Lower Grand River Organization of Watersheds

Watershed Monitoring Manual

Contents

Tables

Figures

Attachments

Attachment 1 – Lower Grand River Watershed TMDL Listing

Attachment 2 – Sampling Site Locations

Attachment 3 – Water Quality Index Information

Attachment 4 – Sample Field Sheet

Attachment 5 - Sampling Procedure

Attachment 6 – Sampling Locations and Frequencies

Attachment 7 - Listing of Local Certified Laboratories

Attachment 8 – Sample Chain of Custody

History and Overview

The Lower Grand River Organization of Watersheds (LGROW) was officially formed in 2009 to provide basin-wide oversight, implement watershed-wide initiatives, and prioritize water quality concerns within the Lower Grand River Watershed. The mission of LGROW is to: "D*iscover and restore all water resources and celebrate our shared water legacy throughout our entire Grand River Watershed community".* Further, LGROW's vision for the watershed is stated as: "S*wimming, drinking, fishing, and enjoying our Grand River Watershed: Connecting water with life".* The core values of LGROW include:

- *Watershed activities are diverse, inclusive, and collaborative*
- *Watershed efforts are sustainable and of high quality*
- *Watershed images and messages create a widely shared sense of legacy and heritage*
- *Watershed methods and products are holistic and employ a systems approach*
- *Watershed organization and programs evaluate progress and reward success*

LGROW is managed by a Board of Directors which includes public and private sector representatives from within the watershed. Several committees support the mission, vision and values of LGROW.

The Data Information and Procedures (DIP) committee is one of the committees that has been established to support LGROW. Its goal is to collect data about the watershed as well as be a clearinghouse for information about the watershed. The DIP committee has previously supported LGROW by assisting in the development and review of Watershed Management Plans as well as providing support in the development of the Illicit Discharge Elimination Plan. Recently and in anticipation of the new NPDES stormwater permits, the DIP committee has refocused its efforts to include watershed monitoring.

This Watershed Monitoring Manual has been developed by members of the DIP committee and is intended to be a technical reference document that can be easily used by LGROW members to further support and validate watershed improvement efforts.

Project Partners

The DIP committee consists of many regional partners throughout West Michigan. The following table lists the primary partners and their organizational affiliations:

Table 1 DIP Committee Membership

Member	Organization
Craig Bessinger	Ferrysburg, City of
Mike Lunn	Grand Rapids, City of
Dan Taber	Grand Rapids, City of
John Koches (Chair)	Grand Valley State University
Angie Latvaitis	Kent County Drain Commissioner's Office
Sarah Simmonds	Kent County Health Department
Jim Beke	Kentwood, City of
Amanda St. Amour	MDEQ
Dana Strouse	MDEQ
Roger Belknap	Spring Lake, Village of
Rachell Nagorsen	Walker, City of
Aaron Vis	Wyoming, City of
Bonnie Broadwater	Grand Valley Metropolitan Council
Wendy Ogilvie	Grand Valley Metropolitan Council

Goals & Objectives

Over the last decade, a number of organizations have collected water quality data throughout the Lower Grand Watershed. These data collection activities have included grade-school children participating in World Water Monitoring Day, DEQ macroinvertebrate studies, and City of Grand Rapids River Run Sampling to name a few. While the data collected served each organization's specific goals (i.e. education, compliance, etc.), there lacked a collaborative, regional and definitive approach to assessing and monitoring watershed health.

In 2014 in an effort to support the overall mission and vision of LGROW, members of the DIP Committee realized that it was necessary to reliably and accurately measure progress and achievements within the Lower Grand Watershed. The Watershed Management Plan (WMP) developed by LGROW and approved by the Michigan Department of Environmental Quality (DEQ) provides an outline of methods for measuring progress and was used as the basis for developing the specific objectives below.

Recognizing that a new NPDES permit would likely require some sort of watershed monitoring, the DIP Committee adopted a goal of measuring progress and achievements in the Lower Grand River Watershed. The following objectives were further developed and are listed in order of importance:

1. Determine Water Quality Standard (WQS) and Total Maximum Daily Load (TMDL) compliance.
2. Establish a baseline/standard for determining a watershed quality indicator
3. Evaluate municipal stormwater runoff controls and practices (BMPs)
4. Evaluate the effectiveness of non-point source pollution controls and practices (BMPs)
5. Establish a quality monitoring program subwatersheds can adopt.

The objectives are further explained and defined on the succeeding pages.

Objective 1: Determining WQS and TMDL compliance

The State of Michigan is required by the Clean Water Act to assess all water resources. If, during this assessment, a water body is found not to support its designated use or attain its WQS, a TMDL is developed such that attainment is possible. There are 16 subwatersheds within the lower Grand River watershed that require a TMDL. LGROW has developed a Watershed Management Plan, maintained under a separate cover which includes more specific information.

A number of communities within the lower Grand River watershed that own or operate a Municipal Separate Storm Sewer System (MS4) are regulated by a National Pollutant Discharge Elimination System (NPDES) permit. This NPDES permit has been issued to the entire Lower Grand River Watershed, with individual MS4 communities within the watershed receiving a certificate of coverage under this general watershed permit. LGROW MS4s will be submitting a new permit application in early 2015. This application requires that MS4s address TMDLs specific to water bodies within their urbanized area, while the remaining unpermitted communities are not. A complete listing of waterbodies, impacted communities and TMDLs within all areas of the watershed is included in Attachment 1. The TMDLs include e. coli and Biota/sediment (total suspended solids).

Given the need to address the TMDLs, the DIP committee determined that it would be to the benefit of LGROW if this was done in a collaborative, uniform manner throughout the watershed.

Objective 2: Establishing a baseline/standard for determining a watershed quality indicator

One of the goals in the WMP is to develop key water quality indicators and organizational evaluation measures. It was determined that this would be a useful tool both internally as a metric for watershed health as well as a simple communication means for external stakeholders as required by the new NPDES permit application. The National Sanitation Foundation (NSF) has created a standard index called the Water Quality Index (WQI). Widely used throughout the United States, a variant of this WQI has been used by the City of Grand Rapids since approximately 1988.

Objective 3: Evaluate municipal stormwater runoff controls and practices (BMPs)

For permitted, MS4 communities, the newest NPDES permit application requires them to develop and evaluate Best Management Practices (BMPs). BMPs are developed specific to each community, and each BMP is designed to remove certain pollutants from entering a waterbody. A separate BMP Manual has been prepared that identifies numerous structural and operational BMPs, yet the effectiveness of these BMPs is best determined through attentive monitoring. The monitoring locations and sampling and analytical procedures identified later in this manual provide a solid foundation for BMP evaluation. The sampling and analytical procedures identified can be further used in various illicit discharge detection and verification processes if needed.

Objective 4. Evaluate the effectiveness of non-point source pollution controls and practices (BMPS)

Non-point source pollution includes both agricultural and urban pollution sources that are difficult to define and locate. Although only a small part (geographically) of the lower Grand River watershed is urbanized and permitted, the majority (~51%) includes farming and other agricultural land uses (*WMP, 2011*). The impact of these non-point sources contribute to the overall health of a watershed, and the effectiveness of the BMPs developed for these sources should be monitored.

Objective 5. Establish a quality monitoring program subwatersheds can adopt

The majority of the DIP committee members are MS4 communities with more financial/sampling/analytical resources than the non-permitted communities. The DIP committee believes that it is important that the framework for a watershed monitoring program be developed such that it can be easily adopted or replicated by anyone within the watershed. It should not be overly complicated but rather clearly defined in a manner that personnel with prior wastewater/water/stormwater sampling and analysis experience can understand. Thus, the sampling locations and procedures developed within this document follow standard protocols either previously adopted in an existing WMP, by the EPA, or by other progressive stormwater agencies within the United States. It is anticipated that the majority of the work will initially be done by MS4 communities or private, local partners. This manual can then be used by others within the Grand River watershed with the assurance that it has been vetted by numerous interested parties.

Other Considerations

The DIP Committee recognizes that there are a number of things that can be monitored or tracked to achieve the above objectives. Yet, the ensuing parameters, protocols and information reflects a balance of current needs/wants and available resources. As other resources, needs, concerns, and funding becomes available it is likely that this monitoring effort will become more robust and inclusive.

Sampling Locations

Historical Sampling Information

Throughout the decades, the DEQ, USGS, numerous local municipalities and a number of non-profit groups have sampled the Grand River and associated tributaries at a variety of locations. The DIP Committee reviewed a number of historical sampling locations at various sites both on the Grand River and within several of the sub watersheds and found that the only consistently sampled locations are those used by City of Grand Rapids on the Grand River since 1988. The following map and table depicts the locations that Grand Rapids has used and currently uses:

Figure 1 Grand Rapids River Run Sampling Sites

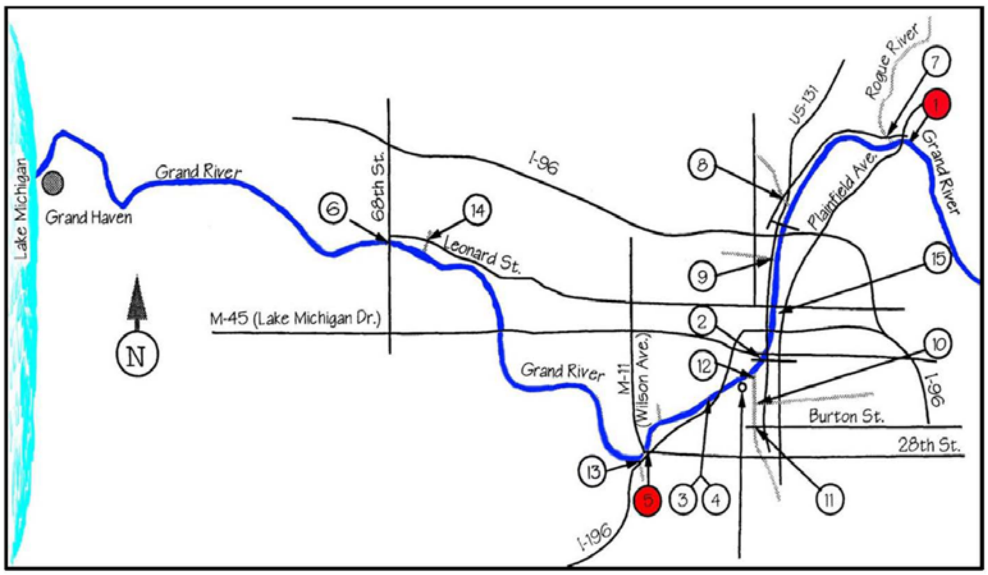


Table 2 Grand Rapids River Run Sampling Sites

Grand River	Tributaries
1. Northland Dr. Bridge	7. Rogue River at West River Drive
2. Wealthy St. Bridge	8. Mill Creek at West River Drive
3. Railroad Bridge South	9. Indian Mill Creek at Turner
4. Railroad Bridge North	10. Silver Creek at Crofton / Roy
5. Wilson (M-11) Bridge	11. Plaster Creek at Burton (Plaster 1)
6. Eastmanville (68th Ave.) Bridge	12. Plaster Creek at the Grand River (Plaster 2)
	13. Buck Creek at Chicago Drive
	14. Deer Creek
	15. Coldbrook Storm Drain

Future Sampling Location Selection Criteria

Sampling site selection is a critical component of the watershed monitoring manual. Given the infinite number of locations where samples could be taken from, the DIP Committee has developed the following guidelines for determining appropriate sampling locations:

- Consideration of the sampling objective.
- Identification of a sampling location that has been used previously by a regulating agency or as part of a grant.
- Identification of a sampling location previously identified in the Watershed Management Plan.
- Location access throughout all types of weather conditions (e.g. high water events, inclement weather, etc.

Selected Sampling Locations

The DIP Committee has determined that the sites used by the City of Grand Rapids provide a good perspective of the Grand River immediately surrounding the City of Grand Rapids, but are not enough to assess the Grand River throughout the breadth of the watershed. Thus, in addition to the sites Grand River sampling stations, the DIP recommends sampling the sites identified below:

Grand River Sampling Stations	Grand River Tributary Stations
Northland Drive Bridge	Indian Mill Creek at Turner Avenue
Wealthy Street Bridge	Plaster Creek at the Grand River
Railroad Bridge South	Buck Creek at Chicago Drive
Railroad Bridge North	Deer Creek at Leonard Street
Wilson (M-11) Avenue Bridge	Spring Lake Outlet (M104) Bridge
Eastmanville (68^{th} Avenue) Bridge	Bass River at Bass Drive
US 31 (Grand Haven Drawbridge)	Crockery Creek at Leonard Street
Rogue River at West River Drive	Sand Creek at Linden Drive

A map of the sites is included in Attachment 2.It is the intent of the DIP Committee to begin its assessment of the Grand River Watershed with sampling locations in and along the Grand River. Once this process has been assessed and as more resources have been made available, the DIP Committee intends to transition the monitoring program into an assessment of the larger subwatersheds with TMDLs.

Data Quality

During the DIP Committee review of existing data, it became apparent that, although there was a significant amount of data available, much of it was either collected by unskilled samplers (i.e. school groups) or analyzed via methods not approved by the EPA or performed by certified laboratories. To achieve the 5 objectives identified above, the DIP Committee strongly felt that a defined, standard set of sampling and analytical procedures needed to be developed such that the resulting data was of similar quality as that expected of wastewater and drinking water facilities and be scientifically sound. For any data to be considered valid and used as a measurement of the objectives mentioned in this manual, the DIP Committee requires that:

1. Samples are collected by personnel trained in water, wastewater or stormwater sample collection and have a strong understanding of sampling and analytical procedures.
2. Analytical methods used are approved by the EPA, Standard Methods (SM), American Society for Testing and Materials (ASTM), or the United States Geological Survey (USGS) and that laboratories used are certified either by the EPA or State of Michigan.

Watershed Monitoring Parameters

There are a number of parameters that could be monitored within the Lower Grand Watershed to gauge watershed health. When placed within the context of the 5 objectives above, a list of what should be monitored becomes practicable. The following is a brief description and breakdown of parameters connected to each objective.

Parameters Related to Objective 1

Objective 1 relates to determining WQS and TMDL Compliance within the Lower Grand River Watershed. The DIP Committee reviewed all the TMDLs within the regulated, urbanized area of Lower Grand River Watershed, and found the following:

- E. coli
- Total Suspended Solids

Parameters Related to Objective 2

The second objective identified by the DIP is to develop a watershed quality indicator. The National Sanitation Foundation (NSF) developed a Water Quality Index (WQI) in the 1970s. The City of Grand Rapids modified the Index in the 1980s and has since used this modified index as a simple gauge to measure the quality of the Grand River. The original and modified Grand Rapids WQI are identified below:

Table 3 Weighted Water Quality Index Parameters

NSF Water Quality Index	
Parameter	**Weight**
Dissolved Oxygen (DO)	.17
Fecal Coliform	.16
pH	.11
Biochemical Oxygen Demand (BOD)	.11
Temperature Change	.10
Total Phosphate	.10
Nitrates	.10
Turbidity	.10
Total Solids	.07

Modified Water Quality Index	
Parameter	**Weight**
Dissolved Oxygen (DO)	.18
Fecal Coliform	.17
pH	.12
Biochemical Oxygen Demand (BOD)	.12
Temperature Change	.11
Total Phosphate	.11
Nitrates	.11
Total Suspended Solids + Chlorides	.08

For each parameter, a graph is used to convert the field data to a “Q”, or Quality Value. The Q Value is then multiplied by the weighting factor for that specific parameter. The results are totaled for an overall WQI that ranges from 1 to 100. Attachment 3 provides greater detail on this conversion and weighting process.

The DIP has determined that the Grand Rapids Modified Water Quality Index, due to its historical significance, would be appropriately used as a means of a Grand River Watershed WQI. In addition, this index can be used to gauge the health of subwatersheds within the larger Grand River Watershed. Following is a list of these parameters:

- Dissolved Oxygen
- Fecal Coliform
- pH
- Biochemical Oxygen Demand
- Temperature
- Total Phosphorous
- Nitrates (NH3-N)
- Total Suspended Solids
- Chlorides

Parameters Related to Objectives 3 and 4

Permitted LGROW members are tasked with gauging the effectiveness of the BMPs that they have installed within their urbanized area to address non-point pollutant sources. Non-permitted members of the organization also realize that certain activities contribute to non-point source pollution and wish to address this, even though they are not required (by the MDEQ) to do so. The following list of pollutants has been determined based upon a review of the assortment of BMPs that have been developed to address non-point pollution within the Lower Grand Watershed:

- Dissolved Oxygen
- Fecal Coliform
- Biochemical Oxygen Demand
- Temperature
- Total Phosphorus
- Nitrates (NH3-N)
- Total Suspended Solids
- Chlorides
- E. coli
- Metals, Mercury
- Polychlorinated biphenyl (PCBs)
- Oil and Grease
- Volatile Organic compounds (VOCs)
- Conductivity

Recommended Monitoring Parameters

Based on the information provided above, the DIP Committee has determined that the following parameters should be monitored throughout the Lower Grand River Watershed:

- Dissolved Oxygen (DO)
- Fecal Coliform
- pH
- Biochemical Oxygen Demand (BOD)
- Temperature
- Total Phosphorus
- Nitrates (NH3-N)
- Total Suspended Solids (TSS)
- Chlorides
- E. coli
- Conductivity
- Oil and Grease

The following table references these parameters and associated method numbers:

Table 4 Watershed Monitoring Parameters and Method Associations

Parameter	EPA Method	Standard Methods	ASTM	USGS	OTHER
e. Coli		SM 9222 & 9223*			
Fecal Coliform		SM 9221			
Total Phosphorus	365.1, 365.4	4500-P	D515 Series	I-4600-85 I-4610-91	
Total Suspended Solids (TSS)	160.2				
Biochemical Oxygen Demand (BOD)	405.1	5210 B		I-1578-78	
pH	150.1	4500-H			
Temperature	170.1				
Nitrates (NO_3)	300 352.1 353 Series 354.1	4500-N	D3867 Series	I-4545-85	

Dissolved Oxygen (DO)	360 Series	4500 Series	D888 Series	I-1575-78 I-1576-78	
Metals	200.7/200.8				
Chloride		4500-E			
Oil and Grease					Visual Assessment
Conductivity	120.1				
VOCs		8260			
SVOCs		8270			

*Method used to analyze sample must produce a quantifiable number not just a positive/negative confirmation. Coliform density must be reported as counts per 100mL water sample.

Sampling Procedures

The DIP Committee recognizes that the generation of quality, usable data begins with properly trained sampling staff, the use of approved analytical methods, and rigorous quality control. Rather than develop detailed standard operating procedures and analytical methods, the DIP Committee intends to utilize the skill sets of existing partners currently involved in water/wastewater/stormwater sampling and analysis as the foundation for the monitoring program. Many of the details below have been taken from the 2009 EPA Industrial Stormwater Monitoring and Sampling Guide Document (#EPA 832-B-09-003) and the 1992 EPA NPDES Storm Water Sampling Guidance Document (#EPA 833-B-92-001), as officially referenced at the end of this manual. Other documents include the Standard Operating Procedures from the Florida Department of Environmental Protection (http://www.dep.state.fl.us/water/sas/sop/sops.htm).

Sampler Qualifications

Those who will collect samples should consist of personnel who are familiar with the sampling locations, sampling equipment and analytical methods. Personnel should have been previously trained in wastewater, drinking water, or stormwater sample collection such that an adequate understanding of proper sampling procedures is known. Ideally, staff should be used who understand the stormwater program, potential pollutant sources, monitoring and reporting requirements, principles of (cross) contamination, as well as general health and safety procedures. These staff should also understand and follow all quality assurance quality control techniques as mandated by the laboratory performing the analytical procedures to ensure valid data.

Health and Safety

Hazardous Weather

Sampling should never occur during unsafe weather conditions, which includes flooding events, lightening storms, hail storms, high winds, etc. Every attempt should be made to conduct the sampling event at least 2 days (48 hours) after a rain event of at least 0.5" or greater such that a representative sample can be obtained of ambient conditions.

Chemical, Physical and Biological Hazards

Chemical hazards that may be encountered primarily include the preservatives used in sample collection containers for sample preservation. Review of applicable Safety Data Sheets (SDS) should be done to follow appropriate safety procedures.

A number of physical hazards include traffic hazards, slippery slopes and lifting hazards. Sampling personnel should be aware of their surroundings at all times and exercise prudent use of appropriate safety equipment.

Sampling personal may encounter ticks, mosquitoes, poison ivy, rodents, etc. as biological hazards. Proper repellants should be used if the sampling location has indications of these hazards.

Safety Equipment

Sampling personnel should be aware of their surroundings and hazards potentially involved. Some appropriate safety equipment should include:

- Cell phone or other communication equipment
- Safety glasses
- Traffic cones
- Insect or poison ivy repellent
- Gloves

Confined Spaces

It is not anticipated that sampling will be conducted in confined space. If that should occur, the confined space protocol that the organization the sampler is from shall dictate the confined space procedures.

Sampling Preparation

Prior to initiating a sampling event, personnel should review proposed sampling sites, weather, past weather, equipment, etc. to verify that they are properly prepared. It is a good idea to develop a sampling equipment checklist to ensure that all equipment, containers, and paperwork are available.

Documentation

Sampling personnel should document their sampling event within a field notebook or field sheets. Attachment 4 includes an example field sheet. Sampling personnel must also secure the proper Chain of Custody sheets as further described in that section. Documentation must be retained for at least 3 years.

It is the responsibility of the certified laboratory used to retain appropriate SOPs, calibration information, QA/QC program information as required both by the certifying agency and/or as required by internal controls.

Identification and Labeling

Personnel should consult with the certified laboratory for proper sampling identification and labeling procedures. In general, samples should be identified by using the site identification as determined by the DIP Committee. Other relevant information should include date, time, sampler, preservative, required test, sample type, and any special handling instructions.

Sample Collection and Handling

The laboratory and analytical methods used will dictate how a sample should be collected and handled. Refer to individual methods prior to sample collection to properly understand appropriate requirements. Generally, guidelines established in 40 CFR 136 should be followed (http://www.epa.gov/region9/qa/pdfs/40cfr136_03.pdf).

Containers, Volume and Preservative

Each analytical method will have specific containers, preservatives, and holding times associated with that method. Following is a list of containers and preservatives for each parameter:

Table 5 General Container, Volume and Preservative Information

Parameter	Bottle Type	Recommended Sample Volume	Preservative
e. Coli	Sterilized Plastic	at least 100mL	Sodium Thiosulfate
Fecal Coliform	Sterilized Plastic	at least 100mL	Sodium Thiosulfate
Phosphorus	Pre-cleaned HDPE	250mL	H2SO4 or 1:1 HCl <2
Total Suspended Solids (TSS)	Pre-cleaned HDPE	1L	None
Biochemical Oxygen Demand	Pre-cleaned HDPE	1L	None

(BOD)			
pH	Pre-cleaned HDPE	125mL	None
Temperature	Pre-cleaned HDPE	125mL	None
Nitrates (NO_3)	Pre-cleaned HDPE	250mL	None - Filter sample
Dissolved Oxygen (DO)	Pre-cleaned HDPE	250mL	None
Metals	Pre-cleaned HDPE	250mL	HNO3 <2

Sample Handling and Hold Time

Generally, samples collected must be cooled to 4 degrees C upon collection. Temperature and pH are field measurements and not necessarily collected for laboratory analysis. Refer to the sample collection SOP for specific handling instructions.

Collection Technique

Grab Sampling

A specific procedure has been developed on the proper procedure for collecting a grab sample, and is located in Attachment 5.

Composite Sampling

At this time, the DIP Committee is not detailing procedures for composite sampling.

Flow Monitoring

At this time, flow monitoring is not part of the watershed monitoring effort. However, the USGS maintains seven (7) flow monitoring station on the Grand River and a number of others within the Lower Grand Watershed. These can be accessed at any time at www.waterdata.usgs.gov. The following table lists the station number and station name.

Table 6 USGS Flow and Station Information

Station Number	Station Name	Watershed
04109000	Grand River at Jackson	Upper Grand
04111000	Grand River near Eaton Rapids	Middle Grand
04113000	Grand River at Lansing	Middle Grand
04114000	Grand River at Ionia	Lower Grand
04118105	Grand River at Ada	Lower Grand
04119000	Grand River at Grand Rapids	Lower Grand
04119055	Plaster Creek at 28th Street	Lower Grand/Plaster Creek
04117500	Thornapple River near Hastings	Lower Grand/Thornapple
04118000	Thornapple River near Caledonia	Lower Grand/Thornapple
04118500	Rogue River near Rockford	Lower Grand/Rockford

Real-Time or Remote Monitoring

The DIP Committee is interested in real-time monitoring of the Grand River, similar to that supported by the USGS (http://pubs.usgs.gov/tm/2006/tm1D3/). However, at this time there is no equipment or resources available to pursue this effort.

Wet Weather Monitoring

At this time, the DIP Committee does not intend to conduct wet weather monitoring events. As mentioned above, samples should be collected at least 48 hours after a 0.5” rain event.

Sampling Frequency

Sampling frequency should be determined by available personnel, laboratory and financial resources. At a minimum, the DIP Committee recommends that the locations identified within this manual be sampled on a quarterly basis. Sampling at the midpoint of the quarter, weather permitting, will maximize consistency. Attachment 2 identifies the current listing of locations sampled at a quarterly frequency.

Certified Laboratories & Contact Information

As was previously mentioned, samples collected by LGROW members for watershed monitoring purposes must be analyzed using laboratories certified by either the EPA or the State of Michigan for the previously listed parameters. Certified laboratories are required to develop and maintain a quality assurance plan which details quality control procedures specific to each method (http://water.epa.gov/scitech/drinkingwater/labcert/index.cfm, http://www.michigan.gov/deq/0,1607,7-135-3307_4131_4156-11433--,00.html). These plans and certification status should be reviewed by the organization collecting the samples to verify their program. Additionally, the DIP Committee and LGROW will maintain a listing of points of contact certified laboratories currently in use, which is included in Attachment 6.

Quality Assurance / Quality Control Procedures

Calibrations and Verifications

Generally, the laboratory maintains all relevant quality assurance/quality control procedure documentation. This documentation is subject to review during certification audits and is thus assumed to be in good order. However, certain field instruments require routine calibration and recordkeeping. For field instruments such as those measuring pH, temperature or dissolved oxygen, a calibration logbook must be maintained. This logbook must include, at a minimum, the date and time of the calibration/verification/maintenance; value of standard or buffer used; instrument reading and indication of pass/fail; name of analyst performing calibration/verification/maintenance.

Chain of Custody

Each laboratory used will have its specific chain of custody and will provide the sampler with the appropriate document. A sample chain of custody is included in Attachment 7. In general, the sampler must note the sample ID, date and time of sample collection, matrix (water), analysis requested, preservative used, and relevant contact information. Some laboratories may require other field measurements such as pH, temperature or dissolved oxygen on their chain of custody.

Duplicates, Equipment and Field Blanks

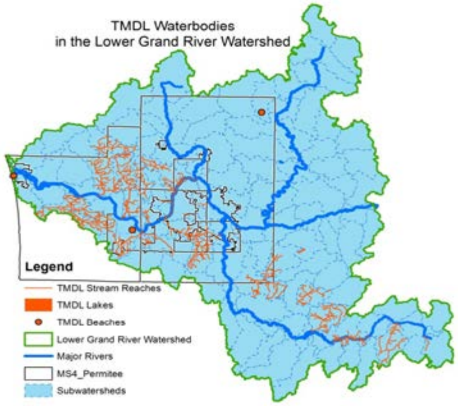
In general, each laboratory dictates the amount of duplicates needed to properly maintain their certification. Proper communication is important with each laboratory to ensure that the appropriate amount of duplicate samples is collected. In general, it is a good rule to take one duplicate sample per 20 samples collected (EPA Region 3 guidance (http://www.epa.gov/region3/esc/qa/pdf/blanks.pdf)).

If field equipment is used in sample collection (i.e. automated sampler, sampling jug, etc), a equipment blank must be collected at least once per 20 samples per parameter, with a minimum of one per day whichever is more frequent. Equipment blanks are used to ensure that equipment used is free from contamination resulting from improper cleaning.

Field blanks should also be collected at least once per 20 samples per parameter, with a minimum of one per day, whichever is more frequent. Field blanks are collected to verify that field conditions do not contribute to sample contamination.

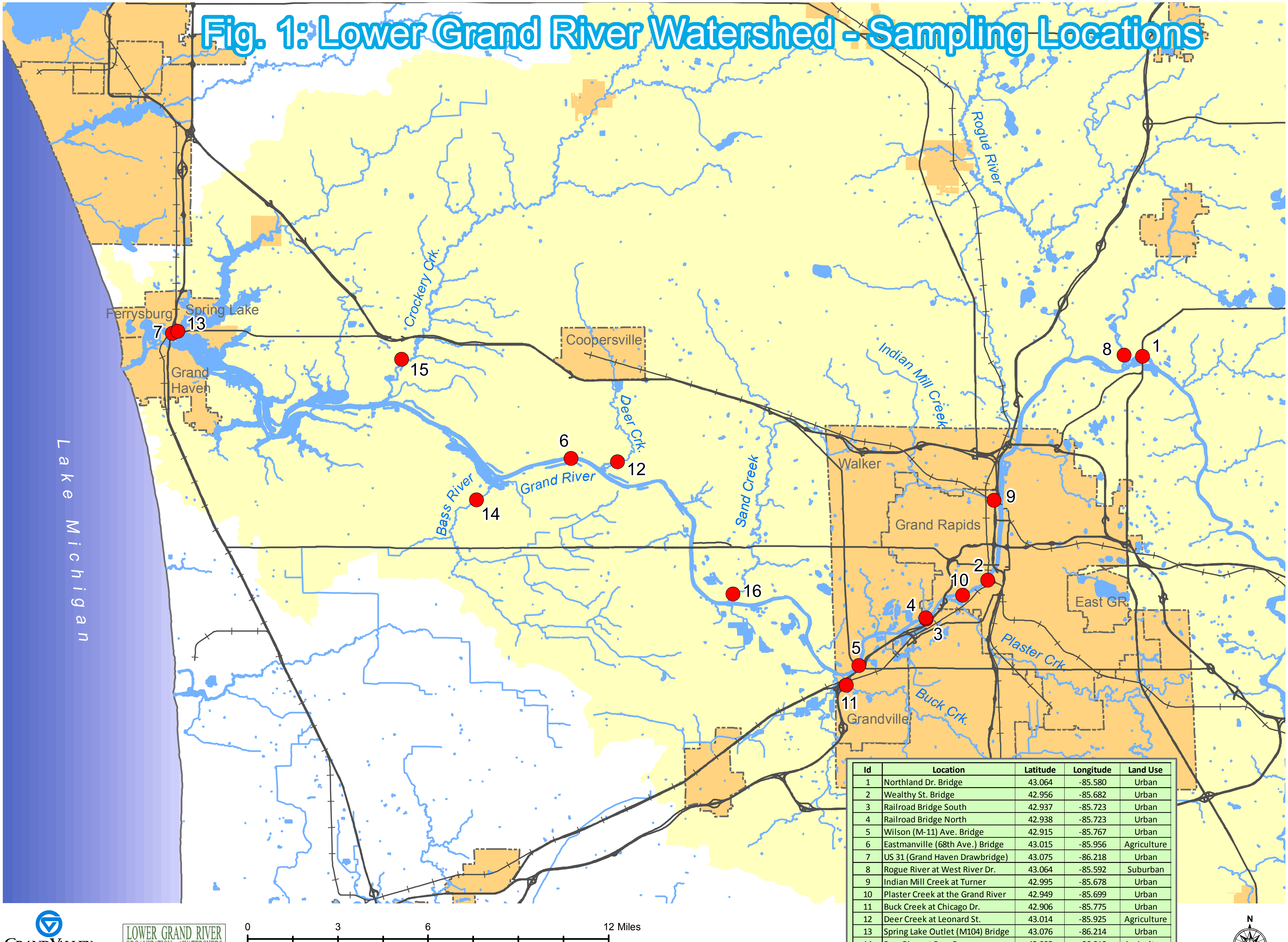
Equipment and field blanks must be collected at a site using analyte free (purified) water. For equipment blanks, the water is poured over/through the collection device and collected in the appropriate sample container. For field blanks, a sample of analyte free water is poured into the appropriate sample container.

NPDES MS4 TMDL Idnetified Waterbodies in the Urbanized Area			
Waterbody	E. Coli	Biota/ Sediment	River Run Sampling Site
Grand River	X		Y
Sand Creek		X	N
York Creek		X	N
Unnamed Trib to the Grand River		X	N
Plaster Creek	X	X	Y
Buck Creek	X		Y
Bass River	X	X	N
Strawberry Creek		X	N



Name	Designated Use	Impairment: Escherichia coli	Sedimentation/siltation	Alterations in wetland habitats	Bacterial Slimes	Cause unknown	Other anthropogenic substrate alteration	Other flow regime alterations	Dissolved oxygen	Total Phosphorus
Egypt Creek	Cold Water Fishery		x							
Mill Creek	Cold Water Fishery		x				x	x		
Mill Creek	Cold Water Fishery						x	x		
Indian Mill Creek	Other Indigenous Aquatic Life and Wildlife									
Plaster Creek	Partial body contact recreation	x	x							
Plaster Creek	Total body contact recreation	x	x							
Lamberton Creek-Grand River	Other Indigenous Aquatic Life and Wil									
Lamberton Creek-Grand River	Cold Water Fishery		x	x						
Grand River	Total body contact recreation	x								
Buck Creek	Total body contact recreation	x								
Rush Creek	Other Indigenous Aquatic Life and Wildlife						x	x		
Town of Walker-Grand River	Cold Water Fishery						x	x		
Rio Grande Creek-Crockery Creek	Total body contact recreation	x								
Sand Creek	Cold Water Fishery		x					x		
Sand Creek	Cold Water Fishery		x					x		
Sand Creek	Cold Water Fishery		x					x		
Deer Creek	Total body contact recreation	x								x
Bass Creek	Total body contact recreation	x	x							
Bass River	Partial body contact recreation	x	x							
Milbourne Allen and Crane Drain-Thornapple River	Other Indigenous Aquatic Life and Wildlife					x				
Fish Creek-Little Thornapple River	Other Indigenous Aquatic Life and Wildlife						x	x	x	
Scipio Creek-Thornapple River	Warm Water Fishery								x	
Mud Creek	Warm Water Fishery						x	x		
Woodland Creek-Little Thronapple River	Other Indigenous Aquatic Life and Wildlife					x				
Bear Creek	Partial body contact recreation	x								
Bullhead Drain-Coldwater River	Total body contact recreation	x								
Thornapple River	Other Indigenous Aquatic Life and Wildlife				x					
Maplewood Lake Park Beach	Total body contact recreation	x								
Grand River Grand Haven Boater's Park Beach	Total body contact recreation	x								
Lincoln Lake Pine Resort Beach	Partial body contact recreation	x								
Morrison Lake	Warm Water Fishery									x

Fig. 1: Lower Grand River Watershed - Sampling Locations



Id	Location	Latitude	Longitude	Land Use
1	Northland Dr. Bridge	43.064	-85.580	Urban
2	Wealthy St. Bridge	42.956	-85.682	Urban
3	Railroad Bridge South	42.937	-85.723	Urban
4	Railroad Bridge North	42.938	-85.723	Urban
5	Wilson (M-11) Ave. Bridge	42.915	-85.767	Urban
6	Eastmanville (68th Ave.) Bridge	43.015	-85.956	Agriculture
7	US 31 (Grand Haven Drawbridge)	43.075	-86.218	Urban
8	Rogue River at West River Dr.	43.064	-85.592	Suburban
9	Indian Mill Creek at Turner	42.995	-85.678	Urban
10	Plaster Creek at the Grand River	42.949	-85.699	Urban
11	Buck Creek at Chicago Dr.	42.906	-85.775	Urban
12	Deer Creek at Leonard St.	43.014	-85.925	Agriculture
13	Spring Lake Outlet (M104) Bridge	43.076	-86.214	Urban
14	Bass River at Bass Dr.	42.995	-86.018	Agriculture
15	Crockery Creek at Leonard St.	43.063	-86.067	Agriculture
16	Sand Creek at Linden Dr.	42.950	-85.849	Rural

Grand Valley State University
Robert B. Annis Water Resources Institute

Lower Grand River Organization of Watersheds

Data Sources: Base infrastructure, hydrology, Michigan Center for Geographic Information, Framework 13a.
Sampling Locations from Lower Grand River Watershed Management Plan - Aug. 2011.

Grand River Monitoring – Water Quality Index

Water Quality Index (WQI) General Information:

- WQI summarizes several water quality parameters into a single value
- Used as an informational tool and is understandable by the general public
- Provides for common understanding / uniform measuring system for multiple entities
- Uses 9 weighted categories to determine Water Quality Index (WQI)

Procedures for determining Water Quality Index Value

- Water samples obtained and analyzed
- WQI Q-Value assigned to each parameter result based on curves developed by professionals
- The Q-Value is indication of water quality between 0-100 (0 = Poor, 100 = Optimal)
- The Q-Value for each value is assigned a weighting factor based on available measuring parameters and judgment of water quality officials
- Composite Water Quality Index (WQI) value determined by summing weighted individual results for a composite WQI Value

- **NSF / Field Manual For Water Quality Monitoring Criteria**

NSF / Field Manual For Water Quality Monitoring	
Parameter	**Weight**
Dissolved Oxygen	0.17
Fecal Coliform	0.16
pH	0.11
Biochemical Oxygen Demand	0.11
Temperature Change	0.10
Total Phosphate	0.10
Nitrates	0.10
Turbidity	0.08
Total Solids	0.07
Total	1.00

WQI Legend	
Range	**Quality**
90-100	Excellent
70-90	Good
50-70	Medium
25-50	Bad
0-25	Very Bad

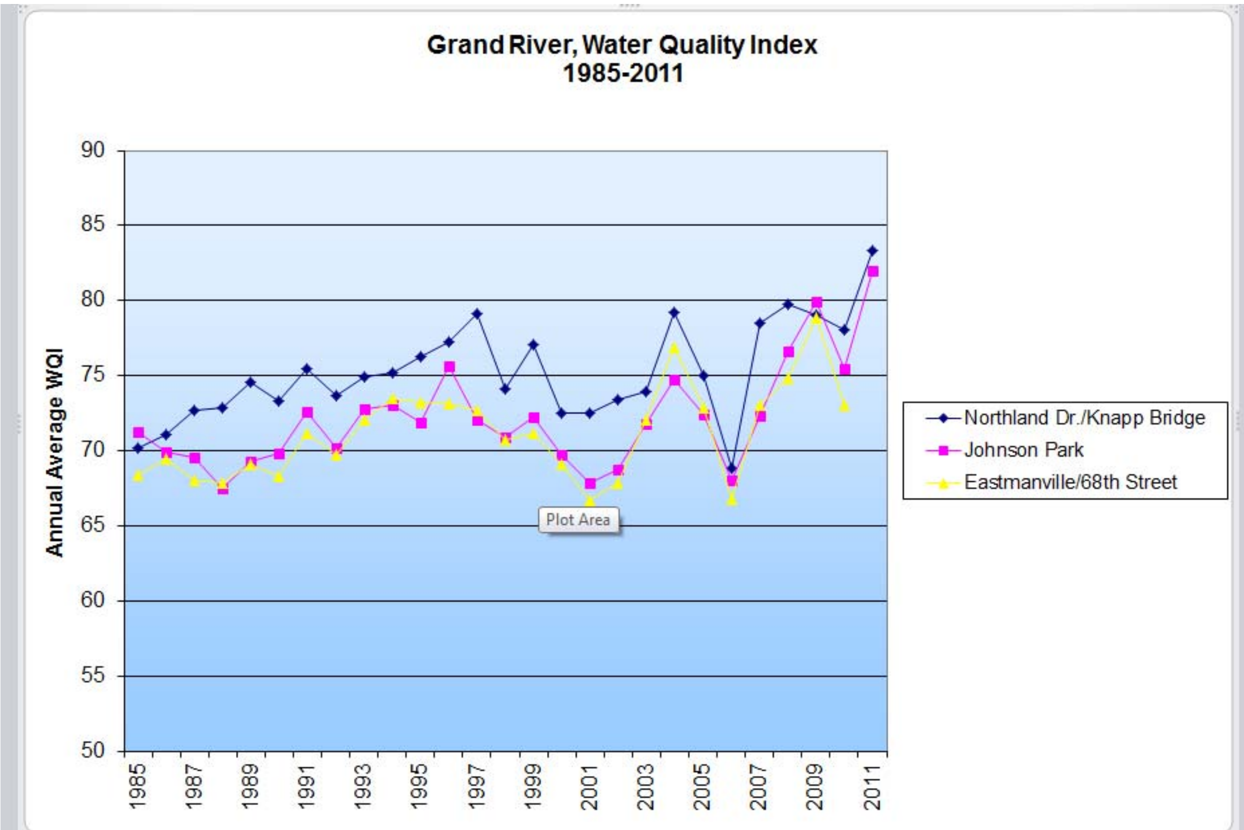
City of Grand Rapids Water Quality Monitoring Program

- Grand River Monitoring Network Established in 1968
- Data collected since 1988:
    - Data maintained in a Database
    - Water Quality Index (WQI) calculated
    - Monthly Monitoring Through August, 2005
    - Quarterly Monitoring Since August, 2005
- 15 Monitoring Locations
    - See Attached Map for Locations
    - Temperature Change Calculated between Northland Drive Bridge and M-11 (Wilson)

City of Grand Rapids Water Quality Monitoring Index

City of Grand Rapids Water Quality Monitoring	
Parameter	**Weight**
Dissolved Oxygen	0.18
Fecal Coliform	0.17
pH	0.12
Biochemical Oxygen Demand	0.12
Temperature Change	0.11
Total Phosphate	0.11
Nitrates	0.11
Turbidity	N/A
Total Suspended Solids + Chlorides	0.08
Total	1.00

- **Grand Rapids Criteria Index Changes vs NSF / Field Manual Monitoring Criteria**
    - Turbidity is not measured and is not included as a parameter.
    - Total suspended solids and Chlorides are measured versus Total Suspended Solids (TSS).
    - Parameter Weighting Factors adjusted to account for not measuring for Turbidity.
    - Annual WQI for each testing location is based on an Annual Average of the four quarterly analyses.



Water Quality Index

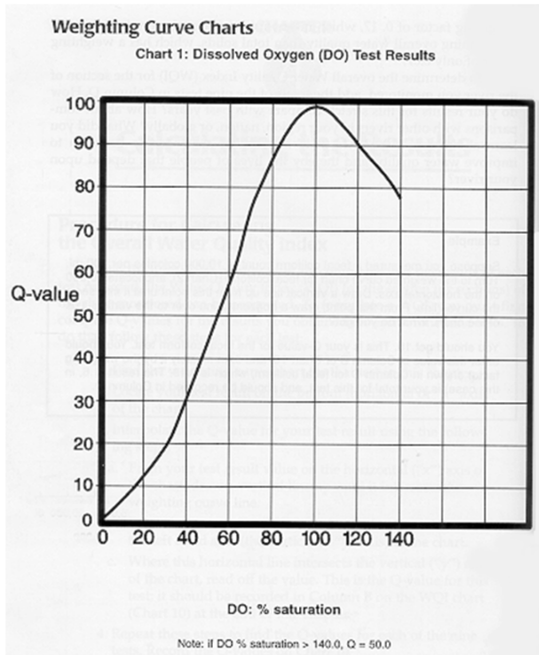
for Grand Rapids Environmental Services Department

2013 River Run Sampling

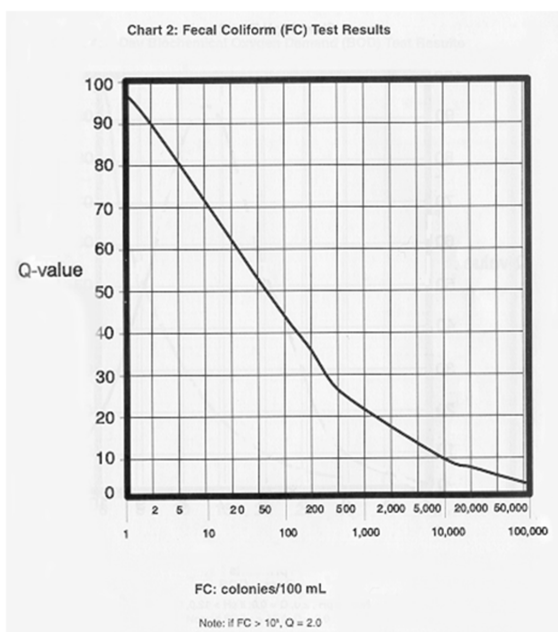
Locations	Sample Date						Annual Average
	3/13/2013	4/25/2013*	4/29/2013*	6/12/2013	9/18/2013	12/11/2013	
Buck Creek at Chicago Drive	81.6		79.3	72.4	74.6	81.8	77.9
Coldbrook Storm Drain	75.2		78.2	70.1	71.6	72.8	73.6
Deer Creek	71.7		75.1	70.6	75.4		73.2
Eastmanville (250040)	69.4		73.6	75.3	74.3	79.2	74.4
Indian Mill Creek at Turner Avenue	66.7		80.3	70.2	69.5	72.6	71.9
M-11, Wilson Avenue (250062)	65.8	76.4	79.4	75.8	75.9	81.1	75.7
Mill Creek at West River Drive	71		77.6	70.2	72.8	84.2	75.2
North Park Bridge		77.4					77.4
Northland Drive Bridge (250120)	68.1	78	80.8	77	83.8		77.5
Plaster 1 at Burton	73.7		74.9	71.9	72	66.6	71.8
Plaster 2 at Market	73.6		78.5	69.6	68.3	76.1	73.2
Railroad Bridge North (250071)	66.2		79.2	79.1	76.1	76.9	75.5
Railroad Bridge South (250070)	65.7		79.2	79.1	77.7	79.1	76.2
Rogue River at West River Drive	73		80.1	78.9	79		77.8
Silver Creek at Croften/Roy	72.6		74.3	61.6	68	70.6	69.4
Wealthy Street Bridge (250090)	65.7	76.2	80.1	78.3	80.7	82	77.2

*The monitoring performed in April was in response to the 2013 flood. The remaining results correspond to routine scheduled monitoring.

Sample Q-Value Sampling Charts:



Dissolved Oxygen (DO%) – Q Value Chart



Fecal Coliform (FC) Q-Value Chart

Sample WQI Calculation:

(Not an Actual Data Collection Point)

	Units	**Result**	**Q-Value**	**Weight Factor**	**Parameter Index**
Dissolved Oxygen (% Sat)	%	82	90	0.18	16.2
Fecal Coliform	CFU/100mL	12	72	0.17	12.24
pH	pH Units	7.67	92	0.12	11.04
Biochemical Oxygen Demand	mg / L	2	80	0.12	9.6
Temperature Change	Δ deg C	5	72	0.11	7.92
Total Phosphorous	mg / L PO_4	0.5	60	0.11	6.6
Nitrates	mg / L NO_3	5	67	0.11	7.37
Turbidity	N/A	N/A	N/A	N/A	N/A
Total Suspended Solids + Chlorides	mg / L	150	78	0.08	6.24
Total					77.21

77.21 = Good

Lower Grand River Organization of Watersheds

Field Data Sheet

Stream name: ____

Samplers name(s): ____

Outfall Site or map number: ____

Date: __________________ Time: _________________

Weather in past 48 hrs:

__Storm (heavy),__Rain (steady rain),__Showers (intermittent rain),__Overcast, __Clear/Sunny

Current Weather:

__Storm (heavy),__Rain (steady rain),__Showers (intermittent rain),__Overcast, __Clear/Sunny

Current Temperature _________

SITE PARAMETERS	MEASUREMENT ON-SITE
Water temperature (°C)	
pH (SU)	
Dissolved Oxygen (mg/L)	

Parameter	Total Phosphorus (PO4)	Nitrate (NO3)	Total Suspended Solids (TSS)	E. Coli	Fecal Coliform	Metals	Biological Oxygen Demand (BOD)	Other: ________
Samples Collected								

Flow Observations

Odor None ____Musty ____Sewage ____Rotten Egg ____Gasoline ____Oil ____Other*

Color Clear ____Light Brown ____Dark Brown ____Green ____Grey ____Black ____Other*

Turbidity Clear ____Slightly ____Moderate ____Highly ____Opaque ____Other*

Floatables None ____Trash ____Sewage ____Foam ____Oil Sheen ____Other*

*If Other, include comments

Other Observations near Sample Point

Stream Bottom ___Cobble/Gravel ___Sand (coarse) ___Muck/Silt (fine) ___Hardpan (solid clay)
___Artificial ___Other*

* If Other, include comments

Pollution Source ___Debris/Trash ____Construction Runoff ____Road Crossing ____Septic System
___Stream bank Erosion ___Gully Erosion ___Upland Source ___Tile Outlet
___Other*

*If Other, include comments

Comments:

____

____

____

Lower Grand River Organization of Watersheds

Field Data Sheet

Stream name: ____
Samplers name(s): ____
Outfall Site or map number: ____
Date: ___________________ Time: _________________
Weather in past 48 hrs:
__Storm (heavy),__Rain (steady rain),__Showers (intermittent rain),__Overcast, __Clear/Sunny

Current Weather:
__Storm (heavy),__Rain (steady rain),__Showers (intermittent rain),__Overcast, __Clear/Sunny

Current Temperature _________

SITE PARAMETERS	MEASUREMENT ON-SITE
Water temperature (°C)	
pH (SU)	
Dissolved Oxygen (mg/L)	

Parameter	Total Phosphorus (PO4)	Nitrate (NO3)	Total Suspended Solids (TSS)	E. Coli	Fecal Coliform	Metals	Biological Oxygen Demand (BOD)	Other: ________
Samples Collected								

Flow Observations

Odor None ____Musty ____Sewage ____Rotten Egg ____Gasoline ____Oil ____Other*
Color Clear ____Light Brown ____Dark Brown ____Green ____Grey ____Black ____Other*
Turbidity Clear ____Slightly ____Moderate ____Highly ____Opaque ____Other*
Floatables None ____Trash ____Sewage ____Foam ____Oil Sheen ____Other*
*If Other, include comments

Other Observations near Sample Point

Stream Bottom ___Cobble/Gravel ___Sand (coarse) ___Muck/Silt (fine) ___Hardpan (solid clay)
___Artificial ___Other* * If Other, include comments

Pollution Source __Debris/Trash ____Construction Runoff ____Road Crossing ____Septic System
___Stream bank Erosion ___Gully Erosion ___Upland Source ___Tile Outlet
___Other* *If Other, include comments

Comments:
____

____

____

Lower Grand River Organization of Watersheds

Field Data Sheet

Stream name: ____

Samplers name(s): ____

Outfall Site or map number: ____

Date: ___________________ Time: _________________

Weather in past 48 hrs:

☐Storm (heavy), ☐Rain (steady rain), ☐Showers (intermittent rain), ☐Overcast, ☐Clear/Sunny

Current Weather:

☐Storm (heavy), ☐Rain (steady rain), ☐Showers (intermittent rain), ☐Overcast, ☐Clear/Sunny

Current Temperature _________

SITE PARAMETERS	MEASUREMENT ON-SITE
Water temperature (°C)	
pH (SU)	
Dissolved Oxygen (mg/L)	

Parameter	Total Phosphorus (PO4)	Nitrate (NO3)	Total Suspended Solids (TSS)	E. Coli	Fecal Coliform	Metals	Biological Oxygen Demand (BOD)	Other: ________
Samples Collected								

Flow Observations

☐

Odor ☐None ☐ Musty ☐ Sewage ☐ Rotten Egg ☐ Gasoline ☐ Oil ☐ Other*

Color ☐Clear ☐ Light Brown ☐ Dark Brown ☐ Green ☐ Grey ☐ Black ☐ Other*

Turbidity Clear ☐ Slightly ☐ Moderate ☐ Highly ☐ Opaque ☐ Other*

Floatables None ☐ Trash ☐ Sewage ☐ Foam ☐ Oil Sheen ☐ Other*

*If Other, include comments

Other Observations near Sample Point

Stream Bottom ☐Cobble/Gravel ☐ Sand (coarse) ☐ Muck/Silt (fine) ☐Hardpan (solid clay)
☐Artificial ☐ Other*

* If Other, include comments

Pollution Source ☐ Debris/Trash ☐ Construction Runoff ☐ Road Crossing ☐ Septic System
☐ Stream bank Erosion ☐ Gully Erosion ☐ Upland Source ☐ Tile Outlet
☐ Other*

*If Other, include comments

Comments:

____

____

____

Watershed Sampling & Handling Procedures for Stream Chemical/Nutrient Monitoring

I. Purpose/Scope.

This procedure will be a guidance document for the sample collection and handling of surface water samples collected within the Lower Grand River Watershed as part of an watershed monitoring effort organized by the Lower Grand River Organization of Watersheds (LGROW). This document will be used in two ways. First, it will be used to list procedures for the collection, preservation and handling of samples thereby eliminating variability between field sampling techniques. Secondly, this document will be used as a reference source for field technicians as well as a training manual for new field staff.

II. Apparatus & Equipment.

Refer to the attached Sampling Preparation Checklist

III. Reagents & Consumable Materials.

- Preservation acids: Refer to specific method used, but generally H2SO4, HNO3, 1:1 HCl
- Coliform bottles w/Sodium Thiosulfate (brand name ex. IDEXX)
- Various size HDPE Precleaned Wide Mouth Bottles
- Sterile latex/nitrile gloves
- Bottle Labels

IV. Sampling Event Preparation.

Prior to initiating a sampling event, collectors will obtain a sufficient supply of sample bottles, a cooler w/ice packs and field data sheets. Refer to the attached Sampling Preparation Checklist and Summary for specific preparatory information.

V. Sample Collection.

All sampling should occur upstream from the samplers physical location to avoid possible contamination. Record the date, weather and temperature on the data sheet (see attached).

A. Basic Water Sampling Procedure

1. At the sampling location (or prior to collection) date and label the sampling bottles.
2. Wade into the water to mid-stream or if water is too deep or flowing too fast use a gallon jug and attached rope to collect sample*.
3. Face in the upstream direction and avoid any sediment disturbed from your stream entry. Hold the bottle in such a manner as to avoid water from passing over samplers hand before collection.
4. For bottle samples (e. *Coli & Fecal Coliform, see Part VII,B.*), remove the cap from the sampling bottle and fill the bottle approximately ¼ full of water. Do this at an arms-length distance in front of where you are standing, again making sure not to disturb the sediments. Shake the bottle, rinsing down the insides of the bottle, and empty the rinse water behind where you are standing. Repeat the bottle rinse 2 more times.
5. Fill the bottle to near the top and screw on the cap.
6. Preserve samples & fill out field data sheet with required information.
7. See Tables for specific test requirements and parameters.

* If sampling from a stream bank or a bridge or culvert over the stream use the gallon jug by holding the end of the rope and tossing the jug into the middle of the stream. Pull the jug in empty and repeat for a total of 3 rinses. Make sure to mix the jug before pouring into sample bottles.

B. E. coli & Fecal Coliform sampling

1. Take Residual Cl_2 reading if needed.
2. Put on a pair of sterile gloves.

3. Open the sterile sample bottle by removing the safety seal and the cap making sure not to touch the inside of the bottle or cap.
4. Dip (DO NOT Submerge) the bottle and fill w/ at least 100mL of sample making sure not to lose any preservative in the process. Cap bottle and swirl to mix sample.
5. Fill out field data sheet with required information.

VI. Sample Handling.

Once field tests (pH, Temperature, DO) are complete that sample may be discarded back into the stream or body of water. For other parameters add appropriate preservative for requested analysis (see parameter tables) and place samples in cooler with ice packs. Fill out chain of custody form and deliver samples and COC to laboratory staff within sufficient hold times.

VII. Interferences.

The likelihood of contamination due to increase contact with the water is greater with bank sampling or wading out into the watercourse to sample. As such, special care is required to prevent and minimize sampling error. Select a point along the river bank where the current flow is pronounced. This will most often occur at the outside bend in the stream. Do not sample in stagnant water. Always face upstream during the collection. If the bottom is soft and the stream is slow moving stand quietly to allow current to sweep away disturbed sediments or move slowly upstream during collection.

Routine Maintenance.

Thermometers and Cl_2 meters should be certified or calibrated with a certified instrument yearly. pH & DO probes need to be calibrated every 24hrs with the slope, time and temperature tracked for QA purposes.

Quality Control.

Samples should only be analyzed by a laboratory with an approved QAQC plan in place. An integral part of any quality assurance program includes field QC samples. There are particularly valuable for evaluating the effectiveness of sampling strategies and estimating the precision and accuracy of results.

A. Field blanks

Field blanks are samples of distilled water that demonstrate the cleanliness of sample bottles, preservatives, equipment, and the sample handling procedures. Deionized water is taken in the field and poured into sample bottles at the same time as when field samples are being preserved. When preparing the field blank any preservative added to investigative samples should also be added to blank samples.

B. Equipment blanks

Equipment blanks are samples of distilled water that demonstrate the cleanliness of the sampling equipment. Deionized water is taken in the field and poured through the sampling instrument and collected into the appropriate sampling bottles. Preservative is added as the analysis dictates.

C. Duplicates

Field duplicates are two independent samples taken from one sampling point. The main purposes of field duplicates are to measure the total variability of samples including analytical variability and field variability.

References.

Standard Methods for the Examination of Water and Wastewater, 20th Edition,
Method 2320 B, APHA, 1998.

Huron River Watershed Council, TMDL Implementation Planning in the Middle Huron River TMDL Watersheds, Quality Assurance Project Plan for Stream Nutrient Monitoring, 2010.

MDNR Quality Assurance Manual for Water Sediment and Biological Sampling, Chapter 4 Field collection and Field Analysis Procedures, 1994.

NEMI (National Environmental Methods Index). www.nemi.gov

Sampling Preparation Check List	
Preparation Day Before:	Completed
Collect supplies/equipment (see equipment list below)	
Check stream sampler rope and handle	
Calibrate field monitoring equipment to verify operation (DO, pH and conductivity)	
Load supplies in vehicle (bottles, samplers and coolers)	
Day of River Run:	Completed
Calibrate field monitoring equipment an complete the calibration worksheet (DO, pH and conductivity)	
Load field monitoring equipment and ice packs for coolers	
Collect samples and record field measurements	
Deliver samples to the designated "Sample Receiver"	
Perform verification checks on field monitoring equipment after sample collection (DO, pH and conductivity)	
Clean VOC bailers	

Supplies/Equipment List	Quantity
Field Monitoring Equipment & Supplies	
DO and pH meter w/ 15 meter cords	1
Disposable BOD bottle w/ DI water (to check DO probe)	1
Conductivity meter w/5 meter cords	1
1 L plastic bottle (to measure conductivity)	1
*Portable DO Meter (Back-up equipment - 1 available)	*
*Back-up pH meter	*
Sampling Equipment	
Stream sampler	1
River bailers (organics sample collection - site specific)	2
*BOD sampler (Back-up equipment - 2 available)	*
Miscellaneous	
Bench sheet/clipboard	1
Indelible pen	1
coolers (for BODs, E. coli, fecal coliform, organics)	
Ice packs for coolers	
Spare set of AAA batteries	
Bottles - (bottle descriptions on back)	

"BOD" round 500 mL plastic bottle	7 + 1 spare
"Metals" round 500 mL plastic bottles	7 + 1 spare
"TSS" round 1000 mL plastic bottle	7 + 1 spare
"Inorganics" square 500 mL plastic bottle	7 + 1 spare
Semi-volatile 1 L amber glass bottle	2
Volatiles vial sets (3 clear, 1 amber)	2
120 mL Sterile Coliform Sample bottles	**10 Total** fecal - 7 + 1 spare; E. coli - 2
*Disposable BOD with stoppers (Back-up if using BOD sampler)	7 + 1 spare

*Notation for back-up equipment and supplies - used if in-stream measurements not taken

River Run Sample Collection Summary

Sample Type	Container(s)	Quantity and Bottle Type	Sample Locations	Sample Collection Instructions
Semi-Volatiles Organics		1 - 1 liter amber glass bottle and a trip blank	1: Northland Dr. Bridge, 2: Wealthy Street Bridge 4: Railroad Bridge North	##
Volatile Organics		3 - clear glass VOA's 1 - amber glass VOA with HCL preservative	1: Northland Dr. Bridge, 2: Wealthy Street Bridge 4: Railroad Bridge North	- Collect samples using the designated bailer - Fill completely, invert to verify vials do not contain any air bubbles -Cool samples during transport
Fecal Coliform		1 - 120 mL **sterile coliform** bottle with or without dechlorinating preservative. Label with **BLACK** sharpie	All locations	-Collect sample using the horizontal stream sampler -Fill 1/4" above the EPA 100 mL fill line with sample -Cool samples during transport
E. coli		1 - 120 mL **sterile coliform** bottle with or without dechlorinating preservative. Label with **RED** sharpie	1: Northland Dr. Bridge 2: Wealthy Street Bridge 4: Railroad Bridge North 5: M-11, Wilson Ave. 6: Eastmanville	-Collect sample using the horizontal stream sampler -Fill 1/4" above the EPA 100 mL fill line with sample -Cool samples during transport
Inorganics - Ammonia, Nitrate, Nitrite, Chloride, Total Phosphorus		1 - square 500 mL bottle	All locations	-Collect samples using the horizontal stream sampler -Fill to the shoulder of the bottle
Metals - Chromium, Copper, Iron, Nickel, Zinc, Silver, Mercury, Total Hardness		1 - round 500 mL bottle	All locations	-Collect samples using the horizontal stream sampler -Fill to the shoulder of the bottle
Total Suspended Solids		1 - round 1000 mL bottle	All locations	- Collect samples using the horizontal stream sampler - Fill to the shoulder of the bottle
BOD		1 - round 500 mL bottle	All locations. **Use if DO is measured in the stream**	- Take a DO reading with the meter and then collect a sample - Collect using the stream sampler - Cool samples during transport
Alternate BOD		1 - 300 mL BOD bottle	All locations. **Use only if DO is <u>not</u> measured in the stream**	- Collect using the BOD Sampler - Fill bottle to the neck; make sure there are no visible air bubbles in sample - Measure DO in sample bottle - Cool samples during transport

Table 1. Sampling Procedures for Dissolved Oxygen (DO)

Collection Technique using hand-held meter – *in situ* field measurement	Meter should be kept in gentle motion through the water column while a reading is being taken. Excessive turbulence should be avoided to minimize presence of air bubbles in the water, near the measurement cell. Allow several minutes for the meter to stabilize. Ideally measurements should be made about 10 cm below the water surface (and then about 10 cm above the sediment surface); however, this is not always possible in shallow water bodies. A mid water column reading will be sufficient in these cases.
Unit of Measurement	mg/L (dissolved oxygen concentration) or % (saturation)
Analysis Method	EPA Method 360.1
Comments	This test must be performed in the field.

Table 2. Sampling Procedures for pH

Collection Technique using hand-held meter – *in situ* field measurement	Meter should be kept in gentle motion through the water column while a reading is being taken. Allow several minutes for the meter to stabilize. Ideally, measurements should be made about 10 cm below the water surface (and then about 10 cm above the sediment surface); however, this is not always possible in shallow water bodies. A mid water column reading will be sufficient in these cases.
Sample collection technique for laboratory analysis	Unfiltered Sample
Volume	125 mL
Container	HDPE, Bottle cap must have a Teflon liner, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Ensure sample bottle is pre-rinsed three times with sample water (3 × 20mL) before final collection.
Treatment to assist preservation	Refrigerate at 1–4°C, do not freeze
Filling Technique	Excessive turbulence should be avoided to minimize presence of air bubbles near the measurement cell or in the sample. Fill container completely to the top to exclude air. The sample must be free of air bubbles. Cap tightly.
Maximum sample holding time and storage conditions	Analyze directly as soon as possible after sample is collected and preferably in the field, but within 6 hours if the sample is refrigerated at 1–4°C, do not freeze.
Unit of Measurement	Standard pH Units
Analysis Method	EPA Method 150.1
Comments	It is preferable to perform this test in the field, in situ.

Table 3. Sampling Procedures for Temperature

Collection technique using hand-held meter – *in situ* field measurement	Thermometer should be kept in gentle motion through the water column while a reading is being taken. Allow several moments for the reading to stabilize. Ideally, measurements should be made about 10 cm below the water surface (for surface measurements).
Unit of Measurement	Degrees Celsius (°C)
Analysis Method	EPA Method 170.1
Comments	This test must be performed in the field.

Table 4. Sampling Procedures for Total Suspended Solids (TSS)

Sample Requirements	Unfiltered Sample
Volume	1 L
Container	HDPE, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Ensure sample bottle is pre-rinsed three times with sample water (3 × 20 mL) before final collection. It is important not to increase the turbidity of the water while collecting a sample, so do not disturb the bottom or the aquatic plants
Treatment of assist preservation	Refrigerate at 1–4°C, do not freeze
Filling Technique	Excessive turbulence should be avoided to minimize presence of air bubbles in the water. Fill to the shoulder of bottle.
Maximum sample holding time and storage conditions	Analyze directly as soon as possible after sample is collected, but within 7 days if the sample is refrigerated at 1–4°C, Do not freeze
Unit of Measurement	mg/L (mg total suspended solids/L)
Analysis Method	EPA Method 160.2
Comments	Take care not disturb bottom sediments or plants during collection.

Table 5. Sampling Procedures for Total Phosphorus

Sample Requirements	Unfiltered Sample
Volume	200 mL
Container	250mL HDPE, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Ensure sample bottle is pre-rinsed three times with sample water (3 × 20 mL) before final collection.
Treatment to assist preservation	Preserve to pH >2 with H2SO4 or 1:1 HCl (laboratory dependent), Cool 4°C
Filling Technique	Fill to just below neck of bottle
Maximum holding time and storage conditions	28 days, Refrigerate 1-4°C, dark
Unit of Measurement	mg/L (mg phosphorus/L)
Analysis Method	EPA Method 365 series
Comments	Sample preservation laboratory dependent

Table 6. Sampling Procedures for Biological Oxygen Demand (BOD)

Sample Requirements	Unfiltered Sample
Volume	1 L
Container	HDPE w/Teflon lined caps or Amber glass, Use new pre-cleaned bottles
Collection Technique	Do not pre-rinse container with sample. Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Keep samples at or below 4°C during compositing. Limit compositing period to 24 hrs after start of collection.
Treatment to assist preservation	Refrigerate at 1–4°C, do not freeze
Filling Technique	Excessive turbulence should be avoided to minimize presence of air bubbles in the water. Fill to the shoulder of bottle.
Maximum holding time and storage conditions	48 hours, Refrigerate 1-4°C, dark
Unit of Measurement	mg/L
Analysis Method	EPA Method 405.1

Table 7. Sampling Procedures for Nitrate & Nitrite ($NO3^-$ & $NO2^-$)

Sample Requirements	Filtered Sample
Volume	200 mL
Container	HDPE, Use new pre-cleaned bottles
Collection Technique	The sample can be collected in a clean sample container prior to filtration. Filtration should occur as soon as possible once sampler has returned from the field. Filtered sample is placed into a different sample bottle, after rinsing. Ensure sample bottle is pre-rinsed three times with filtered sample water (3 × 20 mL) before final collection.
Filtration Technique	Filter the sample through 0.45 µm pore diameter cellulose acetate (membrane) filter
Treatment to assist preservation	Cool to 4°C, Unpreserved or Preserve to pH >2 with H2SO4 (laboratory dependent)
Filling Technique	Fill to just below neck of bottle
Maximum holding time and storage conditions	Analyze within 24 hours if sample is kept refrigerated at 1–4°C Analyze within 28 days if preserved with H2SO4
Unit of Measurement	mg/L
Analysis Method	EPA Method 300.0 or 353 series
Comments	Sample preservation laboratory dependent, NO2 & NO3 can be pulled from same sample bottle

Table 8. Sampling Procedures for Total Metals

Sample Requirements	Unfiltered Sample
Volume	250 mL
Container	HDPE w/Teflon lined cap, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Unless pre-preserved, ensure sample bottle is pre-rinsed three times with sample water (3 × 20 mL) before final collection.
Treatment to assist preservation	Preserve to pH >2 with HNO3
Filling Technique	Fill to neck of bottle, if bottles are pre-preserved to not rinse or overfill
Maximum holding time and storage conditions	6 months, ambient temperature
Analysis Methods	EPA Method 200.7
Comments	Verify if bottle is acidified before taking sample.

Table 9. Sampling Procedure for Microbial Analysis

For example, total plate count, total coliforms, fecal coliforms, or E. coli. (Escherichia coli).

Sample Requirements	Unfiltered Sample
Volume	For each parameter tested, at least 100 mL of sample is required.
Container	Sterilized plastic w/Sodium Thiosulfate. Use new sealed bottles.
Collection Technique	Keep sterilized sample bottle closed until it is ready to be filled Carefully remove seal & container cap, do not contaminate inner surface of bottle and cap. Do not rinse sample container with sample. Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Replace cap immediately.
Treatment to assist preservation	Sodium Thiosulfate. Store in the dark and refrigerate at 1–4°C. Do not freeze.
Filling Technique	Fill to below shoulder of bottle and facilitate mixing by shaking. Do not overfill as preservative will be lost.
Maximum holding time and storage conditions	Sample should be analyzed within 6 hours for compliance or 24 hours for routine monitoring. Keep cool at 1–4°C but do not freeze.
Analysis Methods	SM 9000 series
Comments	Method used to analyze sample must produce a quantifiable number not just a positive/negative confirmation. Coliform density is reported as counts per 100 mL water sample.

Watershed Sampling & Handling Procedures for Stream Chemical/Nutrient Monitoring

I. Purpose/Scope.

This procedure will be a guidance document for the sample collection and handling of surface water samples collected within the Lower Grand River Watershed as part of an watershed monitoring effort organized by the Lower Grand River Organization of Watersheds (LGROW). This document will be used in two ways. First, it will be used to list procedures for the collection, preservation and handling of samples thereby eliminating variability between field sampling techniques. Secondly, this document will be used as a reference source for field technicians as well as a training manual for new field staff.

II. Apparatus & Equipment.

Refer to the attached Sampling Preparation Checklist

III. Reagents & Consumable Materials.

- Preservation acids: Refer to specific method used, but generally H_2SO_4, HNO_3, 1:1 HCl
- Coliform bottles w/Sodium Thiosulfate (brand name ex. IDEXX)
- Various size HDPE Precleaned Wide Mouth Bottles
- Sterile latex/nitrile gloves
- Bottle Labels

IV. Sampling Event Preparation.

Prior to initiating a sampling event, collectors will obtain a sufficient supply of sample bottles, a cooler w/ice packs and field data sheets. Refer to the attached Sampling Preparation Checklist and Summary for specific preparatory information.

V. Sample Collection.

All sampling should occur upstream from the samplers physical location to avoid possible contamination. Record the date, weather and temperature on the data sheet (see attached).

A. Basic Water Sampling Procedure

1. At the sampling location (or prior to collection) date and label the sampling bottles.
2. Wade into the water to mid-stream or if water is too deep or flowing too fast use a gallon jug and attached rope to collect sample*.
3. Face in the upstream direction and avoid any sediment disturbed from your stream entry. Hold the bottle in such a manner as to avoid water from passing over samplers hand before collection.
4. For bottle samples (e. *Coli & Fecal Coliform, see Part VII,B.*), remove the cap from the sampling bottle and fill the bottle approximately ¼ full of water. Do this at an arms-length distance in front of where you are standing, again making sure not to disturb the sediments. Shake the bottle, rinsing down the insides of the bottle, and empty the rinse water behind where you are standing. Repeat the bottle rinse 2 more times.
5. Fill the bottle to near the top and screw on the cap.
6. Preserve samples & fill out field data sheet with required information.
7. See Tables for specific test requirements and parameters.

* If sampling from a stream bank or a bridge or culvert over the stream use the gallon jug by holding the end of the rope and tossing the jug into the middle of the stream. Pull the jug in empty and repeat for a total of 3 rinses. Make sure to mix the jug before pouring into sample bottles.

B. E. coli & Fecal Coliform sampling

1. Take Residual Cl_2 reading if needed.
2. Put on a pair of sterile gloves.

3. Open the sterile sample bottle by removing the safety seal and the cap making sure not to touch the inside of the bottle or cap.
4. Dip (DO NOT Submerge) the bottle and fill w/ at least 100mL of sample making sure not to lose any preservative in the process. Cap bottle and swirl to mix sample.
5. Fill out field data sheet with required information.

VI. Sample Handling.

Once field tests (pH, Temperature, DO) are complete that sample may be discarded back into the stream or body of water. For other parameters add appropriate preservative for requested analysis (see parameter tables) and place samples in cooler with ice packs. Fill out chain of custody form and deliver samples and COC to laboratory staff within sufficient hold times.

VII. Interferences.

The likelihood of contamination due to increase contact with the water is greater with bank sampling or wading out into the watercourse to sample. As such, special care is required to prevent and minimize sampling error. Select a point along the river bank where the current flow is pronounced. This will most often occur at the outside bend in the stream. Do not sample in stagnant water. Always face upstream during the collection. If the bottom is soft and the stream is slow moving stand quietly to allow current to sweep away disturbed sediments or move slowly upstream during collection.

Routine Maintenance.

Thermometers and Cl_2 meters should be certified or calibrated with a certified instrument yearly. pH & DO probes need to be calibrated every 24hrs with the slope, time and temperature tracked for QA purposes.

Quality Control.

Samples should only be analyzed by a laboratory with an approved QAQC plan in place. An integral part of any quality assurance program includes field QC samples. There are particularly valuable for evaluating the effectiveness of sampling strategies and estimating the precision and accuracy of results.

A. Field blanks

Field blanks are samples of distilled water that demonstrate the cleanliness of sample bottles, preservatives, equipment, and the sample handling procedures. Deionized water is taken in the field and poured into sample bottles at the same time as when field samples are being preserved. When preparing the field blank any preservative added to investigative samples should also be added to blank samples.

B. Equipment blanks

Equipment blanks are samples of distilled water that demonstrate the cleanliness of the sampling equipment. Deionized water is taken in the field and poured through the sampling instrument and collected into the appropriate sampling bottles. Preservative is added as the analysis dictates.

C. Duplicates

Field duplicates are two independent samples taken from one sampling point. The main purposes of field duplicates are to measure the total variability of samples including analytical variability and field variability.

References.

Standard Methods for the Examination of Water and Wastewater, 20th Edition,
Method 2320 B, APHA, 1998.

Huron River Watershed Council, TMDL Implementation Planning in the Middle Huron River TMDL Watersheds, Quality Assurance Project Plan for Stream Nutrient Monitoring, 2010.

MDNR Quality Assurance Manual for Water Sediment and Biological Sampling, Chapter 4 Field collection and Field Analysis Procedures, 1994.

NEMI (National Environmental Methods Index). www.nemi.gov

Sampling Preparation Check List

Preparation Day Before:	Completed
Collect supplies/equipment (see equipment list below)	
Check stream sampler rope and handle	
Calibrate field monitoring equipment to verify operation (DO, pH and conductivity)	
Load supplies in vehicle (bottles, samplers and coolers)	
Day of River Run:	Completed
Calibrate field monitoring equipment an complete the calibration worksheet (DO, pH and conductivity)	
Load field monitoring equipment and ice packs for coolers	
Collect samples and record field measurements	
Deliver samples to the designated "Sample Receiver"	
Perform verification checks on field monitoring equipment after sample collection (DO, pH and conductivity)	
Clean VOC bailers	

Supplies/Equipment List

	Quantity
Field Monitoring Equipment & Supplies	
DO and pH meter w/ 15 meter cords	1
Disposable BOD bottle w/ DI water (to check DO probe)	1
Conductivity meter w/5 meter cords	1
1 L plastic bottle (to measure conductivity)	1
*Portable DO Meter (Back-up equipment - 1 available)	*
*Back-up pH meter	*
Sampling Equipment	
Stream sampler	1
River bailers (organics sample collection - site specific)	2
*BOD sampler (Back-up equipment - 2 available)	*
Miscellaneous	
Bench sheet/clipboard	1
Indelible pen	1
coolers (for BODs, E. coli, fecal coliform, organics)	
Ice packs for coolers	
Spare set of AAA batteries	
Bottles - (bottle descriptions on back)	

"BOD" round 500 mL plastic bottle	7 + 1 spare
"Metals" round 500 mL plastic bottles	7 + 1 spare
"TSS" round 1000 mL plastic bottle	7 + 1 spare
"Inorganics" square 500 mL plastic bottle	7 + 1 spare
Semi-volatile 1 L amber glass bottle	2
Volatiles vial sets (3 clear, 1 amber)	2
120 mL Sterile Coliform Sample bottles	**10 Total** fecal - 7 + 1 spare; E. coli - 2
*Disposable BOD with stoppers (Back-up if using BOD sampler)	7 + 1 spare

*Notation for back-up equipment and supplies - used if in-stream measurements not taken

River Run Sample Collection Summary

Sample Type	Container(s)	Quantity and Bottle Type	Sample Locations	Sample Collection Instructions
Semi-Volatiles Organics		1 - 1 liter amber glass bottle and a trip blank	1: Northland Dr. Bridge, 2: Wealthy Street Bridge 4: Railroad Bridge North	######################################
Volatile Organics		3 - clear glass VOA's 1 - amber glass VOA with HCL preservative	1: Northland Dr. Bridge, 2: Wealthy Street Bridge 4: Railroad Bridge North	- Collect samples using the designated bailer - Fill completely, invert to verify vials do not contain any air bubbles -Cool samples during transport
Fecal Coliform		1 - 120 mL **sterile coliform** bottle with or without dechlorinating preservative. Label with **BLACK** sharpie	All locations	-Collect sample using the horizontal stream sampler -Fill 1/4" above the EPA 100 mL fill line with sample -Cool samples during transport
E. coli		1 - 120 mL **sterile coliform** bottle with or without dechlorinating preservative. Label with **RED** sharpie	1: Northland Dr. Bridge 2: Wealthy Street Bridge 4: Railroad Bridge North 5: M-11, Wilson Ave. 6: Eastmanville	-Collect sample using the horizontal stream sampler -Fill 1/4" above the EPA 100 mL fill line with sample -Cool samples during transport
Inorganics - Ammonia, Nitrate, Nitrite, Chloride, Total Phosphorus		1 - square 500 mL bottle	All locations	-Collect samples using the horizontal stream sampler -Fill to the shoulder of the bottle
Metals - Chromium, Copper, Iron, Nickel, Zinc, Silver, Mercury, Total Hardness		1 - round 500 mL bottle	All locations	-Collect samples using the horizontal stream sampler -Fill to the shoulder of the bottle
Total Suspended Solids		1 - round 1000 mL bottle	All locations	- Collect samples using the horizontal stream sampler - Fill to the shoulder of the bottle
BOD		1 - round 500 mL bottle	All locations. **Use if DO is measured in the stream**	- Take a DO reading with the meter and then collect a sample - Collect using the stream sampler - Cool samples during transport
Alternate BOD		1 - 300 mL BOD bottle	All locations. **Use only if DO is not measured in the stream**	- Collect using the BOD Sampler - Fill bottle to the neck; make sure there are no visible air bubbles in sample - Measure DO in sample bottle - Cool samples during transport

Table 1. Sampling Procedures for Dissolved Oxygen (DO)

Collection Technique using hand-held meter – *in situ* field measurement	Meter should be kept in gentle motion through the water column while a reading is being taken. Excessive turbulence should be avoided to minimize presence of air bubbles in the water, near the measurement cell. Allow several minutes for the meter to stabilize. Ideally measurements should be made about 10 cm below the water surface (and then about 10 cm above the sediment surface); however, this is not always possible in shallow water bodies. A mid water column reading will be sufficient in these cases.
Unit of Measurement	mg/L (dissolved oxygen concentration) or % (saturation)
Analysis Method	EPA Method 360.1
Comments	This test must be performed in the field.

Table 2. Sampling Procedures for pH

Collection Technique using hand-held meter – *in situ* field measurement	Meter should be kept in gentle motion through the water column while a reading is being taken. Allow several minutes for the meter to stabilize. Ideally, measurements should be made about 10 cm below the water surface (and then about 10 cm above the sediment surface); however, this is not always possible in shallow water bodies. A mid water column reading will be sufficient in these cases.
Sample collection technique for laboratory analysis	Unfiltered Sample
Volume	125 mL
Container	HDPE, Bottle cap must have a Teflon liner, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Ensure sample bottle is pre-rinsed three times with sample water (3 × 20mL) before final collection.
Treatment to assist preservation	Refrigerate at 1–4°C, do not freeze
Filling Technique	Excessive turbulence should be avoided to minimize presence of air bubbles near the measurement cell or in the sample. Fill container completely to the top to exclude air. The sample must be free of air bubbles. Cap tightly.
Maximum sample holding time and storage conditions	Analyze directly as soon as possible after sample is collected and preferably in the field, but within 6 hours if the sample is refrigerated at 1–4°C, do not freeze.
Unit of Measurement	Standard pH Units
Analysis Method	EPA Method 150.1
Comments	It is preferable to perform this test in the field, in situ.

Table 3. Sampling Procedures for Temperature

Collection technique using hand-held meter – *in situ* field measurement	Thermometer should be kept in gentle motion through the water column while a reading is being taken. Allow several moments for the reading to stabilize. Ideally, measurements should be made about 10 cm below the water surface (for surface measurements).
Unit of Measurement	Degrees Celsius (°C)
Analysis Method	EPA Method 170.1
Comments	This test must be performed in the field.

Table 4. Sampling Procedures for Total Suspended Solids (TSS)

Sample Requirements	Unfiltered Sample
Volume	1 L
Container	HDPE, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Ensure sample bottle is pre-rinsed three times with sample water (3 × 20 mL) before final collection. It is important not to increase the turbidity of the water while collecting a sample, so do not disturb the bottom or the aquatic plants
Treatment of assist preservation	Refrigerate at 1–4°C, do not freeze
Filling Technique	Excessive turbulence should be avoided to minimize presence of air bubbles in the water. Fill to the shoulder of bottle.
Maximum sample holding time and storage conditions	Analyze directly as soon as possible after sample is collected, but within 7 days if the sample is refrigerated at 1–4°C, Do not freeze
Unit of Measurement	mg/L (mg total suspended solids/L)
Analysis Method	EPA Method 160.2
Comments	Take care not disturb bottom sediments or plants during collection.

Table 5. Sampling Procedures for Total Phosphorus

Sample Requirements	Unfiltered Sample
Volume	200 mL
Container	250mL HDPE, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Ensure sample bottle is pre-rinsed three times with sample water (3 × 20 mL) before final collection.
Treatment to assist preservation	Preserve to pH >2 with H2SO4 or 1:1 HCl (laboratory dependent), Cool 4°C
Filling Technique	Fill to just below neck of bottle
Maximum holding time and storage conditions	28 days, Refrigerate 1-4°C, dark
Unit of Measurement	mg/L (mg phosphorus/L)
Analysis Method	EPA Method 365 series
Comments	Sample preservation laboratory dependent

Table 6. Sampling Procedures for Biological Oxygen Demand (BOD)

Sample Requirements	Unfiltered Sample
Volume	1 L
Container	HDPE w/Teflon lined caps or Amber glass, Use new pre-cleaned bottles
Collection Technique	Do not pre-rinse container with sample. Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Keep samples at or below 4°C during compositing. Limit compositing period to 24 hrs after start of collection.
Treatment to assist preservation	Refrigerate at 1–4°C, do not freeze
Filling Technique	Excessive turbulence should be avoided to minimize presence of air bubbles in the water. Fill to the shoulder of bottle.
Maximum holding time and storage conditions	48 hours, Refrigerate 1-4°C, dark
Unit of Measurement	mg/L
Analysis Method	EPA Method 405.1

Table 7. Sampling Procedures for Nitrate & Nitrite (NO_3^- & NO_2^-)

Sample Requirements	Filtered Sample
Volume	200 mL
Container	HDPE, Use new pre-cleaned bottles
Collection Technique	The sample can be collected in a clean sample container prior to filtration. Filtration should occur as soon as possible once sampler has returned from the field. Filtered sample is placed into a different sample bottle, after rinsing. Ensure sample bottle is pre-rinsed three times with filtered sample water (3 × 20 mL) before final collection.
Filtration Technique	Filter the sample through 0.45 µm pore diameter cellulose acetate (membrane) filter
Treatment to assist preservation	Cool to 4°C, Unpreserved or Preserve to pH >2 with H2SO4 (laboratory dependent)
Filling Technique	Fill to just below neck of bottle
Maximum holding time and storage conditions	Analyze within 24 hours if sample is kept refrigerated at 1–4°C Analyze within 28 days if preserved with H2SO4
Unit of Measurement	mg/L
Analysis Method	EPA Method 300.0 or 353 series
Comments	Sample preservation laboratory dependent, NO2 & NO3 can be pulled from same sample bottle

Table 8. Sampling Procedures for Total Metals

Sample Requirements	Unfiltered Sample
Volume	250 mL
Container	HDPE w/Teflon lined cap, Use new pre-cleaned bottles
Collection Technique	Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Unless pre-preserved, ensure sample bottle is pre-rinsed three times with sample water (3 × 20 mL) before final collection.
Treatment to assist preservation	Preserve to pH >2 with HNO3
Filling Technique	Fill to neck of bottle, if bottles are pre-preserved to not rinse or overfill
Maximum holding time and storage conditions	6 months, ambient temperature
Analysis Methods	EPA Method 200.7
Comments	Verify if bottle is acidified before taking sample.

Table 9. Sampling Procedure for Microbial Analysis

For example, total plate count, total coliforms, fecal coliforms, or E. coli. (Escherichia coli).

Sample Requirements	Unfiltered Sample
Volume	For each parameter tested, at least 100 mL of sample is required.
Container	Sterilized plastic w/Sodium Thiosulfate. Use new sealed bottles.
Collection Technique	Keep sterilized sample bottle closed until it is ready to be filled Carefully remove seal & container cap, do not contaminate inner surface of bottle and cap. Do not rinse sample container with sample. Direct collection into sample bottle or transfer into a sample bottle from collection vessel. Replace cap immediately.
Treatment to assist preservation	Sodium Thiosulfate. Store in the dark and refrigerate at 1–4°C. Do not freeze.
Filling Technique	Fill to below shoulder of bottle and facilitate mixing by shaking. Do not overfill as preservative will be lost.
Maximum holding time and storage conditions	Sample should be analyzed within 6 hours for compliance or 24 hours for routine monitoring. Keep cool at 1–4°C but do not freeze.
Analysis Methods	SM 9000 series
Comments	Method used to analyze sample must produce a quantifiable number not just a positive/negative confirmation. Coliform density is reported as counts per 100 mL water sample.

Attachment 6

Lower Grand River Organization of Watersheds
Data Information and Procedures Committee
Directory

Category 1 DIP Committee Members
Category 2 Laboratories
Category 3 Other Partners

Agency: City of Ferrysburg
Name: Craig Bessinger
Street Address: 17290 Roosevelt Road PO Box 38
City: Ferrysburg **State:** MI **Zip Code:** 49409-0038
Phone: (616) 842-5803
Email: cbessinger@ferrysburg.org

Agency: City of Grand Rapids
Name: Mike Lunn
Street Address: 1300 Market Ave SW
City: Grand Rapids **State:** MI **Zip Code:** 49503
Phone: (616) 456-3625, (616) 456-3711
Email: mlunn@grcity.us

Agency: City of Grand Rapids
Name: Dan Taber
Street Address: 300 Monroe
City: Grand Rapids **State:** MI **Zip Code:** 49503
Phone: (616) 456-3104
Email: dtaber@grand-rapids.mi.us

Agency: Kent County Drain Commissioner's Office
Name: Angie Latvaitis
Street Address: 1500 Scribner Ave NW
City: Grand Rapids **State:** MI **Zip Code:** 49504
Phone: (616) 336-3688
Email: angie.latvaitis@kentcountymi.gov

Agency: Kent County Health Department
Name: Sarah Simmonds
Street Address: 700 Fuller Ave. NE
City: Grand Rapids **State:** MI **Zip Code:** 49503
Phone: (616) 632-7100
Email: sara.simmonds@kentcountymi.gov

Agency: City of Kentwood
Name: James Beke
Street Address: 4900 Breton Ave SE
City: Kentwood **State:** MI **Zip Code:** 49508
Phone: (616) 554-0737, (616) 698-7118
Email: bekej@ci.kentwood.mi.us

Agency: MDEQ
Name: Amanda St. Amour
Street Address: Water Division State Office Building Unit 10 350 Ottawa NW
City: Grand Rapids **State:** MI **Zip Code:** 49503
Phone: (616) 356-0215, (616) 356-0202
Email: stamoura@michigan.gov

Agency: MDEQ
Name: Dana Strouse
Street Address: 350 Ottawa NW Unit 10
City: Grand Rapids **State:** MI **Zip Code:** 49503
Phone: (616)356-0261
Email: Stroused@michigan.gov

Agency: Village of Spring Lake
Name: Roger Belknap
Street Address: 102 West Savidge St
City: Spring Lake **State:** MI **Zip Code:** 49456-1696
Phone: (616) 842-1393, 616) 847-1393
Email: rbelknap@springlakevillage.org

Agency: City of Walker
Name: Rachell Nagorsen
Street Address: 4243 Remembrance Rd. NW
City: Grand Rapids **State:** MI **Zip Code:** 49534
Phone: (616) 791-6327
Email: rachell.nagorsen@ci.walker.mi.us

Agency: City of Wyoming
Name: Aaron Vis
Street Address: 2350 Ivanrest Ave SW
City: Grandville **State:** MI **Zip Code:** 49418
Phone: (616) 261-3593
Email: avis@wyomingmi.gov

Agency: Grand Valley Metropolitan Council
Name: Bonnie Broadwater
Street Address: 678 Front Ave NW Suite 200
City: Grand Rapids **State:** MI **Zip Code:** 49504
Phone: (616) 776-7611
Email: bonnie.broadwater@gvmc.org

Agency: Grand Valley Metropolitan Council
Name: Wendy Ogilvie
Street Address: 678 Front Ave NW Suite 200
City: Grand Rapids **State:** MI **Zip Code:** 49504
Phone: (616) 776-7605
Email: wendy.ogilvie@gvmc.org

Agency: Grand Valley State University
Name: John Koches (Chair)
Street Address: 1 Campus Dr. FH 97
City: Allendale **State:** MI **Zip Code:** 49401
Phone: (616) 331-3092
Email: kochesj@gvsu.edu

Laboratory: TriMatirx
Street Address: 5560 Corporate Exchange Court
City: Grand Rapids **State:** MI **Zip Code:** 49512
Phone: 616.975.4500
Staff Contact:
Email:
URL: http://www.trimatrixlabs.com/

Laboratory: Karr Labs
Street Address: 4425 Manchester Road
City: Kalamazoo **State:** MI **Zip Code:** 49001
Phone: (269) 381-9666
URL: http://www.karlabs.com/

Laboratory: ALS
Street Address: 3352 128th Avenue
City: Holland **State:** MI **Zip Code:** 49424
Phone: (616) 399-6070
URL: http://www.alsglobal.com/en/Our-Services/Life-Sciences/Environmental

Laboratory: Wyoming Clean Water Plant
Street Address:
City: **State:** **Zip Code:**
Phone:
Staff Contact:
Email:
URL:

Laboratory: Grand Rapids Waste Water Treatment Plant
Street Address:
City: **State:** **Zip Code:**
Phone:
Staff Contact:
Email:
URL:

Laboratory: Grandville Waste Water Treatment Plant
Street Address:
City: **State:** **Zip Code:**
Phone:
Staff Contact:
Email:
URL:

ATTACHMENT 7 LOWER GRAND RIVER ORGANIZATION OF WATERSHEDS

SAMPLE CHAIN OF CUSTODY RECORD

Client Name:	**P.O./Ref #:**
Contact Person & Address:	**Phone #/Fax#/e-mail:**

Sample Comments:	**Preservatives→** A: None pH ~7 B: HNO3 pH<2 C: H2SO4 pH<2 D: 1:1 HCl pH<2 E: Na2S2O3 F: Other (note)	**Preservative:**								
		Requested Analysis								

	Field Sample ID	Sample Date	Sample Time	Matrix	Number of Bottles							
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Sampler Name (Print):	**Relinquished by:**	**Relinquished by:**
Sampler Signature:	**Received by:**	**Received by:**

ATTACHMENT 7 LOWER GRAND RIVER ORGANIZATION OF WATERSHEDS

SAMPLE CHAIN OF CUSTODY RECORD

Client Name:	**P.O./Ref #:**
Contact Person & Address:	**Phone #/Fax#/e-mail:**

Sample Comments:	**Preservatives→** **A: None pH ~7** **B: HNO3 pH<2** **C: H2SO4 pH<2** **D: 1:1 HCl pH<2** **E: Na2S2O3** **F: Other (note)**	**Preservative:**								
		Requested Analysis								

	Field Sample ID	**Sample Date**	**Sample Time**	**Matrix**	**Number of Bottles**							
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												

Sampler Name (Print):	**Relinquished by:**	**Relinquished by:**
Sampler Signature:	**Received by:**	**Received by:**