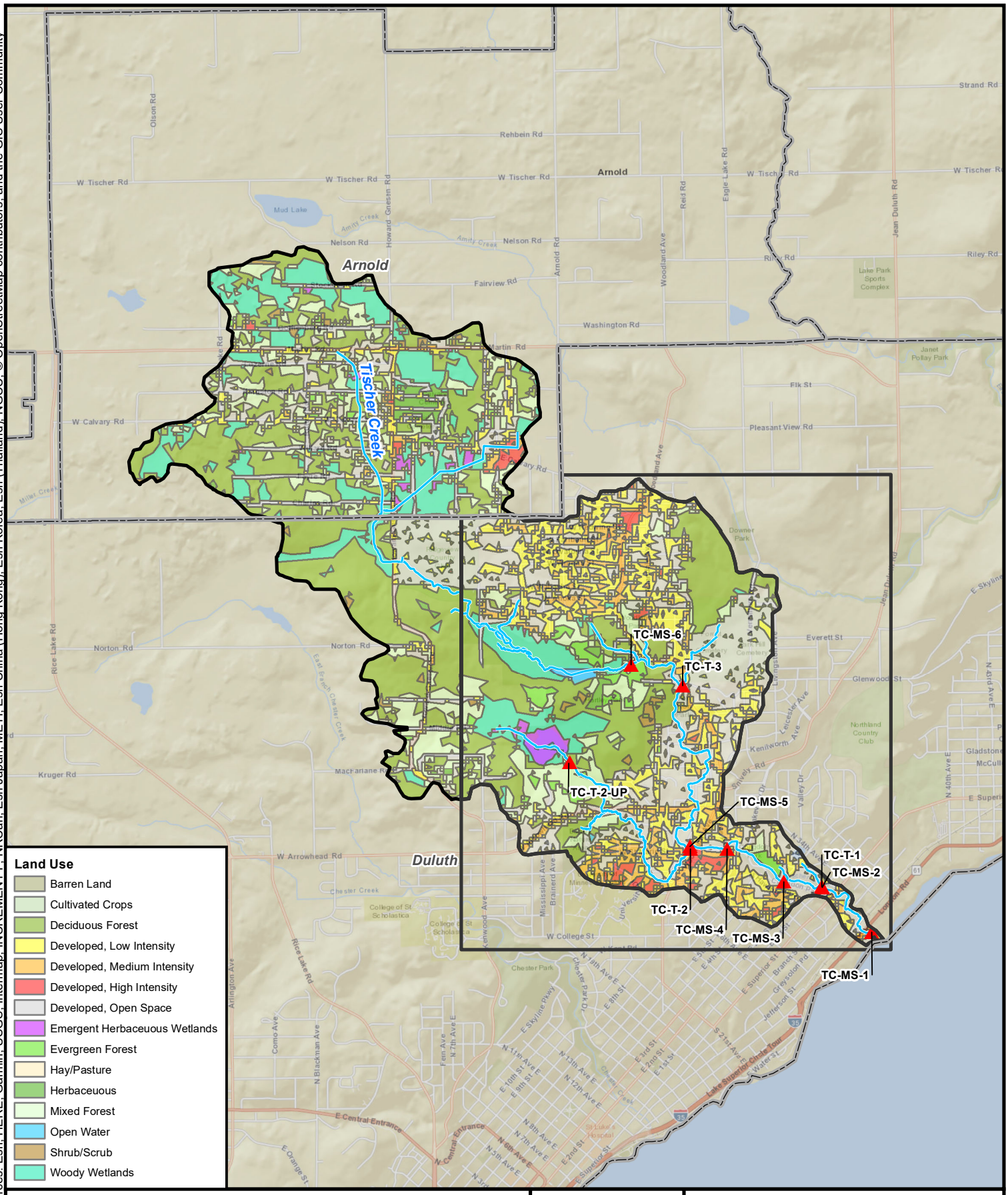

Figure 1-5:
Land Use in the Tischer Creek Watershed and Study Area

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1.3 Study Design

The design used to conduct the Study was based on similar studies conducted in other regions of the country for identifying sources of indicator bacteria (e.g., *E. coli*) in urban watersheds. The design uses three approaches that have been shown to be effective in identifying sources of bacteria in urban watersheds throughout the country (Griffith et al., 2013). The study design is (1) phased, (2) tiered, and (3) adaptive. Each of these design approaches is described briefly below.

1.3.1 Phased Approach

In order to identify the sources of bacteria in the two watersheds, the study was phased to focus first on dry weather conditions (at least 48 hours following precipitation). Identifying and remediating sources of bacteria is much simpler under dry weather conditions than wet weather conditions, particularly when the Study Area has not been thoroughly characterized or monitored (Urban Water Resources Research Institute, 2014). Thus, using a phased approach, this Study focused initially on dry weather conditions only.

The information gained from the dry weather phase, may be used to inform the study design and study questions for a potential future wet weather phase, providing a focused assessment of suspected sources and a more efficient use of limited resources. Moreover, separating the study into dry and wet weather phases provides a more meaningful approach to identifying pollutant-reduction BMPs because effective solutions during dry weather are often very different than wet weather BMPs. In addition, dry weather BMPs can be compromised during wet weather when the receiving waters can be overwhelmed with numerous sources.

1.3.2 Tiered Approach

The tiered approach uses a stepwise procedure of assessing the Study Area and identifying sources of bacteria in a prioritized, progressive process. For both Keene Creek and Tischer Creek, a series of sequential steps were implemented to focus the assessment on high priority sources of bacteria first, followed by additional steps as the study progressed. This tiered approach has been developed from similar monitoring programs (Griffith et al., 2013) with elements specific to the Keene and Tischer Creek watersheds.

The following tiered steps were implemented in the Study:

1. Characterize the watershed by obtaining infrastructure maps, examining historical monitoring data for spatial and temporal trends, and conducting visual inspections during a site

reconnaissance to develop a list of potential fecal contamination sources and transport mechanisms.

2. Based on the watershed characterization, develop a list of study questions to be addressed by the assessment that are specific to the conditions within that drainage.
3. Conduct initial monitoring to produce a more detailed picture of spatial and temporal patterns in the drainage.
4. Test ambient waters for human source specific genetic markers (even if traditional tools have not identified a leaking sanitary system). Place high priority on either detecting or confirming a human fecal source, as this source may pose the greatest relative health risk.
5. Where there is indication of leakage from a sanitary system, investigate it using traditional tools such as closed-circuit television inspections or dye testing.
6. Where human sources have been accounted for and the relative human loadings are better understood, and/or a likely animal fecal pollution source (e.g., runoff from a dog park) has been identified, test ambient waters using non-human (animal) source-specific genetic markers.
7. Where source-specific genetic markers have yet to be developed for the suspected source(s), test ambient waters and potential sources using microbial community analysis (MCA) methods.

The basic steps listed above were used in the dry weather assessment for this Study and were modified to meet the specific characteristics of the two Study Areas.

1.3.3 Adaptive Approach

Bacterial source identification studies can be difficult to conduct due to the ubiquitous nature of bacteria in the environment, the multiple sources within a given watershed, and the potential for regrowth of bacteria outside the host animal. For these reasons, source identification studies often do not lend themselves to prescriptive monitoring plans where the details of each monitoring element are determined prior to the initiation of the study. Instead, the most effective source identification studies often rely on a basic monitoring framework with elements developed from the tiered approach discussed above. The details of each monitoring element are adaptive, whereby the results of the first element are used to focus the design for subsequent elements in the study. The adaptive approach allows the design of each element of the study to build upon the results of the previous element, resulting in an increasingly focused approach to identifying the sources of bacteria in a defined study area. The end result is a comprehensive and efficient assessment of potential bacterial sources in the drainage, leading to multiple lines of evidence for identifying those sources that have the greatest impact on water quality. These results also allow for focused recommendations on the most effective and efficient BMPs to remediate the bacterial source.

In this Study, primary study elements were developed specifically for the two Study Areas and monitoring protocols were established to answer the drainage-specific study questions for dry weather conditions. When the results from the primary study elements were analyzed, special studies were designed and implemented to further address unanswered components of the study questions. This adaptive approach maximizes the efficiency of limited resources to conduct the Study and produces a focused assessment of the sources of *E. coli* in both Keene and Tischer creeks during dry weather conditions.

1.4 Report Organization

This Study used a weight of evidence approach to identify the sources of *E. coli* bacteria in the Keene Creek and Tischer Creek receiving waters. Because two watersheds were assessed in the Study, portions of some chapters were combined for both watersheds and some were separated to allow for a focused discussion of each watershed. The report contains separate sections for each watershed within the Materials and Methods Chapter (Chapter 2.0), but combined sections for field methods and laboratory methods. This chapter discusses the means to achieve the Study objectives. The Results Chapter (Chapter 3.0), which summarizes the Study's findings, has separate sections for each watershed. As does the Conclusions Chapter (Chapter 5.0), which identifies the salient points of the Study. In the Discussion and Recommendations chapters (Chapter 4.0 and Chapter 6.0, respectively), the results from the two watersheds have been integrated to facilitate ease of discussion on how the results of the Study enhance our understanding of the sources of *E. coli* in the watersheds and how potential BMPs might be implemented to reduce *E. coli* levels in the creeks and meet the goals of the TMDL.

1.4.1 Dry Weather Study Elements

The dry weather study design was organized to focus on several primary Study elements first, followed by special studies based on the initial results. The primary dry weather Study elements were the same for both watersheds and included the following:

- Baseline Monitoring
- Sanitary Survey Investigation
- Special Study – Water and Sediment Characterization

2.0 MATERIALS AND METHODS

2.1 Baseline Monitoring

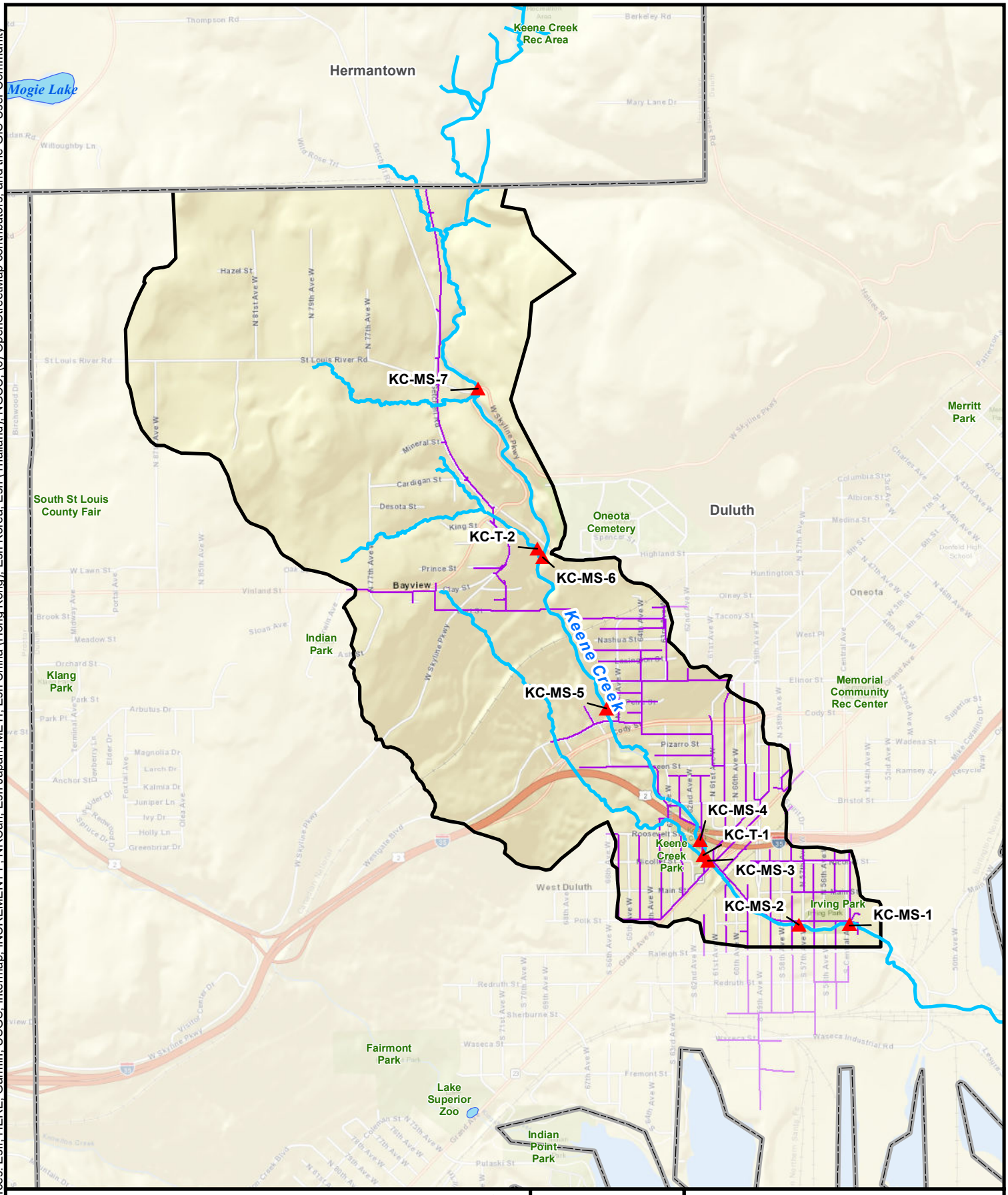
The site locations and procedures for the Baseline Monitoring are presented below for Keene Creek and Tischer Creek.

2.1.1 Keene Creek Monitoring Sites

The Study Area within the Keene Creek Watershed lies within the municipal boundary of the City. The baseline monitoring sites within the Keene Creek Study Area consist of seven mainstem sites (designated as MS-#) and two tributary sites (designated as T-#). The locations are summarized in Table 2-1 and presented graphically on Figure 2-1. The locations were selected to provide spatial coverage along the mainstem of Keene Creek and to account for bacteria sources contributed to the mainstem from the main tributaries within the Study Area.

Table 2-1: Descriptions of Keene Creek Baseline Monitoring Sites in the Study Area

Site Name	Latitude	Longitude	Elevation (feet)	Description
MS-1	46.732431	-92.166296	602	On mainstem, just downstream of South Cedar Avenue
MS-2	46.732391	-92. 169355	605	On mainstem, just upstream of South 57th Avenue West
MS-3	46.735199	-92. 175073	618	On mainstem, upstream of Grand Avenue and just downstream of Keene Creek Dog Park
MS-4	46.736099	-92. 175525	651	On mainstem, in Keene Creek Park across from picnic tables
MS-5	46.741783	-92. 181303	729	On mainstem, upstream of Westgate Boulevard at large boulders on left bank
MS-6	46.748289	-92. 185141	954	On mainstem, approximately 300 feet downstream of Highway 89 Bridge, upstream of confluence with Site T-2
MS-7	46.755519	-92. 189055	1,139	On mainstem, just downstream of West Skyline Parkway off Saint Louis River Road
T-1	46.735442	-92. 175353	623	Tributary to mainstem from right bank at Keene Creek Dog Park, just upstream of confluence with mainstem (borders the northwest border of Keene Creek Dog Park)
T-2	46.748653	-92. 185468	969	Tributary to mainstem from right bank, approximately 150 feet upstream of confluence with mainstem at the walking trail bridge



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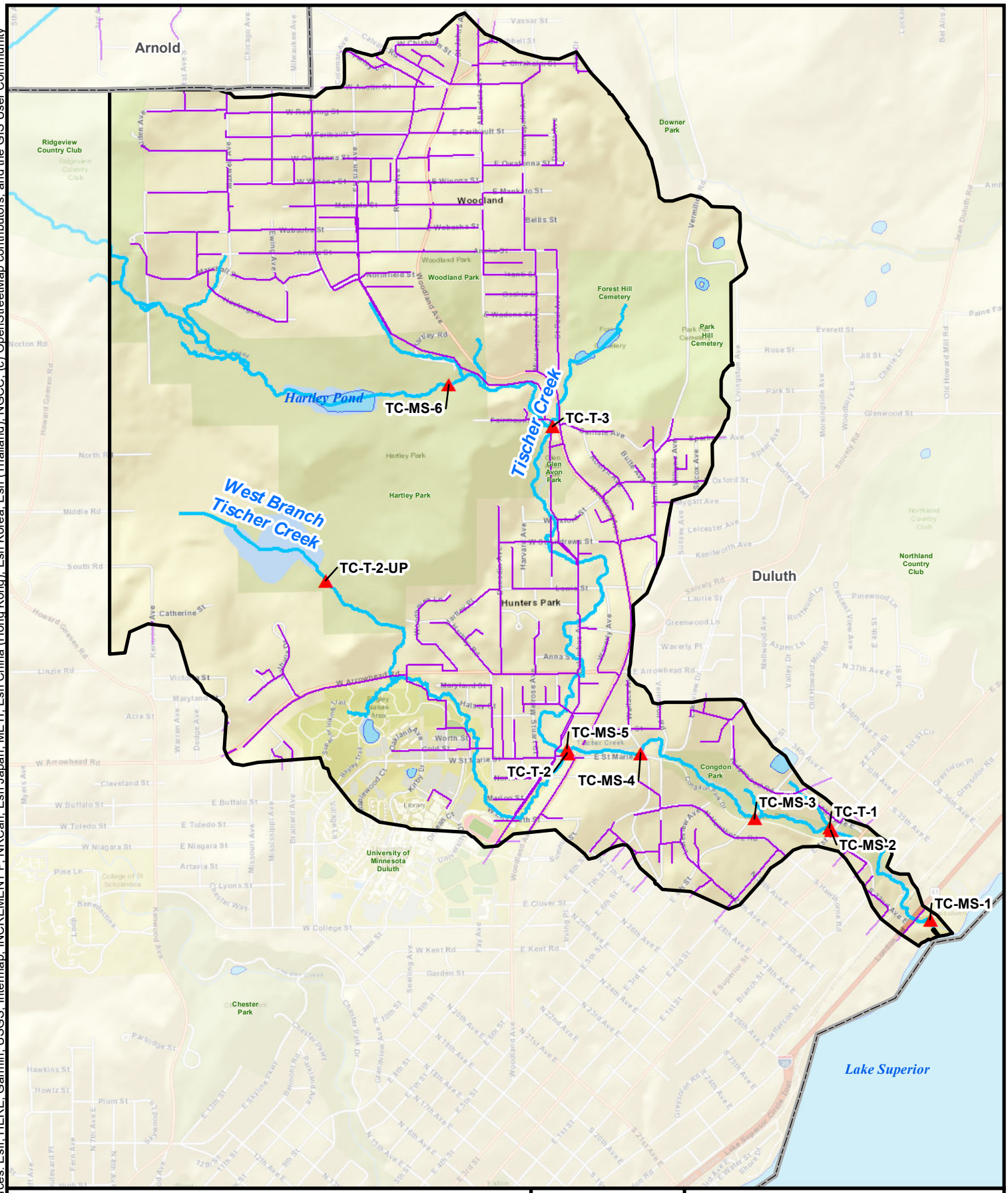
2.1.2 Tischer Creek Monitoring Sites

The Study Area within the Tischer Creek Watershed also lies within the municipal boundary of the City. The baseline monitoring sites within the Tischer Creek Study Area consist of six mainstem sites (designated as MS-#) and two tributary sites (designated as T-#). The locations are summarized in Table 2-2 and presented graphically on Figure 2-2. As with Keene Creek, the Tischer Creek monitoring locations were selected to provide spatial coverage along the mainstem of Tischer Creek and to account for bacteria sources contributed to the mainstem from the main tributaries within the Study Area.

Table 2-2: Descriptions of Tischer Creek Baseline Monitoring Sites within the Study Area

Site Name	Latitude	Longitude	Elevation (feet)	Description
MS-1	46.814288	-92.052083	596	On mainstem, 200 feet downstream of London Road, 100 feet upstream of walking trail bridge
MS-2	46.818833	-92.058182	709	On mainstem, 400 feet upstream of East Superior Street, just upstream of T-1 waterfall
MS-3	46.819393	-92.063008	840	On mainstem, just downstream of East 4th Street
MS-4	46.822268	-92.070059	1,038	On mainstem, just upstream of Wallace Avenue culvert, adjacent to East Saint Marie Street
MS-5	46.822512	-92.074481	1,050	On mainstem, 125 feet upstream of Woodland Avenue, adjacent to East Saint Marie Street, upstream of confluence with T-2
MS-6	46.838154	-92.081735	1,179	On mainstem in Hartley Nature Center, just downstream of walking bridge of mainstem leading from parking lot
T-1	46.818956	-92.058417	710	Tributary to mainstem, at waterfall just downstream of MS-2
T-2	46.822332	-92.074632	1,051	Tributary to mainstem at MS-5 (also known as the West Branch of Tischer Creek), just downstream of West Saint Marie Street, behind Domino's Pizza on Woodland Avenue, upstream of confluence with mainstem
T-3	46.836199	-92.075367	1,125	Tributary to mainstem, just downstream of Fairmont Street, adjacent to Woodland Avenue
T-2-Up	46.829028	-92.088653	1,169	Tributary T-2 to mainstem (West Branch of Tischer Creek) in Hartley Park below beaver dam, approximately 250 feet upstream of wooden walking bridge that crosses creek



Monitoring Locations
Storm Drain
Tischer Creek
Tischer Creek Study Area
City Boundary

NORTH

0 1,000 2,000
Scale in Feet

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Figure 2-2: Tischer Creek Study Area with Baseline Monitoring Sites

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The sites in both watersheds were monitored during dry weather (at least 48 hours after a rain event of 0.1 inch or greater) from August through October 2019. The public data provided by the National Weather Service (2019) was used to determine dates of sampling events, based on precipitation forecasts.

2.1.3 Field Methods

Water samples were collected at the locations identified above for analysis by both culture and molecular techniques. The methods used to collect water samples differ by technique and are discussed below.

2.1.3.1 Sample Collection for Analysis of Bacteria by Culture Techniques

Water samples from the mainstem and tributary baseline monitoring sites (Figure 2-1 and Figure 2-2) were collected by field technicians wearing sterile latex gloves and hip waders. Samples were collected from the thalweg of the stream in sterile, EPA-approved 100-mL plastic bottles containing sodium thiosulfate (to counteract any chlorine that might be present in the water). Sample containers were kept in clear re-sealable food-grade plastic bags until use. Just prior to sampling, the bag and sample container were opened. Both container and lid were held facedown to prevent airborne contamination. Facing upstream, the field technician submerged the bottle approximately 6 inches below the surface of the water. The bottle was then filled and capped. No sediment or debris from the streambed was allowed to enter the sample bottle. All observations during site visits were recorded on field observation forms.

Each bottle was labeled in the field with the project title, appropriate site identification number, date, time, and initials of collector using black, waterproof ink. The sample container was then sealed in the re-sealable plastic bag. The samples were stored on ice in the dark in a closed cooler from the time of sample collection until delivery to the analytical laboratory. All samples were delivered to Pace Analytical Services, Inc. in Duluth (Pace Laboratory) within the required 6-hour holding time. The samples were transferred to the laboratory using standard chain of custody (COC) procedures discussed in Section 2.4. The cooler and sampling equipment were cleaned with biodegradable soap prior to use.

2.1.3.2 Sample Collection for Analysis of Bacteria by Molecular Techniques

Water samples for molecular analyses were collected from the same baseline monitoring sites discussed above, using 250-milliliter (mL) sterile (irradiated), nuclease-free, plastic bottles. Extreme care was taken to avoid sample contamination. Samples were collected exclusively by technicians specifically trained in the “clean hands” aseptic technique.

In the laboratory, each bottle was sealed inside two sterile, plastic bags and placed in a sterilized cooler that had been dedicated for molecular samples only. In the field, field technicians wearing sterile, latex gloves removed the bottle from the plastic bags and labeled it with a unique sample name, location, date,

time, and name of collector using black, waterproof ink. Gloves and outside plastic surfaces were sprayed with DNA *AWAY*™, a deoxyribonucleic acid (DNA) destabilizing reagent, and wiped dry prior to opening sample bottles to remove any potential contamination from human contact. The bags were placed back in the cooler and the capped bottle was carried to the monitoring site. While the sample bottle was open, the cap was held facedown to prevent aerial contamination. After sampling, excessive water was removed from the outside of the sample container, and using clean gloves, the outside of the sample bottle was sprayed with DNA *AWAY*™ and wiped dry prior to placing it in the inner re-sealable plastic bag. The sample bottle sealed in re-sealable plastic bags were placed in a clean, dedicated cooler with-ice and transported to the Pace Laboratory within 2 - 3 hours of collection. Samples for MCA analysis were delivered the University of Minnesota, Saint Paul (UMN) within 48 hours of collection.

To verify proper sampling technique, field blanks were collected during each sampling event (a rate of approximately 10 percent of the overall samples per field event). Field blanks were collected using the sampling technique described above except that reagent-grade, nuclease-free water was substituted for the water sample. Samples were delivered to the laboratory at the same time as the samples for culture analyses (described above) following standard COC procedures discussed in Section 2.4.

2.1.4 Laboratory Methods for Analysis of Bacteria by Culture Techniques

Samples delivered to Pace Laboratory were analyzed by standard methods for total coliforms and *E. coli* following the analytical parameters described in Table 2-3.

Table 2-3: Bacterial Analyte and Corresponding Analytical Parameters for Culture Techniques

Analyte	Method	Units[(a)]	Reporting Limit	Sample Volume	Container (#, Size, Type)	Preservation	Holding Time
E. coli	IDEXX Colilert-18	MPN/ 100 mL	1.0 MPN	100 mL	1, sterile,100-mL plastic	$Na_2S_2O_3$ < 0 to 10 °C[b]	6 hours
Total Coliform	IDEXX Colilert-18	MPN/ 100 mL	1.0 MPN	100 mL	1, sterile, 100-mL plastic	$Na_2S_2O_3$ < 0 to 10 °C[b]	6 hours

(a) MPN – Most Probable Number
(b) °C = degrees Celsius

2.1.5 Laboratory Methods for Analysis of Bacteria by Molecular Techniques

The laboratory analysis procedures for molecular analyses included sample filtration, DNA extraction, and DNA amplification by real-time polymerase chain reaction (PCR). Sample filtration was completed at the Pace Laboratory. DNA extraction and amplification were completed at Weston Solutions in Carlsbad, California (Weston Laboratory).

The Pace Laboratory was responsible for initial sample filtration, as summarized below. Prior to filtration, all surface and equipment were sterilized using DNA *AWAY*™. A 2-mL extraction tube (GeneRite DNA EZ kit) for each sample was labelled with the sample information and placed on a drying rack. Pre-packaged filter funnels (Pall Microfunnels) were removed from the packaging and placed in a sterilized vacuum filter manifold. The polycarbonate filter was 47-millimeter (mm) in diameter with a 0.22-micrometer (µm) mesh size. The water sample was shaken, and 100 mL was pipetted into the funnel using a sterile pipettor. The vacuum was turned on, and the sample was extracted through the filter. The sides of the funnel were rinsed with sterile phosphate buffer solution (PBS), and filtration continued until all fluid had been pulled through. The funnel was then removed from the filter base, exposing the filter. The filter was removed with sterilized forceps, rolled into a cylinder, and inserted into the labelled extraction tubes. The extraction tube cap was secured and frozen at -20 °C. The filters were then placed in a cooler on dry ice and shipped by overnight courier to the Weston Laboratory in Carlsbad, California, following standard COC procedures discussed in Section 2.4.

Once the filters had been received by the Weston Laboratory, they were prepared for DNA extraction and amplification as follows. DNA was extracted and purified using the GeneRite DNA-EZ Kit according to the manufacturer's protocol. Purified DNA was stored at -80 °C until PCR analysis. A blank filter was processed as an extraction blank during every set of extractions (about 1 blank per 12 sample extractions). Extracted DNA was analyzed by real-time PCR for three molecular markers: human marker (HumanBacteroidales-HF183TqamanCAMan), dog marker (DogBacteroidales-DogBact), and bird marker (AvianHelicobacter-GFDSYBRAvian), as described in Boehm et al. (2013). Positive controls for the human marker used genomic *Bacteroides. dorei* DNA (DSMZ 17855), and positive controls for the dog and bird markers used plasmid DNA. DNA was quantified on a Nanodrop 2000 UV-Vis spectrophotometer (Thermo-Scientific, Wilmington, Delaware). Each DNA sample was tested for PCR inhibition with the HumMST assay *B. dorei* DNA added to HF183 Taqman PCR reactions that contained extracted sample DNA at (a) full strength and (b) extract diluted 1:10 by molecular-grade water. Sample DNA was considered inhibited if the cycle threshold (Ct) between the undiluted and diluted extracts differed by more than 1.5 cycles.

Samples were processed on a BioRad CFX96 Real-time PCR Detection System and used default quality control data analysis settings (efficiency 90 to 110 percent, standard curve $r^2 \geq 0.980$), baseline subtracted curve fit with fluorescence drift correction, and baseline threshold set to 100.

2.2 Sanitary Survey Investigation

The purpose of the sanitary survey investigations was to identify any potential sources of *E. coli* within the Study Area of each of the two watersheds (Keene and Tischer Creek). Numerous potential sources were considered at the onset of the investigations, following a review of the existing data, land use, and documentation in the TMDL regarding potential sources. Based on the information available and the characteristics of the watershed, a list of the sources in the Study Area that had the potential to impact receiving waters in either of the creeks was developed. The list of potential sources considered in the Sanitary Surveys is presented in Table 2-4.

Table 2-4: Potential Bacterial Sources Considered within the Study Area for the Sanitary Survey Investigation

General Category	Potential Source/Activity
Municipal Sanitary Infrastructure (piped)	Sanitary sewer overflows
	Combined sewer overflows; regulated under NPDES
	Leaky sewer pipes (exfiltration) (see Sercu et al., 2011)
	Illicit sanitary connections to MS4
Other Human Sanitary Sources (some also attract urban wildlife)	Leaky or failing septic systems
	Homeless encampments
	Temporary toilets (e.g., Porta-Potties)
	Dumpsters (e.g., diapers, pet waste, urban wildlife)
	Trash cans
	Garbage trucks
Domestic Pets	Dogs, cats, other domestic or feral wildlife
Urban Wildlife (naturally occurring and human attracted)	Rodents/vectors (rats, raccoons, squirrels, opossums)
	Birds (gulls, pigeons, swallows, etc.)
	Open space (coyotes, foxes, beavers, feral cats, etc.)
Other Urban Sources (including areas that attract vectors)	Food processing facilities
	Outdoor dining
	Restaurant grease bins
	Bars/stairwells (wash-down areas)
Urban Non-stormwater Discharges (potentially mobilizing surface-deposited bacteria)	Power washing
	Excessive irrigation/overspray
	Car washing
	Pools/hot tubs
	Reclaimed water/graywater (if not properly managed)
MS4 Infrastructure	Illegal dumping

General Category	Potential Source/Activity
	Illicit sanitary connections to MS4 (*also listed above*)
	Leaky sewer pipes (exfiltration) (*also listed above*)
	Biofilms/regrowth
	Decaying plant matter, litter, and sediment in the storm drain system
Recreational Sources	Bathers and/or boaters
	RVs (mobile)
Natural Open Space/Forested Areas	Wildlife populations
	Grazing
Other Naturalized Sources	Plants/algae, sand, soil (naturalized *E. coli*)

Source: Modified from Armand Ruby Consulting (2011)

For each of the two watersheds, the surveys were conducted by dividing the Study Area into drainages that influenced each of the designated monitoring sites (e.g., within the reach or reaches upstream of the monitoring site). The drainages were established by reviewing the storm drain infrastructure within the Study Area and defining areas upstream of a baseline monitoring site.

Using the list of potential bacterial sources identified in Table 2-4, each drainage area was thoroughly surveyed by field technicians in cars and on foot. Field personnel were provided with maps of the drainage area, sanitary survey field observations forms, sample collection gear, and digital cameras to document any potential sources of bacteria within the Study Area that could introduce *E. coli* to the receiving waters. Each street of the drainage area was observed for potential bacterial sources and the results were documented on sanitary survey field observation forms. In addition to visual observations, spot samples were collected from any suspected source of bacteria in the drainage that had the potential to be transported to the creek (e.g., water in gutters from irrigation, car washing, etc.). The location, date/time, and a description of the sample was recorded on the field observation forms.

Samples were collected following protocols described in Subsection 2.1.1.1 for analysis by culture techniques and Subsection 2.1.1.2 for analysis by molecular techniques.

2.3 Special Study – Water and Sediment Characterization

As part of the adaptive study design described in Chapter 1.0, special studies were conducted to address the extent to which streambed sediment, soil from the streambank and riparian area of the creek, and water sources from outside of the creek receiving waters influenced *E. coli* levels in Keene Creek and Tischer Creek receiving waters. Within each of the two study areas, the two most impacted stream reaches (identified by monitoring results and urban landuse) were characterized and compared to a site

with the least urban influence (referred to as a reference site for comparative purposes). The characterization consisted of physical, chemical, and biological parameters for both water and sediment in the three reaches of each Study Area.

2.3.1 Field Methods

The sampling locations for the sediment special study in the Keene Creek and Tischer Creek Study Areas along with the water and sediment collection procedure are discussed in this Subsection.

2.3.1.1 Keene Creek Monitoring Sites

For Keene Creek, two sites (KC-MS-1 and KC-MS-2) were determined to have the greatest *E. coli* concentrations and greatest number of potential *E. coli* sources (due primarily to urbanization) (see Figure 2-1). Samples were collected from three locations within each of the two reaches (MS-1 reach and MS-2 reach): at the bottom (designated as sample A), middle (sample B), and top (sample C) of each reach. In addition, three similar samples were collected from the reach above Site KC-MS-7, which has very little urban influence and is referred to here as a relative "reference" site to compare to the urbanized reaches of KC-MS-1 and KC-MS-2.

At each location within a reach (A, B, and C of each of the three reaches), a single composite sample (consisting of three randomly selected areas for a given location) was collected for sediment analysis. Thus, each reach was characterized by three samples, represented as A, B, and C. An analogous sampling regimen was used to collect water samples from the creek. These samples were considered to be "sinks", for which sources in the watershed and creek were identified and assessed. The site names given to the sinks for Keene Creek are identified in Table 2-5 for the three reaches assessed.

Table 2-5: Keene Creek Special Study Monitoring Sites

Site Name	
Sediment	**Water**
KC-MS-1-Sed-A	KC-MS-1-Wat-A
KC-MS-1-Sed-B	KC-MS-1-Wat-B
KC-MS-1-Sed-C	KC-MS-1-Wat-C
KC-MS-2-Sed-A	KC-MS-2-Wat-A
KC-MS-2-Sed-B	KC-MS-2-Wat-B
KC-MS-2-Sed-C	KC-MS-2-Wat-C
KC-MS-7-Sed-A	KC-MS-7-Wat-A
KC-MS-7-Sed-B	KC-MS-7-Wat-B
KC-MS-7-Sed-C	KC-MS-7-Wat-C

In addition to the samples collected above identified as sinks, several potential sources throughout the Study Area were identified. These sources included sediment at storm drain outfalls or from organically rich wetlands or bogs either in the creek or adjacent to it, soil in the streambank and riparian areas adjacent to the creek, and water from numerous potential sources identified in the Sanitary Survey, such as wetlands, bioswales, ponded water (e.g., in catch basins with accumulate organic debris and other sources), and storm drain effluent. Composited samples consisting of three randomly-selected areas within each potential source were collected and analyzed for physical, chemical, and biological parameters, similar to those conducted for sinks. Fecal samples were also collected as potential sources from goose waste, dog waste, and human sewage.

2.3.1.2 Tischer Creek Monitoring Sites

In Tischer Creek, samples were collected in the same way as described above for Keene Creek above, but were collected from reaches associated with mainstem Site TC-MS-5 and tributary Site TC-T-2, which represented the impacted sites (based on monitoring results and landuse), as well as Site TC-T-2-Up in Hartley Park, which represented the reference site (see map on Figure 2-2). The site names given to the sinks for Tischer Creek are identified in Table 2-5 for the three reaches assessed.

Table 2-6: Tischer Creek Special Study Monitoring Sites

Site Name	
Sediment	**Water**
TC-MS-5-Sed-A	TC-MS-5-Wat-A
TC-MS-5-Sed-B	TC-MS-5-Wat-B
TC-MS-5-Sed-C	TC-MS-5-Wat-C
TC-T-2-Sed-A	TC-T-2-Wat-A
TC-T-2-Sed-B	TC-T-2-Wat-B
TC-T-2-Sed-C	TC-T-2-Wat-C
TC-T-2-Up-Sed-A	TC-T-2-Up-Wat-A
TC-T-2-Up-Sed-B	TC-T-2-Up-Wat-B
TC-T-2-Up-Sed-C	TC-T-2-Up-Wat-C

Potential source samples were also collected within the Tischer Creek Study Area, as discussed above for Keene Creek.

2.3.1.3 Sample Collection

In order to characterize the chemical, physical, and biological conditions within each reach that may contribute to elevated *E. coli* concentrations, samples were collected for analyses of water quality,

sediment quality, and biological community parameters (both water and sediment). Water samples were collected from potential source and sink sites using the methods discussed in Subsection 2.1.3. Water samples for *E. coli* (culture) analysis and chemical analyses were delivered to the Pace Laboratory in Duluth. Water samples for microbial community analyses (MCA; see below) were delivered to the UMN.

A series of sediment and soil samples were collected at each site identified in Table 2-5 and Table 2-6 (as well as potential sediment sinks, such as wetlands). At each site, a series of streambed sediment and soil samples were collected from three discrete zones, defined as follows:

1. Streambed sediment – the bottom of the streambed as close to the thalweg as possible
2. Streambank soil – the unvegetated soil bank above the high-water mark of the creek
3. Riparian soil – the vegetated riparian area above the streambank

Three discrete samples were collected and composited from each zone for analysis of a suite of chemical constituents, grain size, *E. coli* (culture), and MCA. Samples were collected with a sterile, plastic scoop. Sediment and soil samples for chemical analyses were placed in pre-labelled glass jars with Teflon lids (supplied by Pace Laboratory), samples for grain size and MCA were placed in pre-labelled sterile plastic bags, and samples for *E. coli* (culture) were placed in pre-labelled sterile 100-ml plastic bottles (same bottles used for water sampling). The top one to two centimeters of sediment and soil was collected at each site with the sterile plastic scoop and placed in the appropriate containers for each analysis.

All samples were placed on ice in coolers and transported to the laboratory following COC procedures discussed in Section 2.4. Sediment and soil samples for *E. coli* (culture) analysis, chemical analyses, and grain size analysis were delivered to the Pace Laboratory in Duluth. Sediment and soil samples for MCA were delivered to the UMN.

2.3.2 Laboratory Methods

The laboratory methods used to analyze the samples collected as part of the Special Study are discussed in this Subsection.

2.3.2.1 Water and Sediment Chemistry

Samples were collected and analyzed for a suite of water quality constituents: Total Kjeldahl Nitrogen (TKN), nitrate plus nitrite (listed as NO_3), total phosphorus (TP), total organic carbon (TOC), total suspended solids (TSS), and *E. coli*. Sediment and soil samples were analyzed for the same constituents, except TSS. The analytical parameters for water and sediment and soil samples are described in Table 2-7.

Table 2-7: Chemical Analyte and Corresponding Analytical Parameters for Water and Sediment and Soil Samples

Analyte	Method	Units[a]	Reporting Limit	Method	Units[a]	Reporting Limit
	Water			Sediment and Soil		
TKN	EPA 351.2 rev2	mg/L	0.50	EPA 351.2	mg/kg	78
NO_3	EPA 353.2 rev2	mg/L	0.02	EPA 353.2	mg/kg	0.34
TP	EPA 365.3	mg/L	0.05	EPA 365.1	mg/kg	4.0
TOC	SM 5310C	mg/L	1.0	EPA 9060	mg/kg	2220
TSS	USGS I-3765-85	mg/L	10.0	NA[b]	NA	NA
E. coli	IDEXX Colilert-18	MPN/ 100 mL	1.0	SM 9221B	MPN/ 100 g	NA
Percent Moisture	NA	NA	NA	ASTM D 2974-87	%	0.1

(a) MPN – Most Probable Number, mg/L – milligrams per Liter, mg/kg – milligrams per kilogram
(b) NA – Not Applicable

Grain size analyses of sediment and soil samples were conducted using Method ASTM D 6913. Data were reported as percent gravel (coarse and fine), percent sand (coarse, medium, and fine), and percent fines (silt and clay).

2.3.2.2 Microbial Community Analysis

Water, sediment and fecal samples were processed for MCA at the UMN using the following methods. Water samples were filtered through 0.22-µm-pore size mixed cellulose esters filters, whereas fecal slurries and effluent samples were pelleted. Filters, sediment, and fecal/effluent pellets were stored at -20º C prior to DNA extraction. The DNeasy PowerSoil Pro Kit (Qiagen; Hilden, Germany) was used to extract DNA from water filters, added directly to PowerBead tubes, or 0.25 grams of sediment/ fecal pellets according to the manufacturer's instructions. The V4 hypervariable region of the 16S rRNA gene was amplified using the 515F/806R primer set (Caporaso et al., 2012). Illumina (San Diego, CA) sequencing adapters and indices were then added using the dual index method (Gohl et al., 2016). Sterile water negative controls were carried through amplification and sequencing. Samples were paired-end sequenced at a read length of 300 nucleotides on the Illumina MiSeq platform.

Sequence processing was performed using QIIME v. 1.8.0 (Caporaso et al. 2010b). Raw data, as fastq files, were trimmed to 250 nucleotides to remove lower-quality regions (< Q30) using Trimmomatic v. 3.2 (Bolger et al. 2014) and paired-end joined using the fastq-join script (Aronesty, 2013). Chimeras were identified and removed using UCHIME v. 6.1 (Edgar et al. 2011). Taxonomy was assigned version 14

release from the Ribosomal Database Project at a bootstrap confidence cutoff of 80% (Cole et al., 2009). Operational taxonomic units (OTUs) were clustered at 97 percent similarity using UCLUST, and taxonomic assignments were made against the SILVA v.132 16S rRNA gene database using PyNast (Caporaso et al. 2010a; Edgar 2010; Quast et al. 2013). For comparisons among samples (Gihring et al., 2012), the numbers of sequence reads per sample were rarefied by random subsample to 20,000 reads per sample.

Alpha diversity (species richness with a sample) measures were calculated using observed species, and Shannon H indices. Bray-Curtis dissimilarity matrices were used for principal coordinates analysis and to assess differences in beta diversity (number of species that are not the same between samples) by analysis of similarity. Canonical correspondence analysis (CCA) was performed to determine which parameter best explained the variation in microbial community structure within water and sediment samples. All statistics were evaluated at $\alpha = 0.05$, unless corrected for multiple comparisons as noted.

The amount of source contribution was determined using default parameters of SourceTracker software version 0.9.8 (Knights et al., 2011). This software employs an iterative Bayesian approach to determine which OTUs in sink communities are attributable to those in source communities. The fraction of reads that cannot be assigned to a source at a significance threshold of $\alpha = 0.001$ is assigned to an "unknown" category.

2.4 Chain of Custody Procedures

COC procedures were used for all samples throughout the collection, transport, and analytical process. Samples were considered to be in custody if they were: (1) in the custodian's possession or view, (2) retained in a secured place (under lock) with restricted access, or (3) placed in a container and secured with an official seal such that the sample could not be reached without breaking the seal.

COC procedures were initiated during sample collection. A COC record was provided with each sample or group of samples. Each person who had custody of the samples signed the form and confirmed the samples were not left unattended unless properly secured. Documentation of sample handling and custody includes the following:

- Sample identifier
- Sample collection date and time
- Any special notations on sample characteristics or analysis
- Initials of the person collecting the sample
- Date the sample was sent to the analytical laboratory

Completed COC forms were placed in a plastic envelope and kept inside the container containing the samples. Once delivered to the analytical laboratory, the COC form was signed by the laboratory personnel receiving the samples. The condition of the samples was noted and recorded by the receiver.

2.5 Quality Assurance / Quality Control

For culture analyses, field blanks were collected at a rate of one sample per sampling event. Field blanks were used to verify that no contamination originating from the collection, transport, or storage of environmental samples occurred. For molecular analyses, at least one sterile field blank was collected by each sampling field technician during each sampling event. Once in the laboratory, care was taken to avoid contamination during sample processing. Surfaces and instruments were first cleaned with ethanol and DNA *AWAY*™. The outsides of the sample bottles were wiped down with DNA *AWAY*™ and dried with Kimwipes® prior to being brought to the filtration area.

Laboratory controls included the following: (1) laboratory blanks, (2) no-template controls, (3) positive controls, and (4) inhibition controls. In addition to field blanks, a laboratory blank was processed for every set of molecular samples. Laboratory blanks were filtered similarly to samples, except that molecular-grade water was substituted for the water sample. No-template controls (two to three per plate) consisted of PCR reactions set up with molecular-grade water replacing sample DNA. Positive controls consisted of plasmid or genomic DNA.

Samples were tested for inhibition using a matrix spike consisting of *B. dorei* DNA added to HF183 Taqman PCR reactions that contained extracted sample DNA (not crude lysate) at full strength (1:1) and extract diluted 1:10 by molecular-grade water. Sample DNA was considered inhibited if the Ct between the undiluted and diluted extracts differed by more than 1.5 cycles. For samples analyzed by only the HF183 Taqman assay, each sample was accompanied by a matrix spike. If results had indicated inhibition, the sample DNA would have been diluted 1:5 and re-analyzed. No inhibition was observed for the samples analyzed during this study.

A field or laboratory blank or no-template control found positive by PCR analysis would have invalidated the samples for that PCR set. No field or laboratory blanks tested positive by PCR during the entire course of this study. Lack of amplification of a positive control would have invalidated the PCR run, and the samples would have been analyzed again. No positive controls failed to amplify for the entire study.

3.0 RESULTS

3.1 Keene Creek Dry Weather Assessment

The results of the Keene Creek dry weather assessment are described in this Section.

3.1.1 Baseline Monitoring

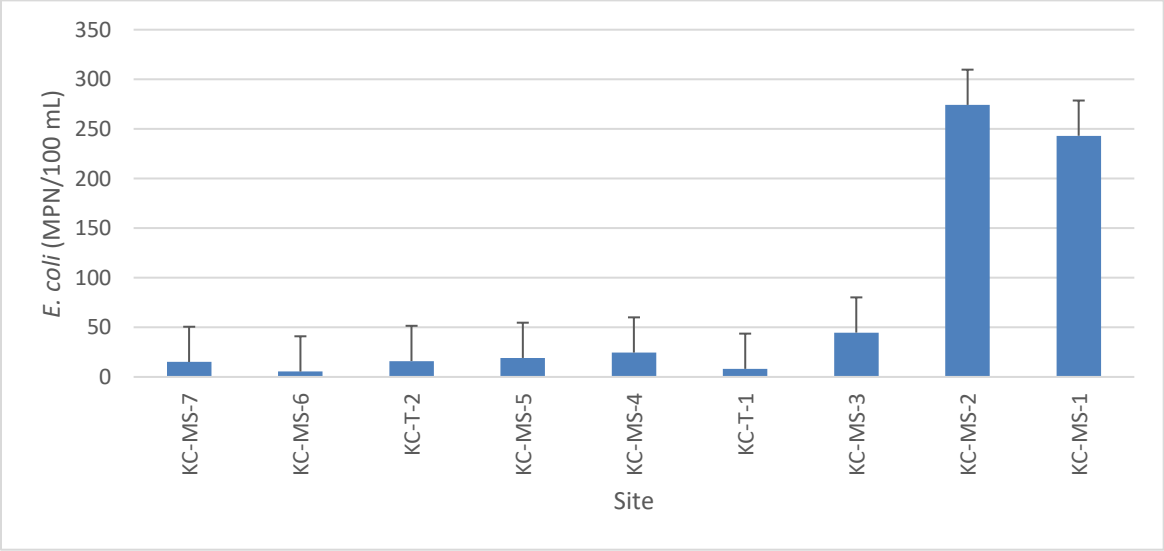
The baseline monitoring results for *E. coli* and molecular markers are presented below.

3.1.1.1 *E. coli* Concentrations

A total of 56 dry weather samples (at least 48 hours after the last rain event) were collected and analyzed for *E. coli* from Keene Creek during the baseline monitoring. Samples were collected and analyzed from seven mainstem monitoring sites (KC-MS-1 through KC-MS-7) and two tributary sites (sites KC-T1 and KC-T2) over seven monitoring events from August 22 to September 26, 2019 (not all sites were monitored during all events). Spatial patterns of *E. coli* concentrations among the Keene Creek baseline monitoring sites are depicted as geometric mean concentrations plus one standard error (SE) on Figure 3-1.

Mean concentrations from samples collected over the course of the dry weather monitoring varied little and were low between Sites KC-MS-7 (upper-most portion of the Study Area) and KC-MS-3 (Keene Creek Dog Park). All individual samples except one were less than 100 MPN/100 mL at these sites and the geometric means were less than 50 MPN/100 mL. In contrast, geometric mean concentrations were much greater at the two sites at the bottom of the Keene Creek Study Area at Sites KC-MS-2 and KC-MS-1, which had geometric mean concentrations of 274.2 and 243.1 MPN/100 mL, respectively.

Figure 3-1: *E. coli* Geometric Mean Concentrations (+1 SE) at Keene Creek Monitoring Sites



3.1.1.2 Molecular Markers

The results of the samples collected for molecular analyses during the Keene Creek baseline monitoring are summarized in Table 3-1. A total of 27 samples were collected over the course of three sampling events (September 24, September 26, and October 8) for molecular analyses from the three baseline monitoring sites with the greatest *E. coli* concentrations (MS-1, MS-2, and MS-3). All samples were analyzed for the three molecular markers (bird, dog, and human). Among the samples collected, two were positive for the bird marker (22.2 percent), none were positive for the dog marker (including samples collected from the Keene Creek Dog Park), and three were positive for the human marker (33.3 percent). All positive samples were collected during the October 8 monitoring event. All blank samples collected during the monitoring were negative for all three markers.

Table 3-1: Keene Creek Baseline Monitoring Results for Molecular Markers

Marker	Sample ID	Date Sampled	Sample Result	Percent Positive
Bird	MS-1	09/24/19	No	22.2%
	MS-2		No	
	MS-3		No	
	MS-1	09/26/19	No	
	MS-2		No	
	MS-3		No	
	MS-1	10/08/19	No	
	MS-2		**Yes**	
	MS-3		**Yes**	
Dog	MS-1	09/24/19	No	0.0%
	MS-2		No	
	MS-3		No	
	MS-1	09/26/19	No	
	MS-2		No	
	MS-3		No	
	MS-1	10/08/19	No	
	MS-2		No	
	MS-3		No	
Human	MS-1	09/24/19	No	33.3%
	MS-2		No	
	MS-3		No	
	MS-1	09/26/19	No	
	MS-2		No	
	MS-3		No	
	MS-1	10/08/19	**Yes**	
	MS-2		**Yes**	
	MS-3		**Yes**	

3.1.2 Sanitary Surveys

Sanitary surveys were conducted over the entire Keene Creek Study Area from September 16 through 19, 2019. Each drainage area corresponding to the seven mainstem sites and two tributary sites were assessed through visual observations and photo-documentation as well as "spot samples" collected from suspected sources of *E. coli* in the drainage. Survey methods are described in Subsection 2.2.1 and the results are presented below.

3.1.2.1 Observations

The results of the sanitary surveys are summarized in Table 3-2 with select photos provided in Figure 3-2. There was no evidence of bacterial sources originating from the municipal sanitary system. The field team did not observe evidence of leaky sewer pipes, illicit connections to the MS4, septic systems/leach fields, or any other evidence of leaking sanitary systems that could convey *E. coli* from human origin to the creek receiving waters. There was some evidence of a potential homeless encampment in the trees adjacent to the left bank of Keene Creek (middle of the MS-2 reach) at South 58th Avenue West. However, there were no people observed in the area and no evidence of human feces were observed at this site or anywhere else throughout the Study Area.

One car washing episode was observed in the alley off Raleigh Street, west of South 59th Avenue West (adjacent to the local school). The field team observed the discharge from the back of a garage as the person washing the car had just finished. Wash water flowed down the dirt alley carrying sediment with it to Raleigh Street in front of the school and then flowed to the creek via gutters on South 59th Avenue West. The discharge path was well-worn, suggesting that the cleaning may be a frequent occurrence (a similar flow can also be seen on Google Earth).

Decaying plant material in the catch basin inlets was a frequent observation in reaches MS-1 and MS-2 of Keene Creek. Leaf litter and sediment clogged catch basin inlets were observed where Keene crosses South Central Avenue, South 57th Avenue West, and South 59th Avenue West. Flow from these catch basins discharges directly to the creek. Similar observations of excessive street debris were noted at Waseca Industrial Road (near South Central Avenue, reach MS-1), the end of South 56th Avenue (right bank, reach MS-2), and North 61st Avenue West and Roosevelt Street (reach MS-4).

Relatively few sightings of dogs (on leash or otherwise) were observed in the Study Area. Dogs on leash were observed at Irving Park soccer field at South 57th Avenue West and in the neighborhood north of Site MS-4 along Green Street. No dog waste was observed anywhere in the Study Area except at the Keene Creek Dog Park. Numerous dogs were observed at the park and dog waste was observed in the

grassy area of the park on separate locations, but there did not appear to be an obvious flow path to the creek. A smaller buffer strip of unmown grass and vegetation was observed along the right bank of the creek adjacent to the dog park, which may prevent flow from the park from reaching the receiving waters. The vast majority of the waste was properly disposed of in trash cans and doggie bags located inside the fenced-in off-leash area. A small tributary with ephemeral flow (Tributary T-1) runs adjacent to the northwest side of the dog park. It was not flowing the last two weeks of August 2019 and the first week of September, with minor flow after that. A vegetated buffer strip also lines the right bank of the stream (similar to the mainstem), which should help prevent sheet flow from transporting *E. coli* from dog waste to the Keene Creek receiving waters.

A variety of songbirds and crows were observed in the Study Area, but sightings were relatively minimal. A population of Canadian geese was observed consistently at Irving Park (MS-2 reach) and large amounts of goose waste were observed in the soccer field and adjacent park area. There is a small detention basin to the west of the soccer field with a catch basin inlet for overflow water and goose waste was observed in and around the basin. There is a also a small catch basin inlet on the south side of the soccer field. It is unclear how these catch basins drain to Keene Creek, but there is a small six-inch PVC line directly on the other side of the riparian buffer from the southern catch basin that discharges directly to the creek. Minimal flow was emanating from the pipe during the sanitary survey (and subsequent observations) and the storm drain appeared to be flooded. The drain may be partially clogged, but when flowing, would represent a pathway for *E. coli* associated with the goose waste from the soccer field, park, and detention basin to enter Keene Creek. Approximately 300 feet downstream from this discharge is another six-inch blue PVC pipe that appears to also originate from the soccer field. The pipe was not flowing during any of the observation days and no catch basin inlet could be found in the soccer field or adjacent area. No other wildlife (including other birds) were observed in large numbers anywhere in the Study Area.

There were several other potential sources of *E. coli* identified in the Keene Creek Study Area, as discussed below:

- **Paper mill tributary (MS-1 reach) –** A tributary originating from the paper mill property that lies to the north of the mouth of Keene Creek discharges to the creek (left bank) approximately 100 feet above the historical MS-1 monitoring site (S004-968). Water quality appeared to be very poor in this discharge water, which had a thick, oily sheen on the surface and very loose, anoxic streambed sediments.

- **Wetland discharge (MS-1 reach) –** Approximately 350 feet upstream of Site S004-968, is an outfall on the left bank of Keene Creek that drains water from a wetland on the opposite side of the bike path that parallels the creek. The wetland contained large amounts of ponded water with decaying organic debris and degraded habitat that can serve as a source of *E. coli* via bacterial regrowth. The outfall had a minor but persistent flow from the wetland to the creek during the sanitary survey.

- **Non-MS4 storm drain outfalls (MS-1 reach) –** Approximately 550 feet upstream of Site S004-968 are two PVC outfalls (approximately 12-inch diameter) that discharge to the right bank of Keene Creek. The pipes originate from the back side of a warehouse at 117 South Central Avenue, but were not flowing during the sanitary survey or during other dry weather observations.

- **Erosion at wooden stairs (MS-2 reach) –** At the end of South 56th Avenue West on the right bank of Keene Creek are a set of wooden stairs that lead from the end of the street to the streambank. A stormdrain outfall that drains the street and discharges adjacent to the stairs has produced severe erosion in the streambank. This can act as a source of *E. coli* to the creek (due to naturalized *E. coli* in the soil and attachment of bacteria to sediment particles), particularly during storm events.

- **Wetland discharge (MS-2 reach) –** On the left bank of the creek where it crosses South 57th Avenue West, lies a wetland that contains large amounts of ponded water with decaying organic debris and degraded habitat that can serve as a source of *E. coli* via bacterial regrowth. Ponded water with large amounts of organic debris were also observed in the gutter of South 57th Avenue West that was flowing into the wetland. It is unclear how this wetland drains to the creek (no outfall could be found), but the wetland is a potential source of *E. coli* to the creek that may be considered for further investigation.

- **Degraded habitat (MS-2 reach) –** The lower portion of reach MS-2 (from South 57th Avenue West to South 59th Avenue West) is severely degraded. This portion of the reach flows directly under two transmission line towers whose foundation impede flow and trap sediment. The streambanks are severely eroded in several places and decaying vegetation has filled the stream. Several storm drain outfalls discharge directly to this part of the MS-2 reach and it is characterized by fine-grained sediment in the streambed, sluggish flow, and very turbid water.

- **Severe erosion (MS-2 reach) –** At the top of reach MS-2, just downstream of Grand Avenue is an abandoned railroad line. The area where the railroad crosses Keene Creek is characterized by severe erosion on the upstream side of the crossing (Particularly the left bank) and decaying vegetation has filled the stream in several areas.

Keene Creek above Site MS-4 (upstream of U.S. Route 2), including tributary T-2, has a steeper gradient, stable, vegetated banks, and much less urban land use than reaches below Site MS-4. There was only one obvious source of *E. coli* observed in the Study Area upstream of Site MS-4. Just upstream of Site MS-6, Keene Creek crosses under Highland Street (State Route 89), which is supported by a large bridge. The area under the bridge is large (due to the depth of the ravine formed by the creek) and the bridge girders are exposed. Very large amounts of bird droppings were found on the rocks and bike path under the bridge presumably from birds roosting on the bridge girders. The bird waste covered the bank of the creek, which was composed of rip rap and concrete. Concentrations of *E. coli* during dry weather monitoring at Site MS-6 (just 100 feet downstream from the bridge) were very low throughout the baseline monitoring period, suggesting that the fecal matter under the bridge is an unlikely source of *E. coli* to Keene Creek during dry weather conditions.

Table 3-2: Potential Bacterial Sources Identified in the Sanitary Survey Investigation of the Keene Creek Study Area

General Category	Potential Source/Activity	Observation
Municipal Sanitary Infrastructure (piped)	Sanitary sewer overflows	Not observed
	Combined sewer overflows (CSOs); regulated under NPDES/LTCP	Not observed
	Leaky sewer pipes (Exfiltration)	Not observed
	Illicit sanitary connections to MS4	Not observed
	Wastewater Treatment Plans regulated under NPDES	Not observed
	Leaky or failing septic systems	Not observed
MS4 Infrastructure	Illegal dumping	Not observed
	Biofilms/regrowth	Observed at mainstem sites and at tributary sites T-2 and T-4
	Decaying plant matter, litter and sediment in the storm drain system	Observed throughout the Study Area in street gutters at multiple locations
Other Human Sanitary Sources (some also attract urban wildlife)	Homeless encampments	Signs of potential homeless at MS-2 and South 58th Avenue West (left bank)
	Temporary toilets (e.g., Porta-Potties)	Observed at Irving Park soccer field east of South 57th Avenue West (good condition)
	Dumpsters (e.g., diapers, pet waste, urban wildlife)	Dumpsters were observed in mixed use areas, but all were well-maintained
	Trash cans	Trash cans were observed throughout the Study area, particularly at parks, but all were well maintained including those at the Keene Creek Dog Park
	Garbage trucks	Not observed on days when sanitary surveys were conducted
	Other wildlife attracted to human sources (deer, coyotes, feral cats, etc.)	No other wildlife was observed in the Study Area attracted to human sanitary sources
Other Urban Sources (including areas that attract vectors)	Food processing facilities	Not observed, but a tributary from the paper plant was observed to be flowing to the mainstem just upstream of Site MS-1 (left bank). The surface water was discolored and appeared to have a thick sheen on the surface of the water.
	Outdoor dining	Not observed
	Restaurant grease bins	Not observed

General Category	Potential Source/Activity	Observation
	Bars/stairwells (wash-down areas)	Not observed
Urban Non-stormwater Discharges (potentially mobilizing surface-deposited bacteria)	Power washing	Not observed
	Excessive irrigation/overspray	Not observed
	Car washing	One car washing episode was observed in the alley off Raleigh Street, west of South 59th Avenue West. The discharge led directly to the right bank of the creek via street runoff. Appears to be a frequent occurrence.
	Pools/hot tubs	Not observed
	Reclaimed water/graywater (if not properly managed)	Not observed
Domestic Pets	Dogs, cats, etc.	Dog waste was observed at the Keene Creek Dog Park, but there was no evidence of runoff to the creek. No dog waste was observed elsewhere in the Study Area and dog walking was minimal.
Urban Wildlife (naturally occurring and human attracted)	Rodents/vectors (rats, raccoons, squirrels, rabbits, opossums)	Minimal evidence of urban wildlife and no feces from these animals were observed. No evidence of rats, raccoons, or opossums was observed.
	Birds (geese, ducks, gulls, crows, pigeons, songbirds, etc.)	A variety of songbirds and crows were observed in the Study Area, but relatively minimal. A population of Canadian geese and goose waste were observed at Irving Park soccer field. Two small drains in the field discharge directly to the creek.
Recreational Sources	Bathers and/or boaters	Not observed
	RVs (mobile)	Not observed
Open Space/ Forested Areas	Wildlife populations	Other than birds, no other wildlife observed
	Grazing	Not observed
Other Sources	Plants/algae, soil (naturalized *E. coli*)	Severe erosion at stairs at the end of South 58th Avenue West (right bank), throughout reach MS-2, and downstream of Grand Avenue at the railroad crossing. Very degraded habitat throughout reach MS-2.

Source: Modified from Armand Ruby Consulting (2011)

Figure 3-2: Photographs of Potential Bacterial Sources Observed During Sanitary Surveys of the Keene Creek Study Area

Inlet from paper plant at MS-1

Inlet from wetland at MS-1

Clogged catch basin at MS-1

Geese in Irving Park at top of MS-1

Catch basin at soccer field

Clogged inlet at MS-2

Degraded habitat at MS-2

Bank erosion at top of MS-2

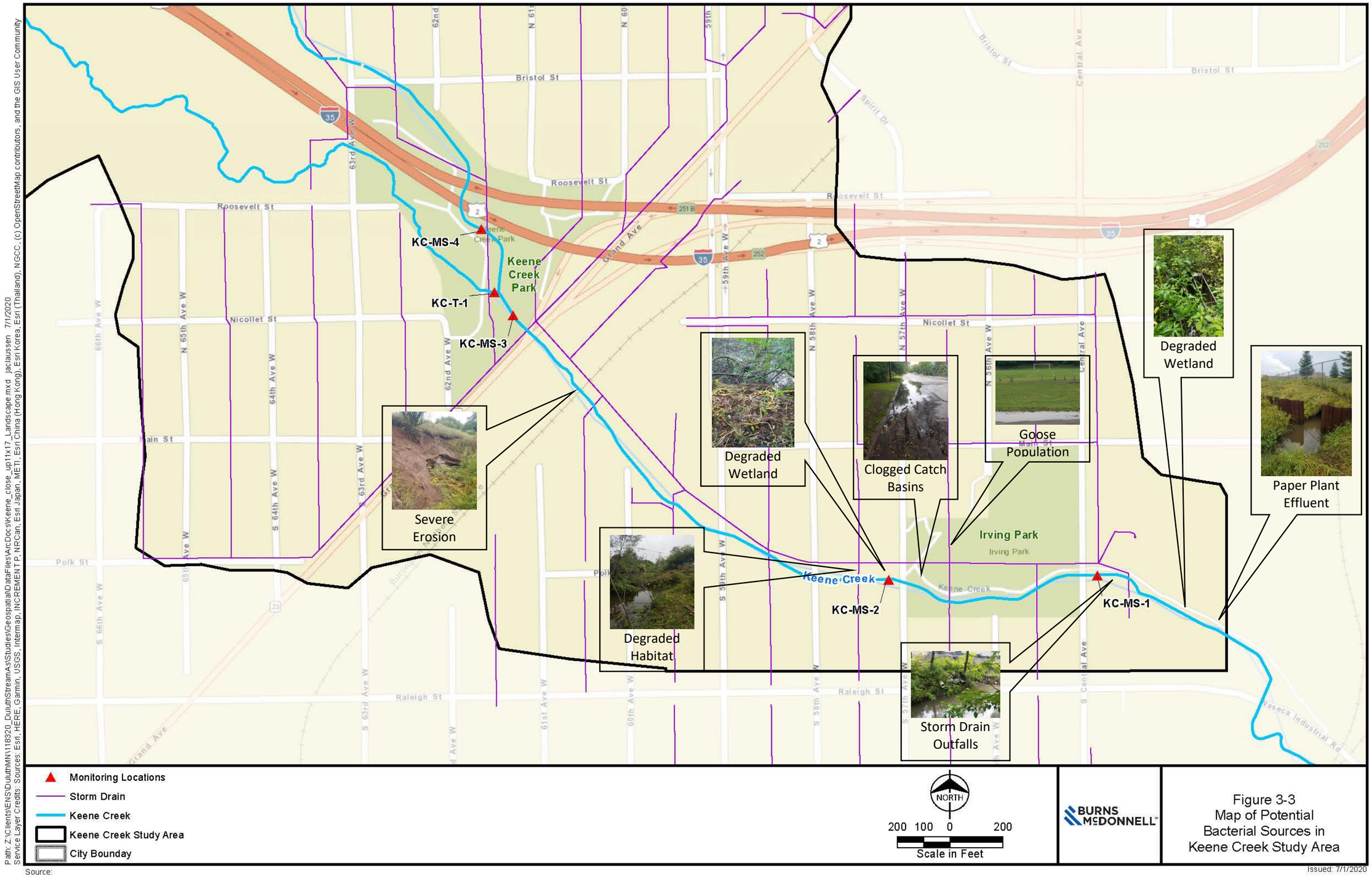
3.1.2.2 *E. coli* Concentrations

In addition to the visual observations conducted during the sanitary survey investigation, a limited number of spot samples were collected from various sources within the Study Area. All samples were collected on September 18, 2019. The results are summarized in Table 3-3. The greatest concentrations among the spot samples were collected from catch basins in the streets either adjacent to or directly on top of Keene Creek and ponded water in Irving Park. These sites were often clogged with sediment, leaf litter, and other debris and contained ponded or slowly draining water that flowed directly to the surface waters of Keene Creek. Lower concentrations were observed from the wetland on the left bank of the MS-1 reach and the outfall from the warehouse off Central at the outfall from the warehouse on South Central Avenue.

Table 3-3: *E. coli* results from the Keene Creek Sanitary Survey Investigation

Sample ID	*E. coli* (MPN/100 mL)	Reach	Site Description
KC-MS-1-A	687	MS-1, Left Bank	Paper mill tributary upstream of Waseca Industrial Road
KC-MS-1-B	190	MS-1, Left Bank	Ponded water from wetland just upstream of paper mill tributary
KC-MS-1-C	7	MS-1, Left Bank	Outfall to Keene Creek from wetland upstream of paper mill tributary
KC-MS-1-D	> 2,420	MS-1, Midstream	South Central Avenue – catch basin above creek
KC-MS-1-E	35	MS-1, Right Bank	PVC outfall, off South Central Avenue behind Moline warehouse
KC-MS-2-B	> 2,420	MS-1, Left Bank	Ponded water in Irving Park soccer field
KC-MS-2-C	> 2,420	MS-1, Left Bank	Detention basin in park to west of soccer field
KC-MS-2-D	2,420	MS-1, Right Bank	South 56th Avenue West – storm drain outfall near bank erosion at stairs
KC-MS-2-A	> 2,420	MS-2, Left Bank	57th Avenue West – catch basin adjacent to creek

A map of the potential sources of *E. coli* identified in the Keene Creek Study Area is shown on Figure 3-3.


KC-MS-4
KC-T-1
KC-MS-3
KC-MS-2
KC-MS-1
Keene Creek Park
Irving Park
Keene Creek
Bristol St
Roosevelt St
Nicollet St
Raleigh St
Polk St
Main St
Grand Ave
Spirit Dr
Central Ave
Degraded Wetland
Clogged Catch Basins
Goose Population
Degraded Wetland
Paper Plant Effluent
Severe Erosion
Degraded Habitat
Storm Drain Outfalls
Monitoring Locations
Storm Drain
Keene Creek
Keene Creek Study Area
City Bounday
NORTH
200 100 0 200
Scale in Feet
BURNS McDONNELL
Figure 3-3
Map of Potential Bacterial Sources in Keene Creek Study Area
Issued: 7/1/2020
Source:
Path: Z:\Clients\ENS\Duluth\MN\118320_Duluth\StreamAssStudies\GeospatialDataFiles\ArcDocs\Keene_close_up11x17_Landscape.mxd jaclaussen 7/1/2020
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

3.1.3 Special Study – Water and Sediment Characterization

Using the adaptive approach discussed in Chapter 1.0, a special study was designed that was based on the results of the baseline monitoring and sanitary survey. For Keene Creek, two sites (KC-MS-1 and KC-MS-2) were determined to have the greatest *E. coli* concentrations and greatest number of potential sources (due primarily to urbanization). Samples were collected from three locations within each of the two reaches (MS-1 reach and MS-2 reach): at the bottom (designated as sample A), middle (sample B), and top (sample C) of each reach. In addition, three similar samples were collected from the reach above Site 7, which has very little urban influence and is referred to here as a relative "reference" site to compare to the urbanized reaches of MS-1 and MS-2. In order to characterize the chemical, physical, and biological conditions within each reach that may contribute to elevated *E. coli* concentrations, samples were collected for analyses of water quality, sediment quality, and biological community parameters (both water and sediment). The results of the Water and Sediment Characterization Special Study are presented below.

3.1.3.1 Water Chemistry

The results of the Keene Creek Water Characterization Special Study are presented in Table 3-4. Samples were collected and analyzed for a suite of water quality constituents: Total Kjeldahl Nitrogen (TKN), nitrate plus nitrite (listed as NO_3), total phosphorus (TP), total organic carbon (TOC), total suspended solids (TSS) and *E. coli*. Mean values are arithmetic means for chemical constituents and geometric means for *E. coli.*

Table 3-4: Keene Creek Water Characterization Results

Site	TKN (mg/L)	NO_3 (mg/L)	TP (mg/L)	TOC (mg/L)	TSS (mg/L)	*E. coli* (MPN/100 mL)
KC-MS-1-Wat-A	1.60	0.00	0.17	12.0	70.6	1,160
KC-MS-1-Wat-B	0.81	0.03	0.16	11.2	69.8	52
KC-MS-1-Wat-C	0.82	0.02	0.08	11.9	58.0	285
Mean:	**1.08**	**0.02**	**0.14**	**11.7**	**66.1**	**499.0**
KC-MS-2-Wat-A	1.50	0.10	0.56	11.4	44.6	119
KC-MS-2-Wat-B	0.64	0.06	0.17	14.3	28.4	41
KC-MS-2-Wat-C	0.50	0.06	0.08	11.4	214.0	185
Mean:	**0.88**	**0.07**	**0.27**	**12.4**	**95.7**	**115.0**
KC-MS-7-Wat-A	0.51	0.06	0.02	12.3	26.6	16
KC-MS-7-Wat-B	0.54	0.04	0.04	12.4	5.0	18
KC-MS-7-Wat-C	0.59	0.06	0.02	13.1	13.5	17
Mean:	**0.55**	**0.05**	**0.03**	**12.6**	**15.0**	**16.9**

Mean TKN, TP, and TSS in Keene Creek surface waters were lower at the reference site (MS-7) than the urbanized sites (MS-1 and MS-2) while NO_3 and TOC concentrations were similar among all sites. Mean concentrations of *E. coli* were seven to thirty times lower at the reference site (MS-7) than mean concentrations at sites MS-2 and MS-1, respectively.

3.1.3.2 Sediment Chemistry

The results of the Keene Creek Sediment Characterization Special Study are presented in Table 3-5. The chemistry patterns in sediment did not reflect those observed in the water samples. Mean concentrations of TKN, TP, and TOC were lowest in sediment at Site MS-1. Concentrations of NO_3 were below detection limit in all samples except one sample at KC-MS-1-Sed-C, which had a concentration of 0.41 mg/kg. Sediment concentrations of *E. coli* were lowest at the T-2-Up reference site with geometric mean concentrations two to seven times lower than those at the urbanized sites.

Table 3-5: Keene Creek Sediment Characterization Results

Site	TKN (mg/kg)	NO_3 (mg/kg)	TP (mg/kg)	TOC (mg/kg)	*E. coli* (MPN/100 g)
KC-MS-1-Sed-A	84.1	ND	156.0	3,140	2,800
KC-MS-1-Sed-B	88.9	ND	164.0	2,600	7,100
KC-MS-1-Sed-C	134.0	0.41	172.0	6,400	13,000
Mean:	**102.3**	**0.41**	**164.0**	**4,047**	**7,633**
KC-MS-2-Sed-A	837.0	ND	219.0	15,000	3,300
KC-MS-2-Sed-B	139.0	ND	181.0	4,230	12,000
KC-MS-2-Sed-C	226.0	ND	169.0	8,330	26,000
Mean:	**400.7**	**ND**	**189.7**	**9,187**	**13,766**
KC-MS-7-Sed-A	315.0	ND	227.0	5,880	6,400
KC-MS-7-Sed-B	235.0	ND	148.0	5,250	2,100
KC-MS-7-Sed-C	328.0	ND	187.0	7,110	3,100
Mean:	**292.7**	**ND**	**187.3**	**6,080**	**3,866**

Results are reported on a dry weight basis, adjusted for percent moisture, sample size, and any dilutions

3.1.3.3 Sediment Grain Size

The results of the Keene Creek streambed sediment grain size analyses are presented in Table 3-6. The differences between grain size at the refence site (MS-7) compared to the urbanized sites were substantial. Streambed sediments collected from the reference site tended to have a larger grain size, with greater percentages of coarse gravel, fine gravel, coarse sand, and medium sand than either of the two urban sites. Streambed sediment at the urbanized sites tended to consist of finer-grained sediment, with greater percentages of fine sand and silt/clay than the reference site.

Table 3-6: Keene Creek Sediment Grain Size Results (values represent the percent abundance of each fraction per site)

Site	Coarse Gravel	Fine Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt/ Clay
KC-MS-1-Sed-A	0.0	0.0	0.0	27.4	72.0	0.6
KC-MS-1-Sed-B	0.0	0.0	0.0	0.3	94.0	5.7
KC-MS-1-Sed-C	0.0	0.0	0.1	17.9	79.2	2.8
Mean:	**0.0**	**0.0**	**0.0**	**15.2**	**81.7**	**3.0**
KC-MS-2-Sed-A	0.0	0.0	0.1	0.8	80.6	18.5
KC-MS-2-Sed-B	0.0	0.1	0.5	19.3	70.7	9.4
KC-MS-2-Sed-C	0.0	0.0	0.1	3.0	77.4	19.5
Mean:	**0.0**	**0.0**	**0.2**	**7.7**	**76.2**	**15.8**
KC-MS-7-Sed-A	0.0	19.7	6.1	26.0	39.5	8.7
KC-MS-7-Sed-B	6.5	20.4	15.6	27.5	28.4	1.6
KC-MS-7-Sed-C	0.0	0.1	4.0	65.7	29.0	1.2
Mean:	**2.2**	**13.4**	**8.6**	**39.7**	**32.3**	**3.8**

3.1.3.4 Canonical Correspondence Analysis (CCA)

The results of the CCA analysis of samples collected from Keene Creek are presented on Figure 3-4 for water samples and Figure 3-5 for sediment samples. Three water samples were collected from each of the three reaches and analyzed with the water chemistry and *E. coli* results. Similarly, sediment samples from the three sites were compared to sediment chemistry, *E. coli*, and grain size results. Figure 3-4 shows that the receiving water samples tended to group together by site (MS-1 sites grouped together, MS-2 sites grouped together, and MS-7 sites grouped together). In addition, MS-1 samples were associated with elevated concentrations of *E. coli*, TKN, TSS, and TP.

Sediment samples also tended to cluster by site. In streambed sediment, MS-1 and MS-2 samples tended to be associated with elevated concentrations of *E. coli*, and NO_3, as well as higher percentages of fine-grained sediment (fine sand and silt).

Figure 3-4: Keene Creek Canonical Correspondence Analysis Results for Water Samples

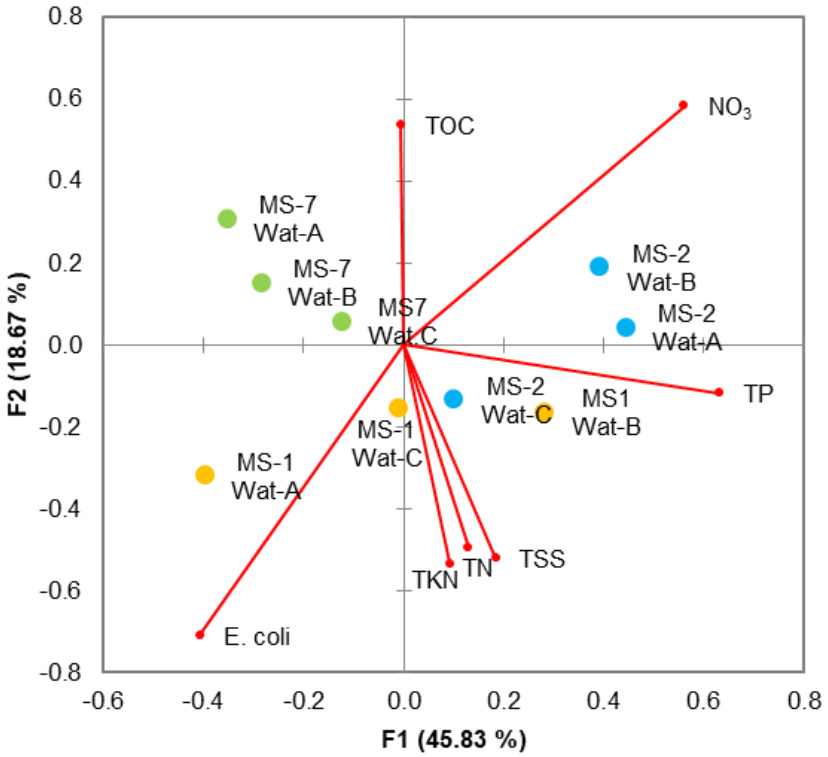
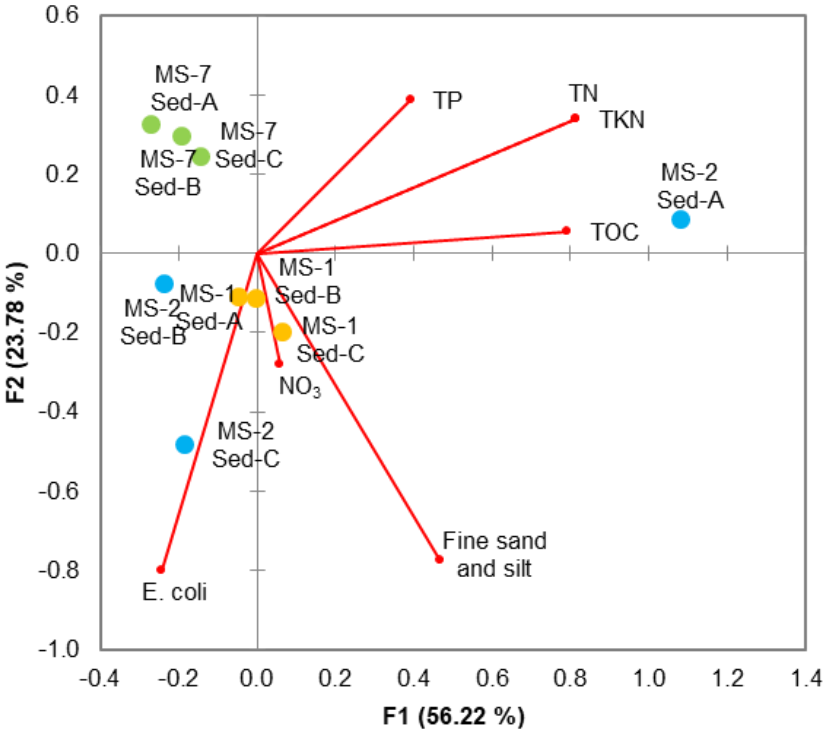


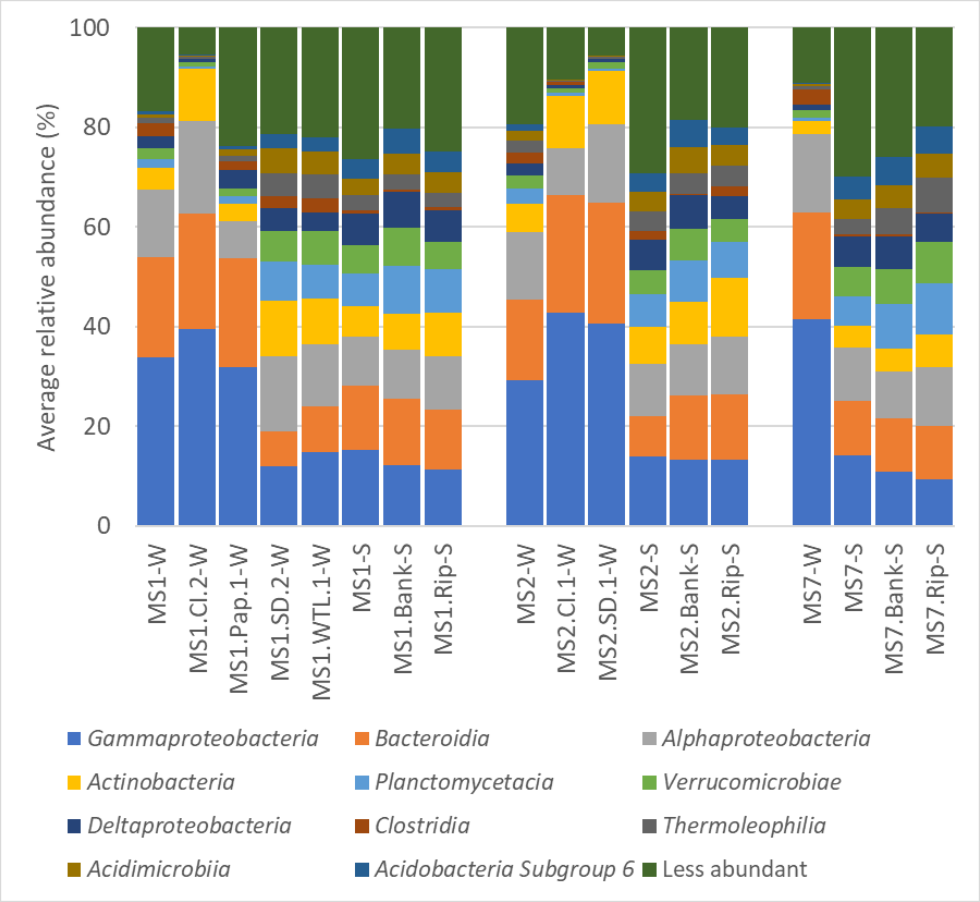
Figure 3-5: Keene Creek Canonical Correspondence Analysis Results for Sediment Samples



3.1.3.5 Bacterial Community Composition

The results of the bacterial community composition analysis are presented on Figure 3-6. Bacterial communities in water and sediment samples mostly consisted of members of the classes *Gammaproteobacteria*, *Bacteroidia*, *Alphaproteobacteria* and *Actinobacteria*. In general, water samples harbored a greater relative abundance of *Gammaproteobacteria*, whereas sediment samples were enriched with *Planctomycetacia*, *Verrucomicrobiae*, *Deltaproteobacteria*, *Thermoleophila*, *Acidimicrobiia*, and *Acidobacteria* Subgroup 6. The genus *Escherichia-Shigella* was detected in water samples from catch basin inlets and storm drains in both MS-1 and MS-2 reaches (data not shown). Microbial community patterns were generally similar for receiving water samples collected from MS-1 (MS-1-W), MS-2 (MS-2-W), and MS-7 (MS-7-W), although the MS-7 water samples tended to be slightly less diverse than the urbanized sites. Similarly, sediment samples tended to have similar microbial communities regardless of the reach from which it was collected. The exception to this was water samples collected from MS-1-SD-2 (storm drain) and MS-1-WTL-1 (wetland), both of which had microbial communities similar to those observed in sediment samples.

Figure 3-6: Keene Creek Bacterial Community Composition (Class Level)



* Samples were grouped by sampling location; W: Water, S: Sediment

3.1.3.6 Source Tracker Analysis

The results of the SourceTracker analysis of water and samples collected from Keene Creek are presented graphically on Figure 3-7 and numerically in Table 3-7. SourceTracker software was used to determine which sources of bacteria (from samples collected from a variety of suspected sources in MS-1, MS-2, and MS-7 reaches) were the major source contributors for a given "sink", where sink is defined as either Keene Creek surface water at sites MS-1, MS-2, or MS-7 or as sediment at sites MS-1, MS-2, or MS-7. Colors in the stacked bar chart on Figure 3-7 and values in Table 3-7 represent the mean percent contribution of each suspected source for a given sink. The means were derived from three samples collected from each suspected source. For each sink, the two identified sources with the highest percent contribution are highlighted in red text.

SourceTracker analysis revealed that the major sources of bacteria to Keene Creek surface waters in the MS-1 reach were water from the paper mill effluent (18.7 percent) and effluent from the MS-1 storm drain outfall at South Central Avenue (16.3 percent). The major sources to receiving water collected in the MS-2 reach were storm drain effluent from the outfall at South 59th Avenue West (26.1 percent) and, streambed sediment from reach MS-7 (14.4 percent). The major identified sources to receiving water collected in MS-7 was MS-7 sediment (36.5 percent), but the largest proportion at this site was from unknown sources.

The major sources of all sediment sinks originated from sediment sources. For example, the major sources of bacteria to Keene Creek streambed sediment in the MS-1 reach were streambed sediments collected from MS-2 (23.1 percent) and MS-7 (19.3 percent). For MS-2 streambed sediment, the major sources were identified as streambed sediment form MS-7 (23.1 percent) and bank sediment from MS-2 (16.6 percent). For MS-7 streambed sediment, the major identified source was MS-7 bank sediment (28 percent), with a large proportion of unknown sources. Contributions from suspected water sources to streambed sediment were small at all three sites.

Figure 3-7: Graphic of Mean Percentage of Source Contributions to Keene Creek

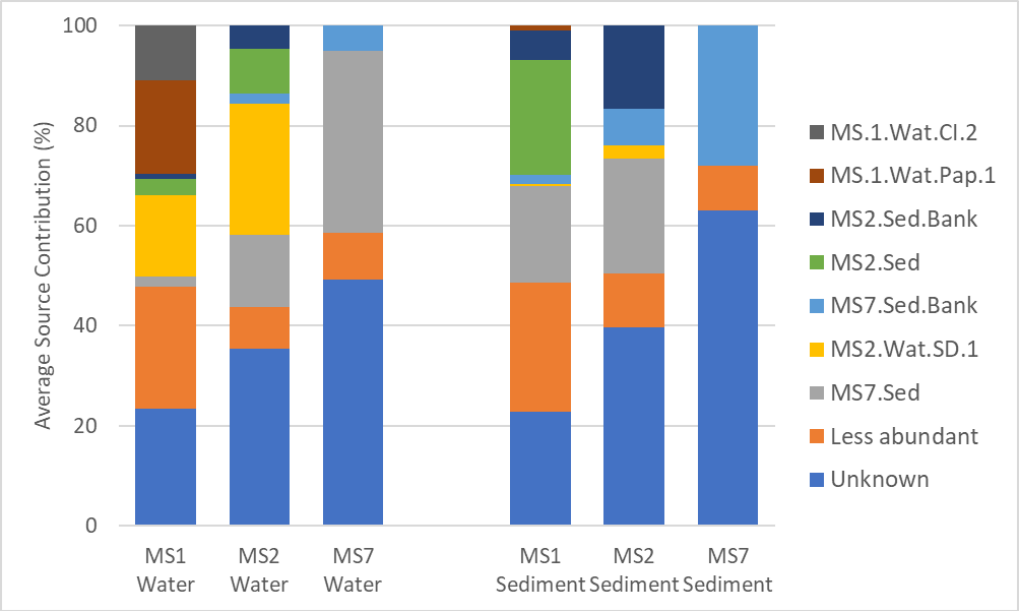


Table 3-7: Table of Mean Percentage of Source Contributions to Keene Creek

Source Label	Description and Reach	Sink					
		Water			Sediment		
		MS1	MS2	MS7	MS1	MS2	MS7
MS1.Wat.CI.2	Catch basin inlet, MS-1	10.9	NA	NA	0.0	NA	NA
MS1.Wat.Pap.1	Paper plant effluent, MS-1	18.7	NA	NA	1.0	NA	NA
MS1.Wat.SD.2	Storm drain outfall, MS-1	5.1	NA	NA	5.8	NA	NA
MS1.Wat.WTL.1	Wetland effluent, MS-1	8.7	NA	NA	5.4	NA	NA
MS1.Sed	Streambed sediment, MS-1	6.3	NA	NA	NA	NA	NA
MS1.Sed.Bank	Bank sediment, MS-1	0.1	NA	NA	6.7	NA	NA
MS1.Sed.RIP	Riparian sediment, MS-1	0.0	NA	NA	3.4	NA	NA
MS2.Sed	Streambed sediment, MS-2	3.3	8.8	NA	23.1	NA	NA
MS2.Sed.Bank	Bank sediment, MS-2	1.0	4.7	NA	5.8	16.6	NA
MS2.Sed.RIP	Riparian sediment, MS-2	2.2	7.5	NA	2.0	8.8	NA
MS2.Wat.CI.1	Catch basin inlet, MS-2	2.1	0.0	NA	0.4	0.1	NA
MS2.Wat.SD.1	Storm drain inlet, MS-2	16.3	26.1	NA	0.4	2.6	NA
MS7.Sed	Streambed sediment, MS-7	1.9	14.4	36.5	19.3	23.1	NA
MS7.Sed.Bank	Streambank sediment, MS-7	0.0	2.2	5.0	1.8	7.3	28.0
MS7.Sed.Rip	Riparian sediment, MS-7	0.0	1.0	4.6	2.0	1.7	8.9
Sewage	Raw human sewage, MS-1	0.0	0.0	0.0	0.0	0.0	0.0
Dog	Dog waste, MS-3	0.0	0.0	0.0	0.0	0.1	0.0
Goose	Goose waste, MS-1	0.0	0.0	4.7	0.0	0.1	0.0
Unknown		23.4	35.3	49.2	22.9	39.6	63.1

NA- Indicates that the source was not included in library configuration

3.2 Tischer Creek Dry Weather Assessment

The results of the Tischer Creek dry weather assessment are described in this Section.

3.2.1 Baseline Monitoring

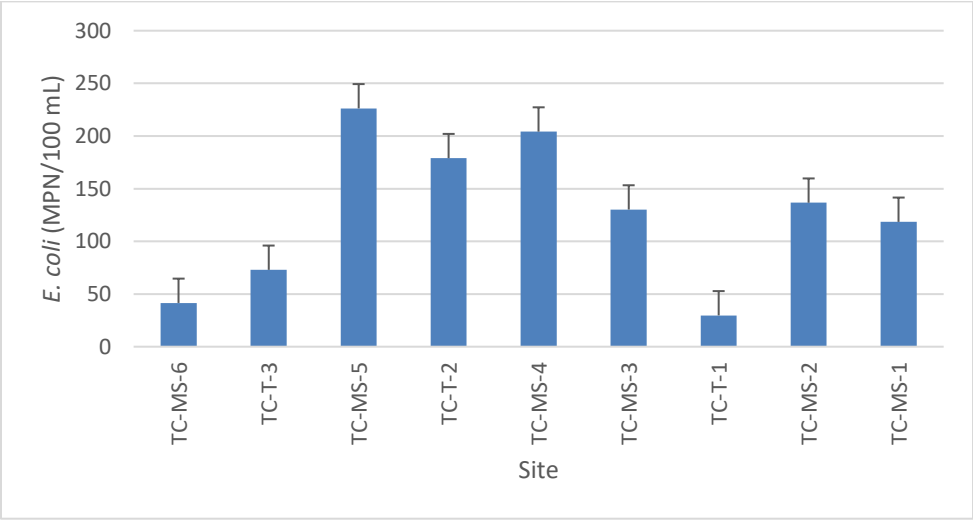
The baseline monitoring results for *E. coli* and molecular markers are presented below.

3.2.1.1 *E. coli* Concentrations

A total of 49 dry weather samples (at least 48 hours after the last rain event) were collected and analyzed for *E. coli* from Tischer Creek during the baseline monitoring. Samples were collected and analyzed from six mainstem monitoring sites (TC-MS-1 through TC-MS-6) and three tributary sites (sites TC-T1, TC-T2, and TC-T3) over six monitoring events from August 23 to September 24, 2019 (not all sites were monitored during all events). Spatial patterns of *E. coli* concentrations among the Tischer Creek baseline monitoring sites are depicted as geometric mean concentrations plus one standard error (SE) on Figure 3-8.

Mean concentrations from samples collected over the course of the dry weather monitoring at Tischer Creek were lowest at the upper-most mainstem site in the Study Area (Site TC-MS-6) and tributary sites TC-T-1 and TC-T-3. Over the course of the baseline monitoring at these three sites, concentrations from individual samples were less than 100 MPN/100 mL except for one sample collected at TC-T-3 (which had a value of 102 MPN/100 mL). The greatest mean concentrations were observed at mainstem sites TC-MS-5, TC-MS-4 (just downstream of TC-MS-5) and tributary site TC-T-2. Geometric mean values for these sites were 222.6 MPN/100 mL, 204 MPN/100 mL, and 178.9 MPN/100 mL, respectively. The remaining sites had generally lower concentrations.

Figure 3-8: *E. coli* Geometric Mean Concentrations (+1 SE) at Tischer Creek Monitoring Sites



3.2.1.2 Molecular Markers

The results of the samples collected for molecular analyses during the Tischer Creek baseline monitoring are summarized in Table 3-8. A total of 27 samples were collected over the course of three sampling events (September 24, September 26, and October 8) for molecular analyses from mainstem Site TC-MS-5 and tributary site TC-T-2 (which had the greatest *E. coli* concentrations during the baseline monitoring) and from the base of the Study Area at mainstem Site TC-MS-1. All samples were analyzed for the three molecular markers (bird, dog, and human). Among the samples collected, five were positive for the bird marker (55.6 percent), none were positive for the dog marker, and four were positive for the human marker (44.4 percent). The human marker was positive in all three samples collected from tributary Site TC-T-2 and from one sample collected from mainstem Site TC-MS-1 at the base of the watershed. All blank samples collected during the monitoring were negative for all three markers.

Table 3-8: Tischer Creek Baseline Monitoring Results for Molecular Markers

Marker	Sample ID	Date Sampled	Sample Result	Percent Positive
Bird	MS-1	09/24/19	No	55.6%
	T-2		**Yes**	
	MS-5		No	
	MS-1	09/26/19	No	
	T-2		**Yes**	
	MS-5		No	
	MS-1	10/08/19	**Yes**	
	T-2		**Yes**	
	MS-5		**Yes**	
Dog	MS-1	09/24/19	No	0.0%
	T-2		No	
	MS-5		No	
	MS-1	09/26/19	No	
	T-2		No	
	MS-5		No	
	MS-1	10/08/19	No	
	T-2		No	
	MS-5		No	
Human	MS-1	09/24/19	No	44.4%
	T-2		**Yes**	
	MS-5		No	
	MS-1	09/26/19	No	
	T-2		**Yes**	
	MS-5		No	
	MS-1	10/08/19	**Yes**	
	T-2		**Yes**	
	MS-5		No	

3.2.2 Sanitary Survey

A Sanitary Survey was conducted over the entire Tischer Creek Study Area from September 16 through 19, 2019. Each drainage area corresponding to the six mainstem sites and three tributary sites were assessed through visual observations and photo-documentation and "spot samples" were collected from suspected sources of *E. coli* in the drainage. Survey methods are described in Subsection 2.2.1 and the results are presented below.

3.2.2.1 Observations

The results of the Sanitary Survey are summarized in Table 3-9 with select photos provided on Figure 3-9. There was no evidence of bacterial sources originating from the municipal sanitary system. The field team did not observe evidence of leaky sewer pipes, illicit connections to the MS4, septic systems/leach fields, or any other evidence of leaking sanitary systems that could convey *E. coli* from human origin to the creek receiving waters. There was also no evidence of homeless encampments observed in the watershed.

Relatively few sightings of dogs (on leash or otherwise) were observed in the Tischer Creek Study Area and we are not aware of any dog parks in the Study Area. Dogs on leash were observed on the University of Minnesota, Duluth (UMD) campus near the stadium, along Ewing Avenue and West Owatonna Street, and West Louis Street and Dunedin Avenue. All dogs observed in the residential neighborhoods were on leash and there was no evidence of dog waste anywhere in the Study Area. Several dogs were observed on the walking trail in Hartley Park (accessed at the trailhead at the end of Hartley Road, just west of Woodhaven Lane. Dogs were observed both on and off leash, but owners were present whenever a dog was observed. Signage and doggie bags were observed at the trailhead and there were no observations of dog waste anywhere in Hartley Park. We are not aware of a dog park within the Tischer Creek Study Area. A variety of songbirds and crows were observed in the Study Area, but sightings were relatively minimal. No other wildlife (including other birds) were observed in large numbers anywhere in the Study Area.

Decaying plant material and sediment in the catch basin inlets, degraded habitat, stagnant water, and wetland bogs were frequent observation in Reach T-2 (also known as the West Branch of Tischer Creek, see Figure 2-2). The T-2 tributary reach makes a large meander from the confluence of the tributary with the mainstem. From the mouth, the tributary crosses under West Saint Marie Street at Woodland Avenue, runs southwest towards Elizabeth Street, then north along the eastern side of the UMD campus where it crosses under West Saint Marie Street again near Midway Avenue and the entrance to the UMD campus. This reach of tributary T-2 had several locations where potential *E. coli* sources were identified, primarily

associated with the potential for regrowth of *E. coli* in the environment that has been associated with fine-grained sediments and stagnant water (see Chapter 4.0). The potential *E. coli* sources identified in this reach of the T-2 tributary are discussed below as one moves upstream from the confluence of the tributary with the mainstem just upstream of Woodland Avenue.

- **Storm drain outfall –** There are two storm drain outfalls on the downstream side of West Saint Marie Street where find-grained sediment and organically-rich ponded water has accumulated. The outfalls discharge on either side of the main flow of the creek. The grade is very flat in this region (as it is throughout the reach) and it appears to be an area of sediment deposition.

- **Eroding banks and organic debris –** Between West Saint Marie Street and North Street, there are several areas along the right bank of the T-2 tributary where eroded banks were observed. The largest area is behind the Republic Bank, where the asphalt in the alley has been severely eroded, forming a small sink hole.

- **Degraded Pond –** Just downstream of Norton Street, the T-2 tributary passes through a stagnant pond where organic debris and fine-grained sediment has accumulated (see photos on Figure 3-9). Sampling of the pond revealed very fine-grained sediment with a gelatinous consistency and a foul (hydrogen sulfide) odor. The pond is adjacent to the foundation of a house and appeared to be formed by a debris dam (appeared to be organic) and emergent vegetation just downstream. Flow through this area of the creek was extremely slow and the water had stagnated. Concentrations of *E. coli* collected from the pond were very high (see Subsection 3.2.2.2).

- **Fouled storm drain infrastructure** – Organic debris and sediment that has accumulated in the streets in this area were also identified as potential sources of *E. coli*. Storm drain catch basins along Norton Street, Waverly Avenue, and Marion Street (which parallel the left bank of the tributary) were nearly completely clogged with debris, primarily leaf litter and organics, but also sediment from front lawns and sidewalks. In some areas along Waverly Avenue south of Norton Street, the curb had been destroyed, and large amounts of sediment clogged the gutter and catch basin inlet.

- **Mulch stockpiles** – South of Marion Street along Waverly Avenue, there is a large stockpile of organic mulch directly on the bank of the creek. BMPs had been installed between the stockpile and the creek, but close proximity of the organic stockpile and the creek receiving water suggest that the stockpile may be a source of E. coli to the creek, particularly during storm events.

- **Storm drain outfall from campus –** South of Marion Street at Waverly Avenue, the tributary turns north and runs along the east side of the UMD campus. On the right bank of the creek, approximately 250 feet upstream of the intersection between Waverly Avenue and Elizabeth Street, there is a PVC pipe (approximately 12-inch diameter) that sticks out from the bank, apparently originating from the campus parking lot. The pipe was not flowing during the Sanitary Survey, but may be a source of *E. coli* during storm events.

- **Ponded water –** On the left bank of the tributary at Norton Street and Carver Avenue, there is a large area of ponded water adjacent to the park on the west side of Carver Avenue (see photos on Figure 3-9). This ponded area is full of organic material and sediment and water was present throughout the duration of the study. It is unclear if there is a catch basin inlet beneath the water surface that may be plugged, but the water had very high *E. coli* concentrations.

- **Grassy swale –** The ponded water at Norton Street and Carver Avenue drains to tributary T-2 via a grassy swale directly west of Carver Avenue and adjacent to the creek. The grassy swale drains directly to the T-2 tributary through a wetland bog and also had high *E. coli* concentrations (see Subsection 3.2.2.2).

- **Wetland bog –** directly north of the grassy swale described above is a wetland bog that the T-2 tributary flows through (see photos on Figure 3-9). This area is characterized by a large amount of organic material, fine-grained sediments, and debris jam (organic material) that has created stagnant water to build up in the area. There was some evidence of beaver activity in this area as well, although it did not appear to be recent and there was no sign of beavers in the area. High concentrations of *E. coli* were documented from both sediment and water samples collected from the wetland bog (see Subsection 3.2.2.2).

The gradient above the portion of the T-2 reach described above increases substantially upstream of East Saint Marie Street and Midway Avenue. The riparian habit is well-developed upstream of East Saint Marie Street and there were no indications of eroded banks or fouled storm drain infrastructure. Samples were collected in this area (including the tributary from Rock Pond on the UMD campus and sites north of West Arrowhead Road) and *E. coli* concentrations were low (see Subsection 3.2.2.2).

In addition to tributary Site T-2, potential *E. coli* sources were observed in reach MS-5 at several locations (Table 3-10), as described below.

- **Mulch stockpile –** Just upstream from the confluence of the mainstem site MS-5 with the T-2 tributary (West Branch of Tischer Creek), on the left bank is a cul de sac at the southern end of

Columbus Avenue. A large stockpile of what appeared to be fertilizer and/or mulch was piled up at the end of the cul de sac, which sits at the top of the bank of Tischer Creek. Standing water had pooled behind it on the creek-side of the stockpile and it was apparent that water from the stockpile had flowed down the bank toward the creek. There were no BMPs in place to prevent runoff to the creek. Water samples collected from the pooled water had very high *E. coli* concentrations (see Subsection 3.2.2.2).

- **Storm drain outfall –** There are relatively few storm drain outfalls in the lower portion of the MS-5 reach that discharge directly to Tischer Creek. One of the larger outfalls is just downstream of West Arrowhead Road on the right bank, which drains a fairly large area in this part of the Study Area (see Figure 2-2). Fined-grained sediment and organic debris has accumulated at the base of the outfall, creating a pool of stagnant water and accumulated debris. Other outfalls in the reach did not appear to have the same conditions. In addition to the storm drain outfall at this site, there are several homes with lawns directly adjacent to the stream bank with no buffer strip or BMPs to prevent sheet runoff from the lawns to the creek during storm events or periods of irrigation. High *E. coli* concentrations are often associated with residential lawns, thus these areas may be a source of *E. coli* to the creek.

- **Wetland bog –** There is a large bog that discharges to mainstem of Tischer Creek at West Louis Street and Harvard Avenue. The bog originates at two small ponds located on West Saint Louis Street and Harvard Avenue. Water from the ponds flows downgradient to the southeast through an organically rich series of wetland pools and marshes. The bog discharges to the mainstem just upstream of a stone walking bridge at West Hardie Street and Columbus Avenue. Water samples collected from the bog at the point of discharge to the creek had vey high E. coli concentrations (see Subsection 3.2.2.2).

- **Construction debris** – During the Sanitary Survey, road construction (apparently associated with cable laying operations) was taking place in the upper part Woodland Avenue between West Oxford Street and Saint Paul Avenue (see Figure 2-2). Sediment from the construction activities had filled the gutters along Woodland Avenue (both side of the road) with soil, which also covered the road in this area (Figure 3-9). Catch basin BMPs (filter socks) had been installed at some locations, but had not been maintained and were no longer preventing sediment from entering the storm drain. Major road construction was also taking place during the Sanitary Survey at Woodland Avenue and Calvary Road in the upper part of the Study Area; however, it was unclear if sediment from the construction site was entering the storm drain infrastructure.

Table 3-9: Potential Bacterial Sources Identified in the Sanitary Survey Investigation of the Tischer Creek Study Area

General Category	Potential Source/Activity	Observation
Municipal Sanitary Infrastructure (piped)	Sanitary sewer overflows	Not directly observed during the sanitary survey, but the team was informed of a sewage leak that occurred on September 9, 2019 upstream of Site TC-MS-5
	Combined sewer overflows (CSOs); regulated under NPDES/LTCP	Not observed
	Leaky sewer pipes (Exfiltration)	Not observed
	Illicit sanitary connections to MS4	Not observed
	Wastewater Treatment Plans regulated under NPDES	Not observed
	Leaky or failing septic systems	Not observed
MS4 Infrastructure	Illegal dumping	Not observed
	Biofilms/regrowth	Observed at mainstem sites and at tributary site T-2
	Decaying plant matter, litter and sediment in the storm drain system	Observed throughout the Study Area in street gutters at multiple locations
Other Human Sanitary Sources (some also attract urban wildlife)	Homeless encampments	Not observed
	Temporary toilets (e.g., Porta-Potties)	Not observed
	Dumpsters (e.g., diapers, pet waste, urban wildlife)	Dumpsters were observed in mixed use areas, but all were well-maintained
	Trash cans	Trash cans were observed throughout the Study Area, particularly at parks, but all were well maintained
	Garbage trucks	Not observed on days when sanitary surveys were conducted
	Other wildlife attracted to human sources (deer, coyotes, feral cats, etc.)	No other wildlife was observed in the Study Area attracted to human sanitary sources
Other Urban Sources (including areas that attract vectors)	Food processing facilities	Not observed
	Outdoor dining	Not observed
	Restaurant grease bins	Not observed
	Bars/stairwells (wash-down areas)	Not observed

General Category	Potential Source/Activity	Observation
Urban Non-stormwater Discharges (potentially mobilizing surface-deposited bacteria)	Power washing	Not observed
	Excessive irrigation/overspray	Not observed
	Car washing	Not observed
	Pools/hot tubs	Not observed
	Reclaimed water/graywater (if not properly managed)	Not observed
Domestic Pets	Dogs, cats, etc.	Dog waste was not observed in the Study Area and dog walking was infrequent, except on Hartley Road Trail where numerous dog walkers were observed. Dog waste signage and dispensers were available at the trail head off Hartley Road near Woodhaven Lane.
Urban Wildlife (naturally occurring and human attracted)	Rodents/vectors (rats, raccoons, squirrels, rabbits, opossums)	Minimal evidence of urban wildlife and no feces from these animals were observed. No evidence of rats, raccoons, or opossums was observed.
	Birds (geese, ducks, gulls, crows, pigeons, songbirds, etc.)	A variety of songbirds and crows were observed in the Study Area, particularly in less urban areas, such as Hartley Nature Center and trail.
Recreational Sources	Bathers and/or boaters	Not observed
	RVs (mobile)	Not observed
Open Space/ Forested Areas	Wildlife populations	Other than birds, no other wildlife observed
	Grazing	Not observed
Other Sources	Plants/algae, soil (naturalized *E. coli*)	Extensive road construction along Woodland Avenue between West Oxford Street and Saint Paul Avenue and at Woodland Avenue and Calvary Road. Soil erosion prevent BMPs appeared to be inadequate along Woodland Avenue. Very turbid water was apparent in the mainstem below Site TC-T-3 during one of the reconnaissance visits, possibly due to construction-related soil. A large wetland bog is located off West Louis Street and Harvard Avenue that discharges to the mainstem near Columbus Avenue. Severely degraded habitat and poorly maintained catch basins at TC-T-2 at Norton Street and Waverly Avenue. Wetland bogs, large ponded areas, and swales that drain to mainstem at Carver Avenue and Norton Street.

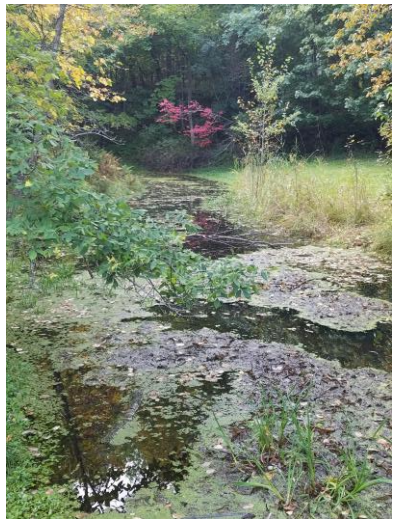
Source: Modified from Armand Ruby Consulting (2011)

Figure 3-9: Photographs of Potential Bacterial Sources Observed During Sanitary Surveys of the Tischer Creek Study Area

Clogged catch basin at MS-5

Construction sediment at MS-5

Storm drain outfall at MS-5

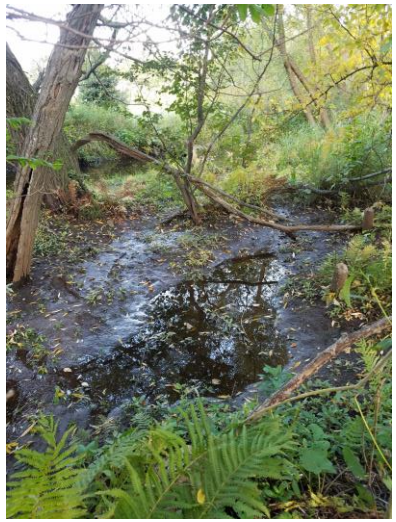


Wetland bog at upper MS-5

Degraded pond at T-2

Ponded water that drains to T-2

Grassy swale at T-2



Wetland bog at T-2

3.2.2.2 *E. coli* Concentrations

In addition to the visual observations conducted during the sanitary survey investigation, a limited number of spot samples were collected from various sources within the Study Area. All samples were collected on September 18 and 19, 2019. The results are summarized in Table 3-10. The samples were separated into three groups based on location in the Study Area and the potential source:

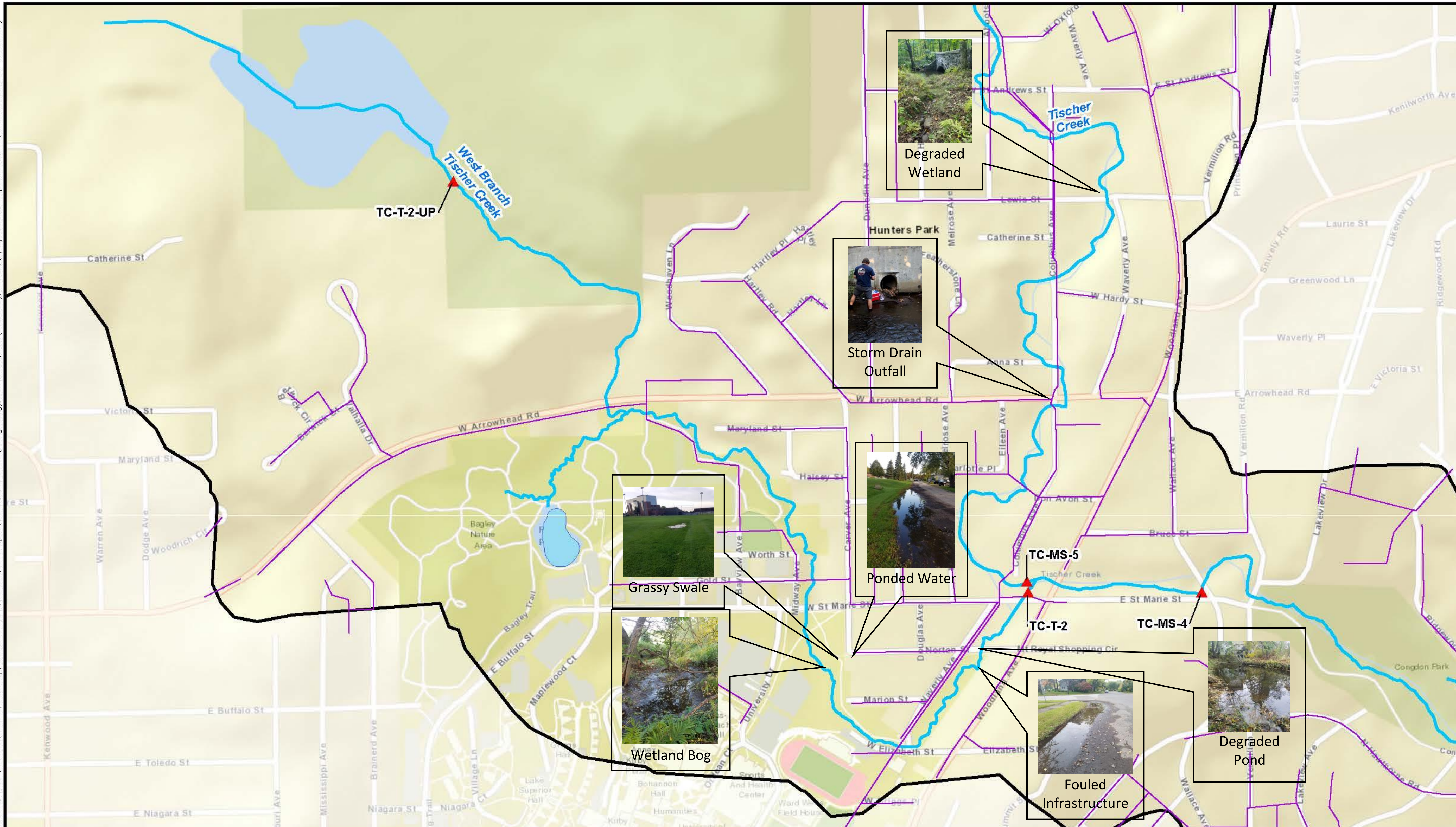
1. Sites in reach TC-T-2 near UMD campus (off stream potential sources)
2. Sites in upper reach TC-T-2 upstream of UMD campus (in stream)
3. Sites in reach TC-MS-5 (off stream potential sources)

The first group consisted of puddles, swales, wetland bogs, and catch basins that were located adjacent to Tischer Creek near the UMD campus and had the potential to influence creek surface waters (Table 3-10). The results were extremely variable, and ranged from 28 MPN/100 mL to > 2,420 MPN/100 mL. the greatest concentrations were associated with roadside puddles that drained to the creek, a swale at Carver avenue and Norton Street, water form a catch basin inlet at Waverly Avenue and Marion Street, and a small wetland in a creek meander off Carver Avenue. All of these sites drain directly to the T-2 tributary that winds through the campus and are potential sources of *E. coli* to the creek receiving waters.

Table 3-10: *E. coli* results from the Tischer Creek Sanitary Survey Investigation

Sample ID	*E. coli* (MPN/100 mL)	Reach	Site Description
Sites in reach TC-T-2 near University of Minnesota Duluth campus (off stream potential sources)			
TC-T2-A	> 2,420	TC-T-2	Pond at Norton St. & Waverly Ave.
TC-T2-D-1	> 2,420	TC-T-2	Ponded water across from stadium, left bank
TC-T2-E	422	TC-T-2	Ponded water at swale at Carver Ave. & Norton St
TC-T2-C	308	TC-T-2	Grassy swale across from stadium, left bank
TC-T2-F	28	TC-T-2	Grassy swale across from stadium, right bank
TC-T2-D-2	> 2,420	TC-T-2	Grassy swale, Carver Ave. and Norton St.
TC-T2-B	1,986	TC-T-2	Catch basin inlet at Waverly Ave. & Marion St.
TC-T2-G	1,565	TC-T-2	Wetland, left bank, off Carver Ave.
Sites in upper reach TC-T-2 upstream of University of Duluth campus (in stream)			
TC-T2-I	54	TC-T-2-Up	Beaver Pond just upstream of T-2-UP
TC-T2-H	93	TC-T-2 Trib	Rock Pond tributary at confluence with T-2
TC-T2-J	62	TC-T-2	T-2 mainstem, just upstream of W. Arrowhead Rd.
TC-T2-K	53	TC-T-2	T-2 mainstem just upstream of W. St. Marie St.
TC-T2-L	91	TC-T-2	T-2 mainstem just downstream of W. St. Marie St.
Sites in reach TC-MS-5 (off stream potential sources)			
TC-MS5-A	6,867	MS-5	Ponded water at end of Columbus Street
TC-MS5-B	6,867	MS-5	Major bog at Lewis and Harvard
TC-MS5-C	301	MS-5	Detention basin at Hartley Nature Center

A map of the potential sources of *E. coli* in the Tischer Creek Study Area is shown on Figure 3-10.



NORTH

500 250 0 500

Scale in Feet

BURNS McDONNELL

Figure 3-10: Map of Potential Bacterial Sources in Tischer Cfreek Study Area

Path: Z:\Clients\ENS\DuluthMN\118320_DuluthStreamAs\Studies\Geospatial\DataFiles\ArcDocs\Tischer_close_up11x17_Landscape.mxd jaclaussen 7/1/2020
Service Layer Credits: Sources: Esri, HERE, Garmin, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), NGCC, (c) OpenStreetMap contributors, and the GIS User Community

Source:

Issued: 7/1/2020

3.2.3 Special Study – Water and Sediment Characterization

Using the adaptive approach discussed in Chapter 1.0, a special study was designed that was based on the results of the baseline monitoring and sanitary survey. For Tischer Creek, two sites (TC-MS-5 and TC-T-2) were determined to have the greatest *E. coli* concentrations and greatest number of potential sources (due primarily to urbanization). Samples were collected from three locations within each of the two reaches (MS-5 reach and T-2 reach): at the bottom (designated as sample A), middle (sample B), and top (sample C) of each reach. In addition, three similar samples were collected from the reach near the top of the T-2 tributary in Hartley Park, which has very little urban influence and is referred to here as a relative "reference" site (T-2-Up) to compare to the urbanized reaches of MS-5 and T-2. In order to characterize the chemical, physical, and biological conditions within each reach that may contribute to elevated *E. coli* concentrations, samples were collected for analyses of water quality, sediment quality, and biological community parameters (both water and sediment). The results of the Water and Sediment Characterization Special Study for Tischer Creek are presented below.

3.2.3.1 Water Chemistry

The results of the Tischer Creek Water Characterization Special Study are presented in Table 3-11. Samples were collected and analyzed for a suite of water quality constituents: TKN, nitrate plus nitrite (listed as NO_3), TP, TOC, TSS and *E. coli*. Mean values are arithmetic means for chemical constituents and geometric means for *E. coli.*

Nearly all the mean concentrations of the chemical constituents assessed and *E. coli* were lowest at the T-2-Up reference site compared to the urbanized sites at MS-5 and T-2 (mean TOC at Site T-2, 10.9 mg/L, was slightly lower than that at T-2-Up, 10.7 mg/L) (Table 3-11). In general, TKN concentrations were two to four times lower at the reference site than the urbanized sites, NO_3 concentrations were below detection limit in all three reference site samples, TOC concentrations were half that observed at Site MS-5, and TSS concentrations at the reference site were below detection limit in two of the three samples, with a mean concentration two to three times lower than mean concentrations observed at the urbanized sites. The biggest differences between the three sites was for *E. coli*. *E. co*li concentrations in the three samples collected at the T-2-Up reference site were 20 MPN/100 mL or lower with a geometric mean concentration of 7 MPN/100 mL. in the two urbanized sites (MS-5 and T-2), *E. coli* concentrations ranged from 185 MPN/100 mL to over 11,000 MPN/100 mL. Geometric mean concentrations at the urbanized sites were 60 to 360 times greater than the mean concentration at the reference site.

Table 3-11: Tischer Creek Water Characterization Results

Site	TKN (mg/L)	NO_3 (mg/L)	TP (mg/L)	TOC (mg/L)	TSS (mg/L)	*E. coli* (MPN/100 mL)
TC-MS-5-Wat-A	0.57	0.19	0.04	21.20	0.76	185
TC-MS-5-Wat-B	1.20	0.22	0.20	23.90	1.40	1,722
TC-MS-5-Wat-C	1.60	0.15	1.10	15.40	1.70	231
Mean:	**1.12**	**0.19**	**0.45**	**20.17**	**1.29**	**419**
TC-T-2-Wat-A	0.63	0.18	0.07	9.90	0.80	2,613
TC-T-2-Wat-B	3.70	0.09	9.50	11.50	3.80	11,199
TC-T-2-Wat-C	2.30	0.05	0.71	10.70	2.40	583
Mean:	**2.21**	**0.11**	**3.43**	**10.70**	**2.33**	**2,574**
TC-T-2-Up-Wat-A	0.53	ND	0.05	10.90	0.54	16
TC-T-2-Up-Wat-B	ND	ND	0.04	10.90	ND	20
TC-T-2-Up-Wat-C	ND	ND	0.07	10.90	ND	1
Mean:	**0.53**	**ND**	**0.05**	**10.90**	**0.54**	**7**

3.2.3.2 Sediment Chemistry

The results of the Tischer Creek Sediment Characterization Special Study are presented in Table 3-12. Similar to the Keene Creek sediment characterization results, the chemistry patterns in Tischer Creek sediment did not reflect those observed in the water samples. Mean concentrations of TKN, TP, and TOC were lowest in sediment at Site MS-5. Concentrations of NO_3 were below detection limit in all samples except one sample at TC-MS-5-Sed-B, which had a concentration of 0.28 mg/kg. Urbanized Site T-2 had the greatest concentrations of TP and TOC, and had a TKN value only slightly less than the reference site. Sediment concentrations of *E. coli* were two to three times lower at the reference site (T-2-Up) than at the urbanized sites.

Table 3-12: Tischer Creek Sediment Characterization Results

Site	TKN (mg/kg)	NO_3 (mg/kg)	TP (mg/kg)	TOC (mg/kg)	*E. coli* (MPN/100 g)
TC-MS-5-Sed-A	361.0	ND	246.0	16,300	700
TC-MS-5-Sed-B	142.0	0.28	236.0	3,500	600
TC-MS-5-Sed-C	629.0	ND	307.0	14,400	25,000
Mean:	**377.3**	**0.28**	**263.0**	**11,400**	**2,190**
TC-T-2-Sed-A	753.0	ND	276.0	50,800	2,300
TC-T-2-Sed-B	3,010.0	ND	568.0	57,400	20,000
TC-T-2-Sed-C	1,540.0	ND	313.0	20,800	16,000
Mean:	**1,767.7**	**ND**	**385.7**	**43,000**	**9,029**
TC-T-2-Up-Sed-A	2,150.0	ND	248.0	13,200	2,200
TC-T-2-Up-Sed-B	2,030.0	ND	331.0	34,200	1,000
TC-T-2-Up-Sed-C	1,330.0	ND	243.0	35,900	900
Mean:	**1,836.7**	**ND**	**274.0**	**27,767**	**1,256**

Results are reported on a dry weight basis, adjusted for percent moisture, sample size, and any dilutions

3.2.3.3 Sediment Grain Size

The results of the Tischer Creek streambed sediment grain size analyses are presented in Table 3-13. Similar to the results of the Keene Creek grain size analysis, streambed sediment at the reference site in Tischer Creek (Site TC-T-2-Up) tended to have a larger grain size, with greater relative percentages of coarse gravel, fine gravel, and coarse sand than the two urbanized sites (MS-5 and T-2). Streambed sediment at the urbanized sites tended to consist of finer-grained material than the reference site, with greater proportions of fine sand and silt/clay.

Table 3-13: Tischer Creek Sediment Grain Size Results (values represent the percent abundance of each fraction per site)

Site	Coarse Gravel	Fine Gravel	Coarse Sand	Medium Sand	Fine Sand	Silt/ Clay
TC-MS-5-Sed-A	0.0	5.7	6.8	57.2	27.4	2.9
TC-MS-5-Sed-B	0.0	0.1	1.0	66.1	32.0	0.8
TC-MS-5-Sed-C	0.0	0.2	1.3	9.7	79.1	9.7
Mean:	**0.0**	**2.0**	**3.0**	**44.3**	**46.2**	**4.5**
TC-T-2-Sed-A	0.0	1.5	5.5	25.7	50.3	17.0
TC-T-2-Sed-B	0.0	0.1	1.4	9.6	34.4	54.5
TC-T-2-Sed-C	0.0	0.7	0.8	17.5	57.4	23.6
Mean:	**0.0**	**0.8**	**2.6**	**17.6**	**47.4**	**31.7**
TC-T-2-Up-Sed-A	7.7	18.6	21.7	35.2	9.8	7.0
TC-T-2-Up-Sed-B	14.2	34.5	11.7	19.7	13.7	6.2
TC-T-2-Up-Sed-C	0.0	0.4	5.1	33.8	49.5	11.2
Mean:	**7.3**	**17.8**	**12.8**	**29.6**	**24.3**	**8.1**

3.2.3.4 Canonical Correspondence Analysis (CCA)

The results of the CCA analysis of samples collected from Tischer Creek are presented on Figure 3-11 for water samples and Figure 3-12 for sediment samples. Three water samples were collected from each of the three reaches (MS-5, T-2, and T-2-Up) and analyzed with the water chemistry and *E. coli* results. Similarly, sediment samples from the three sites were compared to sediment chemistry, *E. coli*, and grain size results. Figure 3-11 shows that the receiving water samples in general tended to group together by site (MS-5 sites grouped together, T-2 sites grouped together, and T-2-Up sites grouped together). In addition, T-2 samples (particularly sample T-2-B) were associated with elevated concentrations of *E. coli*, TKN, TSS, and TP. These results are vey similar to those observed for the urbanized site MS-1 in Keene Creek (see Figure 3-4).

Tischer Creek sediment samples also tended to cluster by site, although more loosely than the clusters seen for water. In streambed sediment, Sample T-2-Sed-B tended to be associated with elevated concentrations of *E. coli*, TP, TOC, as well as higher percentages of fine-grained sediment (fine sand and silt). Sample T-2-Sed-B was collected from the badly degraded pond (see Figure 3-9) upstream of the mouth of the T-2 tributary with the Tischer Creek at Norton Street. Sediments in the pond appeared to have large amounts of decaying organic material, a very fine grain size, and had a hydrogen sulfide odor.

Figure 3-11: Tischer Creek Canonical Correspondence Analysis Results for Water Samples

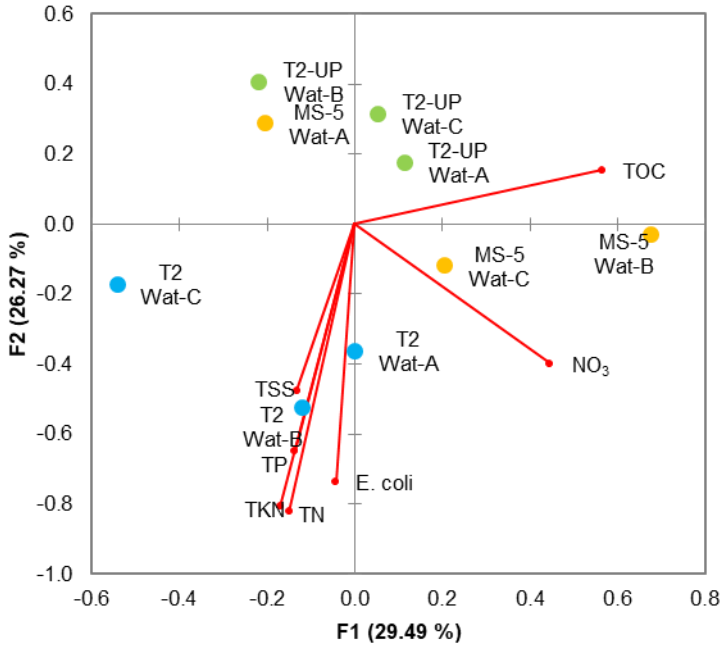
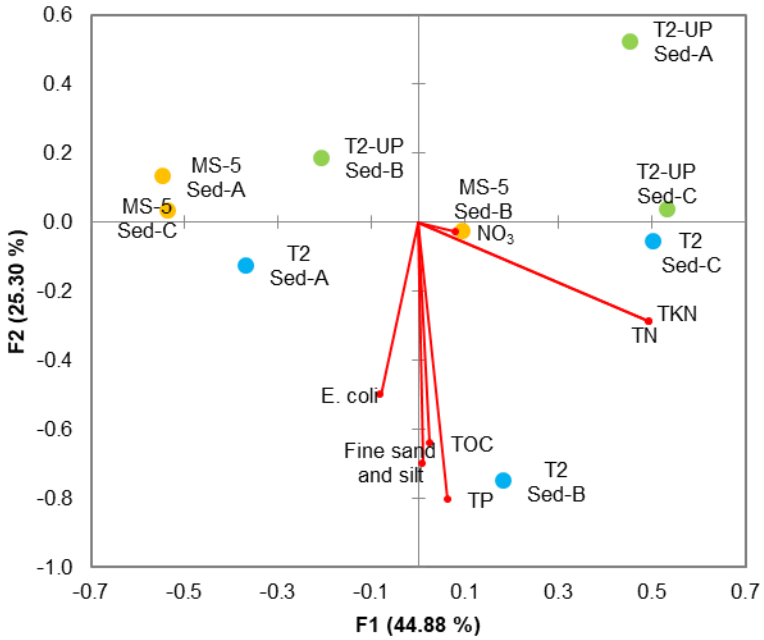


Figure 3-12: Tischer Creek Canonical Correspondence Analysis Results for Sediment Samples

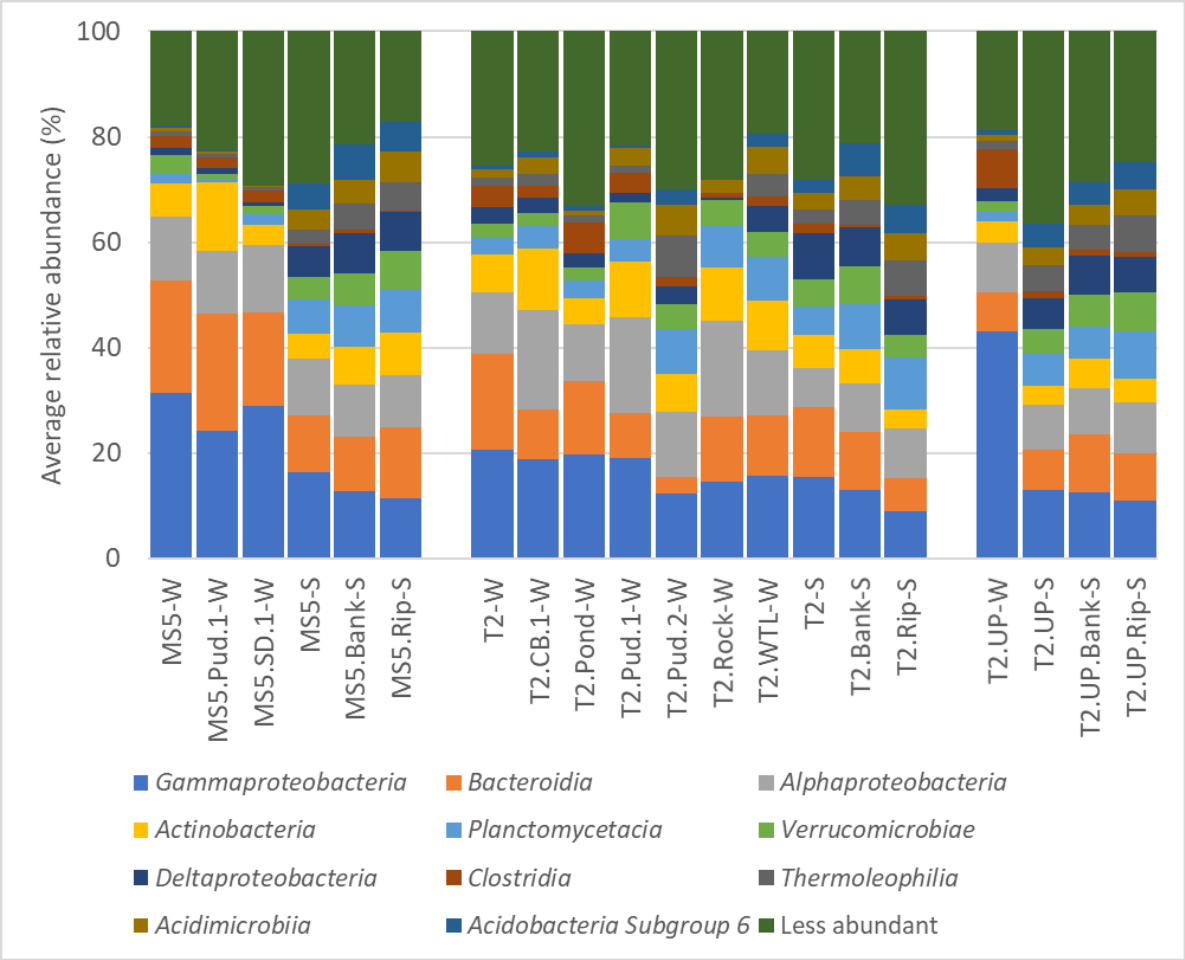


3.2.3.5 Bacterial Community Composition

The results of the bacterial community composition analysis are presented on Figure 3-13. Bacterial communities in water and sediment samples mostly consisted of members of the classes *Gammaproteobacteria*, *Bacteroidia*, *Alphaproteobacteria* and *Actinobacteria* (as well as the less abundant class-level taxa, represented as a mix of other class-level taxa on Figure 3-13). These results are very similar to those observed in Keene Creek.

Microbial community patterns in sediment were generally similar across all sites (MS-5, T-2, and T-2-UP) (Figure 3-13). Microbial community patterns in water also were similar among sites with a generally lower proportion of *Gammaproteobacteria* and *Bacteroidia* than was found in sediment samples and a larger proportion of more diverse taxa. The exception to that was reach T-2, where little difference was observed in microbial community structure between water and sediment samples.

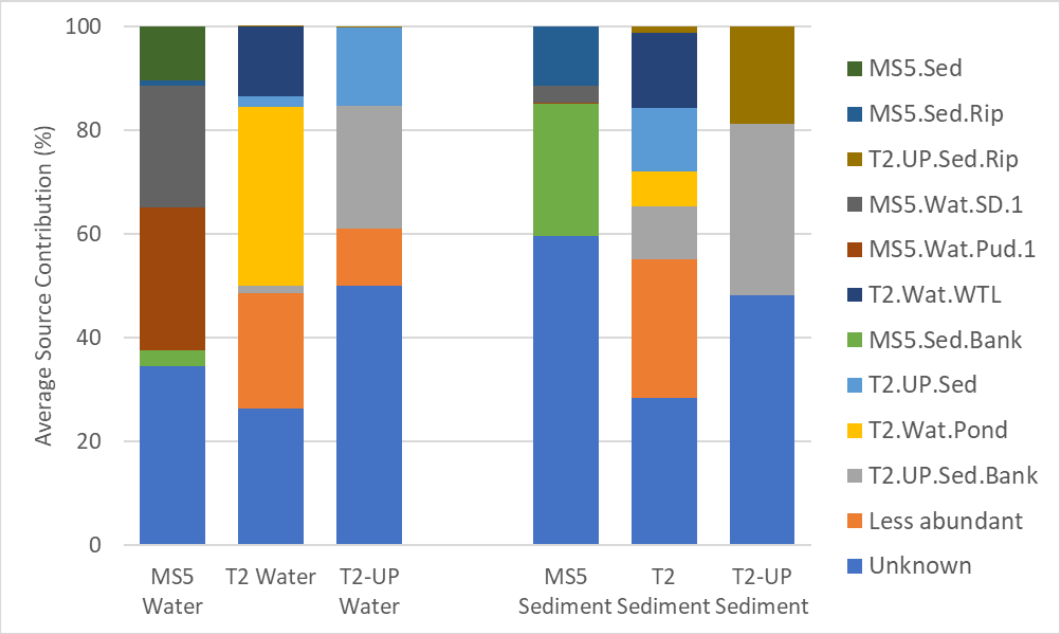
Figure 3-13: Tischer Creek Bacterial Community Composition (Class Level)



3.2.3.6 Source Tracker Analysis

The results of the SourceTracker analysis of water and samples collected from Tischer Creek are presented graphically on Figure 3-14 and numerically in Table 3-14. SourceTracker software was used to determine which sources of bacteria (from samples collected from a variety of suspected sources in MS-5, T-2, and T-2-Up reaches) were the major source contributors for a given "sink", where sink is defined as either Tischer Creek surface water at sites MS-5, T-2, or T-2-Up or as sediment at sites MS-5, T-2, or T-2-Up. Colors in the stacked bar chart on Figure 3-14 and values in Table 3-14 represent the mean percent contribution of each suspected source for a given sink. The means were derived from three samples collected from each suspected source. For each sink, the two identified sources with the highest percent contribution are highlighted in red text.

Figure 3-14: Graphic of Mean Percentage of Source Contributions to Tischer Creek



SourceTracker analysis revealed that the major sources of bacteria to Tischer Creek surface waters in the MS-5 reach were water from samples collected within the reach from ponded water at the southern end of Columbus Avenue (27.7 percent) and storm drain effluent from the storm drain outfall at West Arrowhead Road (23.3 percent) (Table 3-14). The major sources to receiving water collected in the T-2 reach were ponded water at Norton Street and Waverly Avenue (34.4 percent) and the wetland adjacent to the creek off Carver Avenue (13.5 percent). The major identified sources to receiving water collected at T-2-Up was T-2-Up bank sediment (23.7 percent) and T-2-Up streambed sediment (15.1 percent), but the largest proportion at this site was from unknown sources (50.1 percent).

Similar to the Keene Creek sediment results, the major sources of most sediment sinks in Tischer Creek originated from sediment sources. For example, the major sources of bacteria to Tischer Creek streambed sediment at the bottom of the MS-5 reach was streambank and riparian sediment at MS-5 (25.5 and 11.5 percent, respectively) (Table 3-14). For T-2 streambed sediment in Tischer Creek, the major sources were identified as the water from the wetland adjacent to the T-2 tributary off North Street (14.5 percent) and streambed sediment from T-2-Up (12.3 percent). For streambed sediment at the T-2-Up reference site, the major sources were the bank and riparian sediments at T-2-Up (33.2 and 18.7 percent, respectively).

Table 3-14: Table of Mean Percentage of Source Contributions to Tischer Creek

Source	Description and Reach	Sink					
		Water			Sediment		
		MS5	T2	T2-UP	MS5	T2	T2-UP
MS5.Wat.Pud.1	Puddle at end of Columbus St., MS-5	27.7	NA	NA	0.2	NA	NA
MS5.Wat.SD.1	Storm drain inlet, MS-5	23.3	NA	NA	3.3	NA	NA
MS5.Sed	Streambed sediment, MS-5	10.3	NA	NA	NA	NA	NA
MS5.Sed.Bank	Streambank sediment, MS-5	3.0	NA	NA	25.5	NA	NA
MS5.Sed.Rip	Riparian sediment, MS-5	1.1	NA	NA	11.5	NA	NA
T2.Wat	Receiving water, T-2	NA	NA	NA	NA	4.7	NA
T2.Wat.CB.1	Catch basin inlet, T-2	NA	3.6	NA	NA	3.1	NA
T2.Wat.Pond	Degraded pond, T-2	NA	34.4	NA	NA	6.7	NA
T2.Wat.Pud.1	Puddle 1, T-2	NA	3.3	NA	NA	4.7	NA
T2.Wat.Pud.2	Puddle 2, T-2	NA	1.5	NA	NA	3.0	NA
T2.Wat.Rock	Rock Pond, T-2	NA	8.5	NA	NA	0.0	NA
T2.Wat.WTL	Wetland, T-2	NA	13.5	NA	NA	14.5	NA
T2.Sed	Streambed sediment, T2	NA	3.5	NA	NA	NA	NA
T2.Sed.Bank	Streambank sediment, T2	NA	1.7	NA	NA	7.9	NA
T2.Sed.Rip	Riparian sediment, T2	NA	0.0	NA	NA	3.2	NA
T2.UP.Sed	Streambed sediment, T-2-Up	NA	2.0	15.1	NA	12.3	NA
T2.UP.Sed.Bank	Streambank sediment, T-2-Up	NA	1.5	23.7	NA	10.2	33.2
T2.UP.Sed.Rip	Riparian sediment, T-2-Up	NA	0.0	0.2	NA	1.2	18.7
Sewage	Raw human sewage, MS-1	0.0	0.0	1.1	0.0	0.0	0.0
Dog	Dog waste, MS-3	0.0	0.0	0.0	0.0	0.0	0.0
Goose	Goose waste, MS-1	0.0	0.0	9.8	0.0	0.0	0.0
Unknown		34.5	26.5	50.1	59.6	28.5	48.1

NA- Indicates that the source was not included in library configuration

4.0 DISCUSSION

The purpose of this Study was to identify the sources of *E. coli* that may be causing exceedances of water quality standards in Keene Creek and Tischer Creek and to use the information gathered from the Study to provide recommendations on bacterial-reduction BMPs that can be implemented to meet TMDL reduction targets. The project team used a weight of evidence approach to gather information on numerous potential sources of *E. coli* in each of the two Study Areas and applied a phased, tiered, and adaptive approach that has been shown to be successful in identifying bacterial sources in urban streams (City of Minneapolis, 2019; Goodwin et al., 2016; Griffith et al., 2013; Gruber et al., 2005). The design for this Study combined primary studies shown to be effective in other investigations with site-specific special studies based on the initial findings. The results indicate the sources of *E. coli* in Keene Creek and Tischer Creek are influenced by a dynamic process involving several factors, including insufficient maintenance of storm drain infrastructure, environmental reservoirs of *E. coli* with varying transport mechanisms that deliver bacteria to the creek, sources of *E. coli* originating from wildlife, soil from construction activities, degraded habitat, and likely contributions from naturalized *E. coli* in the environment.

4.1 *E. coli* Sources in the Keene Creek Watershed

The baseline monitoring conducted in Keene Creek revealed a strong spatial pattern of *E. coli* concentrations among the monitoring sites within the Study Area (Figure 3-1). Sites located in the lower portion of the watershed along the mainstem of Keene Creek (KC-MS-1 and KC-MS-2) consistently had the highest *E. coli* concentrations in all of the synoptic baseline monitoring events, suggesting that this portion of the watershed was contributing the majority of the *E. coli* to the Keene Creek receiving waters. This lower portion of the watershed is characterized by a flatter gradient compared to upstream reaches, urbanized land use that results in a large number of storm drain outfalls draining the urban infrastructure of the City to the receiving waters, and degraded habitat that was identified below Grand Avenue (i.e., below KC-MS-3 at Keene Creek Dog Park). Geometric mean concentrations of *E. coli* were approximately five times greater in the lower part of the watershed (sites KC-MS-1 and KC-MS-2) than all the other sties in the Study Area. These results suggest that future BMPs designed to reduce *E. coli* concentrations in Keene Creek should be focused on this area of the watershed.

The results of the molecular marker analyses conducted in Keene Creek indicate that the bird markers was positive in 22% of the samples collected (Table 3-1), suggesting that birds were a likely contributor to the *E. coli* in the receiving waters, but not necessarily a dominant source. The goose population (and associated goose waste) was prevalent at the Irving Park soccer field and the detention basin and catch

basin on the south side of the park provide a means of transporting elevated levels of *E. coli* to the Keene Creek mainstem. This source and associated transport mechanism represent an area where focused BMPs should be considered. In contrast, all or the samples analyzed for the dog marker were negative, indicating that dog waste was an unlikely contributor to *E. coli* in the receiving waters. These results are consistent with the baseline monitoring, which indicate that *E coli* concentrations were low at tributary Site KC-T-1 (adjacent to Keene Creek Dog Park) and at Site KC-MS-3 (just downstream of Keene Creek Dog Park). It is also consistent with the results of the Sanitary Survey conducted in the Keene Creek Watershed, where very minimal evidence of dog waste that may contribute to *E. coli* levels in Keene Creek were found. Together, the results indicate that dogs were an unlikely source of *E.coli* to the receiving waters of Keene Creek.

There was little evidence that human sewage was contributing to elevated *E coli* levels in Keene Creek. There was no evidence of failing septic systems or sewage infrastructure anywhere in the watershed and there were no signs that active homeless encampments were present. However, the percentage of positive results for the human marker in Keene Creek (33.3%) was higher than is typically seen in urban watersheds where failing sewage infrastructure is not present (Goodwin et al., 2016, Gruber et al., 2005, City of Minneapolis, 2019, Griffith et al., 2013). The sample size for the molecular monitoring was low for this element of Study (nine samples collected over three separate monitoring events) and all the positive samples were collected on the same day (see Table 3-1), so the results may not be reflective of true conditions in the watershed. Additional monitoring and investigation of the sewage infrastructure in the lower port of Keene Creek may be needed to fully address the extent to which *E. coli* originating from human sources is present.

The Sanitary Survey in Keene Creek did identify several areas in the lower portion of the watershed where degraded habitat and poorly-maintained stormwater infrastructure (e.g., clogged catch basin inlets) were present. Although degraded habitat may not be thought of as a source of *E. coli* in the traditional development and interpretation of fecal indicator bacteria (especially when compared to sources identified by molecular markers, which signal bacterial host origin), the presence of naturalized *E. coli* in the environment associated with both sediment and water sources is well-documented (see discussion below) and is considered in this assessment as potential source of *E. coli* to the receiving waters of both Keene and Tischer creeks.

Degraded habitat, severe erosion, and discharges from wetland bogs and the paper mill were found in several areas in the lower reaches of the watershed (and in many cases elevated levels of E. *coli*), particularly in reach MS-2, where severe erosion downstream of Grand Avenue and degraded habitat

upstream of South 57th Avenue West were particularly evident. Exposed streambank soil and degraded habitat characterized by stagnant, organically rich conditions can act as sources of *E. coli* by sequestering bacteria delivered from upstream sources and creating an environment that can amplify bacterial regrowth. In Keene Creek, degraded habitat, storm drain outfalls, and eroded banks in reaches MS-1 and MS-2 were identified as the dominant sources of *E. coli* in the Study Area.

The Water and Sediment Characterization Special Study demonstrated how the more urbanized reaches (e.g., MS-1 and MS-2, see Figure 1-4) provide an environment conducive to regrowth of *E. coli*. Keene Creek water in the urban areas had greater concentrations of nutrients and TSS and much greater concentrations of *E. coli* than the upstream reference site (this was also demonstrated in the CCA for water, see Figure 3-4). The main effect of urbanization on streambed sediments was observed in the differences in grain size between the urbanized and upstream reference site. Urban streambed sediments had a much smaller grain size than the sediments at the reference site, with much higher relative percentages of fine sand and silt/clay. A smaller grain size creates a larger surface area to volume ratio, which increases the potential for bacterial-binding. Thus, smaller gain size was the likely driver for the higher concentrations of *E. coli* observed in the Keene Creek sediments. Smaller grain size particles in the streambed are also more likely to be entrained in the water column than larger particles, which is consistent with the elevated TSS concentrations (and *E. coli* concentrations) observed in the Keene Creek water samples from the urbanized sites (MS1 and MS-2).

4.2 *E. coli* Sources in the Tischer Creek Watershed

In Tischer Creek, the baseline *E. coli* monitoring also revealed an important spatial pattern, although it was not as strong as that observed in Keene Creek. In Tischer Creek, mean *E. coli* concentrations were greatest at mainstem Site MS-5 and at the tributary site T-2 (Figure 3-8), both of which are upstream of mainstem Site MS-4 (which also had elevated *E. coli* concentrations compared to other sites). These results indicate that in Tischer Creek, these two areas of the watershed should be prioritized for bacterial-reduction BMPs. Several potential sources of E. coli were identified in these two reaches. The results of the molecular marker analyses conducted in Tischer Creek indicated that over 55 percent of the samples were positive for the bird marker. This is twice the percentage observed in Keene Creek and suggests that birds are likely an important source of E. coli to the receiving waters. Similar to Keene Creek, none of the samples in Tischer Creek analyzed for the dog marker were positive. These results are consistent with the Sanitary Survey in which no dog waste was observed in the Study Area and suggests that dogs are an unlikely source of *E. coli* to the receiving waters.

Similar to the results of the Keene Creek assessment, there was little evidence that human sewage was contributing to elevated *E coli* levels in Tischer Creek. There was no evidence of failing septic systems or sewage infrastructure anywhere in the watershed and there were no signs that active homeless encampments were present. However, the percentage of positive results for the human molecular marker was high. Four out of the nine samples analyzed from the Tischer Creek Study Area were positive for the human marker (Table 3-8), including all three of the samples collected from tributary Site T-2. Although the sample size was small for this element of the Study, future monitoring should be considered to determine the extent to which sewage infrastructure may be contributing to elevated *E. coli* levels in this reach of Tischer Creek.

The Sanitary Survey conducted in Tischer Creek also revealed several areas of degraded habitat, ponded water associated with insufficient storm drain infrastructure, and wetland bogs, all of which are likely contributors to elevated *E. coli* concentrations in the MS-5 and T-2 reaches. The largest potential source of this kind identified in the MS-5 reach was in the upper portion of the drainage at West Louis Street and Harvard Avenue. This large wetland area produced very high concentrations of *E. coli* that produced dry weather flows directly to the Tischer Creek receiving waters. The MS-5 reach was also characterized by storm drain outfalls with accumulated organic debris and stockpiles of mulch on the streambank without pollution prevention BMPs.

However, the largest potential source of *E. coli* in the reach was found in the upper portion of the drainage along Woodland Avenue between West Oxford Street and Saint Paul Avenue (see Figure 2-2). Cable-laying construction activities in this area generated a large amount of soil that had severely impacted the gutters, storm drain inlets, and adjacent street in this area. *E. coli* in the environment has been shown to adsorb rapidly to soil particles of all types, particularly soils with high clay content (Nola et al. 2005, Ling et al., 2003, Abu-Ashour and Lee, 1999) and can be released to receiving waters during rain events or other transport mechanisms (City of Minneapolis, 2019; Ling et al., 2009, Muirhead et al., 2006, Schillinger and Gannon, 1985). Thus, the soil generated form construction activities can act as a reservoir for *E. coli* that can be transported to the receiving waters when pollution prevention BMPs are not in place. The City of Minneapolis (2019) quantified the potential impact of construction-related soil on *E. coli* levels in downstream receiving waters as part of a larger scale bacterial source identification study. The study was designed to determine the extent to which construction-related soil and organic debris in the street gutters of the study area contained *E. coli*. The results suggested that *E. coli* levels in street gutter runoff containing soil associated with a cable installation project were thirty times greater than gutters without soil debris and the *E. coli* could be easily transported directly to the MS4 via runoff to the storm drain inlets. Similar results have been found in other studies (Skinner et al, 2010). Thus,

constructed-related soil (and organic debris) in the street gutters, when not properly managed, can act as a reservoir of *E. coli* (albeit temporary during the time of construction activities) that can be transported to local creeks through over-irrigation or storm events.

The tributary reach T-2 had the most degraded habitat observed in the Tischer Creek Study Area. The reach between the mouth of the tributary at the confluence with the mainstem just downstream of Site MS-5 and West Saint Marie Street near Midway Avenue and the entrance to the UMD campus had several areas of degraded habitat and other conditions that are the likely source of *E. coli* to the water of the creek. This reach was characterized by an accumulation of organic debris at storm drain outfalls, eroding banks, debris dams causing an accumulation of organically-rich sediment and stagnant water, ponded water due to insufficient drainage, bioswales, and wetland bogs. All of these areas had high *E. coli* concentrations in the water (and sediment in some cases) and act as potentially large sources of *E. coli* that can cause exceedances of water quality standards in the receiving waters of the tributary as well as downstream reaches of the Tischer Creek mainstem. Based on our assessment, the Tischer Creek T-2 reach should be considered as a high priority for potential restoration activities.

4.3 *E. coli* Sources in Stream Sediment and Soil

The concept that degraded habitat can be a source of *E. coli* to receiving waters is well-documented. The City of Minneapolis (2019) quantified *E. coli* in streambed sediment, streambanks, and riparian soil of an urban creek and found high concentration in all three of these zones, which act as environmental reservoirs that can introduce *E. coli* to the creek receiving waters. These results are similar to those of other studies in both tropical and temperate areas, where *E. coli* has been found in high concentrations in stream sediment, streambank soil, and riparian soil (Byappanahalli et al., 2012; Silyn-Roberts, 2012; Byappanahalli et al., 2006; Ishii and Sadowsky, 2008; Ishii et al., 2006; Gruber et al., 2005; Byappanahalli et al., 2003; Roll and Fujioka, 1997; Hardina and Fujikoa, 1991). For example, Byappanahalli et al. (2003) studied an urban stream in Michigan and found high concentrations of *E. coli* in these environmental reservoirs correlated significantly with those in the creek receiving waters and accounted for continuous loading of bacteria to the creek.

Byappanahalli et al. (2006) found frequent occurrence of *E. coli* in temperate forest soils contained within exclosures designed to prevent direct fecal deposition from wildlife. Using genetic techniques, they determined that *E. coli* can exist for extended periods of time in forest soil, independent of input from wildlife sources, and that the soil *E. coli* populations formed a cohesive phylogenetic group compared to *E. coli* from fecal sources. The authors concluded that soil-borne *E. coli* should be treated as a background concentration in source identification investigations. Thus, even in the absence of a known

contamination source, *E. coli* levels in streams may remain high as a result of input from adjacent soil reservoirs. Direct fecal input inadequately explained the widespread and consistent occurrence of *E. coli* in the watershed and suggested that long-term survival of *E. coli* in the sediment and soil habitats or multiplication in the environment was likely. Byappanahalli et al. (2012) found high densities of *E. coli* in a variety of soil types in Hawaii. In mesocosm studies, they demonstrated that *E. coli* inoculated on sterilized soil samples from the region increased two orders of magnitude (100-fold) in 4 days. They concluded that the *E. coli* identified in the stream sediment and streambank soil was part of a natural soil microfauna that had the potential to influence the quality of the stream receiving waters.

Ishii and Sadowsky (2008) described a conceptualized life cycle of *E. coli* in secondary habitats, such as water, sediment, and soil. *E. coli* is released from the primary host (warm-blooded animals) to the environment through direct deposition of fecal matter. The majority of the bacteria die due to environmental stresses outside the host, but some of them are able to survive longer as they become attached to physical structures in the environment, such as soil, sediment, or the surfaces of vegetation. In some cases, these strains can grow and maintain their populations long enough to survive and replicate and thus become adapted or "naturalized" to the environment.

High concentrations of *E. coli* found in sediment and soils in the sreambeds, streambanks, and riparian areas of both Keene Creek and Tischer Creek suggest that these areas act as large reservoirs for potential input of bacteria to the creek receiving waters. The extent to which the *E. coli* in these environmental reservoirs may be naturalized to the environment remains to be determined; however, the results from this Study and others suggest that these reservoirs can have a dramatic influence on *E. coli* levels in the creek receiving waters.

4.4 *E. coli* Sources in Biofilms

The storm drain infrastructure itself can also serve as a reservoir of *E. coli* to the receiving waters of urban creeks. Biofilms are matrices of bacteria and other microbes that form on various solid surfaces in the environment exposed to a liquid (Characklis and Marshall, 1990). Storm drain infrastructure with periodic urban flows, a steady supply of nutrients, and dark environments protected from ultraviolet radiation and desiccation are ideal environments for biofilm growth (Sylin-Roberts, 2012; Tiefenthaler et al., 2008). Storm drain systems therefore have the potential to act as reservoirs for *E. coli* and other fecal indicator bacteria within the biofilm matrix, and several studies have identified regrowth of fecal indicator bacteria within the urban MS4 infrastructure (City of Minneapolis, 2019; Goodwin et al., 2013; Balzer et al., 2010; Langmark et al., 2007; Silyn-Roberts, 2012; Griffith and Ferguson, 2012; Schultz-Fademrecht et al., 2008; Gruber et al., 2005). When environmental conditions are favorable for growth, bacteria in the

biofilm can replicate to high levels and eventually slough off, to be released into the water column where it can be transported downstream and become an intermittent or persistent source of bacteria to the receiving waters (Tiefenthaler et al., 2008). The extensive storm drain infrastructure and large number of storm drain outfalls in both the Keene Creek and Tischer Creek Study Areas where E. coli concentrations were greatest (Figure 1-4 and Figure 1-5, respectively) demonstrate the large potential for inputs of *E. coli* to the creeks in urbanized areas of the watersheds.

4.5 Urban Stream Syndrome

According to the US Environmental Protection Agency (EPA), the term "urban stream syndrome" describes the consistently observed ecological degradation of streams draining urban land (Walsh et al., 2005). Streams in urbanized areas are characterized by flashier hydrograph, elevated concentrations of nutrients and contaminants, altered channel morphology and particle size in the streambed, and increased suspended solids (TSS) in the water column. The mechanisms driving the syndrome are complex, but are primarily a result of impervious services in the urban landscape and an efficient drainage system that directs runoff rapidly to streams. Although the impacts of the urban stream syndrome have been well-studied, the effects of urbanization on levels of fecal indicator bacteria in the water column (e.g., *E. coli*) have not.

There are several characteristics of urban streams that may result in elevated *E. coli* concentrations in the receiving waters.

- Storm drain infrastructure in urbanized areas short circuit the natural attenuation of bacteria that occurs in un-urbanized watersheds that occurs through infiltration.

- Storm drain infrastructure in urbanized creeks promotes the growth of biofilms that act as a continuous reservoir of *E. coli* and other microbes that can be delivered to the creek receiving waters during high flow events.

- An increase in impervious surfaces and a storm drain infrastructure designed to efficiently move water away from structures and roads often leads to hydromodification of urban creeks, which erodes streambanks and exposes soil that contains *E. coli* to the receiving waters.

- Runoff from developed areas can alter the chemical makeup of the streambed sediment resulting in higher nutrient concentrations that may promote the growth of *E. coli* within the urbanized stream ecosystem.

- Runoff from urbanized areas can also change the physical characteristics of the streambed sediment by delivering fine-grained sediments to the creek, which increases the surface area to volume ratio of streambed sediment, essentially creating habitat for *E. coli* (and other microbes) within the urban stream.

The results of this Study suggest that these characteristics associated with the urbanized streams are the major factors that have increased the concentrations of *E. coli* in the receiving waters of both Keene Creek and Tischer Creek. One large review of the urban stream syndrome (Kominkova, 2012) emphasized that restoration is the only way to achieve good ecological status (health) of waterways affected by urbanization.

5.0 CONCLUSIONS

Several conclusions can be drawn from the Study. Conclusions presented below are organized by the study questions posed for the Keene Creek and Tischer Creek assessments.

Keene Creek:

1. **What are the potential sources of *E. coli* in Keene Creek (e.g., local wildlife, domestic animals, leaking sewer or septic lines, other human sources, natural, etc.)?**
   - Synoptic monitoring of seven mainstem and two tributary sites within the Study Area revealed that the greatest *E. coli* concentrations in Keene Creek during dry weather were found near the bottom of the watershed in reaches MS-1 and MS-2.
   - In general, *E. coli* concentrations were low at mainstem and tributary sites over the course of the Study, with no exceedances of the single sample water quality standard during dry weather.
   - Several potential sources of *E. coli* that were considered unlikely sources to Keene Creek include the homeless population, septic systems and sewer lines, illegal dumping, trash operations, outdoor dining and wash-down, and wildlife populations other than birds.
   - Car washing (possibly a persistent occurrence) was observed at one location in the watershed (in the alley off Raleigh Street, west of South 59th Avenue West) and transport of sediment-laden water to the creek was documented.
   - The Sanitary Survey, molecular markers, and spatial monitoring of Keene Creek Dog Park indicate that dogs are an unlikely source of E. *coli* to Keene Creek.
   - Birds were present throughout the Study Area, but only identified in large numbers at the Irving Park soccer field. Goose waste in this area is a likely source of *E. coli* to the creek.
   - Several areas of degraded habitat and eroded streambanks were observed in reaches MS-1 and MS-2 and likely act as a source of *E. coli* to the receiving waters.
   - The small tributary that apparently originates from the pulp mill had degraded water quality, high *E. coli* concentrations, and was shown to be a source of bacteria to the downstream receiving waters.

2. **How does bacteria survival, propagation, or re-growth contribute to *E. coli* levels in the storm drain system (e.g., leaf litter and grass clippings along curb lines or ditches) and discharge to surface waters of the creek?**

- Several locations were identified in the lower portion of the Study Area where leaf litter, organic debris, and soil had accumulated in the catch basin inlets.
- Ponded water associated with the clogged infrastructure was identified as a source of *E. coli* to the creek receiving waters and is a likely location for regrowth of *E. coli* to occur.
- Stagnant water created by debris dams (mostly organic) in reach MS-2 is a likely source of *E. coli* to the receiving waters.
- Streambed sediment in urbanized areas contained high concentrations of *E. coli* (potentially naturalized *E. coli*) and are likely source of bacteria to the receiving waters.

3. Does the *E. coli* in the Study Area originate from human sources?

- There was no evidence of active homeless encampments, leaking sewage infrastructure, septic systems, or other sources of *E. coli* from human waste, except temporary toilets in some locations observed anywhere in the Study Area, suggesting that *E. coli* from human source origin is unlikely.
- However, the percentage of positive results for the human molecular marker was higher than would be expected in an urban stream. The sample size for this element of the Study was small and additional assessment may be necessary to fully address this question.

4. How can the City adapt current management practices to reduce levels of *E. coli*?

- Several management practices that may contribute to elevated levels of *E. coli* in the creek were identified (see below) and include better maintenance of street infrastructure to prevent clogged storm drain inlets, management of goose waste to prevent introduction to the creek, stabilization of eroded streambanks, and restoration of degraded habitat.

Tischer Creek:

1. What are the potential sources of *E. coli* in Tischer Creek (e.g., local wildlife, domestic animals, leaking sewer or septic lines, other human sources, natural, etc.)?

- Synoptic monitoring of six mainstem and three tributary sites within the Study Area revealed that the greatest *E. coli* concentrations in Tischer Creek during dry weather were found at mainstem Site MS-5 and tributary Site T-2.
- In general, *E. coli* concentrations were low at mainstem and tributary sites over the course of the Study, with no exceedances of the single sample water quality standard during dry weather.

- Several potential sources of *E. coli* that were considered unlikely sources to Tischer Creek include the homeless population, septic systems and sewer lines, illegal dumping, trash operations, outdoor dining and wash-down, car washing, and wildlife populations other than birds.
- The Sanitary Survey and molecular marker results indicate that dogs are an unlikely source of E. *coli* to Tischer Creek.
- Birds were present throughout the Study Area, but were not identified in large numbers at any particular location. Over 55 percent of the bird molecular marker samples were positive, suggesting that birds are a likely source of *E. coli* to Tischer Creek.
- Several areas of degraded habitat, ponded water, eroded streambanks, and discharges from wetland bogs were observed in reaches MS-5 and T-2 and likely act as source of *E. coli* to the receiving waters.
- Soil from construction activities and insufficient BMPs in the upper portion of the MS-5 reach are likely sources of *E. coli* to the receiving waters.

2. How does bacteria survival, propagation, or re-growth contribute to *E. coli* levels in the storm drain system (e.g., leaf litter and grass clippings along curb lines or ditches) and discharge to surface waters of the creek?

- Several locations were identified in reaches MS-5 and T-2 where leaf litter, organic debris, and soil had accumulated in the catch basin inlets.
- Ponded water associated with the clogged infrastructure is a likely source of *E. coli* to the creek receiving waters and is a likely location for regrowth of *E. coli* to occur.
- Wetland bogs in reach MS-5 and T-2 are likely sources of regrowth of *E. coli* and had high concentrations of *E. coli* that were sources to the receiving waters.
- Streambed sediment in urbanized areas contained high concentrations of *E. coli* (potentially naturalized *E. coli*) and are likely source of bacteria to the receiving waters.

3. Does the *E. coli* in the Study Area originate from human sources?

- There was no evidence of active homeless encampments, leaking sewage infrastructure, septic systems, temporary toilets, or other sources of *E. coli* from human waste observed anywhere in the Study Area, suggesting that *E. coli* from human source origin is unlikely.
- However, the percentage of positive results for the human molecular marker was higher than would be expected in an urban stream. The sample size for this element of the Study was small and additional assessment may be necessary to fully address this question.

4. How can the City adapt current management practices to reduce levels of *E. coli*?

- Several management practices that may contribute to elevated levels of *E. coli* in the creek were identified (see below) and include better maintenance of street infrastructure to prevent clogged storm drain inlets, increased enforcement of construction BMPs to minimize soil (and associated *E. coli*) from entering the MS4, stabilization of eroded streambanks, and restoration of degraded habitat.

6.0 RECOMMENDATIONS

Based on the Study conclusions, the following recommendations are offered for consideration by the City.

General Recommendations for both Keene Creek and Tischer Creek.

- Assess and consider enhancing the street sweeping program to remove leaf litter and soil in street gutters, which were shown to be sources of *E. coli*.
- Implement and/or enforce BMPs for construction crews (contractor and City) to prevent construction-related soil from entering the storm drain system.
- Implement inlet protection at City parks (e.g., the soccer field at Irving Park in the Keene Creek Study Area) and other public facilities to prevent flow from grassy areas from entering the storm drain system during irrigation activities and storm events.
- Assess the use of fertilizer on City-owned properties and replace manure-based fertilizers with synthetic fertilizers, as appropriate.
- Implement and/or continue education and outreach BMPs that focus on preventing *E. coli* from entering the MS4. Messaging may include dog waste control (e.g., dog waste dispensers and signage), water conservation (preventing irrigation overflow from entering the MS4), and minimizing the accumulation of organic debris (leaf litter and grass clippings) in street gutters.
- Enhance the City's illicit discharge program to identify sources of *E. coli* in dry weather flows within the Study Area and implement BMPs as appropriate.
- Consider additional studies to better understand the potential health risks associated with *E. coli* in Keene Creek and Tischer Creek (such as a quantitative microbial risk assessment) and an associated assessment of the applicability of the existing standards.

Specific Recommendations for Keene Creek.

- **Prioritization:** the first priority in improving water quality in creeks impaired by *E. coli* is to identify the extent to which *E. coli* concentrations represent a threat to human health. In Keene Creek, the percentage of molecular samples that were positive for the human marker were relatively high, suggesting the potential presence of *E. coli* from human sewage. The sample size for the molecular marker testing in this Study was small and additional assessments of the potential for human sewage in reaches MS-1, MS-2, and MS-3 should be conducted first. The assessments should include the use of the human molecular marker (along with standard culture methods to enumerate *E. coli*) collected from the same sites used in this study in the lower reaches, collected synoptically, during dry weather. After several rounds of testing, assess the

data to determine the frequency of positive results for the human marker and determine if spatial patterns exist. These data can be used to determine if specific areas within the lower three reaches are consistently positive for the human marker, which would indicate a potential sewage source. If an area can be isolated, then further assessments should be conducted, such as an evaluation of sewer line integrity in the area (or nearby upstream areas). If sewage infrastructure problems are identified, repairing them as quickly as possible should be the major priority.

- The second priority in Keene Creek would be to implement the general BMPs outlined above (again, focusing on the lower three reaches of the Study Area). These BMPs represent the "low hanging fruit" because they are the easiest and most cost-effective to implement and because some of them are already established and may need to be enhanced or modified. These general strategies can often be the most effective in reducing *E. coli* concentrations in urban streams because they focus on source control of non-point sources that are common throughout urbanized areas.
- The third priority in Keene Creek is to implement structural BMPs and restoration activities that focus on restoring the integrity and natural stream processes that help attenuate *E. coli* levels in un-urbanized streams.
    - Identify areas where streambank erosion has occurred and implement streambank stabilization BMPs. In Keene Creek, streambank erosion was identified in the lower two reaches, as discussed in Subsection 3.1.2 and identified on the map on Figure 3-3. The most obvious area of streambank erosion was just downstream of Grand Avenue at the railroad overpass in the upper area of Reach MS-2.
    - Identify areas of degraded habitat where restoration activities could be prioritized and implemented. In Keene Creek, several areas were identified where degraded habitat was a likely contributor to elevated *E. coli* levels (see Subsection 3.1.2 and Figure 3-3). The most obvious areas in need of restoration is the lower portion of Reach MS-2 (between North 57th Avenue West and North 59th Avenue West) and the degraded wetland area and paper plant effluent downstream of South Central Avenue.
    - Identify areas where riparian buffers are minimal or not present and enlarge buffers where possible to prevent sheet flow runoff from adjacent grassy areas to the creek. In Keene Creek, areas that may be considered for riparian buffer improvements are Reach MS-3 Keene Creek Park (both at the Keene Creek Dog Park and just upstream across from the picnic tables) and at Irving Park where sheet flow from the grass fields is a likely contributor to elevated *E. coli* levels in the creek.

- **BMP Effectiveness Monitoring:** As BMPs are implemented, it is important to monitor their effectiveness in reducing *E. coli* levels in the receiving waters. BMP effectiveness monitoring typically consists of measuring *E. coli* concentrations upstream and downstream of the BMP or before and after implementation. The study design should be sufficiently robust (e.g., number and frequency of samples) to provide a statistical comparison of changes in *E. coli* concentrations due to BMP implementation.
- **Monitoring Program.** The effectiveness of specific BMPs in reducing *E. coli* concentrations should be one part of an overall strategy to improve water quality in Keene Creek and meet the goals of the TMDL. Water quality improvement strategies are typically incorporated into a stormwater management plan (SWMP) that outlines the goals and specific steps needed to achieve them for the watershed. It is recommended that for Keene Creek, the monitoring program should build off of this Study, using the results as a baseline for future assessments. Because *E. coli* concentrations were low in the upper part of the Study Area, we recommend that the City focus future monitoring in reaches MS-1, MS-2, and MS-3. Synoptic, dry weather (at least 24 hours after a rain event) surveys at the sites used in this Study should be considered for future monitoring programs for a consistent evaluation of water quality conditions over time (we recommend that wet weather assessments be considered after dry weather assessments and BMP implementation). Typically, monthly evaluations are sufficient to assess changes in water quality, but more frequent monitoring may be needed, depending on specific goals. The monitoring program in the SWMP should be considered as a living document with three basic steps: 1. Plan development, 2. BMP implementation, and 3. Assessment. These three steps are repeated to reach the overall goals of the SWMP.

Specific Recommendations for Tischer Creek.

- **Prioritization:** As with Keene Creek, the first priority in improving water quality in Tischer Creek is to identify the extent to which *E. coli* concentrations represent a threat to human health. In Tischer Creek, all of the samples collected form tributary Site T-2 were positive for the human marker, which suggests the potential presence of *E. coli* from human sewage in the T-2 tributary (West Branch of Tischer Creek). The sample size for the molecular marker testing in Tischer Creek was small and additional assessments of the potential for human sewage in the T-2 reach should be conducted first. The assessment should include the use of the human molecular marker (along with standard culture methods to enumerate *E. coli*) collected from the mouth of the T-2 tributary and several other locations within the reach. As with Keene Creek, the samples should be collected synoptically during dry weather. After several rounds of testing, assess the data to

determine the frequency of positive results for the human marker and determine if spatial patterns exist. These data can be used to determine if specific areas within the T-2 Reach are consistently positive for the human marker, which would indicate a potential sewage source. If an area can be isolated, then further assessments should be conducted, such as an evaluation of sewer line integrity in the area (or nearby upstream areas). If sewage infrastructure problems are identified, repairing them as quickly as possible should be the major priority.

- The second priority in Tischer Creek would be to implement the general BMPs outlined above. These general BMPs should be considered for all of Reach T-2, as well as Reach MS-4 and MS-5. Good housekeeping BMPs are a particular priority in Reach T-2 where storm drain infrastructure was clogged with debris (primarily leaf litter and organics), but also sediment from front lawns and sidewalks. In some areas along Waverly Avenue south of Norton Street, the curb had been destroyed, and large amounts of sediment clogged the gutter and catch basin inlet. These areas should be considered a high priority for the general recommendations outlined above.
- The third priority in Tischer Creek is to implement structural BMPs and restoration activities that focus on restoring the integrity and natural stream processes that help attenuate *E. coli* levels in un-urbanized streams.
    - Identify areas where streambank erosion has occurred and implement streambank stabilization BMPs. In Tischer Creek, streambank erosion was identified just upstream of the mouth of the T-2 tributary between West Saint Marie Street and North Street (See Subsection 3.2.2). Failing asphalt was observed along the road that parallels the creek and streambank stabilization should be considered as a high priority along this entire area.
    - Identify areas of degraded habitat where restoration activities could be prioritized and implemented. In Tischer Creek, several areas were identified where degraded habitat was a likely contributor to elevated *E. coli* levels (see Subsection 3.2.2 and Figure 3-10). The most obvious areas were in Tributary T-2, particularly at degraded pond just downstream of Norton Street, which had very poor habitat and was shown to be a source of *E. coli* to downstream receiving waters. Other areas in Reach T-2 that are in need of habitat restoration include the ponded water at Norton Street and Carver Avenue and the wetland bog in the creek just south of this area, which was clogged with organic debris and degraded habit. In Reach MS-5, the most degraded habitat was observed at West Saint Louis Street and Harvard Avenue. This large area adjacent to the creek had very poor habitat with high *E. coli* concentrations that are likely contributing to elevated levels in the Tischer Creek mainstem.
- **BMP Effectiveness Monitoring:** As discussed above for Keene Creek, it is important to monitor BMP effectiveness in reducing *E. coli* levels in the receiving waters. BMP effectiveness

monitoring typically consists of measuring *E. coli* concentrations upstream and downstream of the BMP or before and after implementation. The study design should be sufficiently robust (e.g., number and frequency of samples) to provide a statistical comparison of changes in *E. coli* concentrations due to BMP implementation.

- **Monitoring Program.** The effectiveness of specific BMPs in reducing *E. coli* concentrations should be one part of an overall strategy to improve water quality in Tischer Creek and meet the goals of the TMDL. It is recommended that for Tischer Creek, the monitoring program should build off of this Study, using the results as a baseline for future assessments. Because *E. coli* concentrations were low in the upper part of the Study Area, we recommend that the City focus future monitoring in reaches T-2 and MS-5. Synoptic, dry weather (at least 24 hours after a rain event) surveys in these reaches, as well as Reach MS-4 should be considered for future monitoring programs for a consistent evaluation of water quality conditions over time (we recommend that wet weather assessments be considered after dry weather assessments and BMP implementation). Typically, monthly evaluations are sufficient to assess changes in water quality, but more frequent monitoring may be needed, depending on specific goals.

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APPENDIX F – GLSNRP2022 GRANTEE CONTRACT

CITY OF DULUTH

RFP# 23-99029

CONTRACT APPENDICES

Appendix A – Approved Project Work Plan and Budget

Appendix B – Reporting Forms

Appendix C – Insurance Certification and Documentation

Appendix D – Federal Requirements

Appendix E – NRCS-GLC Cooperative Agreement # NR213A750013C001

I. PROJECT SCOPE

(A) This Contract and its appendices constitute the entire Contract between the Commission and the Grantee. The Contract may be modified only by signed written agreement between the Commission and the Grantee. If any provision of this Contract shall for any reason be held by a court of law to be invalid, illegal, or unenforceable in any respect, that invalidity, illegality, or unenforceability shall not affect any other provision of this Contract. All remaining provisions of this Contract shall remain in full force and effect.

(B) The scope of this Project is limited to the activities specified in the approved Project work plan and budget (Appendix A), which is specifically incorporated by reference herein and made part of this Contract. Changes in Project scope may require prior written approval in accordance with Section III of this Contract.

(C) By acceptance of this Contract, the Grantee commits to complete the Project, including without limitation meeting or exceeding the approved Phosphorus Reduction Target specified on page one of this Contract, along with other applicable measures of progress identified within Appendix A, and submitting all required reporting during the effective dates of this Contract, in accordance with the terms and conditions of this Contract.

(D) This Contract is funded by the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) through a grant to the Great Lakes Commission. Neither the United States nor any of its departments, agencies, or employees is a party to this Contract.

(E) The Grantee commits to implement conservation practices to reduce phosphorus and sedimentation only within the area(s) identified in Appendix A and listed on page one of this Contract, and to report on progress and results that specifically relate to the practices described and installed under this Contract.

(F) Grant funds provided herein cannot be used to provide additional cost-share or pay for technical assistance to plan, design, or install any conservation practice paid for in any part by farm bill programs administered by USDA-NRCS, such as EQIP, other GLRI awards, Clean Water Act section 319 programs or other federally-funded programs.

II. CONTRACT PERIOD

Upon signature by the Grantee, the Contract shall be effective from the Start Date until the End Date on page one of this Contract, unless terminated sooner as provided in this Contract (Section XVIII). The Commission shall have no responsibility to provide funding to the Grantee for Project work performed except between the Start Date and the earlier of the End Date specified on page one or the date of Termination. Expenditures made by the Grantee prior to the Start Date or after the earlier of the End Date or the date of Termination of this Contract are not eligible for payment under this Contract.

III. CHANGES

The Grantee must receive prior written approval from the Commission for: (1) any changes to the Grant Contract, (2) material changes to the approved project work plan (Appendix A), which include changes in Project activities that may compromise achievement of the Phosphorus Reduction Target specified on page one of this Contract and other applicable measures of progress, (3) changes to the approved Project budget (including transfers of funds between existing budget categories) in excess of $5,000 or that will result in a material change to the approved Project work plan, or 4) an extension of the End Date listed on page one.

All such changes must be requested by the Grantee in writing on organizational letterhead and, if approved, will be formalized by the Commission in writing in the form of a Contract Amendment. The Commission reserves the right to deny requests for changes to the Contract or to its appendices.

For budget changes totaling less than $5,000, the Grantee does not need prior authorization from the Commission unless the changes will result in a material change to the approved Project work plan (e.g., moving funds from an approved conservation practice to a different practice or activity not identified in the existing Project work plan and/or changes that may compromise Grantee's achievement of the Phosphorus Reduction Target). To implement non-material budget changes less than $5,000, the Grantee should amend its Invoice

Form (Appendix B.1) to reflect the adjusted budget amounts in the "Budget Adjustments" column, and then clearly describe all budget changes within the Narrative Progress Report Form (Appendix B.3) for the next reporting period.

IV. GRANTEE DELIVERABLES AND REPORTING REQUIREMENTS

(A) The Grantee shall complete all deliverables specified in Appendix A of this Contract and meet or exceed the approved Phosphorus Reduction Target and other applicable measures of progress during the Contract period specified on page one of this Contract.

(B) Quarterly Reporting: The Grantee shall be required to complete and submit progress reports at least quarterly (i.e., every three months) following the procedures and schedule detailed below, **even if no Project activity has occurred and no funds are being requested during the reporting period**. These reports shall be due fourteen (14) days after the end of each quarter of the federal fiscal year, which runs from October 1 through September 30. Reports are due as follows:

Reporting Period	Due Date
Q1: October 1 – December 31	January 14
Q2: January 1 – March 31	April 14
Q3: April 1 – June 30	July 14
Q4: July 1 – September 30	October 14

Your first quarterly progress report is due January 14, 2023, with additional progress reports due every three months thereafter. The final quarterly report shall be due no later than October 14, 2025. Failure to submit quarterly reports in a timely fashion may result in Contract termination.

Progress report forms must include a signed (electronic or hard copy) invoice for reimbursement, a description of the conservation practice(s) installed during the quarter, and a narrative report of the Project's activity. Before, during, and after pictures will also be required for the Project and should be submitted with each quarterly report. Quarterly reports must report on the *entire 3-month period*, through the final day of the last month of the reporting period and should not be signed and dated prior to the end of the period.

(C) Monthly Reporting (Optional): The Grantee may choose to submit reports and invoices on a monthly basis. Monthly reports will include the same components as above and shall be due no later than fourteen days after the end of the calendar month under consideration. Monthly reports should include the *entire month* and should not be signed and dated prior to the end of the month. If the Grantee chooses to submit three separate monthly reports and invoices, then a quarterly report is not required. However, the entire three-month period must be reported in monthly increments for that quarter (in lieu of a single quarterly report) to stay on schedule with the quarterly reporting timeframes listed above.

(D) Report Submittal: Quarterly report file names must include the Project Number (listed on page one of this Contract) and be labeled according to the federal fiscal year and quarter using the format: FY followed by the last two digits of the federal fiscal year followed by a dash (–) followed by either Q1, Q2, Q3 or Q4 depending on the particular quarter. An example for a report submitted in the second quarter of federal fiscal year 2022 would be GLSNRP-12-00 – FY22-Q2. Monthly reports should be labeled with the fiscal year and month (e.g., GLSNRP-12-00 – FY22-April). Please note the federal fiscal year begins on October 1 of each year, thus quarters aligns with the table in Paragraph (B), above.

To submit a progress report, please use the following procedure:

1. The following three forms (provided to the Grantee as Appendices to this Grant Contract) must be completed for each report:

    a. Invoice Form (Appendix B.1), signed by an Authorized Representative of the Grantee,
    b. Load Reduction Reporting Form (Appendix B.2), submitted as an Excel file – no pdfs, and
    c. Narrative Progress Report Form (Appendix B.3).

Additional material such as pictures and news articles may be included within the narrative report.

2. Access the program webpage at **https://www.glc.org/work/sediment/progress_report** and fill out the submittal data/information – Project Number, Contact Name, Email, and Project Title in the web form.

3. Upload each form by clicking on the Choose File buttons and finding the appropriate completed form in your files.

4. Once all forms have been selected, submit the web form.

(E) Final Project Report: The Grantee shall provide a Final Project Report using the final report form and instructions provided at **https://www.glc.org/work/sediment/final_report,** as well as a final Invoice Form (Appendix B.1) for all remaining eligible Project expenses and a final Load Reduction Reporting Form (Appendix B.2). Final Project Report procedures for submittal are similar to those listed above for the quarterly reports. The Final Project Report, Invoice Form, and Load Reduction Reporting Form must be submitted by **November 30, 2025**. The Grantee may invoice the Commission for costs incurred in preparation of the Final Project Report, Invoice Form, and Load Reduction Reporting Form; however, Projects are expected to be complete not later than September 30, 2025, the End Date depicted on page one of this Contract.

V. RESPONSIBILITIES

(A) The Commission covenants to:

1. Respond to questions and inquiries from the Grantee in a timely manner.

2. Respond to all requested changes to the Contract, material changes to the Project work plan (Appendix A), and to budget changes in excess of $5,000 in writing.

3. Provide administrative guidance to the Grantee on the Project.

4. Assure timely review and processing of Narrative Progress Reports and Invoices.

5. Share Project outcomes and progress, including load reductions and innovative approaches, across the Great Lakes region.

(B) The Grantee covenants to:

1. Fulfill all requirements in the Project work plan (Appendix A) or as modified by Contract Amendment, including the approved Phosphorus Reduction Target specified on page one of this Contract.

2. Appoint a designated staff contact person to serve as the day-to-day contact with the Commission in the administration and execution of the Project (identified as the Grantee Project Manager on page one of this Contract). Should this person change duties or leave the Grantee organization during the Contract period, the Grantee must notify the Commission of such changes in writing within 30 calendar days of the change, identifying who shall be responsible for the continued direction and management of the Project.

3. Design and install all implementation practices according to USDA-NRCS standards and specifications, applicable state standards, or under the approval of a certified professional engineer or agronomist, as applicable for the specific practice.

4. Obtain all necessary federal, state, and local government permits and approvals where necessary for the proposed work prior to the expenditure of funds for those activities requiring permits.

5. Achieve the total soil and phosphorus reduction savings as specified in the Project work plan (Appendix A) and documented within the Load Reduction Reporting Form (Appendix B.2).

6. Provide before, during, and after pictures of the implementation, media events, and other activities of interest to the Project.

7. Abide by all local, state/provincial, and federal laws, rules, ordinances and regulations in the performance of this Project and conduct all work in a lawful and safe manner, consistent with the standards and level of care normally provided under this profession. The Grantee is solely responsible for determining the requirements for and obtaining any permits or licenses that may be required by local, state, or federal laws, regulations, or rules to carry out the activities funded under this Contract.

8. Preserve and submit appropriate documentation to support reported expenses on quarterly invoices (or monthly, if preferred) to the Commission, within 14 days after the end of the quarter (or month).

9. Submit a Final Project Report, final Invoice Form (Appendix B.1), and final Load Reduction Reporting Form (Appendix B.2) due no later than November 30, 2025.

10. Plan and conduct outreach efforts in a timely manner consistent with the requirements of the Project work plan (Appendix A). Outreach materials and all communications with the media and the public should acknowledge the Project funders and other cooperators, as appropriate. Additional details are provided in Appendix D of this Contract, Federal Requirements. The Grantee should seek approval from the Commission prior to using the Commission's logo.

11. Request changes to the Contract, work plan, or budget (as described in Section III) in writing on the Grantee's organizational letterhead.

12. Unless otherwise specified in separate landowner cost-share agreements, the Grantee shall provide necessary maintenance and/or repairs both during and after the specified Contract period to assure continued performance of practices installed consistent with Appendix A, and for the intended life of the practice under the relevant USDA-NRCS practice standard.

13. The Grantee agrees to inform the Commission as soon as problems, delays, or adverse conditions become known which will materially impair the Grantee's ability to meet the outputs/outcomes specified in the approved Project work plan (Appendix A).

(C) The Grantee and any designee, subcontractor, or agent shall at all times be an independent entity. The Grantee shall, under no circumstance during the term of this Contract, be an employee or agent of the Commission. The Commission and Grantee agree that the Commission is not required to withhold income tax for any payment to the Grantee, its employees, or its designees or agents under this Contract, including reimbursement of expenses, but that it may file informational returns with the U.S. Internal Revenue Service (IRS) or similar federal or state agencies regarding payment made hereunder to the Grantee under conditions imposed by federal, state or local laws applicable to such payment. It is further understood that neither the Grantee, nor its designees, agents, or employees, are employees of the Commission or its party states, within the meaning or application of any federal or State of Michigan unemployment insurance, retirement benefits law or social security law, or any worker's compensation or industrial law or otherwise.

(D) The Grantee shall secure the necessary personnel to perform the services as described in the approved work plan (Appendix A), and all personnel shall be employees or shall be under the direct supervision of the Grantee. The Grantee shall accept responsibility for and make payments as required by law for workers' compensation insurance, social security, income tax deductions, unemployment compensation, and any other taxes or payroll deductions as required by law for its employees. The above shall be the responsibility of any firm or individual employed under a subcontract. All personnel, employees, or subcontractors working under this Contract shall be professionally qualified to perform the duties required.

(E) The Grantee is responsible for the professional quality, technical accuracy, timely completion, and coordination of all designs, drawings, specifications, reports, and other services furnished by the Grantee or its subcontractor under this Contract. The Grantee or its subcontractor shall, without additional compensation,

correct or revise any errors, omissions, or other deficiencies in drawings, designs, specifications, reports, or other services.

(F) The Commission's approval of all reports, products, and incidental work or materials furnished hereunder shall not in any way relieve the Grantee of responsibility for the technical adequacy of the work. The Commission's review, approval, acceptance, or payment for any of the services shall not be construed as a waiver of any rights under this Contract or of any cause of action arising out of the performance of this Contract, and the Grantee shall be and remain liable to the Commission for breach of obligation with respect to any of the services furnished under this Contract.

(G) The Grantee acknowledges that it is a crime to knowingly and willingly file false information with the Commission for the purpose of obtaining this Contract or any payment under the Contract, and that any such filing may subject the Grantee, its agents, and/or employees to criminal and civil prosecution and/or termination of the grant.

VI. ASSIGNABILITY

The Grantee and its respective directors, officers, and employees shall not transfer, pledge, mortgage, or otherwise assign the value of this Contract or assign or delegate any of Grantee's duties or obligations under this Contract to any other party without the prior written consent of the Commission, which consent the Commission may grant or withhold in its sole discretion.

VII. SUBCONTRACTS

(A) Subject to all applicable provisions of this Contract, the Grantee may enter into subcontracts for the performance of work under this Contract.

(B) No subcontract shall be deemed an assignment of Grantee's rights or obligations under this Contract. No subcontract shall relieve Grantee of any of Grantee's obligations under this Contract and Grantee shall remain solely responsible to the Commission for performance of its obligations under this Contract. Except as specifically provided herein, no subcontract shall create any contractual relationship between the Commission and the subcontractor. The Commission shall not be liable to any subcontractor for performance of any obligations under the subcontract including without limitation payment to the subcontractor. The Commission shall consider Grantee to be the sole point of contact for all matters relating to this Contract, including without limitation the payment of any and all charges resulting from the Grant.

(C) Grantee shall ensure that any subcontractor is qualified to perform the duties required.

(D) Grantee shall require that all subcontractors comply with the provisions of Sections VIII (Non-Discrimination), XI (Conflict of Interest), XII (Anti-Lobbying) and debarment and suspension requirements incorporated by reference within Appendix D (Federal Requirements) of this Contract.

(E) Grantee shall require and ensure that all subcontractors maintain the insurance coverage required pursuant to Appendix C of this Contract. Upon request from the Commission, Grantee shall provide the Commission with proof (i.e., a certificate of coverage) showing that each subcontractor has met the minimum insurance requirements within Appendix C.

(F) The Grantee and its agents and designees agree to follow procurement standards established under Uniform Guidance 2 CFR 200.

VIII. NON-DISCRIMINATION

The Grantee shall comply with all Civil Rights Acts, as amended and all other federal, state, and local fair employment practices and equal opportunity laws and covenants that it shall not discriminate. The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic Information, political beliefs, reprisal, or because all or in part of an individual's income is derived from any public assistance program. The Grantee agrees to include in every

subcontract entered into for the performance of this Contract this covenant not to discriminate. A breach of this covenant, whether by Grantee or any subcontractor to Grantee, shall be deemed a material breach of this Contract by Grantee.

IX. DISPUTE RESOLUTION AND GOVERNING LAWS

(A) The Parties agree to work in good faith to resolve any disputes over the interpretation of the terms of this Contract. If the Parties are not able to resolve their differences, the Parties shall be entitled to submit to a court of competent jurisdiction as provided herein.

(B) This Contract shall be construed in accordance with and governed by the laws of the state of Michigan.

(C) Any suit to enforce or interpret this Contract shall be brought in the federal or state courts residing in Washtenaw County, Michigan.

X. LIABILITY

(A) The Grantee agrees to defend, indemnify, save, and hold harmless the Commission, its representatives, employees, agents, officers, directors, and party states from and against any and all liabilities, obligations, penalties, costs, claims, injuries (including death), demands, damages, expenses and losses, including, but not limited to, attorney fees, consultant fees and expert witness fees, arising in whole or in part out of any act, error or omission of the Grantee, its employees, officers, agents or subcontractors, including, but not limited to: a) any negligent or tortious act, error, or omission; b) any failure to perform obligations, either express or implied, under this Contract; c) any misuse, or failure to properly account for the use, of funds received under the Grant; d) any release of any pollutant or hazardous substance or hazardous material, without regard to whether such release is negligent, reckless or violates any applicable local, state or federal ordinance, statute, rule or regulation; and e) any failure to comply with any applicable local, state, or federal ordinance, statute, rule, regulation or requirement including any permit, license or order issued thereunder which governs or applies to the work under this Contract.

(B) The Grantee understands and agrees that the Commission's only financial obligation with respect to the Grantee in connection with the Project is to provide funding as set forth herein. The Commission shall have no other liability or obligations to or on behalf of the Grantee except those expressly stated herein.

(C) The Grantee's obligation under Section X(A) shall survive the End Date or earlier termination of this Contract and shall remain in full force and effect.

(D) In the event of Grantee negligence, the Grantee shall be responsible for any repairs or replacements to the installed practices (at Grantee's expense) that may be needed to assure continued performance of practices for the intended life of the practice under the relevant USDA-NRCS practice standard. See also Section XIX, Force Majeure.

XI. CONFLICT OF INTEREST

No government employee, or member of the legislative, judicial, or executive branches, or member of the Grantee's Board of Directors, its employees, partner agencies or their families shall benefit financially from any part of this Contract.

XII. ANTI-LOBBYING

The Grantee shall ensure that no funds provided under this Contract are used to engage in lobbying of the Federal Government, in litigation against the United States unless authorized under existing law, or for other political activities. Further, the Grantee shall require that the language of this assurance be included in the agreement documents of all subcontracts at all tiers.

XIII. AUDIT AND ACCESS TO RECORDS

(A) Grantee agrees to maintain any and all Project files for all activities associated with this Project Contract for a period of three (3) years after the final payment has been issued to the Grantee by the Commission and in accordance with generally accepted accounting principles. The files shall contain at a minimum: Project work plans, copies of all federal and state permits/consultations associated with Project implementation, copies of all financial documents and supporting materials, including source documentation for all accounting records for all costs incurred under this grant. Such documentation includes, but is not limited to, canceled checks, paid bills, payroll records, and subcontract agreement documents. In addition, Grantee agrees to maintain comparable records of all maintenance and repair work performed pursuant to Section V(B)13 of this Contract until three (3) years after the intended life of the installed practices under the relevant USDA-NRCS practice standard.

(B) The Commission reserves the right to conduct a programmatic and financial audit of the Project, and the Commission may withhold payment until the audit is satisfactorily completed.

(C) The Commission, USDA-NRCS, EPA and the Federal Office of the Inspector General, at all reasonable times during normal business hours, shall have the right to inspect, audit, and reproduce all records, books, documents, correspondence, instruction, drawings, receipts, vouchers, memoranda, similar data and other evidence, and accounting procedures in any manner relating to this Contract, and the work performed and services rendered hereunder. Furthermore, Grantee agrees to allow an appropriate representative of the Commission, USDA-NRCS, EPA or the Federal Office of the Inspector General to interview any officer or employee of the recipient, subcontractor, grantee, sub grantee, or agency regarding such transactions related to this Contract. The Commission may demand, and Grantee shall be required to deliver, forthwith, such additional records, accounts, summaries, and supporting documents as the Commission in its sole discretion may deem appropriate.

(D) In accordance with Uniform Guidance 2 CFR 200 Subpart F, the Grantee hereby agrees to obtain a single audit from an independent auditor **if it expends $750,000 or more in total Federal funds in any fiscal year**. If this applies to the Grantee at any point during the Contract period, the Grantee shall submit the SF-SAC and a Single Audit Report Package using the Federal Audit Clearinghouse's Internet Data Entry System (see **https://facweb.census.gov/uploadpdf.aspx)** within nine months after the end of the Grantee's fiscal year or 30 days after receiving the report from the auditor and provide an additional copy to the Commission.

XIV. MATCH REQUIREMENTS

(A) The Grantee is committed to the match amount listed on page one of the Contract, in accordance with the approved budget in Appendix A. Match cannot be earned prior to the Start Date on page one of the Contract. The Grantee shall expend all local match committed to the Project by the End Date on page one of the Contract.

Match can be in cash, in-kind or a combination of both. The list below is not exhaustive.

1. Cash is any money received from any source, other than from federal sources, that is part of the applicant's annual budget and audit process and will be utilized in the implementation of the Project.

2. In-kind includes services or financial contributions to the Project not paid for with the grant or other federal funds. These include:

    a. Technical and/or administrative assistance provided by the Grantee, other entities, or persons not paid for with the grant or with federal funds.
    b. All or a portion of the Grantee's indirect costs not otherwise paid for with the grant or with federal funds.
    c. Use of local and state agency vehicles other than those of the Grantee.
    d. Cost-share agreements from landowners.
    e. Unpaid members of local task forces, watershed councils, work groups, citizen groups, etc. are considered volunteers, and may be calculated at the prevailing national minimum

wage (currently $7.25/hour) unless justification is provided for a higher rate. Additional skilled labor may be charged at a higher rate with additional, detailed justification.

(B) Grantee match from other projects may not be counted toward meeting the specific match requirement of this Contract and must come from non-Federal sources.

(C) Should the Grantee become aware that it may be unable to provide the Grantee match amount identified on page one of this Contract, the Grantee must:

1. Immediately notify the Commission's Point of Contact of the situation and provide a detailed description of the Grantee's impaired ability to provide the match amount;

2. Specify the steps Grantee plans to take to secure replacement Grantee match in writing for approval by the Commission; and

3. Indicate the Grantee's plans to either continue or phase out the Project in the absence of Grantee match.

(D) If the Commission agrees to the Grantee's proposed plans, the Grantee will be notified accordingly. If the Grantee's plans are not acceptable to the Commission, the Contract may be subject to termination or modification. Modifications to proposed Grantee match revisions may be made on a case-by-case basis.

(E) Failure by the Grantee to notify the Commission in accordance with paragraph (C) above may result in the disallowance of some or all of the costs charged to the grant, the subsequent recovery by the Commission of some of the grant funds, and possible termination of the Contract.

(F) The Grantee must maintain records of all Project costs that are claimed by the Grantee as Grantee match, as well as records of costs to be paid with grant funds. If the Grantee's match includes in-kind contributions, the basis for determining the valuation for volunteer services and donated property must be documented.

XV. OTHER SOURCES OF FUNDING

The Grantee guarantees that any claims for reimbursement made to the Commission under this Contract must not be financed by any source other than the Commission under the terms of this Contract. If funding is received through any other source, the Grantee agrees to delete the item(s) in question from its billings, or to immediately refund to the Commission, the total amount representing such duplication of funding.

XVI. COMPENSATION

(A) The Commission shall pay the Grantee a total amount not to exceed the amount on page one of this Contract, in accordance with the approved budget for the Project (Appendix A or its approved amendments), and only for eligible expenses already incurred and paid by the Grantee. Any change in the approved budget meeting the conditions listed in Section III must be approved in advance and in writing by the Commission. All other costs necessary to complete the Project are the sole responsibility of the Grantee. Labor cost charges to this grant must be based upon salaries actually earned and the time actually worked on this Project. Costs that cannot be supported by source documentation or that are incurred outside of the approved Project period and budget may be disallowed and may result in grant funds being returned to the Commission by the Grantee.

(B) Payments for work conducted under this Contract are made on a cost reimbursement basis. After reviewing the reports submitted by the Grantee as specified in Section IV for satisfactory progress and approving all submitted expenses, the Commission shall initiate the reimbursement process. This process can take up to 90 calendar days to complete. Compiled reimbursement requests from all Great Lakes Sediment and Nutrient Reduction Program grant projects are submitted to the USDA-NRCS each mid-month. If the Grantee does not submit a complete report, including a signed Invoice Form, by the fourteenth of the month, payment may be delayed by an additional 30 days. **The Commission is not responsible for delayed payments if funds from USDA-NRCS are not provided in a timely manner to cover the reimbursement request from the Grantee, nor is the Commission responsible for delays arising from incomplete or inaccurate reporting by the Grantee.**

(C) The Commission reserves the right to request additional information necessary to substantiate payment requests.

(D) Expenses incurred by the Grantee prior to the Start Date or after the End Date of this Contract are not allowed under this Contract and the Commission is not liable for these costs.

(E) The Commission shall provide an advance of **ten percent (10%)** of the Project budget listed on page one of this Contract to the Grantee upon execution of this Contract. Grantee will draw upon these funds to cover initial costs for the Project and to assist in cash flow during the implementation. Advanced fund expenditures must be noted by the Grantee on the Invoice Form (Appendix B.1).

(F) Payment for reimbursable Project costs shall be made only upon receipt and approval of quarterly or monthly reports as specified in Section IV and described in the approved work plan (Appendix A). The final reimbursement request for the Contract shall be made only upon receipt and approval of the Final Project Report, final Invoice Form (Appendix B.1), and final Load Reduction Reporting Form (Appendix B.2).

(G) If the Final Project Report, final Invoice Form (Appendix B.1), final Load Reduction Reporting Form (Appendix B,2) or other Project deliverables are found to be incomplete or otherwise unacceptable by the Commission, or if the Project work has not been accomplished in accordance with the approved work plan (Appendix A), the Commission reserves the right to retain a **five percent (5%)** holdback of funds until the Project is completed in accordance with Section XVIII and Appendix A.

XVII. CLOSEOUT

(A) A determination of Project completion, which may include a site inspection and an audit, shall be made by the Commission after the Grantee has met all match obligations, satisfactorily completed required reports, and provided products and deliverables described in Appendix A. The determination shall be conveyed to the Grantee in the form of a Final Close-Out Letter from the Commission.

(B) Upon issuance of final payment from the Commission, the Grantee releases the Commission of all claims against the Commission arising under this Contract. Unless otherwise provided in this Contract or by state law, final payment under this Contract shall not constitute a waiver of the Commission's claims against the Grantee.

(C) The Grantee shall immediately refund to the Commission any payments made in excess of the documented costs allowed by this Contract.

XVIII. TERMINATION

(A) This Contract may be terminated by either Party before the End Date for any reason subsequent to the provision of 30 days advance notice to the other Party. Any termination notice shall be provided in writing specifying the reasons for termination and new project end date. Notices shall be sent by certified mail with return receipt requested.

(B) If the Contract is terminated, the Grantee shall continue to be responsible and liable for the proper performance of its obligations through the date of termination, unless otherwise instructed by the written notice. The Commission shall honor requests for just and equitable compensation to the Grantee for all satisfactory and eligible work completed under this Contract through the date of termination, upon which time all outstanding reports and documents are due to the Commission and the Commission shall no longer be liable to pay the Grantee for any further charges to the grant. If funds previously advanced to the Grantee have not been expended in the performance of the Project, all unexpended funds shall be returned to the Commission or a settlement shall be negotiated as to the proportion to be reimbursed based on satisfactory work completed.

XIX. FORCE MAJEURE

Neither of the Parties hereto shall be liable for damages for any delay or default in performance during the term hereof if such delay or default is caused by conditions beyond its control, including, but not limited to, acts of God, government restrictions, continuing domestic or international problems such as wars, threats of terrorism, or insurrections, strikes, fires, floods, work stoppages (not issued by the Commission), and embargoes.

XX. SAFETY

The Grantee agrees that it alone shall be responsible for the safety of its representatives while performing any services hereunder and will familiarize itself with any hazards it may encounter in conducting its work hereunder, including threats arising from the COVID-19 pandemic. The Grantee agrees to comply with all applicable federal, state, municipal and local laws, rules, ordinances and requirements concerning health, safety, and training with respect to Grantee's work hereunder, including the Federal Occupational Safety and Health Act of 1970, as amended under 29 CFR 1910 et seq., and all standards, rules, regulations and orders which have been or shall be adopted or issued thereunder.

GLSNRP Work Plan

Applicant Organization:	City of Duluth, Minnesota
Project Name:	Keene Creek Resiliency Report - Irving Park Biofiltration Basin
Project Manager:	Tom Johnson, Senior Engineer – City of Duluth
Project Manager Contact Information:	(218) 730-5103 tajohnson@DuluthMN.gov

Award Amount:	$121,000
Match/ In-kind Amount:	$31,250
Total Project Cost (grant request + match):	$152,250

1. Project Description

Utilizing funds from the GLSNRP, Duluth aims to implement a high visibility green infrastructure project in an area that had been previously identified through a feasibility study with the goal to increase community climate resilience and enhance the condition of Lake Superior's outstanding water resources. Modeled after similar mapping efforts conducted by the University of Minnesota Institute on the Environment, the City has systematically identified, prioritized and cataloged the convergence of underutilized or vacant parcels within the immediate proximity of stormwater collectors and seeks to accelerate implementation of stormwater green infrastructure.

Located in the Irving Neighborhood on Duluth's West End, the Irving Park raingarden with biofiltration features as proposed will provide treatment to 17.341 acres of urban runoff, actively contribute to GLRI Focus Area 3 Measures of Progress in Lake Superior and the St. Louis River Estuary, and increase the climate resiliency of an economically disadvantaged, flood-prone locale. The underutilized area of the proposed raingarden, systematically identified through extensive geospatial analyses (Draft Resiliency Report – Keene Creek Watershed, p. 14), will serve to offtake and subsequently treat southerly stormwater flows of existing conveyance infrastructure along South 57th Avenue West. Flows received to the proposed basin will be treated for E. coli via combination of beneficial perennial plantings and engineered soil media which incorporates bio-char prior to subsurface drain reconnection to existing conveyance systems. Bio-char amended soils are believed to be an effective method by which to retain bacteria, this was concluded with guidance from the most recent version of the Minnesota Stormwater Manual, https://stormwater.pca.state.mn.us/index.php?title=Biochar_and_applications_of_biochar_in_stormwater_management . Additionally, the use of a sediment pretreatment basin will aid in the capture of sediment and sediment-bound phosphorus during annual maintenance. The particular soil media will be chosen with guidance from the chosen consultant for design and local researchers to best characterize pollutant removal from stormwater flows before their eventual discharge to nearby Keene Creek. Being located in a highly visible location near to parkland frequented by recreationalists, the area utilized for stormwater treatment will be publicly demarcated via the usage of educational signage meant to increase awareness of water quality enhancement mechanisms, and generally beautify the western portion of Irving Park.

The proposed location of the biofiltration raingarden in Irving Park, as designed, will mitigate E. coli deposition to Keene Creek and confer improved water quality benefits to the St. Louis River Estuary, and to Lake Superior. The installation of this stormwater treatment feature will serve to enhance the appearance of an underutilized portion of Irving Park, function as an educational component to recreationalists and passersby, and aligns with goals for the creek corridor and park usability in general. Awarded funds from the Great Lakes Sediment

and Nutrient Reduction program for the purpose of implementing the raingarden in Irving Park would represent a crucial first investment in the City of Duluth's stormwater green infrastructure geospatial mapping process, likely "proving" our method to other grantors and accelerating the rollout of stormwater green infrastructure across the City.

2. Project Work Area

HUC-12 Code(s)	HUC-12 Watershed Name(s)
040101020405	City of Duluth – Frontal Lake Superior
040102011604	St. Louis River

List the county or counties that comprise your project work area:	St. Louis County

3. Conservation Practices to be Installed

The following table includes a list of approved conservation practices to be installed with this award. Any changes to the amount of practice to be installed, the budget for each practice, and/or the addition of a conservation practice will require written approval from the Commission. Detailed information on conservation practices can be found in Section 9, Details on Conservation Practices.

Practices	**Amount (e.g., acres, linear feet, etc.)**	**Budgeted for Installation**	**Annual Soil Savings**	**Annual Total Phosphorus Savings**	**Feet of Streambank Restored**	**Annual Gallons Stormwater Captured or Treated**
Underground Outlet (620)	70 linear feet	$33,000	0 tons	0 pounds	N/A	0 gallons
Sediment Basin (350)	500 cubic yards	$33,000	1.7 tons TSS	16.59 pounds	N/A	7.2 million gallons

4. Timing of Conservation Practice Implementation

Practice Name	**Federal FY 2023**	**Federal FY 2024**	**Federal FY 2025**
	Amount Installed	**New Amount Installed**	**New Amount Installed**
Underground Outlet (620)	0 linear feet	70 linear feet	0 linear feet
Sediment Basin (350)	0 cubic yards	500 cubic yards	0 cubic yards

5. Schedule of Activities

Activity	Planned Delivery Date
Formulation of RFP	10/1/2023
Issuance of RFP to hire engineering consultants	11/1/2023
Review, score, and select highest scoring RFP response	12/1/2023
Complete contracts with consultant and facilitate kickoff meeting with project partners. Issue Notice to Proceed with final portion of site design.	1/15/2024
Final Design/Construction Plans Approval. Plans put out for public bid/awarded to low bidder	4/1 - 4/28/2024
Issuance of Notice to Proceed with project construction of the proposed Irving Park biofiltration raingarden.	5/15/2024
Share news of the implementation of the Irving Park raingarden; inspect completed work and sign-off on completion of project as required per site design standards	Summer of 2024
Complete construction of the biofiltration raingarden. Site visit and review maintenance with City of Duluth Utility Operations staff to discuss long term O&M of the BMP.	9/30/2024
Complete Final Report and invoice	12/31/2024

6. Performance Measures

Estimated annual Total Phosphorus (TP) reduction (pounds):	16.59 pounds per year
Description of activities intended to assure performance: See response to "Estimated annual gallons of untreated stormwater runoff captured or treated" below.	

Estimated annual gallons of untreated stormwater runoff captured or treated	7.2 million *(for maximum allowable area of 12 acres in EPA's stormwater calculator)*
Description of activities intended to assure performance (300 words or less): In addition to the many alignments of the Irving Park biofiltration raingarden to previously enacted climate ordinances, the implementation of the feature as described will substantially contribute to the mitigation of a known bacterial impairment in Keene Creek, and, as a consequence, GLRI Focus Area 3. The City of Duluth has engaged in extensive measures intended to identify and mitigate the incidence of E. coli loading to the receiving waters of Keene Creek with the goal of addressing TMDL impairments. Implementation of the project as proposed offers considerable opportunity for water quality improvement as a 2019 bacterial source assessment conducted by Burns and McDonnell identified the specific location of the proposed Irving Park biofiltration raingarden as one likely to harbor bacterial growth. Forthcoming initiatives of the One Watershed, One Plan in addition to future bacterial monitoring efforts by the Minnesota Pollution Control Agency will allow for ongoing evaluations of performance rooted in the interplay of climate resiliency and the quality of our outstanding water resources.	

7. Communication Efforts

A. Kickoff Event

Following the RFP process, and prior to the issuance of a Notice to Proceed, City of Duluth stormwater engineers, utility program coordinators and sustainability professionals will meet with the selected engineering firm to discuss the project and its desired outcomes. Serving as a sort of "kickoff meeting", details on this project's source of funding, a description of desired public engagement via social media, and the broader impact of implementing a project from the aforementioned Keene Creek Resiliency Report will be relayed to all project partners. The City of Duluth regularly relies upon both in-person conference rooms and virtual meeting platforms to conduct official business, and will monitor the ongoing COVID-19 pandemic before determining how best to facilitate this introductory discussion.

B. Ongoing Outreach

Duluth has a robust public engagement culture. All park and community development planning is vetted through processes that include on-site public meetings, web-based and paper surveys that produce Small Area Plans and park Mini-master Plans that guide development. Irving Park has a complete and approved Mini-master Plan facilitated by Duluth Parks and Small Area Plan facilitated through Duluth LISC and Duluth's Community Development division. Improvements to the Keene Creek watershed are in keeping with these publicly approved plans. This project serves to make measurable steps towards improving water quality while complimenting park usability. Duluth regularly updates residents on park related matters via public meetings, press releases, and Facebook and Instagram.

Spreading awareness of the many benefits derived from nature-based stormwater management will gain public support for the implementation of additional green stormwater projects. Site design of the biofiltration basin in Irving Park will include educational signage intended to increase awareness to passersby on the many benefits of nature-based stormwater treatment systems, and the ecological advantages conferred via perennial grasses, forbs and wildflowers beneficial to pollinators and other desirable species.

Duluth maintains working relationships with the Regional Stormwater Protection Team (RSPT), an assortment of local, state and federal government officials, agency partners, and university professionals. RSPT, which allows its members to annually vote upon and select "focus areas" has, for Fiscal Year of 2022, selected green infrastructure as an area of particular value for outreach and engagement. Duluth will gladly share with the RSPT the project progress and outcomes to foster mutual learning and cross-network sharing of green infrastructure implementation strategies. Duluth is committed to accelerating the rollout of nature-based stormwater treatment strategies and will participate in public and professional stormwater outreach opportunities as they are identified.

C. Project Wrap-up

Duluth has multiple ways to disseminate information to project funders and the public. In addition to Duluth's Facebook and Instagram accounts and ongoing working relationship with RSPT, Duluth employs a Public Information Officer who frequently publishes statements and press releases about Duluth's advancements and successes. Duluth will conduct at least one press release highlighting the project and its impact for local water quality. Duluth has engaged in high-impact outreach and information transfer projects in the past, including the Duluth Citizens' Climate Action Plan and the ImagineDuluth2035 Plan, and is committed to engaging with and educating members of the public on future green infrastructure implementation plans.

D. Knowledge Transfer

Duluth is willing to attend virtually and will revisit the possibility of physically attending this event closer to the scheduled date in 2024.

8. Budget Narrative

A. Salaries and Fringes

N/A

B. Travel

N/A

C. Equipment

N/A

D. Supplies and Materials

N/A

E. Other Direct Costs

N/A

F. Contractual Services

Type of Service (and Conservation Practices to be Installed, if applicable)	Contract Amount (Grant Funding Only)
Contractual services for construction of underground outlet structures and sediment basin comprising the Irving Park biofiltration basin	$66,000
Surveying, design and development of construction plans and technical specifications from contracted engineering firm for outlet structures and sediment basin comprising the Irving Park biofiltration basin; provide construction administration.	$55,000

Where possible, please describe any additional plans or details you may have for the project tasks to be subcontracted.

N/A

G. Indirect

N/A

H. Match (25% minimum required)

Senior Engineer – $79.94/hour x 50 hours = $4,000.00 (salary & 60% fringe)

Utility Programs Coordinator – $54.16/hour x 60 hours = $3250.00 (salary & 60% fringe) Total Amount in Salary + Fringe = $7,250 and the one-time financial contribution of $24,000 for a cumulative sum of $31,250.

9. Details on Conservation Practices

The following table(s) describe approved conservation practices to be installed with this award. Any changes to the amount of practice to be installed, the budget for each practice, incentive method and rate, and/or the addition of a conservation practice will require written approval from the Commission.

Part I: Practice Details	
Practice Name (with NRCS FOTG code, if applicable):	Underground Outlet (620)
Description of Practice:	Diversion of excess surface and shallow subsurface flows along South 57th Avenue West via introduction of 70 feet of 10-inch diameter corrugated polyethylene pipe located beneath the driving surface; introduction of perforated pipe beneath surface of sediment basin for timely collection and conveyance of flows following percolation through engineered soil media
Amount Implemented (in appropriate units e.g. acres, linear feet, number of practices, etc.)	70 linear feet
Cost per unit: (where applicable include % contributed from landowners and other sources).	$9.00/foot
Funds Budgeted for Practice Installation: (In dollars, grant fund expenditures only.)	$33,000
Estimated Installation Date(s): (month/year)	09/2024
Life of Installed Practice:	At least 20 years
Part II: Performance Measures (as applicable, fill in all that apply)	
Estimated Annual Soil Savings (in tons):	N/A
Estimated Annual Total Phosphorus Reduction (in pounds):	N/A
Nutrient management acres (improved amount, placement, or timing of fertilizer or manure):	N/A
Stormwater runoff captured or treated annually (gallons):	N/A

Shoreline or streambank stabilized (feet):	N/A
Additional measurable benefits:	N/A
Description of Calculation Methods:	N/A

Part I: Practice Details	
Practice Name (with NRCS FOTG code, if applicable):	Sediment Basin (350)
Description of Practice:	Excavated basin with sediment and trash pre-treatment forebay and biofiltration soil media for improvement to water quality; introduction of native perennial grasses, forbs and wildflowers species beneficial to pollinators and/or other desirable insects atop soil media designed to treat bacteria through the addition of bio-char, with an educational signage component for passers-by.
Amount Implemented (in appropriate units e.g. acres, linear feet, number of practices, etc.)	500 yards^3
Cost per unit: (where applicable include % contributed from landowners and other sources).	$5/cubic yard
Funds Budgeted for Practice Installation: (In dollars, grant fund expenditures only.)	$33,000
Estimated Installation Date(s): (month/year)	09/2024
Life of Installed Practice:	At least 20 years
Part II: Performance Measures (as applicable, fill in all that apply)	
Estimated Annual Soil Savings (in tons):	1.7 tons TSS

Estimated Annual Total Phosphorus Reduction (in pounds):	16.59 pounds
Nutrient management acres (improved amount, placement, or timing of fertilizer or manure):	N/A
Stormwater runoff captured or treated annually (gallons):	7.2 million gallons (for maximum allowable area of 12 acres in EPA's stormwater calculator)
Shoreline or streambank stabilized (feet):	N/A
Additional measurable benefits:	N/A
Description of Calculation Methods:	To determine the estimated pollutant removal for Total P the estimated design parameters of the proposed biofiltration raingarden were entered into the MPCA MIDS Calculator including the drainage characteristics for the drainage area captured by the stormwater conveyance routed to the BMP. The associated drainage characteristics yielded a Total P load of 25.6 pounds with a pollutant removal efficiency of 65% to yield an estimate reduction of 16.59 pounds Total P annually. Additionally, the MPCA MIDS Calculator assigned the defined drainage area a total annual TSS load of 4664lbs with the designed BMP having a pollutant removal efficiency of 73% for TSS. Thus, the estimated annual capture of TSS for the BMP is 3411lbs or 1.7 tons. The process for determining the annual stormwater runoff to be captured by the Irving Park biofiltration raingarden is as follows. ArcGIS Pro was used to digitize an area equal to the sum of the total catchment diverted to the planned biofiltration rain garden. The summation of this area (determined to be 70,176.537m^2 and converted to 17.341 acres) is composed of roads, sidewalks, driveway aprons residential rooftops, and a complex assortment of intermingled vegetated foliage existing on both public and private parcels. The highest allowable treatment area (12 acres) was submitted to the EPA's National Stormwater Calculator assuming an 80% extent of impervious land cover and the following selections/entries of the tool were as follows: • Hydrologic Soil Group - D • Surface Slope (%) - 5 • Precipitation Data Source - Duluth Intl. AP • Climate Change Scenario - None • % Lawn – 20

	• % Impervious – 80 • % Infiltration Basin – 100 • Years Analyzed – 20 The stormwater calculator results were as follows: • Average Annual Rainfall (inches) – 28.26 • Average Annual Runoff (inches) – 16.97 • Days per Year with Rainfall – 57.41 • Days per Year with Runoff – 31.63 • Percent of Wet Days Retained – 44.91 The proposed practice is estimated to divert 90% of the 16.97 inches of annual stormwater runoff from the 17.341 acre catchment area for treatment and subsequently treat up to 7.2 million gallons of stormwater annually.

updated 8/14/19

INVOICE FORM

NAME OF ORGANIZATION: City of Duluth
PROJECT NAME: Keene Creek Resiliency Report - Irving Park Biofiltration Basin
REPORTING PERIOD: **10/01/2022 - 12/31/2022**
(MM/DD/YYYY - MM/DD/YYYY)

PROJECT ID: **GLSNRP-12-05**
AWARD AMOUNT: **$121,000.00**
MATCH AMOUNT: **$31,250.00**
ADVANCE AMOUNT: **$12,100.00**

Instructions: Fill in the yellow cells only.

	Total Amount Advanced (A)	Grant Funds Budget (B)	Previous Project Expenses To Date (C) *Pull from previous invoice, Column E*	Amount Expended This Period (D) *Include any advanced funds expended this period*	Total Project Funds Expended to Date (E = C + D)	Budget Adjustments To Date (Should add to $0) (F)	Budget Remaining (G = B - E + F)	Balance Available for Reimbursement (After this Period) (H)	Pledged Match (I)	Previous Match Contributed To Date (J) *Pull from previous invoice, Column L*	Match Contributed This Period (K)	Total Match Contributed to Date (L = J + K)	Balance Remaining from Pledged Match (M)
Salaries and Fringe Benefits		$0.00			$0.00		$0.00		$7,250.00			$0.00	
Travel		$0.00			$0.00		$0.00		$0.00			$0.00	
Equipment *(items valued at over $5,000)*		$0.00			$0.00		$0.00		$0.00			$0.00	
Supplies and Materials													
		$0.00			$0.00		$0.00		$0.00			$0.00	
		$0.00			$0.00		$0.00		$0.00			$0.00	
		$0.00			$0.00		$0.00		$0.00			$0.00	
		$0.00			$0.00		$0.00		$0.00			$0.00	
Other Direct Costs	$12,100.00							$108,900.00					$31,250.00
		$0.00			$0.00		$0.00		$0.00			$0.00	
		$0.00			$0.00		$0.00		$0.00			$0.00	
		$0.00			$0.00		$0.00		$0.00			$0.00	
		$0.00			$0.00		$0.00		$0.00			$0.00	
Contractual Services *(itemize below)*													
Engineering Consultant Services		$55,000.00			$0.00		$55,000.00		$0.00			$0.00	
Construction of underground outlet structures and sediment basin		$66,000.00			$0.00		$66,000.00		$0.00			$0.00	
					$0.00		$0.00		$24,000.00			$0.00	
	10%	$0.00			$0.00		$0.00	90%	$0.00			$0.00	100%
Indirect		$0.00	$0.00	$0.00	$0.00	$0.00	$0.00		$0.00	$0.00	$0.00	$0.00	
Total	$12,100.00	$121,000.00	$0.00	$0.00	$0.00	$0.00	$121,000.00	$108,900.00	$31,250.00	$0.00	$0.00	$0.00	$31,250.00

Amount of Advance Used in Previous Periods: $0.00
Amount of Advance Used This Period:
Amount of Advance Retained by Grantee for Later Project Use: $12,100.00

Total Changes: $0.00
(Not to exceed $5,000)

Amount Requested This Invoice: $0.00

(Note: The final 5% of the Contract will be held back until the project has been fully completed.)

I hereby certify that the supporting documentation and records upon which the above costs are claimed, including those claimed as in-kind / match contributions, are reasonable, eligible, and allowable based upon the specific requirements set forth in the Contract for this project; are distinguishable from work done on other projects during the same time frame; are maintained in accordance with all applicable federal, state and general municipal accounting practices and procedures; and are available in our files for inspection. Furthermore, these files will be maintained for a period of three (3) years beyond the end of this contract term.

Authorized Representative (signature) | **Name and Title (print)** | **Date**

Project Title: Keene Creek Resiliency Report - Irving Park Biofiltration Basin **Project # GLSNRP-12-05**

Organization: City of Duluth **Savings Goals:** 0 tons of soil and 17.42 pounds of phosphorous

Conservation Practice Type	NRCS Conservation Pratice Code	Date installed xx/xxxx (Month/year)	Subwatershed/Tributary - 12 digit HUC	Life Span of Practice (Years)	Units	Amount Implemented	Grant Dollars Spent on Installing Practice

Total Dollars Spent on installing Practice	Sediment Load Reduction	PP Load Reduction	DRP Load Reduction	N Load Reduction	Method for Calculation

Narrative Progress Report Form

Project Name: Keene Creek Resiliency Report - Irving Park Biofiltration Basin

Project Number: GLSNRP-12-05

Project Sponsor: City of Duluth

Reporting Period (mm/dd/yyyy): from _____ to _____.

Summary of Reporting Period

Number of unique producers receiving assistance: _____
Number of events held:_____ and total number of attendees:_____

Implementation Summary

	Proposed				Progress to date			
Practices	Amount	Budgeted for Installation	Soil Savings	Total Phosphorus Savings	Amount Completed	Dollars Spent	Soil Saved	Total Phosphorus Savings
Underground Outlet (NRCS 620)	70 linear feet	$33,000	0 tons	0 pounds				
Sediment Basin (NRCS 350)	500 cubic yards	$33,000	0 tons	17.42 pounds				

Progress this Reporting Period

Please provide a detailed description of the work that occurred during this reporting period.

Challenges and Solutions

Please provide a description of any challenges encountered this period and how the challenges were addressed.

Invoice Narrative

Please provide a detailed explanation for each budget category (line) for which reimbursement is requested. The total of the figures under each budget category must match the amount listed on the related invoice's budget lines.

Salaries and Fringes. List staff members and associated hours.

Travel. Specify trips taken and breakdown of costs.

Equipment. Specify by item.

Supplies and Materials.

Other Direct Costs. Specify by item.

Contractual Services. List by individual contract and include amount of reimbursement requested for each contract.

Indirect. Calculated in Invoice Form (Appendix B)

Appendix C- Insurance Certification & Documentation

As evidenced by the signatures below, the Grantee commits to maintaining insurance coverage that meets or exceeds the requirements set forth below:

(A) Without limiting the Grantee's obligations pursuant to Section X of the Contract, the Grantee agrees to obtain, provide, and maintain at its own expense the liability and other insurance coverages at not less than the levels indicated below (including coverage for Grantee's employees working on the Project) for the duration of the Contract period and for three (3) years thereafter. The Grantee must provide a current Certificate of Insurance coverage (COI) or other equivalent documentation to the Commission upon entering into this Contract and will ensure that an updated COI is on file at the Commission through the end of the grant period and for three years thereafter. Failure to meet this requirement may result in work stoppage orders issued by the Commission and/or Contract termination, as appropriate.

1. Commercial General Liability with the following minimum coverages:
   - $2,000,000 General Aggregate
   - $2,000,000 Products/Completed Operations Aggregate
   - $1,000,000 Personal & Advertising Injury
   - $1,000,000 Each Occurrence

   Grantee must list the Great Lakes Commission as an ADDITIONAL INSURED or COVERED PARTY on the Commercial General Liability certificate, on a Primary and Noncontributory basis, with a Waiver of Subrogation.

2. If a motor vehicle is used to provide services or products under this Contract, the Grantee must have vehicle liability insurance on any auto including owned, hired and non-owned vehicles used in Grantee's business for bodily injury and property damage as required by law.

3. Workers' compensation coverage must be provided according to applicable laws governing the employees and employers work activities in the state in which the Project is located.

4. Employers liability insurance with the following minimum limits:
   - $100,000 Each Accident
   - $100,000 Disease (each employee)
   - $500,000 Disease (aggregate limit)

   Commission staff recommend that Grantees make appropriate inquiries on whether Contractors Pollution Liability insurance should be secured or otherwise made available to cover claims from third parties against bodily injury and property damage caused by hazardous substances and materials released during work performed under the Contract and from completed operations.

(B) The insurance policies shall provide that the Commission be given thirty (30) days prior written notice in the event of cancellation or material change in coverage.

(C) The Grantee must require that all contracted personnel or entities used by the Grantee in performing the Project work maintain the required insurances contained in this section for the duration of the Contract period.

(D) The Grantee shall give the Commission prompt and timely notice of any claims made or suits instituted in association with or arising out of the Contractor's performance of this Contract.

Appendix C- Insurance Certification & Documentation

Insurance Certification, Grantee:

As evidenced by my signature below, I certify that I am an authorized representative of the Grantee and will assure that the specific insurance requirements set forth above will be maintained as required by the Commission. I further certify that I understand the obligation to ensure that all subcontractors retained for the Project also maintain insurance coverage as specified in Section VII, Subcontracts, Item E, of the Grant Contract.

Name and Title: Jesse Budisalovich, Risk Manager

Signature: See Self-Insured letter provided

Date: 9-15-2022

Insurance Certification, Insurance Professional:

As evidenced by my signature below, I certify that I am a qualified professional tasked providing insurance services and/or consultation to the Grantee. I have examined the requirements set forth above and attest that the attached documentation meets or exceeds all the specific requirements of the Grant Contract.

Organization:

Name and Title:

Signature: _____

Date: _____

City Attorney's Office

Room 440
411 West First Street
Duluth, Minnesota 55802

218-730-5490

attorneys@duluthmn.gov

April 15, 2022

To: Great Lake Commission
1300 Victors Way, Suite 1350
Ann Arbor, MI 48108

RE: CITY OF DULUTH SELF-INSURED GENERAL LIABILTY LETTER

To Whom It May Concern:

This is to certify that Public Works and Engineering is an agency of the City Of Duluth. Please be advised that City of Duluth and all its divisions are self-insured as authorized by Minnesota Statutes Section 471.981 for General and Auto Liability, to the full extent of its statutory limits of liability as set forth in Minnesota statutes Chapter 466. The self-insurance provides for coverage in the event an incident occurs that is deemed to be attributed to the negligent or intentional acts or omissions of the City and of its officers and employees acting within the scope of their authority.

Please accept this document as evidence of self-insurance for General Liability for the City of Duluth and our Public Works department.

Since this program is self-insured and is covered by the above statutes, there is no insurance policy and there are no effective/expiration dates.

If you have any questions or need anything further, I can be reached at 218-730-5276.

Sincerely,

Jesse Budisalovich | City of Duluth Attorney's Office
Investigator and Claims Agent

Duluth City Hall
411 West First Street
Duluth, Minnesota 55802

Email: jbudisalovich@duluthmn.gov

Office: 218-730-5276

Certificate of Coverage

This is to certify that coverage described below is effective per the applicable statutory authority referenced. This certificate is not a policy or a binder of Insurance and does not in any way alter, amend or extend the coverage afforded by any reference herein. The coverage is subject to all terms and conditions of the statutory authority.

Insured: City of Duluth
411 W. 1st Street
Duluth, MN 55804

Policy Term: 1/1/2015 to Indefinite
Date Certificate Issued: 1/1/2015
Certificate Number: 1011

Type of Coverage	Limits and Deductibles
General & Automobile Liability	$500,000.00 Bodily Injury and Property Damage per person $1,500,000.00 Bodily Injury and Property Damage per Occurrence
Workers Compensation	Self-Insured in compliance with MN Stat. 176

STATUTORY REFERENCES

Automobile Liability – Minnesota Statute 65B Self-Insured Number 1011 as assigned by the MN Department of Commerce
General Liability – Minnesota Statutes 471.981 and 466.

DATES OF COVERAGE: 1/1/2020 To Indefinite
DESCRIPTION OF COVERAGE: Evidence of Insurance

ISSUED TO: **City of Duluth**
Public Works & Engineering
411 West 1st Street
Duluth MN 55802

ISSUED BY: CLAIMS AGENT/ADJUSTER

Jesse Budisalovich
Authorized Signature

SFM
The Work Comp Experts®
Risk Solutions

LaFonda Leshovsky
TPA Business Leader
(952) 838-4272

October 6, 2021

RE: Workers' Compensation Coverage for:
City of Duluth

To whom it may concern:

This letter is to verify that **The City of Duluth**, Duluth, MN, is self-insured for its workers' compensation liabilities. **The City of Duluth** is authorized by the Minnesota Department of Commerce to self-insure for these liabilities. The Minnesota Department of Commerce grants the authority for private companies to self-insure their workers' compensation obligations in the State of Minnesota, subject to the requirements in Minnesota Stat. ß79A .01 - .18. **The City of Duluth** has been continuously self-insured since 1982. SFM Risk Solutions is the administrator for this self-insured program effective 3.1 2014. SFM Risk Solutions client number for this account is 60293.

If this authority is revoked or **The City of Duluth** withdraws from this plan, they will attempt to provide 30-days written notice of such revocation or withdrawal. However, failure to do so shall impose no obligation of liability of any kind upon SFM Risk Solutions, or SFM Risk Solutions parent company, SFM-The Work Comp Experts. The provisions in this paragraph expire on 2.28.2018.

If you have any questions, please do not hesitate to contact me.

Sincerely,

LaFonda Leshovsky

LaFonda Leshovsky
TPA Business Leader

I. FEDERALLY FUNDED PROJECT REPORTING REQUIREMENTS

The Catalog of Federal Domestic Assistance (CFDA) title associated with this Project is Soil and Water Conservation and the CFDA number is 10.902. The federal award number is NR213A750013C001 and this grant is funded with Federal funds from the USDA-NRCS. By accepting this Contract, the Grantee agrees to comply with the requirements of the above-referenced agreement (attached as Appendix E), including, but not limited to, the specific requirements described below.

II. APPLICABLE REGULATIONS

(A) The Grantee, and recipients of any subawards or subcontracts under this grant, agree to comply with the following regulations, as applicable. (The full text of Code of Federal Regulations references may be found at **https://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR** and **http://www.ecfr.gov**.)

1. 2 CFR Part 25, "Universal Identifier and System of Award Management"
2. 2 CFR Part 170, "Reporting Subaward and Executive Compensation Information"
3. 2 CFR Part 175, “Award Term for Trafficking in Persons”
4. 2 CFR Part 180, “OMB Guidelines To Agencies On Governmentwide Debarment And Suspension (Nonprocurement)”
5. 2 CFR Part 182, “Governmentwide Requirements for Drug-Free Workplace (Financial Assistance)”
6. 2 CFR Part 200, "Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards"
7. 2 CFR Part 400, “Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards”
8. 2 CFR Part 417, “Nonprocurement Debarment and Suspension”
9. 2 CFR Part 418,”"New Restrictions on Lobbying”
10. 2 CFR Part 421,”"Requiirements for a Drug-Free Workplan (Financial Assistance)
11. 2 CFR Part 422, “Research Institutions Conducting USDA-Funded Extramural Research; Research Misconduct”

(C) Allowable Project costs will be determined in accordance with the authorizing statute, the purpose of the award, and to the extent applicable to the type of organizations receiving the grant, regardless of tier. The following portions of the Code of Federal Regulations are hereby incorporated by reference. (The full text of Code of Federal Regulations references may be found at **https://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR** and **http://www.ecfr.gov**.)

1. 2 CFR Part 200, "Uniform Administrative Requirements, Cost Principles And Audit Requirements For Federal Awards"

2. 48 CFR Part 31, "Contract Cost Principles and Procedures"

III. UNALLOWABLE COSTS

The following costs are not allowed:

(A) Costs above the amount authorized for the Project;

(B) Costs incurred after the Project End Date denoted on page one of the Contract including any no-cost extensions of time;

(C) Costs that lie outside the scope of the approved Project and any amendments thereto;

(D) Profit resulting from Federal financial assistance. Grantees may not earn and keep income resulting from an award.

(E) Costs of promotional items and memorabilia, including models, gifts, and souvenirs.

(F) Compensation for injuries to persons or damage to property arising from Project activities.

This list is not exhaustive. For general information about the allowability of particular items of costs, please see 2 CFR Part 200, “Subpart E – Cost Principles,” or direct specific inquiries to the Commission’s Point of Contact.

IV. FAIR LABOR STANDARDS

The Grantee assures and certifies that it shall comply with the minimum-wage and maximum-hour provisions of the Federal Fair Labor Standards Act.

V. PATENTS, INVENTIONS, COPYRIGHTS, AND ACKNOWLEDGMENT OF SUPPORT AND DISCLAIMER

(A) Allocation of rights of patents, inventions, and copyrights must be in accordance with 2 CFR Part 200.315. This regulation provides that small businesses normally may retain the principal worldwide patent rights to any invention developed with USDA support.

(B) In accordance with 37 CFR Section 401.14, each subject invention must be disclosed to the Federal agency within 2 months after the inventor discloses it in writing to contractor personnel responsible for patent matters. Invention disclosure statements pursuant to 37 CFR Section 401.14(c) must be made in writing to:

Farm Production and Conservation Business Center
Grants and Acquisitions Division
1400 Independence Avenue, SW
Room 6819 South Building
Washington, DC 20250

(C) USDA receives a royalty-free license for Federal Government use, reserves the right to require the patentee to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must manufacture it domestically.

(D) The following acknowledgement of USDA-NRCS support must appear in the publication of any material, whether copyrighted or not, and any products in electronic formats (World Wide

Web pages, computer programs, etc.) that is substantially based upon or developed under this grant:

"This material is based upon work supported by the Natural Resources Conservation Service, U.S. Department of Agriculture, under number NR213A750013C001**"**

In addition, all publications and other materials, except scientific articles or papers published in scientific journals, must include the following statement:

"Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Agriculture. In addition, any reference to specific brands or types of products or services does not constitute or imply an endorsement by the U.S. Department of Agriculture for those products or services."

(E) All publications printed with Federal Government funds will include the most current USDA nondiscrimination statement, available from the Public Affairs Division, Civil Rights Division, or on the USDA home page. If the material is too small to permit the full nondiscrimination statement to be included, the material must, at a minimum, include the statement:

"USDA is an equal opportunity provider and employer."

Any publication prepared with funding from this agreement must include acknowledgement to USDA, Natural Resources Conservation Service.

The Grantee is responsible for ensuring that an acknowledgment of USDA-NRCS is made during news media interviews, including popular media such as radio, television, and news magazines, that discuss work funded by this grant in a substantial way.

VI. PROGRAM INCOME

All potential program income must be reported to the Commission Point of Contact. Program income is the gross revenue generated by a Federally funded activity earned during the performance period of the award. Program income may be earned by recipients from fees charged for conference or workshop attendance, from rental fees earned from real property or equipment acquired with Federal funds, or from the sale of commodities or items developed under the grant or cooperative agreement. It must fall within the guidelines at 2 CFR 200.307. Unless identified and addressed in the award, the recipient must provide notification to the administrative contact and request the manner it would like to treat the income (i.e., deductive or additive). Program income may be used to meet recipient cost-share requirements with the approval of the Government.

VII. NONEXPENDABLE EQUIPMENT

If the Grantee has been approved to purchase equipment or products with funds provided under this grant, the Grantee is encouraged to purchase only American-made equipment and products. Title to nonexpendable equipment purchased with grant funds will vest in the Grantee upon completion of the Project and acceptance by the Commission and USDA-NRCS of required final reports. When equipment is no longer needed by the Grantee and the per-unit fair market value is less than $5,000, the Grantee may retain, sell, or dispose of the equipment with no further obligation to the Commission or USDA-NRCS. However, if the per-unit fair market value is $5,000 or more, the Grantee must submit a written request to the Commission for disposition instructions.

VIII. PRIVACY ACT AND PROHIBITION AGAINST CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS

(A) Activities performed under this grant may involve access to confidential and potentially sensitive information about governmental and landowner issues. The term "confidential information" means proprietary information or data of a personal nature about an individual, or information or data submitted by or pertaining to an organization. This information must not be disclosed without the prior written consent of USDA-NRCS, which may be sought by first providing written notice to the Commission Point of Contact.

(B) The Grantee's personnel shall follow the rules and procedures of disclosure set forth in the Privacy Act of 1974, 5 U.S.C. Section 552a, and implementing regulations and policies with respect to systems of records determined to be subject to the Privacy Act. The Grantee's personnel must also comply with privacy of personal information relating to natural resources conservation programs in accordance with section 1244 of Title II of the Farm Security and Rural Investment Act of 2002 (Public Law 107-171).

(C) The Grantee agrees to comply with the "Prohibition Against Certain Internal Confidentiality Agreements:" Grantees may not require employees, contractors, or subrecipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting them from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information.

IX. ACKNOWLEDGMENT OF SECTION 1619 COMPLIANCE

The Grantee agrees to comply with USDA-NRCS guidelines and requirements regarding the disclosure of information protected under Section 1619 of the Food, Conservation, and Energy Act of 2008 (PL 110-246), 7 U.S.C. 8791 as described below.

a. Responsibilities.

1. Acceptance of this award indicates acknowledgment and understanding that the Grantee, along with every owner, manager, supervisor, employee, contractor, agent, and representative of the Grantee, is legally bound by Federal statute to comply with the provisions of Section 1619 and that the Grantee will not subsequently disclose information protected by section 1619 other than to meet Commission reporting requirements or engage with other project partners identified within Appendix A. Any other disclosure of the protected information (except as permitted under Section 1619) will be considered a violation of Section 1619. The Grantee will be held responsible should disclosure of the protected information occur.

2. The Grantee will use the protected information only to perform work that is directly connected to this award. Use of the protected information to perform work that is not directly connected to this award is expressly prohibited. Use of the protected information for any purpose is expressly prohibited after the period of performance end date of this award.

3. The Grantee must internally restrict access to the protected information to only those individuals who have a demonstrated need to know the protected information to perform work under this award.

4. The provisions in Section 1619 are continuing obligations. Even when the Grantee is no longer a Grantee, or when individuals currently affiliated with the Grantee become no longer so affiliated, every person having been provided access to the protected information will continue to be legally bound to comply with these provisions.

5. Subsequent to the Grantee's receipt of a Final Close-Out Letter from the Commission, any protected information provided under this award must be immediately destroyed or returned to the Commission for transfer to USDA-NRCS custodians. Grantees should maintain written documentation that the protected information (paper copy, electronic copy, or both) was properly destroyed, removed from any electronic

storage media, or both and make such documentation available to the Commission or USDA-NRCS upon request.

6. Any State's "sunshine law," "open records act" or other version of the Freedom of Information Act is superseded by section 1619 under the Supremacy Clause of the U.S. Constitution. Accordingly, information protected from disclosure by section 1619 must not be released under such State laws.

b. Examples of protected information prohibited by disclosure under Section 1619 include, but are not limited to, the following:

i. State identification and county number (where reported and where located).
ii. Producer or landowner name, business full address, phone number, Social Security Number, and similar personal identifying information.
iii. Farm, tract, field, and contract numbers.
iv. Production shares and share of acres for each Farm Serial Number (FSN) field.
v. Acreage information, including crop codes.
vi. All attributes for Common Land Units (CLUs) in USDA's Geospatial Information System
vii. Any photographic, map, or geospatial data that, when combined with other maps, can be used to identify a landowner.
viii. Location of conservation practices.

U.S. Department of Agriculture
Natural Resources Conservation Service

NOTICE OF GRANT AND AGREEMENT AWARD

1. Award Identifying Number	2. Amendment Number	3. Award /Project Period	4. Type of award instrument:
NR213A750013C001		04/01/2021 - 12/31/2025	Cooperative Agreement

5. Agency (Name and Address)	6. Recipient Organization (Name and Address)
USDA, NRCS Programs Division 1400 Independence Avenue SW, Room 5239-S Washington, DC 20250	GREAT LAKES COMMISSION 1300 VICTORS WAY ANN ARBOR MI 48108-5203 DUNS: 060977998 EIN:

7. NRCS Program Contact	8. NRCS Administrative Contact	9. Recipient Program Contact	10. Recipient Administrative Contact
Name: Jill Reinhart Phone: (317) 295-5883 Email: jill.reinhart@usda.gov	Name: Aileen Anderson Phone: (315) 221-5884 Email: aileen.anderson@usda.gov	Name: Nicole Zacharda Phone: (734) 396-6084 Email: nzacharda@glc.org	Name: Joseph Bertram Phone: (734) 971-9135 Email: jbertram@glc.org

11. CFDA	12. Authority	13. Type of Action	14. Program Director
10.902	16 U.S.C. 2001-2009 16 U.S.C. 2004 16 U.S.C. 3801 et seq 16 U.S.C. 590a-590f, 590q 7 CFR 12 7 U.S.C. 1010a	New Agreement	Name: Nicole Zacharda Phone: (734) 396-6084 Email: nzacharda@glc.org

15. Project Title/ Description: 2021 Funding to the Great Lakes Commission (GLC) to implement priorities of the Great Lakes Restoration Initiative (GLRI).

16. Entity Type: E = Regional Organization

17. Select Funding Type

Select funding type:	☒ Federal	☐ Non-Federal
Original funds total	$2,000,000.00	$0.00
Additional funds total	$0.00	$0.00
Grand total	$2,000,000.00	$0.00

18. Approved Budget

Personnel	$0.00	Fringe Benefits	$0.00
Travel	$0.00	Equipment	$0.00
Supplies	$0.00	Contractual	$0.00
Construction	$0.00	Other	$2,000,000.00
Total Direct Cost	$2,000,000.00	Total Indirect Cost	$0.00
		Total Non-Federal Funds	$0.00
		Total Federal Funds Awarded	$2,000,000.00
		Total Approved Budget	$2,000,000.00

This agreement is subject to applicable USDA NRCS statutory provisions and Financial Assistance Regulations. In accepting this award or amendment and any payments made pursuant thereto, the undersigned represents that he or she is duly authorized to act on behalf of the awardee organization, agrees that the award is subject to the applicable provisions of this agreement (and all attachments), and agrees that acceptance of any payments constitutes an agreement by the payee that the amounts, if any, found by NRCS to have been overpaid, will be refunded or credited in full to NRCS.

Name and Title of Authorized Government Representative	Signature	Date
Gayle Barry Acting Associate Chief		
Name and Title of Authorized Recipient Representative	Signature	Date
Thomas Crane Deputy Director	Thomas Crane	02-20-2021

NONDISCRIMINATION STATEMENT

The U.S. Department of Agriculture (USDA) prohibits discrimination in all its programs and activities on the basis of race, color, national origin, age, disability, and where applicable, sex, marital status, familial status, parental status, religion, sexual orientation, genetic information, political beliefs, reprisal, or because all or a part of an individual's income is derived from any public assistance program. (Not all prohibited bases apply to all programs.) Persons with disabilities who require alternative means for communication of program information (Braille, large print, audiotape, etc.) should contact USDA's TARGET Center at (202) 720-2600 (voice and TDD). To file a complaint of discrimination write to USDA, Director, Office of Civil Rights, 1400 Independence Avenue, SW., Washington, DC 20250-9410 or call (800) 795-3272 (voice) or (202) 720-6382 (TDD). USDA is an equal opportunity provider and employer.

PRIVACY ACT STATEMENT

The above statements are made in accordance with the Privacy Act of 1974 (5 U.S.C. Section 522a).

Statement of Work

Purpose

The purpose of this cooperative agreement is to provide funding to the Great Lakes Commission (GLC) to implement the priorities of the Great Lakes Restoration Initiative (GLRI) as authorized under Public Law 116–94. GLC will subaward grants to non-federal units of government and incorporated non-profit organizations to control nutrient and sediment losses and reduce nutrient loading into the Great Lakes Basin. Financial and technical support will be provided to promote a variety of conservation projects as part of this cooperative agreement.

The grants program will support projects with the purpose of reducing delivery of nutrients and sediment from agricultural lands and other critical lands to improve water quality in the U.S. Great Lakes Basin with an emphasis on a significant reduction of phosphorus loads in the Great Lakes. This program supports the implementation of objectives identified in the Great Lakes Action Plan to protect and maintain the Great Lakes ecosystem.

Objectives

The GLC administers the grants program in cooperation with NRCS. GLC also convenes and manages the Great Lakes Sediment and Nutrient Reduction Task Force, which includes NRCS members. Through the grant program, NRCS and GLC will promote efforts to reduce nutrient and sediment runoff from public and private lands and encourage locally-led conservation through community involvement to promote effective land and resource management. Target nutrients include phosphorus and nitrogen, with total phosphorus being the primary measure of progress. Estimating measures of progress, consistent with Focus Area 3 of the Great Lakes Action Plan III, may also be incorporated into the Request for Proposals.

Budget Narrative

The official budget (including cost category itemization as identified on the SF-424A) described in this Budget Narrative will be considered the "the total budget as last approved by the Federal awarding agency" for this award.

Budget Category NRCS Funding Requested
Personnel – Salaries $118,490
Personnel – Fringe $49,766
Travel - GLC Program Staff $5,000
Equipment $0
Supplies $3,750
Other Costs $1,876
Meetings $576
Phone / Webinar Services $250
Printing / Reproduction $750
Postage $300
Other - subawards (Grants) $1,738,000

Total Direct Costs $1,916,882
Indirect Costs $83,118
Total Funding $2,000,000

Salaries
The proposed program budget includes $118,490 for GLC salaries to support an average of roughly 27% FTE of staff time over the nearly five-year agreement. In practice, the level of GLC staff support will likely be greater during the first year of the agreement, when proposals are evaluated, and grants are selected and awarded, with a reduced level of effort in the out years as the grant projects are implemented. (Note: The GLC staff support provided under this agreement is complementary to the support provided by GLC staff under the other ongoing NRCS GLSNRP agreements from previous years.)

Staff Category Annual Ave. FTE Total (length of program)
Deputy Director 2% $12,640
Program Manager 9% $43,200
Program Specialist 11% $38,830
Communications and
Web Design Staff 2% $9,600

GIS Support Staff 1% $2,700
Financial Operations Manager 2% $11,520
Total- Salaries 27% $118,490

Fringe Benefits
The program budget includes $49,766 for fringe benefits. The GLC's fringe benefits rate is calculated as 42% of salaries and covers a basic benefits package, including the employer portion of FICA and MED FICA; vacation, sick and holiday time; health/optical/dental care; disability insurance; and a percentage of retirement benefits. Fringe benefit costs allocated by the program will contribute to the benefits package for the program staff at a level commensurate with staff hours for the program.

Travel
Travel funding in the amount of $5,000 is requested for GLC staff to travel to grantee kickoff, field days, and other sponsored events, along with any trips necessary to evaluate grantee progress. Mileage expenses will be charged at the U.S. Federal government mileage reimbursement rate ($0.575/mile for privately owned vehicles as of 2020) in effect at the time of travel. Other direct travel expenses will be reimbursed at actual cost. Funds will also cover travel to meetings of regional or national interest in furtherance of outreach activities on the GLSNRP and its outcomes.

Equipment
No equipment purchases with a unit cost of $5,000 or more are anticipated for this program.

Supplies
$3,750 is requested for general office and meeting supplies and for the purchase and/or maintenance of equipment associated with the program, including items such as hardware, software, and bandwidth necessary to carry out the program tasks.
Other Costs
The following other costs in the amount of $1,876 are included for this program:
• Meetings: $576 is requested for meeting costs (e.g., room rental, A/V needs, etc.) for periodic in-person meetings of the Task Force.
• Phone/Webinar Services: $250 is anticipated for normal telephone use and conference calls.
• Printing/Reproduction: $750 for copying and printing program documents as needed.
• Postage: $300 is requested for postage expenses under the program.
NOTE: Increased budget (over amounts requested in recent years) is requested for printing/reproduction and postage in anticipation of mailing proposals to Task Force members for scoring. This was done in 2020 due to the COVID-19 pandemic and Task Force members working from home. It is anticipated that in-office work is likely to remain limited for Task Force members in 2021.

Other - subawards (Grants)
$1,738,000 is requested to support an estimated 8-10 multi-year Great Lakes Sediment and Nutrient Reduction Program grants of not more than $200,000 each beginning on or around October 1, 2021.

Contractual
With NRCS approval, GLC may contract for specialized services such as legal reviews of contract templates or other consulting services to supplement GLC staff competencies.

Indirect Costs
$83,118 is requested for indirect costs. The GLC's approved indirect cost rate for the year ending June 30, 2021, is currently 49.4% with a direct salary and fringe base, as approved by the GLC's cognizant federal agency (NOAA). A copy of the current indirect cost agreement can be provided upon request.
Cost Rate Calculation:
(Personnel + Fringe) x Indirect Rate = Indirect Costs
($118,490 + $49,766) x 49.4% = $83,118

Expeditious Spending and Sufficient Progress in the Use of GLRI Funds
The GLC will ensure GLRI funds awarded for this grant are used expeditiously using the projected quarterly expenditures that were calculated based on the program schedule and estimated associated funding levels for various tasks that will occur in each quarter. As part of its standard operating procedures, the GLC generates monthly budget reports for each grant and contract it administers. GLC staff will track the expenditure of program funds using these reports and comparing them to progress made in accomplishing program tasks.

Responsibilities of the Parties:

If inconsistencies arise between the language in this Statement of Work (SOW) and the General Terms and Conditions

attached to the agreement, the language in this SOW takes precedence.

A. NRCS will:
• Assign at least one staff person to serve on the Sediment and Nutrient Control Task Force to participate in the review and selection of grants; and
• Assign a program coordinator to serve as the point of contact for NRCS with GLC. The program coordinator may also serve as the NRCS member on the Task Force.

B. The GLC will:
• Administer the grant program in cooperation with NRCS and with oversight from the Sediment and Nutrient Reduction Task Force;
• Assign a permanent professional staff member to serve as program coordinator and contact person;
• Administer the program such that subawards are awarded not later than October 1, 2021 and are for no more than 3 years in length, unless otherwise approved by the GLC in writing;
• Utilize the Adaptive Management Process that identifies the most critical ecosystem problems in the Great Lakes, selects projects that effectively address those problems, assesses and reports on progress and effectiveness of GLRI actions, and informs future restoration and protection priorities.
• Be open to any contributions of funds, technical assistance, and in-kind services that add value to the federal funding;
• Collaborate with NRCS and EPA to comply with requirements, including provisions for science review or competition, under the GLRI as expressed in conference and committee reports and as required by statute;
• Comply with the attached GENERAL TERMS AND CONDITIONS GRANTS AND COOPERATIVE AGREEMENTS (GT&C);
• Agree that all information obtained under the terms of this agreement will be used by each of the parties in performance of its responsibilities (in keeping with 2 CFR 200.315). Either party may publish the findings and results of this agreement with due credit being given for contributions of the other party (in keeping with the GT&C).
• Provide 6-month progress reports which will follow the federal fiscal year and take the form of a mid-year report and an end-of-year summary report of the grants awarded. Information from the reports will be included in NRCS' GLRI reports to EPA and the annual report to the President on progress in achieving the GLRI's goals, outcomes, and targets;
• Submit Measures of Progress to NRCS for the GLRI Action Plan measures 3.1.1 and 3.1.2 for anticipated benefits in FY21 through the grant projects, and
• Submit a final report to NRCS upon expiration of this cooperative agreement performance period. This report will incorporate: discrete project outputs and summarize the nature and the extent of the grants program; outputs used to evaluate program accomplishments; program outcomes; significant events and experiences; and data collected.

• Submit performance reports on a semi-annual basis to the ezFedGrants system or the Farm Production and Conservation (FPAC) Grants and Agreements Division staff via email to: FPAC.BC.GAD@usda.gov. Reports are due 30 calendar days after the reporting period and are based on the agreement period of performance start date.

• Submit SF425 Financial Reports on a semi-annual basis to the ezFedGrants system or the Farm Production and Conservation (FPAC) Grants and Agreements Division via email to: FPAC.BC.GAD@usda.gov. Reports are due 30 calendar days after the reporting period end. Please note that financial reporting is based on the calendar year.

• Submit payment requests to the ezFedGrants system or the Farm Production and Conservation (FPAC) Grants and Agreements Division via email to: FPAC.BC.GAD@usda.gov on a monthly basis. Refer to the General Terms and Conditions for more information regarding payment requests.

The recipient (including subrecipients) is responsible for compliance with the prohibition on certain telecommunications and video surveillance services or equipment identified in 2 CFR 200.216. See Public Law 115-232, Section 889 for additional information. In accordance with 2 CFR 200.216, the recipient (including subrecipients) is prohibited from obligating or expending loan or grant funds for covered telecommunications equipment or services to:

(1) procure or obtain, extend or renew a contract to procure or obtain;
(2) enter into a contract (or extend or renew a contract) to procure; or
(3) obtain the equipment, services or systems.

In accordance with 2 CFR 200.340, the recipient understands this agreement may be terminated in whole or in part as follows:
(1) By the Federal awarding agency or pass-through entity, if a recipient fails to comply with the terms and conditions of a Federal award;
(2) By the Federal awarding agency or pass-through entity, to the greatest extent authorized by law, if an award no longer effectuates the program goals or agency priorities;
(3) By the Federal awarding agency or pass-through entity with the consent of the recipient, in which case the two parties must agree upon the termination conditions, including the effective date and, in the case of partial termination, the portion to be terminated; or
(4) By the recipient upon sending to the Federal awarding agency or pass-through entity written notification setting forth

the reasons for such termination, the effective date, and, in the case of partial termination, the portion to be terminated. However, if the Federal awarding agency or pass-through entity determines in the case of partial termination that the reduced or modified portion of the Federal award or subaward will not accomplish the purposes for which the Federal award was made, the Federal awarding agency or pass-through entity may terminate the Federal award in its entirety.

Expected Accomplishments and Deliverables

The GLC will:
• Select and award subawards (grants) through a competitive grants process to non-federal units of government and non-profit organizations to control nutrient and sediment losses to reduce nutrient loading into the Great Lakes basin. The target phosphorus reduction over the life of this Agreement is 17,380 pounds to be reported as estimated total phosphorus. As an alternative measure of progress, linear feet of streambank restored or otherwise improved, along with other measures identified for Focus Area 3 within Great Lakes Action Plan III, will be tracked in recognition of the program's long history of support for work to control erosion and sedimentation within tributary rivers and streams to the Great Lakes Basin. GLC will seek projects that collaborate with NRCS conservation practice incentives offered through the Farm Bill programs, avoiding activities that would compete with Farm Bill conservation programs. Work to select and award grants includes, but is not limited to:
o Creation and distribution of a Request for Proposals and associated reviews and provision of forms related to scoring of proposals by the Task Force.
o Negotiation of grant agreements and provision of forms for reporting and invoicing.
o Webinars for potential applicants and new grantees.
• Provide financial and technical support to promote a variety of conservation projects as part of this cooperative agreement.
• Review grantee reports and invoices, with site visits conducted as needed.
• Regularly update and improve the GLSNRP website, www.nutrientreduction.org.
• Provide monthly financial reports including funds disbursed for each grant requesting reimbursement. Reports will be submitted electronically to the NRCS technical contact and administrative contact, or electronically via ezFedGrants.
• Provide mid-year and end-of-year reports for each federal fiscal year of the grant program documenting the grants (projects) approved. Reports will be submitted electronically to the NRCS technical contact and administrative contact, or electronically via ezFedGrants.
o Mid-Year Reports on GLC Activities will summarize program administration activities for this and other open cooperative agreements governing the GLSNRP.
o End-of-Year or Annual Reports will detail information on each grant (project), report the funding approved and disbursed, the outcomes anticipated, the program's quarterly reports, any milestones reached, and the progress achieved.
o The first Annual Report submitted for this Cooperative Agreement will share summaries of each newly-funded project and include estimated conservation outcomes and match or leverage of non-federal funds as contained in each Grant Agreement's work plan.
• Provide a short final report on the accomplishments of the grant program (Agreement Report). The report will incorporate grant program outputs and summarize the nature and the extent of the grant program, measures of progress to evaluate the accomplishments of the program (including pounds of phosphorus reduced per year, linear feet of streambank restored or otherwise improved, and other measures of progress under Focus Area 3 of Great Lakes Action Plan III), significant events and experiences, and compile data collected. The final report will also include analysis of the data to support program outcomes as well as conclusions and recommendations for program improvement. The final Agreement Report will incorporate photo documentation of funded projects and environmental progress under the projects at appropriate phases, and appropriate illustrations, diagrams, charts, graphs, and maps to express the data and findings.
• Identify and include in the reports to NRCS any contributions of funds, technical assistance, and in-kind services that add value to the federal funding.

Resources Required

A. NRCS Resources Required:
• As described elsewhere in this agreement.

B. GLC's Resources Required:
• As described elsewhere in this agreement.
• Technical expertise to administer the program as well as expertise in soil erosion, sediment control, nutrient runoff and delivery to surface water.

Milestones

A. Identification of Funding Priorities- The Sediment and Nutrient Task Force will convene by conference call or meeting to discuss priorities for the upcoming year and begin crafting a Request for Proposals. NOTE: to maintain the Program's traditional schedule, discussions of funding priorities and drafting of the Request for Proposals may before the Cooperative Agreement is executed.

B. Proposal Review and Selection - A proposal review and selection process for awarding grants will be implemented involving members of the Sediment and Nutrient Task Force, including representatives from the NRCS, U.S. EPA, and the GLC staff. Reviewers will evaluate projects, discuss them via a conference call meeting, and rank them based on criteria established by the Task Force.

C. Grants Awarded - After completion of the proposal review and selection process, projects will be obligated by contract no later than six (6) months after the signing of the agreement, unless otherwise approved by NRCS in writing.

D. Program Completion - All activity with this agreement will be completed by the period of performance end date listed in the ADS-093 Notice of Award.

E. Mid-Year Reporting - Semi-annual reports will be provided to NRCS no later than April 30th of each year during the agreement period. The reports will highlight GLC's work to administer the program.

F. End of Federal Fiscal Year Reporting - The end-of-year reports will be provided by November 30th of 2021, 2022, 2023, 2024, and 2024.

G. Final Report –Electronic and paper versions of the final report will be submitted no later than 90 days after the end of the agreement period.

GENERAL TERMS AND CONDITIONS

Please reference the below link(s) for the General Terms and Conditions pertaining to this award:

U.S. DEPARTMENT OF AGRICULTURE FARM PRODUCTION AND CONSERVATION

GENERAL TERMS AND CONDITIONS GRANTS AND COOPERATIVE AGREEMENTS

The Farm Production and Conservation (FPAC) mission area encompasses the following USDA agencies: Natural Resources Conservation Service (NRCS), Farm Service Agency (FSA), Risk Management Agency (RMA), the Commodity Credit Corporation (CCC), and the FPAC Business Center.

I. APPLICABLE REGULATIONS

a. As a condition of this award, the recipient assures and certifies that it has and/or will comply and require subrecipients to comply with the requirements contained in the following statutes and regulations, as applicable. The full text of Code of Federal Regulations references may be found at https://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR and http://www.ecfr.gov/.

(1) 2 CFR Part 25, “Universal Identifier and System of Award Management” (2) 2 CFR Part 170, “Reporting Subaward and Executive Compensation Information” (3) 2 CFR Part 175, “Award Term for Trafficking in Persons” (4) 2 CFR Part 180, “OMB Guidelines to Agencies On Governmentwide Debarment And Suspension (Nonprocurement)” (5) 2 CFR Part 182, “Governmentwide Requirements for Drug-Free Workplace (Financial Assistance)” (6) 2 CFR Part 200, “Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards” (7) 2 CFR Part 400, “Uniform Administrative Requirements, Cost Principles, And Audit Requirements for Federal Awards” (8) 2 CFR Part 417, “Nonprocurement Debarment and Suspension” (9) 2 CFR Part 418, “New Restrictions on Lobbying” (10) 2 CFR Part 421, “Requirements for Drug-Free Workplace (Financial Assistance)” (11) 2 CFR Part 422, “Research Institutions Conducting USDA-Funded Extramural Research; Research Misconduct”

b. Allowable project costs will be determined in accordance with the authorizing statute, the purpose of the award, and, to the extent applicable, to the type of organizations receiving the award, regardless of tier. The following portions of the Code of Federal Regulations are hereby incorporated by reference. The full text of Code of Federal Regulations references may be found at https://www.gpo.gov/fdsys/browse/collectionCfr.action?collectionCode=CFR and http://www.ecfr.gov/.

(1) 2 CFR Part 200, “Uniform Administrative Requirements, Cost Principles And Audit Requirements For Federal Awards” (2) 48 CFR Part 31, “Contract Cost Principles and Procedures” c. For corporate recipients, by accepting this award the recipient acknowledges: (1) that it does not have a Federal tax delinquency, meaning that it is not subject to any unpaid Federal tax liability that has been assessed, for which all judicial and administrative remedies have been exhausted or have lapsed, and that is not being paid in a timely manner pursuant to an agreement with the authority responsible for collecting the tax liability, and (2) that it has not been convicted of a felony criminal violation under any Federal law within 24 months preceding the award, unless a suspending and debarring official of the USDA has considered suspension or debarment of the recipient corporation based on these convictions and/or tax delinquencies and determined that suspension or debarment is not necessary to protect the interests of the Government. If the recipient fails to comply with these provisions, the agency will annul this agreement and may recover any funds the recipient has expended in violation of the above cited statutory provisions.

II. UNALLOWABLE COSTS

The following costs are not allowed:

a. Costs above the amount authorized for the project. b. Costs incurred after the award period of performance end date. c. Costs not identified in the approved budget or approved budget revisions. d. Profit resulting from Federal financial assistance. Recipients may not earn and keep income resulting from an award. e. Costs of promotional items and memorabilia, including models, gifts, and souvenirs. f. Compensation for injuries to persons or damage to property arising from project activities.

This list is not exhaustive. For general information about the allowability of particular items of costs, please see 2 CFR Part 200, “Subpart E - Cost Principles”, or direct specific inquiries to the administrative contact identified in the award.

The allowability of some items of costs may be difficult to determine. To avoid disallowance or dispute of such costs, the recipient may seek prior approval before incurring them. See 2 CFR 200.407. III. PRIOR APPROVAL REQUIREMENTS

Certain items of cost and award revisions require the prior written approval of the awarding agency. The following are the most common situations requiring prior approval. However, this list is not exhaustive, and the recipient is also bound by any other prior approval requirements identified in the Uniform Administrative Requirements, Cost Principles, and Audit Requirements for Federal Awards.

a. Pre-award costs.—To receive reimbursement for costs incurred prior to the award date, recipients must request written approval before incurring the costs. This restriction also applies to costs intended to meet cost-share requirements. FPAC agencies will not approve expenses incurred more than 90 calendar days before the period of performance start date. All costs incurred before the period of performance start date, even if approved, are at the recipient's risk (i.e., the Federal awarding agency is under no obligation to reimburse such costs if for any reason the recipient does not receive a Federal award or if the Federal award is less than anticipated and inadequate to cover such costs). b. Revisions to scope, objective, or deliverables.—When it is necessary to modify the scope, objective, or deliverables of an award, the recipient authorized signatory must submit a written request and justification for the change along with the revised scope, objective, or deliverables of the award to the administrative contact. The request should contain the following information: 1. Grant or agreement number 2. Narrative explaining the requested modification to the project scope, objectives, or deliverables 3. A description of the revised scope, objectives, or deliverables

c. Additions or changes to subawards and contracts.—The subawarding, transferring, or contracting out of any work under a Federal award not identified in the original award budget or any changes to subaward or contracts requires prior written approval. The recipient must submit a justification for the proposed subaward/contract, a statement of work to be performed, and a detailed budget for the subaward/contract to the administrative contact. This provision does not apply to the acquisition of supplies, material, equipment, or general support services. d. Change in a key person specified in the application or award.— When there is a change in key personnel, the recipient must request prior written approval for the substitution or change. The request must identify the replacement personnel and provide his or her qualifications.

e. Absence or change in project leadership.—If the approved project director or principal investigator disengages from the project for more than three months or reduces time devoted to the project by 25 percent or more, the recipient must notify the administrative contact in writing, identifying who will be in charge during the project director’s absence. The notification must include the qualifications of the replacement.

f. Budget revisions.—Recipients must request prior written approval for deviations from the approved budget in the instances described below. For all budget revisions, the recipient must submit a new SF 424A or 424C and budget narrative to support the request. 1. The inclusion of costs that require prior approval in accordance with Subpart E—Cost Principles of this part or 45 CFR part 75 Appendix IX, “Principles for Determining Costs Applicable to Research and Development under Awards and Contracts with Hospitals,” or 48 CFR part 31, “Contract Cost Principles and Procedures,” as applicable. 2. Where the cumulative amount of transfers of funds among direct cost categories or programs, functions, and activities exceeds or is expected to exceed 10 percent of the total budget as last approved by the Federal awarding agency, and where the Federal share of the project exceeds the simplified acquisition threshold. 3. The transfer of funds budgeted for participant support costs to other categories of expense requires prior written approval. Participant support costs means direct costs for items such as stipends or subsistence allowances, travel allowances, and registration fees paid to or on behalf of participants or trainees (but not employees) in connection with conferences or training projects. 4. Changes in the approved cost-sharing or matching provided by the recipient. 5. Additional Federal funds needed to complete the project. 6. Changes to negotiated indirect cost rates during the award period of performance. 7. Equipment purchases not specifically identified in the approved budget.

g. No-Cost Extensions of Time.—When a no-cost extension of time is required, the recipient authorized signatory must submit a written request to the FAPC administrative contact. Except in very limited circumstances, a no-cost extension of time cannot exceed 12 months. FPAC cannot approve requests for no-cost extensions received after the expiration of the award. In addition, time may not allow extension requests submitted less than 30 calendar days before the period of performance end date to be processed, so recipients are encouraged to submit requests as soon as possible. FPAC agencies cannot approve no-cost extensions requested merely to expend remaining funds. The request must contain the following: 1. Amount of additional time requested 2. Explanation for the need for the extension 3. A summary of progress to date and revised milestones

IV. PAYMENTS

a. Recipients must request reimbursement or advances using a properly completed and executed SF-270, submitted with supporting documentation to either the ezFedGrants system or to the e-mail address specified in the statement of work. FPAC agencies will make payment to the recipient on a reimbursable or advance basis in accordance with the frequency specified in the statement of work.

b. Recipients requesting advances should request payments in amounts necessary to meet their current needs pursuant

to procedures contained in the Federal administrative provisions and 31 CFR Part 205. At the end of each advance period, the recipient must provide a justification (i.e., documentation) showing the amount of advanced funds spent.

c. The method of payment between the recipient and its contractors will be in accordance with the policies and procedures established by the recipient except that the contractors may not use the USDA Office of Financial Management/National Finance Center method to request payments. If the recipient makes advance payments to contractors, the recipient must ensure that the timing of such payments is designed to minimize elapsed time between the advance payment and the disbursement of funds. Recipients must not submit requests from their contractors for review or approval.

d. Accounting records for all costs incurred under this award must be supported by source documentation. Such documentation includes, but is not limited to, canceled checks, paid bills, payroll records, and subaward documents. Labor cost charges to this award must be based upon salaries actually earned and the time actually worked on this award. All project costs must be incurred within the approved project period of this award, including any approved no-cost extension of time. Costs that cannot be supported by source documentation or that are incurred outside of the approved project period and budget may be disallowed and may result in award funds being returned to the Federal Government by the recipient. The level of detail and documentation required to be provided to support any individual payment request is at the discretion of the Government.

e. Recipients must pay all costs incurred (i.e., liquidate obligations) under the award not later than 90 calendar days after the period of performance end date.

V. FINANCIAL REPORTING

a. Recipients must submit a Federal Financial Report (FFR), SF 425 in accordance with the schedule included in the award statement of work. Recipients must submit reports to either the ezFedGrants system or to the email address specified in the statement of work. Failure to submit reports as required may result in suspension or termination of award.

b. The recipient must submit a final financial report no later than 90 days after the period of performance end date. c. The FPAC awarding agency will withhold payments under this award if the recipient is delinquent in submitting required reports.

VI. PERFORMANCE MONITORING AND REPORTING

a. The recipient is responsible for monitoring day-to-day performance and for reporting to FPAC. If the project involves subaward/contractual arrangements, the recipient is also responsible for monitoring the performance of project activities under those arrangements to ensure that approved goals and schedules are met.

b. The recipient must submit a written progress report at the frequency specified in the statement of work to either the ezFedGrants system or to the email address specified in the statement of work. Each report must cover— 1. A comparison of actual accomplishments with the goals and objectives established for the reporting period and, where project output can be quantified, a computation of the costs per unit of output.

2. The reasons why goals and objectives were not met, if appropriate.

3. Additional pertinent information including, where appropriate, analysis and explanation of cost overruns or high unit costs.

c. The recipient must submit a final performance report within 90 calendar days of the period of performance end date. d. The FPAC awarding agency will withhold payments under this award if the recipient is delinquent in submitting required reports.

VII. AUDIT REQUIREMENTS

The recipient is responsible for complying with audit requirements in accordance with 2 CFR 200, Subpart F. A recipient entity that expends $750,000 or more during the recipient’s fiscal year in Federal awards must have a single or program-

specific audit conducted for that year.

VIII. SPECIAL PROVISIONS

a. The recipient assures and certifies that it will comply with the minimum-wage and maximum- hour provisions of the Federal Fair Labor Standards Act.

b. Employees of FPAC agencies will participate in efforts under this agreement solely as representatives of the United States. They may not participate as directors, officers, employees, or otherwise serve or hold themselves out as representatives of the recipient. They also may not assist the recipient with efforts to lobby Congress or to raise money through fundraising efforts. Further, FPAC employees must report to their immediate supervisor any negotiations with the recipient concerning future employment and must refrain from participation in projects or agreements with such recipients.

c. Employees of the recipient will not be considered Federal employees or agents of the United States for any purposes under this agreement. d. Except in very limited circumstances (e.g., construction agreements), no agreement period of performance can exceed a total of five years, including extensions. e. Recipients who engage or assist in scientific related activities on behalf of USDA must uphold the principles of scientific integrity established by Departmental Regulations 1074-001, Scientific Integrity. Covered activities include engaging in, supervising, managing, and reporting scientific work; analyzing and publicly communicating information resulting from scientific work; and utilizing information derived from scientific work in policy and decision making. f. Recipients of awards under covered programs (as defined in Executive Order 13858, January 31, 2019) are hereby notified that they are encouraged to use, to the greatest extent practicable, iron and aluminum as well as steel, cement, and other manufactured products produced in the United States in every contract, subcontract, purchase order, or subaward that is chargeable under the award. “Covered program” means a program that provides financial assistance for the alteration, construction, conversion, demolition, extension, improvement, maintenance, construction, rehabilitation, or repair of an infrastructure project in the United States. However, it does not include programs for which a domestic preference is inconsistent with law or programs providing financial assistance that are subject to comparable domestic preferences. g. The recipient and its employees are prohibited from promoting, recommending, or discussing the availability of specific commercial products or services with FPAC agency clients in the course of carrying out activities under this agreement, including any products or services offered by the recipient, except as may be specifically allowed in the agreement.

IX. PATENTS, INVENTIONS, COPYRIGHTS, AND ACKNOWLEDGMENT OF SUPPORT AND DISCLAIMER

a. Allocation of rights of patents, inventions, and copyrights must be in accordance with 2 CFR Part 200.315. This regulation provides that small businesses normally may retain the principal worldwide patent rights to any invention developed with USDA support.

b. In accordance with 37 CFR Section 401.14, each subject invention must be disclosed to the Federal agency within 2 months after the inventor discloses it in writing to contractor personnel responsible for patent matters. Invention disclosure statements pursuant to 37 CFR Section 401.14(c) must be made in writing to:

Farm Production and Conservation Business Center Grants and Acquisitions Division 1400 Independence Avenue, SW. Room 6819 South Building Washington, DC 20250

c. USDA receives a royalty-free license for Federal Government use, reserves the right to require the patentee to license others in certain circumstances, and requires that anyone exclusively licensed to sell the invention in the United States must manufacture it domestically.

d. The following acknowledgment of USDA support must appear in the publication of any material, whether copyrighted or not, and any products in electronic formats (World Wide Web pages, computer programs, etc.) that is substantially based upon or developed under this award:

“This material is based upon work supported by the U.S. Department of Agriculture, under agreement number [recipient should enter the applicable award number here].”

In addition, all publications and other materials, except scientific articles or papers published in scientific journals, must include the following statement:

“Any opinions, findings, conclusions, or recommendations expressed in this publication are those of the author(s) and do not necessarily reflect the views of the U.S. Department of Agriculture. In addition, any reference to specific brands or types of products or services does not constitute or imply an endorsement by the U.S. Department of Agriculture for those products or services.”

e. All publications printed with Federal Government funds will include the most current USDA nondiscrimination statement, available from the Public Affairs Division, Civil Rights Division, or on the USDA home page. If the material is too small to permit the full nondiscrimination statement to be included, the material must, at a minimum, include the statement:

“USDA is an equal opportunity provider and employer.”

The recipient is responsible for ensuring that an acknowledgment of USDA is made during news media interviews, including popular media such as radio, television, and news magazines, that discuss work funded by this award in a substantial way.

X. COST-SHARING REQUIREMENTS

a. If the award has specific cost-sharing requirements, the cost-sharing participation in other projects may not be counted toward meeting the specific cost-share requirement of this award and must come from non-Federal sources unless otherwise stated in the applicable program authorizing statute. b. Cost share must be documented on each SF 425 and SF 270 and in source documentation as it is provided by the recipient or third party. The required cost-share or matching ratio must be met by the end of the agreement period of performance; however, it does not have to be maintained for every payment request.

c. Should the recipient become aware that it may be unable to provide the cost-sharing amount identified in this award, it must— 1. Immediately notify the FPAC administrative contact of the situation. 2. Specify the steps it plans to take to secure replacement cost sharing. 3. Indicate the plans to either continue or phase out the project in the absence of cost sharing. If the recipient’s plans are not acceptable to FPAC, the award may be subject to termination. FPAC modifications to proposed cost sharing revisions are made on a case-by-case basis. Failure by the recipient to notify FPAC in accordance with this section may result in the disallowance of some or all the costs charged to the award, the subsequent recovery by FPAC of some of the FPAC funds provided under the award, and possible termination of the award. It may constitute a violation of the terms and conditions of the award so serious as to provide grounds for subsequent suspension or debarment.

d. The recipient must maintain records of all project costs that are claimed by the recipient as cost sharing as well as records of costs to be paid by FPAC. If the recipient’s cost participation includes in-kind contributions, the basis for determining the valuation for volunteer services and donated property must be documented.

e. Recipients must provide notification to the agency administrative contact when adding or replacing sources of cost-share contributions.

XI. PROGRAM INCOME

Program income is the gross revenue generated by a Federally funded activity earned during the performance period of the award. Program income may be earned by recipients from fees charged for conference or workshop attendance, from rental fees earned from real property or equipment acquired with Federal funds, or from the sale of commodities or items developed under the grant or cooperative agreement. It must fall within the guidelines at 2 CFR 200.307. Unless identified and addressed in the award, the recipient must provide notification to the administrative contact and request the manner it would like to treat the income (i.e., deductive or additive). Program income may be used to meet recipient cost-share requirements with the approval of the Government. All program income must be reported on the applicable SF 270 and SF 425.

XII. NONEXPENDABLE EQUIPMENT

Recipients purchasing equipment or products with funds provided under this award are encouraged to purchase only American-made equipment and products. Title to nonexpendable equipment purchased with award funds will vest in the recipient upon completion of the award project and acceptance by FPAC of required final reports. When equipment is no longer needed by the recipient and the per-unit fair market value is less than $5,000, the recipient may retain, sell, or dispose of the equipment with no further obligation to FPAC. However, if the per-unit fair market value is $5,000 or more, the recipient must submit a written request to the FPAC administrative contact for disposition instructions.

XIII. LIMIT OF FEDERAL LIABILITY

The maximum financial obligation of FPAC to the recipient is the amount of funds indicated in the award as obligated by FPAC. However, if an erroneous amount is stated on the approved budget, or any supporting document relating to the award, FPAC will have the unilateral right to make the correction and to make an appropriate adjustment in the FPAC share of the award to align with the Federal amount authorized.

XIV. MODIFICATIONS AND TERMINATIONS

The parties may amend this award through an exchange of correspondence between the authorized signatory of each or via formal amendment document. The award is subject to termination if FPAC determines that the recipient has failed to comply with the terms and conditions of the award. If the award is terminated, the guidelines at 2 CFR 200.339-42 will govern the obligations of the parties.

XV. PRIVACY ACT AND PROHIBITION AGAINST CERTAIN INTERNAL CONFIDENTIALITY AGREEMENTS

a. Activities performed under this award may involve access to confidential and potentially sensitive information about governmental and landowner issues. The term “confidential information” means proprietary information or data of a personal nature about an individual, or information or data submitted by or pertaining to an organization. This information must not be disclosed without the prior written consent of FPAC.

b. The recipient’s personnel will follow the rules and procedures of disclosure set forth in the Privacy Act of 1974, 5 U.S. C. Section 552a, and implementing regulations and policies with respect to systems of records determined to be subject to the Privacy Act. The recipient’s personnel must also comply with privacy of personal information relating to natural resources conservation programs in accordance with section 1244 of Title II of the Farm Security and Rural Investment Act of 2002 (Public Law 107-171).

c. The recipient agrees to comply with the “Prohibition Against Certain Internal Confidentiality Agreements:”

1. You may not require your employees, contractors, or subrecipients seeking to report fraud, waste, or abuse to sign or comply with internal confidentiality agreements or statements prohibiting or otherwise restricting them from lawfully reporting that waste, fraud, or abuse to a designated investigative or law enforcement representative of a Federal department or agency authorized to receive such information. 2. You must notify your employees, contractors, or subrecipients that the prohibitions and restrictions of any internal confidentiality agreements inconsistent with paragraph (1) of this award provision are no longer in effect. 3. The prohibition in paragraph (1) of this award provision does not contravene requirements applicable to any other form issued by a Federal department or agency governing the nondisclosure of classified information. 4. If FPAC determines that you are not in compliance with this award provision, FPAC: i. Will prohibit your use of funds under this award, in accordance with sections 743 and 744 of Division E of the Consolidated Appropriations Act, 2016, (Pub. L. 114-113) or any successor provision of law; ii. May pursue other remedies available for your material failure to comply with award terms and conditions. XVI. ACKNOWLEDGMENT OF SECTION 1619 COMPLIANCE

The recipient agrees to comply with FPAC guidelines and requirements regarding the disclosure of information protected under Section 1619 of the Food, Conservation, and Energy Act of 2008 (PL 110-246), 7 U.S.C. 8791 as described below.

a. Responsibilities. 1. Acceptance of this award indicates acknowledgment and understanding that the recipient is legally bound by Federal statute to comply with the provisions of Section 1619 and that the recipient will not subsequently disclose information protected by section 1619 to any individual or organization that is not directly covered by this award. Any such subsequent disclosure of the protected information (except as permitted under Section 1619) will be considered a violation of Section 1619. The recipient will be held responsible should disclosure of the protected information occur.

2. Acceptance of this award legally binds every owner, manager, supervisor, employee, contractor, agent, and representative of the recipient to comply with the provisions in Section 1619. The recipient must consult with FPAC prior to providing protected information to an entity or individual outside of the recipient and as necessary to implement the program to ensure that such release is permissible.

3. The recipient will use the protected information only to perform work that is directly connected to this award. Use of the protected information to perform work that is not directly connected to this award is expressly prohibited.

4. The recipient must internally restrict access to the protected information to only those individuals who have a demonstrated need to know the protected information to perform work under this award.

5. The provisions in Section 1619 are continuing obligations. Even when the recipient is no longer a recipient, or when individuals currently affiliated with the recipient become no longer so affiliated, every person having been provided access to the protected information will continue to be legally bound to comply with these provisions.

6. The recipient must notify all managers, supervisors, employees, contractors, agents, and representatives about this provision and the requirements of Section 1619. Notifications about the existence of this provision must be made to those individuals who are new to the organization and periodic notifications must be sent throughout the organization (as well as to all contractors and agents) to remind all about the ongoing and continuing requirements.

7. When the recipient is unsure whether particular information is covered or protected by Section 1619, the recipient must consult with FPAC to determine whether the information must be withheld.

8. Use of the protected information for any purpose is expressly prohibited after the period of performance end date of this award. Upon the award end date, any protected information provided under this award must be immediately destroyed or returned to FPAC. The recipient must provide to FPAC written certification that the protected information (paper copy, electronic copy, or both) has been properly destroyed, removed from any electronic storage media, or both.

9. Any State's "sunshine law," "open records act" or other version of the Freedom of Information Act is superseded by section 1619 under the Supremacy Clause of the U.S. Constitution. Accordingly, information protected from disclosure by section 1619 must not be released under such State laws.

b. Protected Information.

1. Examples of the types of information prohibited by disclosure under Section 1619 include, but are not limited to, the following:

i. State identification and county number (where reported and where located). ii. Producer or landowner name, business full address, phone number, Social Security Number, and similar personal identifying information. iii. Farm, tract, field, and contract numbers. iv. Production shares and share of acres for each Farm Serial Number (FSN) field. v. Acreage information, including crop codes. vi. All attributes for Common Land Units (CLUs) in USDA's Geospatial Information System vii. Any photographic, map, or geospatial data that, when combined with other maps, can be used to identify a landowner. viii. Location of conservation practices.

2. Section 1619 allows disclosure of "payment information (including payment information and the names and addresses of recipients of payments) under any Department program that is otherwise authorized by law" (emphasis added). The names and payment information of producers generally may be provided to the public; however, the recipient shall consult with FPAC if there is any uncertainty as to the provision of such information.

3. Section 1619 also allows disclosure of otherwise protected information if "the information has been transformed into a statistical or aggregate form without naming any—(i) individual owner, operator, or producer; or (ii) specific data gathering cite." The recipient must consult with FPAC as to whether specific information falls within this exception prior to relying on this exception.

c. Violations. The recipient will be held responsible for violations of this provision and Section 1619. A violation of this provision by the recipient may result in action by FPAC, including termination of the underlying Federal award.

d. Effective Period. The requirements of this provision is effective on the date of the final signature and will continue until FPAC notifies the recipient that it is no longer required based on changes in applicable Federal law.

XVII. AWARD CLOSEOUT

a. Award closeout is the process by which FPAC determines that all required project activities have been performed satisfactorily and all necessary administrative actions have been completed. b. The recipient must submit, no later than 90 calendar days after the end date of the period of performance, all financial, performance, and other reports as required by the terms and conditions of the agreement, including documentation showing that match or cost-share requirements have been met. The awarding agency may approve extensions when requested by the recipient. c. Unless the awarding agency authorizes an extension, the recipient must liquidate all obligations incurred under the agreement not later than 90 calendar days after the end date of the period of performance. d. Recipients must submit all requests for reimbursements no later than 90 calendar days after the end date of the period of performance. e. The recipient must promptly refund any balances of unobligated cash that the awarding agency paid in advance or paid and that are not authorized to be retained by the recipient for use in other projects. See OMB Circular A-129 and see §200.345 Collection of amounts due, for requirements regarding unreturned amounts that become delinquent debts. f. Recipients must retain all records pertaining to the agreement in accordance with 2 CFR 200.333-337 and any additional requirements included in the agreement statement of work. g. Recipients must follow disposition requirements for property acquired with award funds in accordance with 2 CFR 200.310-316.

GREAT LAKES SEDIMENT AND NUTRIENT REDUCTION PROGRAM
GRANT CONTRACT
BETWEEN THE
Great Lakes Commission
AND the City of Duluth

This Grant Contract ("Contract") is made between the Great Lakes Commission ("Commission") and the City of Duluth ("Grantee"), both sometimes hereinafter collectively referred to as the "Parties." The purpose of this Contract is to provide funding in exchange for work to be performed for the project named below (the "Project"). The Commission is authorized to provide grant assistance pursuant to U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Award Number NR213A750013C001 to implement the priorities of the Great Lakes Restoration Initiative (GLRI) as specified in Interagency Agreements between NRCS and the U.S. Environmental Protection Agency. This Contract is subject to the terms and conditions specified herein.

Project Name: Keene Creek Resiliency Report - Irving Park Biofiltration Basin

Project Number: GLSNRP-12-05
Project Start Date: upon contract execution
Project End Date: December 31, 2023
Project Authorized Watershed(s) (HUCs): 040101020405, 040102011604
Total Phosphorus Reduction Target: 16.59 lbs.

Project Grant Amount: $121,000.00
Project Advance (10% of grant): $12,100.00
Project Match: $31,250
Project Total (grant plus match): $152,250

Grantee Project Manager:
Tom Johnson, Senior Engineer
City of Duluth
411 West First Street
Duluth, MN 55812
218-730-5103
tajohnson@duluthmn.gov

Commission Point of Contact:
Nicole Zacharda, Program Manager
Great Lakes Commission
1300 Victors Way, Suite 1350
Ann Arbor, MI 48108-5203
734-396-6084
nzacharda@glc.org

The individuals signing below certify by their signatures that they are authorized to sign this Grant Contract on behalf of their agencies, and that the Parties shall fulfill the terms of this Contract, including any attached appendices, as set forth herein.

Having read and understood the terms of the Contract, the Parties do by their respective signatures dated below hereby execute this Contract in two (2) originals. One (1) original shall be retained by each Party. If there is any inconsistency between the documents, the document on file at the Commission shall control.

One fully-executed Contract, including the insurance certification and documentation (Appendix C), must be returned to the Commission by October 1, 2022, or this grant offer will be void. Requests for extensions may be granted by the Commission in its sole discretion if made more than seven (7) calendar days in advance of this date.

FOR THE GRANTEE:

See attached signature page
Authorized Signatory

Date

Print Name / Title

FOR THE GREAT LAKES COMMISSION:

Thomas R. Crane, Deputy Director

10-4-22
Date

CITY OF DULUTH, MINNESOTA

By:

DocuSigned by:
36F2E826ED714AA...
Mayor

DocuSigned by:

Attest:
DocuSigned by:
Ian B. Johnson
EE9D2CA1AA9F42B...
City Clerk

Date Attested: 9/30/2022

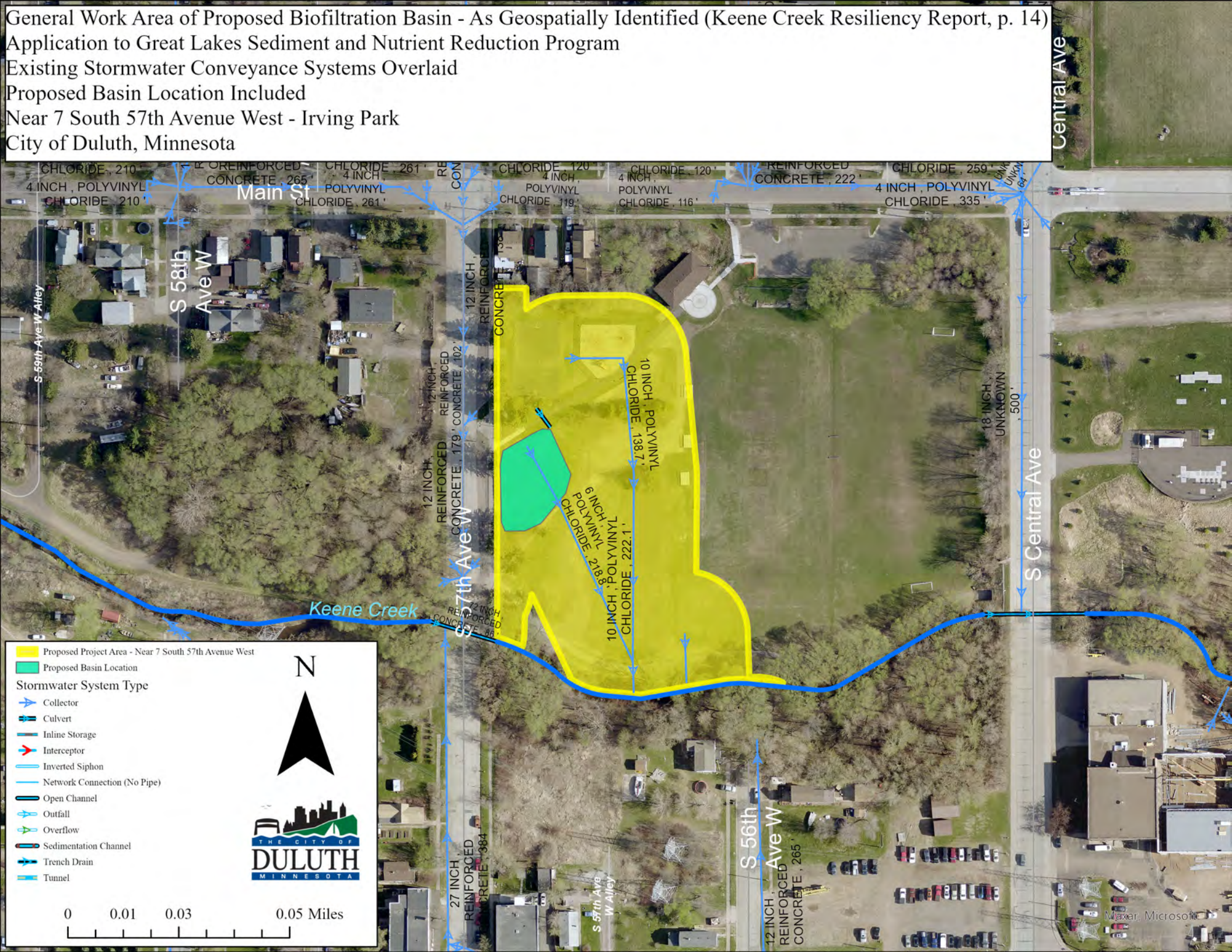
Countersigned:
DocuSigned by:
B40A839EAF93410...
City Auditor

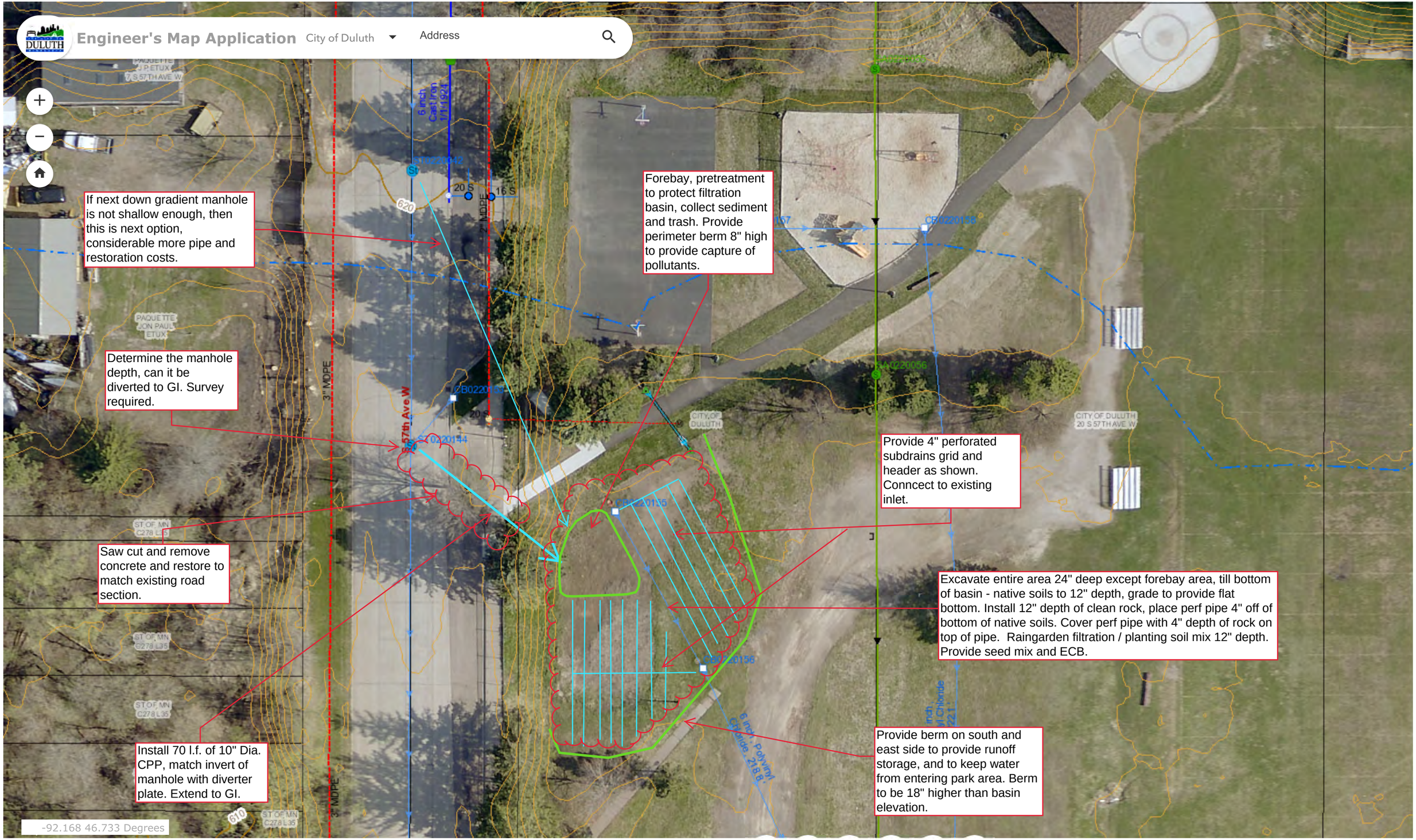
Approved as to form:
DocuSigned by:
F4C4D28DF08942A...
City Attorney

APPENDIX G – IRVING PARK BIO-FILTRATION MAP PACKET

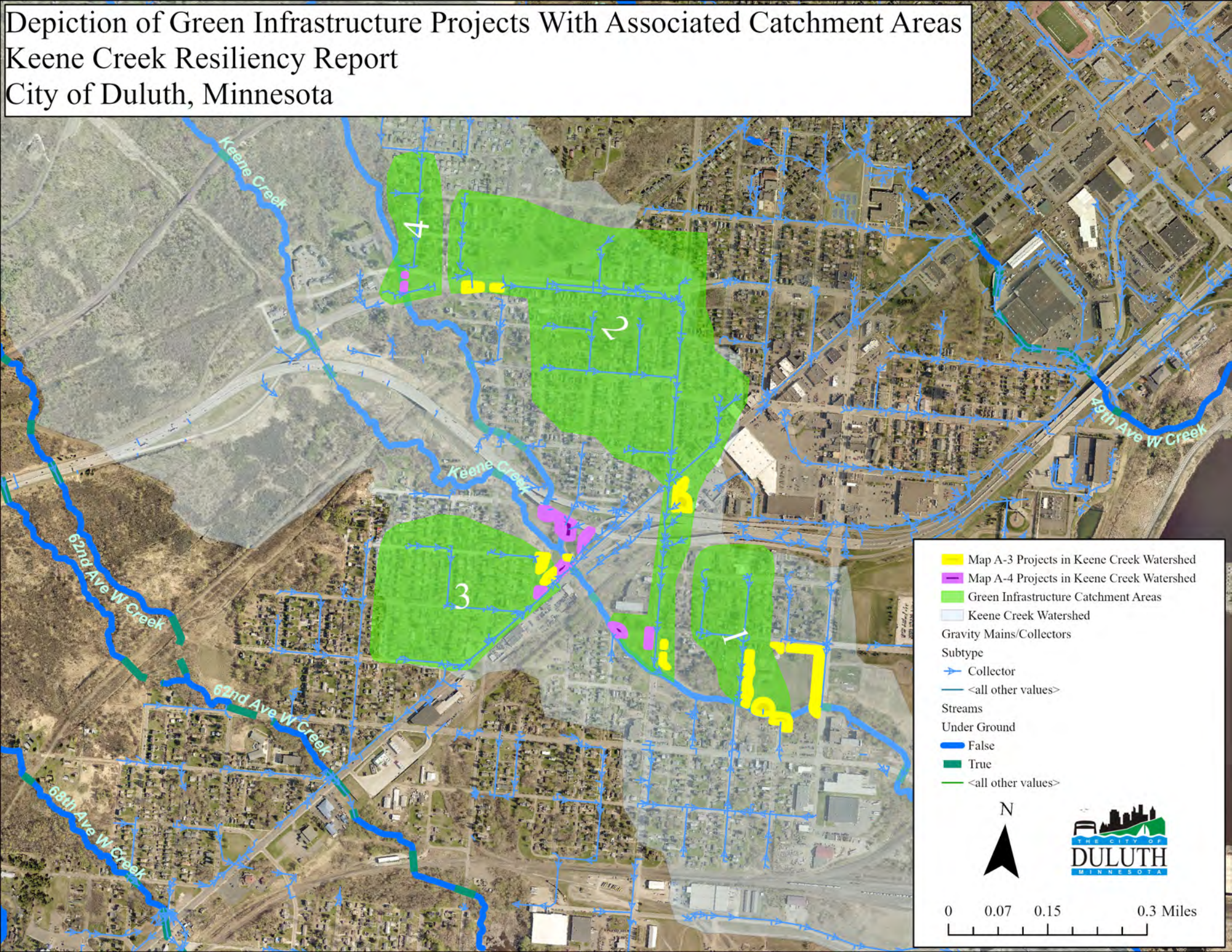
CITY OF DULUTH

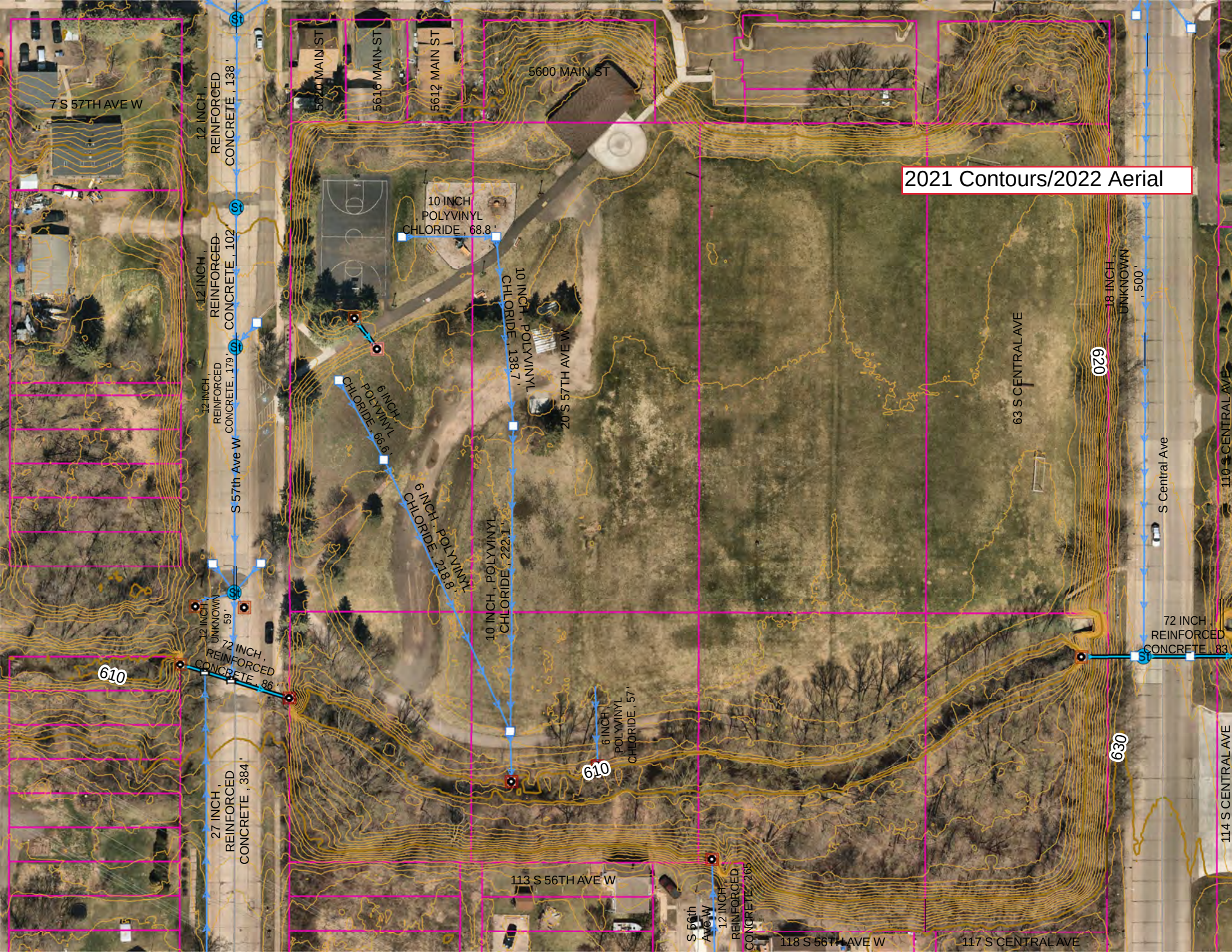
RFP# 23-99029

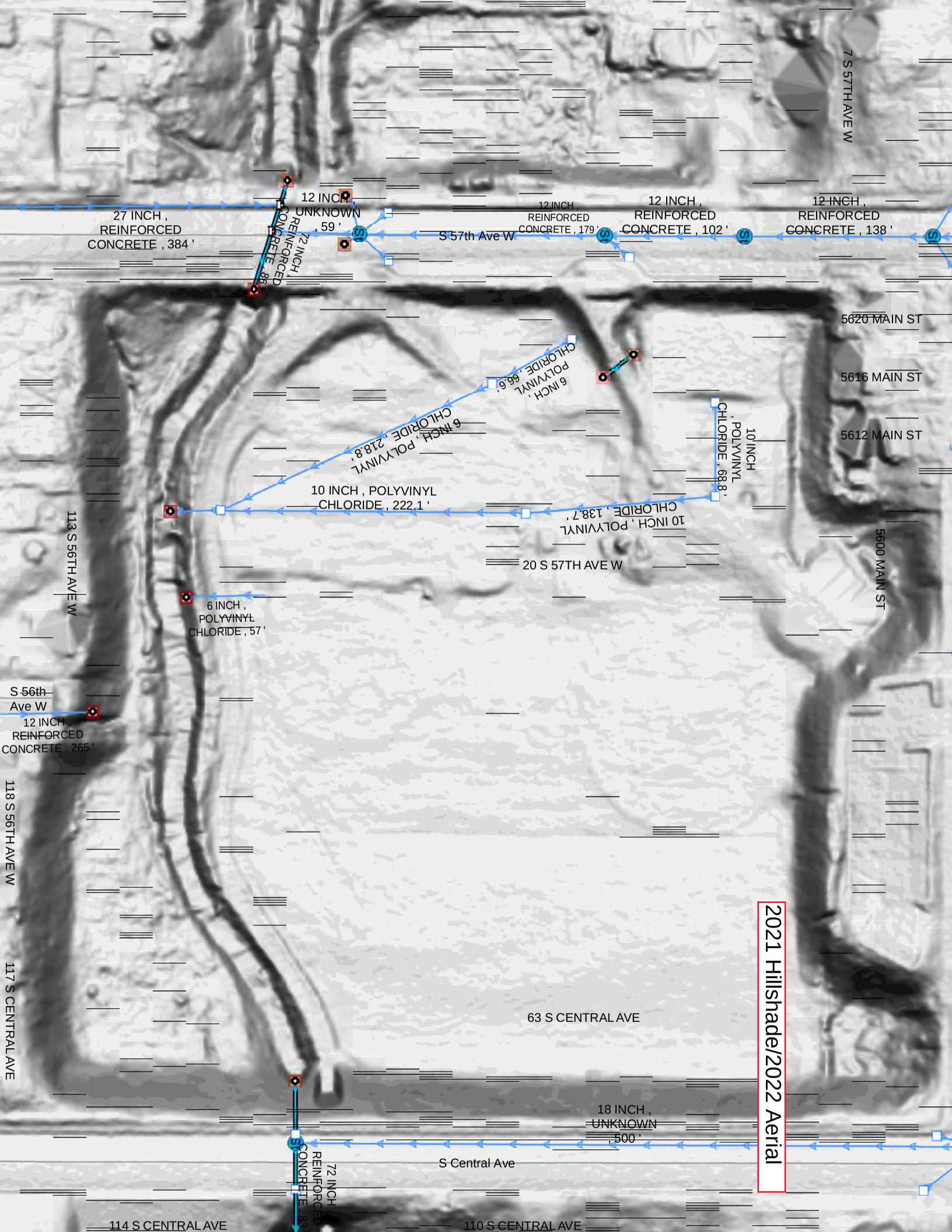

General Work Area of Proposed Biofiltration Basin - As Geospatially Identified (Keene Creek Resiliency Report, p. 14)
Application to Great Lakes Sediment and Nutrient Reduction Program
Existing Stormwater Conveyance Systems Overlaid
Proposed Basin Location Included
Near 7 South 57th Avenue West - Irving Park
City of Duluth, Minnesota
Main St
S 58th Ave W
S 59th Ave W Alley
S 57th Ave W
S Central Ave
S 56th Ave W
S 57th Ave W Alley
Keene Creek
10 INCH, POLYVINYL CHLORIDE, 138.7'
6 INCH, POLYVINYL CHLORIDE, 218.8'
10 INCH, POLYVINYL CHLORIDE, 222.1'
12 INCH, REINFORCED CONCRETE, 179'
12 INCH, REINFORCED CONCRETE, 102'
12 INCH, REINFORCED CONCRETE, 86'
18 INCH, UNKNOWN, 500'
27 INCH, REINFORCED CONCRETE, 384'
12 INCH, REINFORCED CONCRETE, 265'
Proposed Project Area - Near 7 South 57th Avenue West
Proposed Basin Location
Stormwater System Type
Collector
Culvert
Inline Storage
Interceptor
Inverted Siphon
Network Connection (No Pipe)
Open Channel
Outfall
Overflow
Sedimentation Channel
Trench Drain
Tunnel
N
THE CITY OF DULUTH MINNESOTA
0 0.01 0.03 0.05 Miles
Maxar, Microsoft


Engineer's Map Application
City of Duluth
Address
If next down gradient manhole is not shallow enough, then this is next option, considerable more pipe and restoration costs.
Forebay, pretreatment to protect filtration basin, collect sediment and trash. Provide perimeter berm 8" high to provide capture of pollutants.
Determine the manhole depth, can it be diverted to GI. Survey required.
Provide 4" perforated subdrains grid and header as shown. Conncect to existing inlet.
Saw cut and remove concrete and restore to match existing road section.
Excavate entire area 24" deep except forebay area, till bottom of basin - native soils to 12" depth, grade to provide flat bottom. Install 12" depth of clean rock, place perf pipe 4" off of bottom of native soils. Cover perf pipe with 4" depth of rock on top of pipe. Raingarden filtration / planting soil mix 12" depth. Provide seed mix and ECB.
Install 70 l.f. of 10" Dia. CPP, match invert of manhole with diverter plate. Extend to GI.
Provide berm on south and east side to provide runoff storage, and to keep water from entering park area. Berm to be 18" higher than basin elevation.
6 inch Cast Iron 1/1/1924
3" MDPE
57th Ave W
CITY OF DULUTH
20 S 57TH AVE W
PAQUETTE JON PAUL ETUX
ST OF MN C278 L35
-92.168 46.733 Degrees
30ft

Depiction of Green Infrastructure Projects With Associated Catchment Areas
Keene Creek Resiliency Report
City of Duluth, Minnesota




2021 Contours/2022 Aerial
7 S 57TH AVE W
5600 MAIN ST
5608 MAIN ST
5616 MAIN ST
5612 MAIN ST
12 INCH , REINFORCED CONCRETE , 138 '
12 INCH , REINFORCED CONCRETE , 102 '
12 INCH , REINFORCED CONCRETE , 179 '
S 57th Ave W
10 INCH , POLYVINYL CHLORIDE , 68.8 '
10 INCH , POLYVINYL CHLORIDE , 138.7 '
20 S 57TH AVE W
6 INCH , POLYVINYL CHLORIDE , 66.6 '
6 INCH , POLYVINYL CHLORIDE , 218.8 '
10 INCH , POLYVINYL CHLORIDE , 222.1 '
63 S CENTRAL AVE
18 INCH , UNKNOWN , 500 '
S Central Ave
620
610
72 INCH , UNKNOWN , 59 '
72 INCH , REINFORCED CONCRETE , 86 '
72 INCH , REINFORCED CONCRETE , 83 '
6 INCH , POLYVINYL CHLORIDE , 57 '
630
27 INCH , REINFORCED CONCRETE , 384 '
113 S 56TH AVE W
S 56th Ave W
12 INCH , REINFORCED CONCRETE , 265 '
118 S 56TH AVE W
117 S CENTRAL AVE
110 S CENTRAL AVE
114 S CENTRAL AVE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S Central Ave
72 INCH , REINFORCED CONCRETE , 83 '
114 S CENTRAL AVE
110 S CENTRAL AVE
2021 Hillshade/2022 Aerial

Irving Park Mini Master Plan




THE CITY OF DULUTH MINNESOTA

LHB PERFORMANCE DRIVEN DESIGN.

Updated October 2015

Presentation Contents

Project Stakeholders & Contributors

The City of Duluth Community Development

The City of Duluth Parks and Recreation
Valley Youth Centers
Irving Community Club
Denfeld Youth Football League
Arrowhead Youth Soccer Association
Duluth Edison Charter School
Irving Recreation & Events Association (IREA)
Western Area Business & Civic Club

LHB, Inc.
Duluth, Superior, and Minneapolis

Project Summary & Background

This Mini Master Plan addresses an updated concept for Irving Park, a 9 acre park in Duluth, Minnesota.

Located in West Duluth near the waterfront, the compact Irving Neighborhood was born from a blue collar community heavily involved in industry. Over the decades, demographics and industry have shifted but the strong community has persevered. Organizations such as the Irving Community Club, the Irving Recreation and Events Association (IREA), the Keene Creek Youth organization, and involvement in the Spirit Valley Citizens Neighborhood Development Association (SVCNDA) reflect the importance of community based decisions and leadership in the area.

Although small, the Irving Neighborhood had a strong identity and persistent residents who fought to establish Irving Park in the 1930's. The park quickly became the local hub of activity and recreation. As outlined in *The Irving Sustainable Neighborhood Action Plan (2010)*, 80-year-old Irving Park is an important asset to the Irving Neighborhood as a feature as well as a gathering place. The revitalization of Irving Park directly reflects the core principles of *Duluth's Parks and Recreation Master Plan (2010)*, which, among others, includes connecting the park with the community, connecting the park and the people with nature, ensuring equitable access, and continuing to meet evolving recreation needs.

The Irving Sustainable Neighborhood Action Plan laid out detailed issues and opportunities for Irving Park. Within *Duluth's Parks and Recreation Master Plan*, Irving Park is categorized as a secondary community center with a "Tier 3" limited maintenance program where minimal maintenance needs and life-cycle costs are to be implemented in the revitalization of the park. All of these issues, opportunities, and vision within the greater system from these two plans have been taken into consideration in the re-visioning of Irving Park.

The Planning Process

An advisory group consisting of key user groups in the park convened two times throughout the 2015 process to help guide planning efforts. One public meeting was also held to gain public input on the project goals, needs, and potential constraints of the project.

Meetings

June 30, 2015	*Irving Park Stakeholder Meeting*
July 28, 2015	*Irving Park Public Input Meeting*
September 29, 2015	*Irving Park Stakeholder & Public Meeting*

Needs

- open green space
- football field as #1 priority
- soccer field as #2 priority
- bathroom facilities
- ADA accessibility
- better playground
- walking loop / trail improvements
- wayfinding & signage

Project Goals

- restore park from flood damage
- revitalize park to become community focal point again
- increase neighborhood green space
- reduce undesired/after-hours use of park (increase safety)
- encourage healthy living for all ages
- identify other areas for site improvements & connectivity

Constraints

- building in a floodplain
- topography
- funding
- park access
- user safety

Recent Flooding Impact

On June 19th and 20th in 2012, the City of Duluth incurred significant flood damage throughout the region due to an unprecedented rain event.

Being situated within the floodplain of Keene Creek, Irving Park experienced irreparable damage throughout the park's limits. The Irving Park Community Center building was flooded with several feet of water, destroying everything inside and out. The structure was deemed unsalvageable and therefore was torn down. Although salvaged, the adjacent storage building and garage was also flooded with 31" inches of standing water. The recreational fields also suffered significant loss, ranging from a plugged drain tile system to downed trees and scattered remnant debris. The entire park was covered with silt deposits, leaving a film of slime coating the playground and other hard scape elements.

Clean up from the flood was completed by community volunteers as well as the Irving Recreation & Events Association and lasted until the fall of 2012. Although the park is currently being used for recreation, the damages from the 2012 storm event are still evident. Flood recovery and park improvement efforts for this site are addressed in this Mini Master Plan update.

PRIMARY PARK ENTRANCE

STAIRWAY ACCESS TO PARK

PLAYGROUND

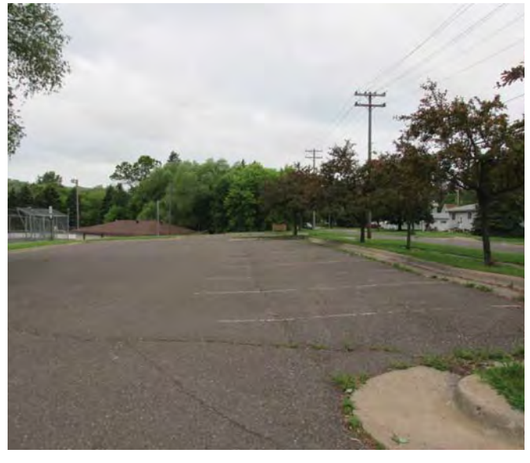
TRAILHEAD

WATERLOGGED FIELDS

TRAIL ACCESS THROUGH TUNNEL

STORAGE BUILDING

PARKING LOT



PARKING LOT

Map 5 - Site Plan - Proposed Master Plan

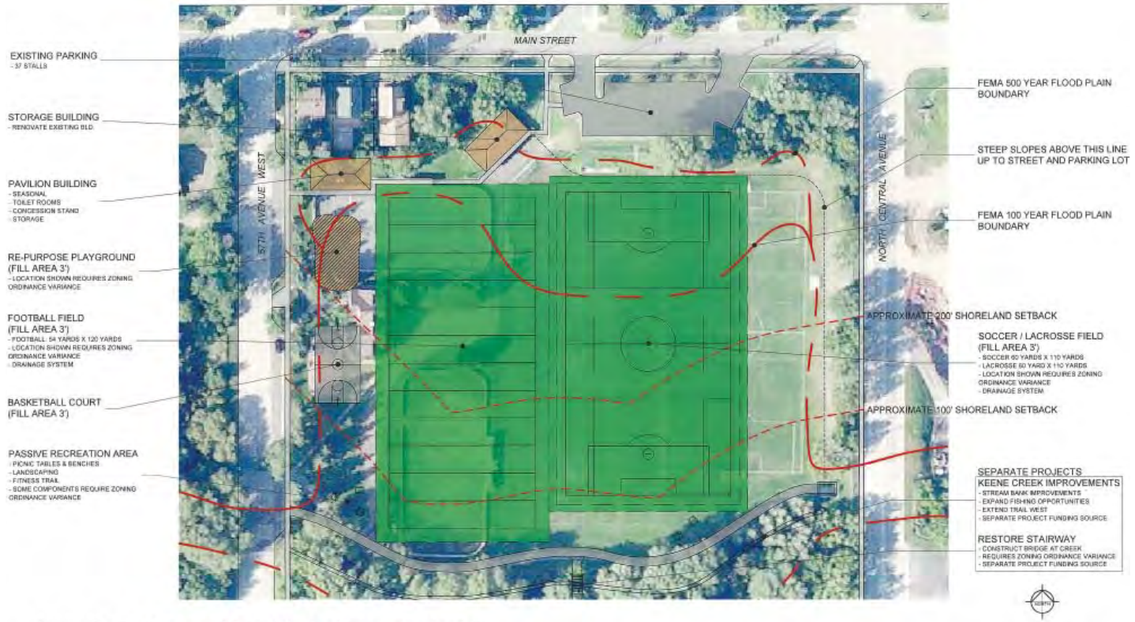
10-035
01/13/11
DRAWN BY: TP

Three former plans for Irving Park have been developed in the past.

The first (above) dates from 2011 and was developed from *The Irving Sustainable Neighborhood Action Plan (2010)*. This plan ultimately did note move forward because the needs of the neighborhood had changed (such as less emphasis on hockey) and there was a lack of available funding.

To the right, two concepts were developed in 2013. Concept A (top), included everything the neighborhood desired, and was estimated to cost nearly $4.2 million. Concept B (bottom) featured basic site improvements and had a reduced total project cost of $1.2 million. Concept A was presented to the City Council for approval, however it was turned down due to the high estimated cost. The neighborhood felt there was a misconception within the City that they were asking for too much.

Irving Park - Proposed Mini Master Plan - Concept A



Irving Park - Proposed Mini Master Plan - Concept B

12-179
8/05/13
DRAWN BY: JMS

ADDITIONAL PARKING ON 57TH
- Add parallel parking spots

STORAGE BUILDING
- Renovate existing building

GATHERING SPACE
- ADA accessibility from parking lot
- Include benches

PICNIC SHELTER/PAVILION

RESTROOM FACILITIES

RELOCATED AND RENOVATED PLAYGROUND
- 65 ft x 90 ft minimum
- Fully accessible
- Age appropriate
- Drainage system

BASKETBALL COURT
- 50 ft x 94 ft

BLEACHER SEATING
- Reuse existing bleachers

SERVICE VEHICLE ENTRANCE
- Combine with trailhead

FOOTBALL FIELD
- 184 ft x 360 ft
- Drainage system
- Irrigation system
- Lighting requires zoning ordinance variance

LANDSCAPE SCREENING
- Plantings for screening noise & lights

EXISTING PARKING LOT
- Surfacing improvements

IMPROVED STAIRCASES AND RAMP
- 8' wide and 5' wide
- ADA accessible from parking lot

APPROXIMATE FEMA 500 YEAR FLOOD PLAIN

WALKING PATH
- 1/3 mile long circuit
- Retaining wall to stabilize hill

APPROXIMATE FEMA 100 YEAR FLOOD PLAIN

APPROXIMATE 200' SHORELAND SETBACK

BLEACHER SEATING

SOCCER/LACROSSE FIELD
- 204 ft x 364 ft
- Drainage system
- Irrigation system

APPROXIMATE 100' SHORELAND SETBACK

UNDERPASS & STAIRS

PASSIVE RECREATION AREA
- Picnic tables and benches
- Landscaping
- Fitness Trail
- Some components require zoning ordinance variance

FUTURE WORK: RESTORE STAIRWAY AND BRIDGE
- Construct bridge at creek
- Requires zoning ordfinance variance
- Separate project funding source

Project Phasing Plan

Below is a recommended implementation plan for Irving Park site improvements. The priority areas listed below were generated by key stakeholders during the planning process and will be implemented as funding sources become available.

Phase 1 Priorities

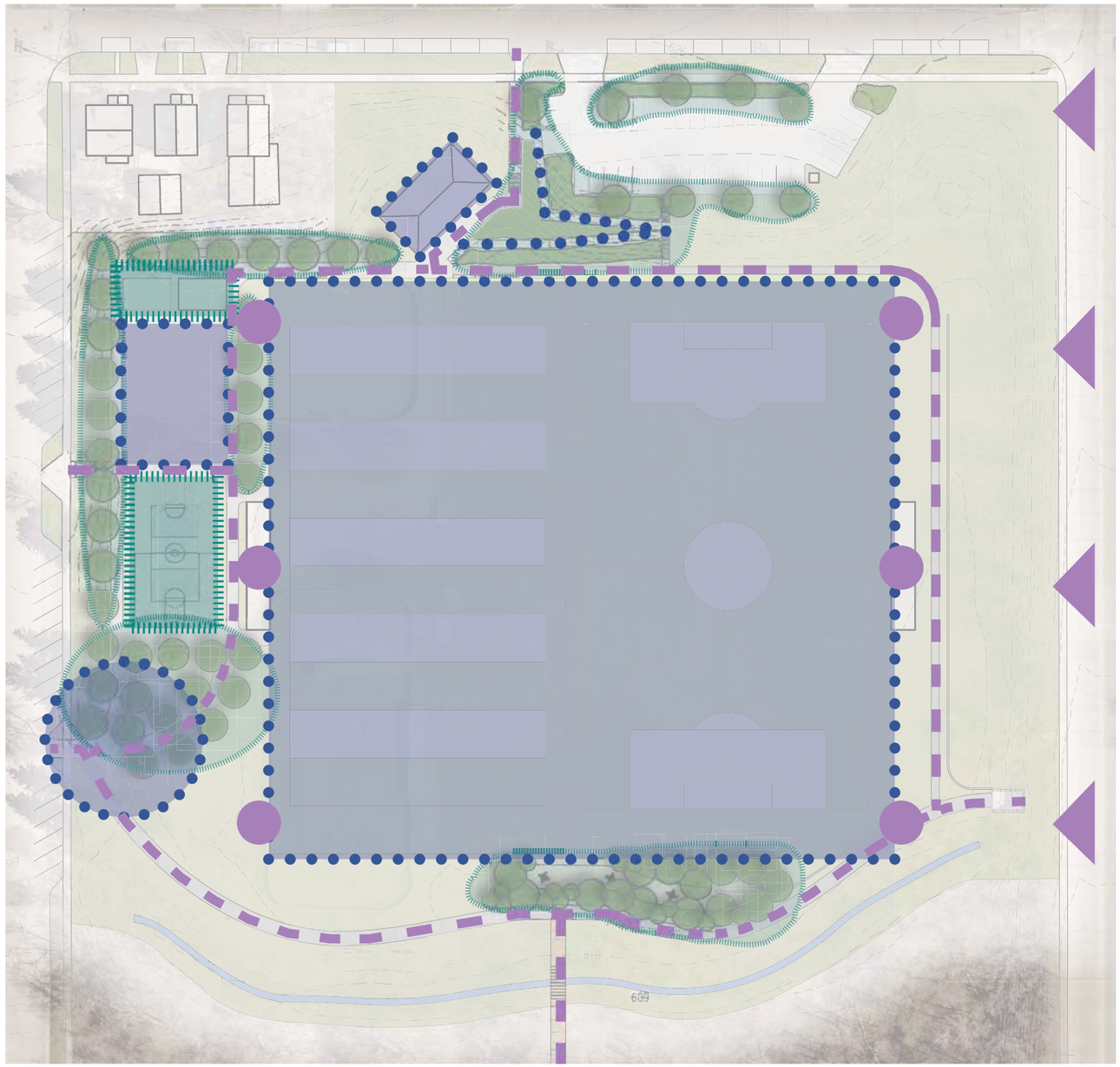
1. **Recreational fields:** Priorities shall include all earthwork activities, installing a drainage system and turf re-establishment for football and soccer field use. Other improvements that are associated with having fully functional fields include storage building upgrades, improved walkways, and ADA accessibility for field access.
2. **Security and safety features:** Installing a gate at the trail head/service entrance, implementing new site lighting and all other safety features should be addressed during Phase I.
3. **Playground renovation:** A primary user group of the park are neighborhood families with young children. Efforts to relocate and construct a quality playground should also be included in this phase.

Phase 2 Priorities

1. **Lighting for Recreational Fields:** In order to extend the use of the recreational fields for seasonal practice and evening games, field lighting should be a main priority in Phase 2.
2. **Trail Improvements:** Linking neighborhoods and enhancing green space connectivity is an ongoing initiative and has been listed in past Irving Park revitalization plans. Trail improvements will strengthen the community's use of the park and shall include surface upgrades and extension of walking trails, passive use areas, and wayfinding signage.
3. **Central Avenue Improvements:** Upgrades to the existing staircase, signage, as well as selective vegetation clearing along the Central Avenue will allow for better park access and viewing opportunities from above field parking areas.

Phase 3 Priorities

1. **Picnic Pavilion/Shelter:** Providing a larger gathering space with site amenities (grills, tables, etc.) will increase park use and should be a priority in Phase 3.
2. **Restroom Building:** If an operations and maintenance plan can be negotiated with City Parks, efforts to construct a modest restroom building should be addressed.
3. **Site Furnishings & Landscaping:** Installing site furnishings, a basketball court, and low maintenance landscaping elements will enhance the overall aesthetic of the park and allow for increased park enjoyment.



CITY OF DULUTH PARKS
Irving Park Mini Master Plan - Cost Estimate (October 2015)

		UNIT	**QTY**	**COST**
A.	**Renovate Existing Storage Garage**	**Lump Sum**	1	**$30,000.00**
	Repair Flood Damaged Interior			
	Replace Shingles			
	Replace Siding			
	Replace Existing Exterior Openings			
B.	**Gathering Space by Storage Garage**	**SQ FT**	**Area**	**$8,140.00**
	Concrete Area	$6	1090	$6,540.00
		EACH	**QTY**	
	Benches	$800	2	$1,600.00
C.	**Basketball Court**	**SQ FT**	**Area**	**$28,200.00**
		$6.00	4700	$28,200.00
D.	**Picnic Shelter / Pavilion**	**SQ FT**	**Area**	**$75,000.00**
		$125.00	600	$75,000.00
E.	**Restrooms Facilities**	**SQ FT**	**Area**	**$270,000.00**
		$450.00	600	$270,000.00
F.	**Relocated and/or Renovated Playground**	**Lump Sum**	1	**$75,000.00**
G.	**Bleacher Seating by Football Field**	**Lump Sum**	1	**$13,000.00**
	New Bleachers & install already purchased scoreboard			
H.	**Football Field**	**SQ FT**	**Area**	**$281,521.00**
	Natural turf seed	$1.00	66240	$66,240.00
	Irrigation	$1.00	66241	$66,241.00
	Drainage system	$1.25	66240	$82,800.00
	Regrading	$1.00	66240	$66,240.00
I.	**Landscape Screening by Parking Lot**	**SQ FT**	**Area**	**$16,350.00**
	Shrubs	$2.50	5532	$13,830.00
		UNIT	**QTY**	
	Trees (Assume 2.5" caliper, B&B tree)	$360	7	$2,520.00
J.	**Existing Parking Lot Repairs**	**SQ FT**	**Area**	**$44,976.00**
	Surfacing repairs	$4.00	11244	$44,976.00
K.	**Improved Staircases by Parking Lot**	**SQ FT**	**Area**	**$10,728.00**
	8' wide Staircase	$12	662	$7,944.00
	5' wide Staircase	$8	228	$1,824.00
		LF	**Length**	
	Railing	$12	80	$960.00

L.	**Ramp Access from Parking Lot**	**SQ FT**	**Area**	**$8,400.00**
	5' wide Ramp @ 5% grade	$12	700	$8,400.00
M.	**Bleacher Seating by Soccer Field**	**UNIT**	**QTY**	**$10,000.00**
	New bleachers	$10,000	1	$10,000.00
N.	**Soccer / Lacrosse Field**	**SQ FT**	**Area**	**$314,542.50**
	Natural turf seed	$1.00	74010	$74,010.00
	Irrigation	$1.00	74010	$74,010.00
	Drainage system	$1.25	74010	$92,512.50
	Regrading	$1.00	74010	$74,010.00
O.	**Passive Recreation Area**	**UNIT**	**QTY**	**$15,262.00**
	Picnic Tables	$1,000	4	$4,000.00
	Trees	$360	25	$9,000.00
		SQ FT	**Area**	
	Compacted gravel zone	$1.00	2262	$2,262.00
P.	**Additional Trees around Site**	**UNIT**	**QTY**	**$13,320.00**
	Trees	$360	37	$13,320.00
Q.	**Walking Paths around Site**	**SQ FT**	**Area**	**$33,310.00**
	Concrete paths	$12	662	$7,944.00
	Bituminous paths	$2	8867	$17,734.00
	Retaining wall by walking path	$8	954	$7,632.00
R.	**Site Lighting**	**Lump Sum**	1	**$100,000.00**
S.	**Field Lighting**	**Lump Sum**	1	**$175,000.00**
T.	**New Park Signage**	**Lump Sum**	1	**$20,000.00**

Project Costs beyond Construction		
U.	**Site Survey & Investigation Fees**	**$40,000.00**
	(Includes topographic survey, soil testing, utilities locate)	
V.	**A/E Design Fees**	**$153,575.00**
	Estimated at 10% of project construction cost	
W.	**Legal/Insurance/Regulatory Permitting Fees**	**$107,500.00**
	Estimated at 7% of project construction cost	
X.	**Construction Contingency**	**$153,575.00**
	Estimated at 10% of project construction cost	

TOTAL ESTIMATED PROJECT COST
$1,997,399.50

CITY OF DULUTH PARKS
Irving Park Mini Master Plan - Cost Estimate for Phase 1

		COST
A.	**Renovate Existing Storage Garage**	**$30,000.00**
B.	**Gathering Space by Storage Garage**	**$8,140.00**
F.	**Relocated and/or Renovated Playground**	**$75,000.00**
G.	**Bleacher Seating by Football Field**	**$13,000.00**
H.	**Football Field**	**$281,521.00**
L.	**Ramp Access from Parking Lot**	**$8,400.00**
M.	**Bleacher Seating by Soccer Field**	**$10,000.00**
N.	**Soccer / Lacrosse Field**	**$314,542.50**
R.	**Site Lighting**	**$100,000.00**
Project Costs beyond Construction		
U.	**Site Survey & Investigation Fees**	**$40,000.00**
	(Includes topographic survey, soil testing, utilities locate)	
V.	**A/E Design Fees**	**$84,060.35**
	Estimated at 10% of project construction cost	
W.	**Legal/Insurance/Regulatory Permitting Fees**	**$58,842.00**
	Estimated at 7% of project construction cost	
X.	**Construction Contingency**	**$84,060.35**
	Estimated at 10% of project construction cost	

TOTAL ESTIMATED PROJECT COST FOR PHASE 1
$1,107,566.20

ESTIMATED MAINTENANCE BUDGET FOR IRVING PARK

For Duluth Parks & Recreation, Irving Park Mini Master Plan
December 2015

Maintenance Description	Annual/Seasonal Estimate
1. Bathroom Facilities Upkeep	$3,800
a. Option 1: Portable Units ($3,800) b. Option 2: Permanent Bldg ($16,380)	
2. Snow Removal	$5,225
3. Trash Removal	$1,980
4. Spring Clean-up	$4,032
5. Lawn Mowing & Vegetation Trimming	$6,840
6. Concession Building (trash, utilities, paint, roof, etc)	$3,400
7. Parking Lot, Sidewalk & Stair Maintenance	$2,360
8. Playground (resilient surface material, repairs, etc)	$1,480
9. Site Furnishings (bench replacement, painting, sign repair)	$3,871
10. Site Lighting (fixture replacement, etc)	$1,500
11. Trail/Erosion Control/Creek Maintenance	$4,650
12. Safety	$1,200
13. Other?	NA

Estimated Annual Total **$40,338**

**Information provided by City Parks & Recreation Division; Buildings & Grounds Maintenance.*


2016 Aerial, Pre-Mini Master Plan items
4 INCH , POLYVINYL CHLORIDE , 261 '
Main St
15 INCH , REINFORCED CONCRETE , 51 '
ST0220073
4 INCH , POLYVINYL CHLORIDE , 119 '
4 INCH , POLYVINYL CHLORIDE , 116 '
4 INCH , POLYVINYL CHLORIDE , 335 '
Main St
UNKNOWN , UNKNOWN , 52 '
12 INCH , REINFORCED CONCRETE , 138 '
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ST0220043
72 INCH , REINFORCED CONCRETE , 86 '
ST0220049
6 INCH , POLYVINYL CHLORIDE , 57 '
27 INCH , REINFORCED CONCRETE , 384 '
Keene Creek


2019 Aerial, Post-Mini Master Plan items
Main St
Main St
4 INCH , POLYVINYL CHLORIDE , 261 '
15 INCH , REINFORCED CONCRETE , 51 '
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