PERMIT NO. ALS000032 PART III

WATER QUALITY MONITORING & REPORTING SOP

City of Birmingham
Stormwater Management

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1. Introduction

1.1 Scope

The water quality portion of Stormwater Management for the City of Birmingham is the foundation for basing all strategies to reduce pollutants and maintain water quality in waterways within the City (**Figure 1**)**.** Water Quality Monitoring and evaluation drives all aspects of the Management of the City's efforts to improve the water quality in the MS4. The following is a

model depicting the importance of water quality monitoring and evaluation for the City to achieve goals set in the MS4 permit.

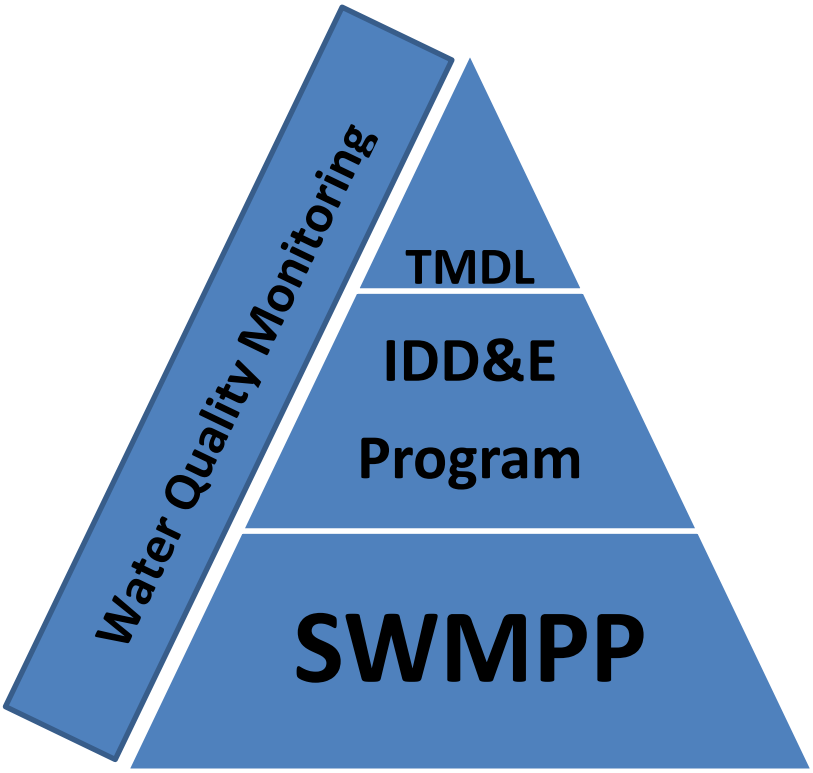


Figure 1.1

This standard operating procedure (SOP) is applicable to the field measurement and collection of water samples from Birmingham streams and rivers for the purpose of water quality monitoring and is consistent and incorporates all recommended modification of the City water quality stream monitoring from the existing permit (Dated 2001) and Stormwater Program Plan (SWPP) revised in 2011 and approved by ADEM in October, 2013. The objective of this manual is to provide the standardized set of methods and procedures for bi-monthly (every two months) storm water sampling events to ensure consistent quality of results. Five rivers and streams are covered by this SOP, including the Cahaba River, Five Mile Creek, Shades Creek, Valley Creek, and Village Creek. Within these waterways, a total of 20 sites (**Table 1.1**) are monitored through water quality sampling.

The City of Birmingham has several water resource segments that do not meet beneficial use requirements. As a result, they have been placed on the State's Section 303(d) list of impaired water bodies and either have or are scheduled to have total maximum daily loads (TMDLs) established to further control pollutants from being discharged into the Cities waterways. (See page 8 of the SWMPP Receiving Waters Figure 1).

If unacceptable levels of pollutants are detected following the SOP during sampling events, then additional samples are taken as part of the strategy to narrow stream segments and reduce search areas so that information can be forwarded to the IDDE portion of Stormwater Management for investigation. The details of the IDDE program and dry weather screening procedures are also addressed in the IDDE SOP.

Table 1.1

The reduction of, or removal of pollutants by using Best Management Practices (BMP's) utilizing pollution control and preventative approaches is incorporated into the City of Birmingham's Stormwater Management Program.

Table 1.1 Sampling Locations

Creek	Site ID
Five Mile Creek	FMC19.5
	FMC08.2
	FMC03.6
Shades Creek	SC05.5s
	SC0.5.5
Valley Creek	VC04.9s
	VC02.9
	VC0.7
	VC0.1s
Village Creek	VIC14.0
	VIC13.0
	VIC09.4
	VIC08.1
	VIC07.0
	VIC07.0s
	VIC06.5
	VIC05.6s
	VIC01.8
	VIC01.6s
Cahaba River	CR280

The Birmingham MS4 program uses dry weather monitoring and illicit discharge screening to examine water quality. Dry weather monitoring is used to create a baseline of the types of pollutants present in a body of water that may come from everyday activities such as lawn watering, car washing, and groundwater seepage. On the other hand, illicit discharge screening provides an opportunity to identify outfalls that are flowing when they should not be, possibly as a result of industrial, commercial processes, or other illegal discharges and spills that may present a problem for the water quality or contaminate the MS4.

Screening sites are selected as a representation of land use types within a basin based on proximity to industries, densely populated area, or where a tributary empty into a creek in order to pinpoint where various pollutants may be entering the waterway (**Table 1.2**). Screening sites are denoted by an "s" and identified using an abbreviation of the creek name and the distance (in miles) from the headwater where the creek originates in Birmingham. Water quality sampling is always conducted farthest from the head waters first, moving towards the head waters. This technique assures that the same block of water is not sampled more than once.

Samples are analyzed for a variety of parameters such as major ions, nutrients, fecal bacteria, trace and minor elements, and pesticide constituents (**Table 1.3**) and are consistent with the City of Birmingham's NPDES Permit Requirements. Sampling sites are identified using an abbreviation of the creek name and the distance (in miles) from the headwater where the creek originates in Birmingham. Additional sites at Little Cahaba River and Lake Purdy, selected to be representative of former sampling sites, are now monitored by Birmingham Water Works Board under an agreement with The City of Birmingham Stormwater Program and the sampling results are then provided to the City for data extraction and documentation.

Percentage of Land Use Type for Each Screening Site

Table 1.2

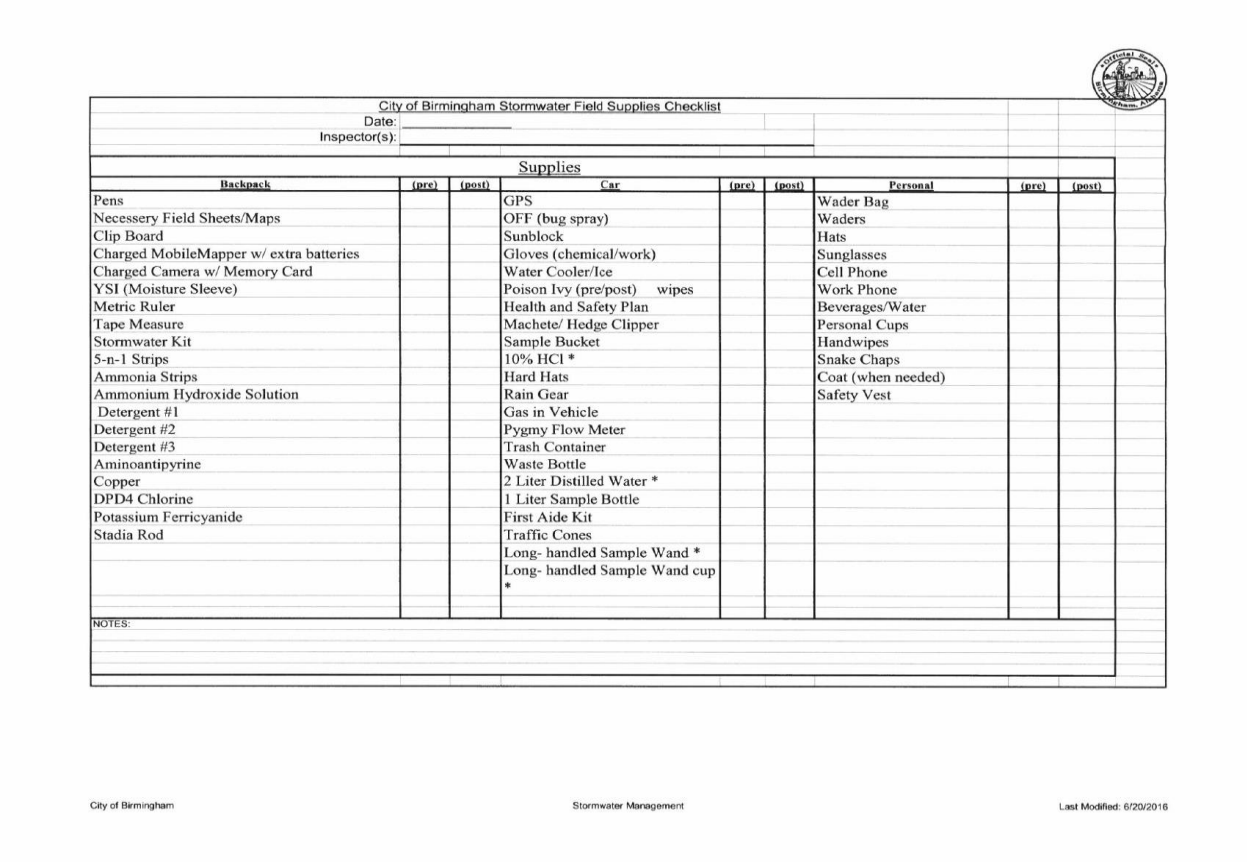
Screening Sites	Basin Acres	Land use Type Residential	Land use Type Commercial	Land use Type Industrial	Land use Type Undeveloped	Total Impervious Area
SC05.5s	450.6	42.6%	50.9%	0%	6.5%	54.9%
VC04.9s	2556	66.1%	11%	0%	22.9%	26%
VC0.1s	1626.2	76%	9.3%	0%	14.7%	37.8%
VIC07.0s	2288.8	48.2%	32.8%	15.6%	3.4%	45.2%
VIC05.6s	2145.3	65.8%	9%	5%	20.2%	30.3%
VIC01.6s	2298	60.4%	10.6%	0%	29%	19.9%

Table 1.3 Testing Parameters

Parameters	In-Lab Sample	In-Field Sample
BOD	X	
TSS	X	
TDS	X (Village Creek only)	
Ammonia		X
TKN	X	
Total Nitrogen	X	
Total Phosphorus (as P)	X	
Turbidity		X
E-Coli	X	
Total Coliform	X	
Hardness		X
Water Temperature		X
pH		X
DO		X
DO%		X
Conductivity		X
Barometric Pressure		X
Nitrates		X
NO2/NO3 (as N)	X	
*Stormwater Kit		X
Zinc	X (Village Creek only)	
Total Hardness		X
Total Chlorine		X
Free Chlorine		X
Total Alkalinity		X
***Stormwater Kit (Illicit Discharge Monitoring) includes: Detergents, Phenols, Total Chlorine, Total Copper**		

1.2 Equipment and Supplies

A variety of equipment for the vehicle and personal backpack is needed during field sampling activities. **Figure 1.1** provides a Field Supplies Checklist to be completed before and after a sampling event. This is done to ensure needed field equipment and supplies used during each sampling event are returned or not misplaced upon return to the field office.



City of Birmingham Stormwater Field Supplies Checklist

Date: _____

Inspector(s): _____

Supplies

Backpack	(pre)	(post)	Car	(pre)	(post)	Personal	(pre)	(post)
Pens			GPS			Wader Bag		
Necessery Field Sheets/Maps			OFF (bug spray)			Waders		
Clip Board			Sunblock			Hats		
Charged MobileMapper w/ extra batteries			Gloves (chemical/work)			Sunglasses		
Charged Camera w/ Memory Card			Water Cooler/Ice			Cell Phone		
YSI (Moisture Sleeve)			Poison Ivy (pre/post) wipes			Work Phone		
Metric Ruler			Health and Safety Plan			Beverages/Water		
Tape Measure			Machete/ Hedge Clipper			Personal Cups		
Stormwater Kit			Sample Bucket			Handwipes		
5-n-1 Strips			10% HCl *			Snake Chaps		
Ammonia Strips			Hard Hats			Coat (when needed)		
Ammonium Hydroxide Solution			Rain Gear			Safety Vest		
Detergent #1			Gas in Vehicle					
Detergent #2			Pygmy Flow Meter					
Detergent #3			Trash Container					
Aminoantipyrine			Waste Bottle					
Copper			2 Liter Distilled Water *					
DPD4 Chlorine			1 Liter Sample Bottle					
Potassium Ferricyanide			First Aide Kit					
Stadia Rod			Traffic Cones					
			Long- handled Sample Wand *					
			Long- handled Sample Wand cup *					

NOTES:

City of Birmingham Stormwater Management Last Modified: 6/20/2016

Figure 1.1 City of Birmingham Stormwater Field Supplies Checklist

2. Pre- Sampling Procedures

2.1 Calibrating Equipment

The electrical sampling equipment (YSI and Hydrolab) are calibrated once every two months on the day before a field sampling event. Meter sensor calibration is required for pH, conductivity, barometric pressure, oxidation reduction potential (ORP), and turbidity (TN100 Turbidimeter). All calibration standards are recorded and dated and all records are maintained in calibration logs **Appendix D**. If for some reason the calibration is not accepted by the instrument the calibration process is repeated. If the instruments are not accepting the calibration as required by the calibration procedure after repeated attempts, then the monitoring equipment is sent to the manufacturer to be evaluated and calibrated. All contact and manufacturer information is located in the equipment manuals or in **Appendix D**.

All chemicals used for field measurements are date checked and rotated or disposed of, to make sure they are current and meet all manufactures requirements. All MSDS sheets for

chemicals used in field sampling and cleaning are posted on the exterior wall of the Stormwater Management Field Office as per OSHA standards.

2.2 Vehicle Maintenance

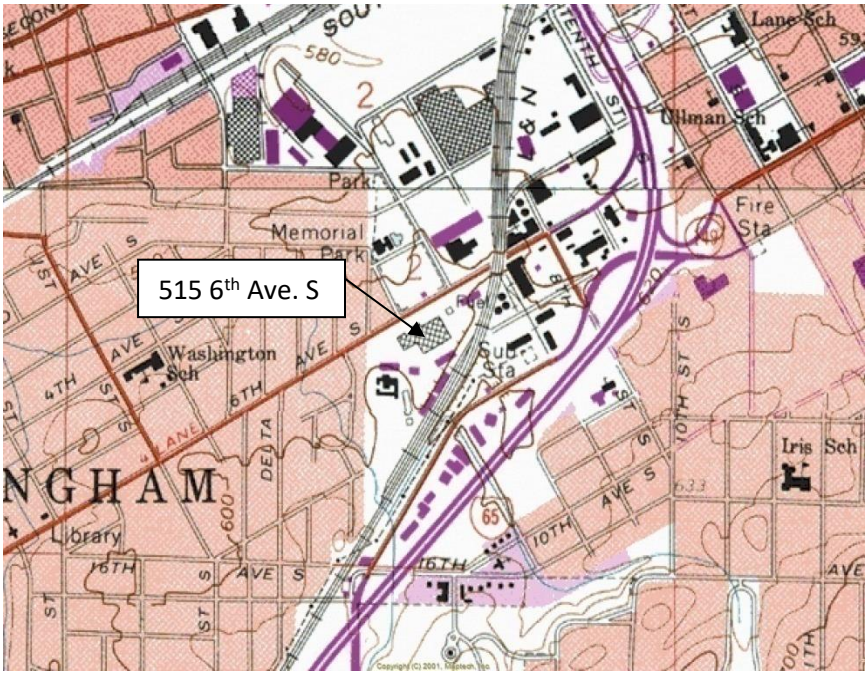
Vehicle maintenance, such as refueling, should be performed at least 1 day prior to all sampling events. Such activities are to be completed at the 6th Street Maintenance Facilities (**Figure. 2.1**) located at 515 6th Ave. South. Additionally, the cooler should be filled with ice from the maintenance facilities and allowed to thaw overnight, to allow for drinking water during sampling the next day.

2.2.1 Steps to Refueling Vehicle

- Enter pump number
- Swipe key fob
- Enter mileage
- Swipe employee gas card
- Begin fueling
- DO NOT RE-ENTER VEHICLE WHILE PUMP IS OPERATING
- Shut off pump and return handle to pump when finished.

*A car wash is available at the 6th Ave. City Maintenance Facility.

Figure 2.1 6th Ave. South Maintenance Facilities



2.2.2 Stormwater Vehicles

City of Birmingham Vehicles must be signed out before and after sampling events using the Stormwater Management Vehicle Login Sheet (**Figure 2.4**). The City of Birmingham has two Ford F150 Super Crew Trucks that are used for field work.

Truck 601(**Figure 2.2**) is assigned to personnel that conducts IDD&E program investigations.

Figure 2.2 City of Birmingham Stormwater Management Ford F150 Supercrew 4x4 Truck 601.

Truck 602 (**Figure 2.3**) is assigned to personnel that conducts Water Quality Monitoring.

Figure 2.3 City of Birmingham Stormwater Management Ford F150 Supercrew 4x4 Truck 602.

Both trucks are equipped with identical equipment and can be interchanged as necessary.

2.2.3 Signing Out Vehicle

City of Birmingham Vehicles must be signed out before and after sampling events using the Stormwater Management Vehicle Login (**Figure 2.4**).

Stormwater Management
Vehicle Login Sheet

Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		
Name	Truck #	Date	Time Out	Time In	Mileage In
Trip Purpose:			Comments:		

Figure 2.4 Stormwater Management Vehicle Login Sheet

Sections to be completed before Departing

Name- Name of person signing out vehicle

- **Truck Number**- Truck identification number
- **Date**- Today's date
- **Destination**- Location vehicle is being driven.
- **Truck Condition**- Visual Inspection

Sections to be completed after Returning

- **In Mileage**- Final mileage of vehicle
- **Parking Location**- Level 4 of parking garage
- **Truck Condition**- Visual inspection
- **Comments**- Any additional comments

2.4 Communication with Laboratory

Coordinate with the laboratory ahead of time to allow for preparation of Chain of Custody paperwork, sampling bottles, and other sampling materials such as deionized water, 10% HCl solution, and coliform sampling equipment. Prior notice also allows for retrieval of addition Cahaba River data. On the day of sampling event, ensure the following activities take place:

- Contact the laboratory to confirm that the samples will be expected.
- Pick up coolers supplied by BWWB. (**Figure 2.5**)

Figure 2.5

- Pick up sample bottles and ice packs from the laboratory.

- Pick up additional bottles of 10% HCl solution and Deionized Water if needed.(**Figure 2.6**)

Figure 2.6

- Double check that all labels on the sample bottles have been properly and legibly notated.
- When samples are dropped-off/ picked-up, sign Chain of Custody (**Figure 4.1**), including date and time.
- Make sure a waste bottle is available for proper waste disposal.

BWWB Points of Contact:

Drusilla Hutchenson 205-244-4404

Ollie Kelly 205-617-1936

Roosevelt Banks 205-244-4480

Stacy Littleton 205-244-4476

Derrick Felton 205-244-4465

2.5 Preparing Bottles and Equipment

Sample bottles should be labeled with the following information prior to filling the bottles:

- Location designation
- Date
- Temperature of water
- Time of collection

3. Sampling Procedures

3.1 Traveling to Sampling Location

Travel to the sample locations using the assistance of a GPS unit and/or map. Preferable parking locations are on a flat surface or public parking area close to a sampling locations. If neither is available, park on the road shoulder, ensuring the vehicle is clear of the traffic lane and turn on flashers. Orange cones should be placed on the road behind and leading up to the vehicle to warn other drivers that a vehicle and sampler are near the lane of traffic. Try to avoid traffic if possible!

3.2 Health and Safety

For safety, navigation, and logistics, best judgment and common sense should always be used to avoid dangerous situations. The following document is the Health and Safety Plan for Stormwater Management. **(3.2.3 Health and Safety Plan)**.

3.2.1 Clothing

Wear clothing that is loose fitting and comfortable for movement. It is recommended that long sleeves be worn at all times to shield the skin from passing through trees and brush that may have thorns or that may be rugged. Clothes with Stormwater Management City of Birmingham logo should be worn when sampling. Safety vest should be worn at all times when sampling. Coats and rain gear and other equipment such as boots and waders are provided by the City of Birmingham.

- **Hot weather**: Loose, airy clothing. White shirts are best to reflect sunlight.
- **Cold weather**: Layer clothing to ensure warmth, as stream temperature is several degrees colder.
- **Wet weather**: A rain suit or poncho can be worn for protection in the rain.

3.2.2 Buddy System

For safety reasons there is a need for at least a two person team. Each team member is responsible for the following:

- Constantly communicating with other team members, warning them of potential hazards such as slippery rocks or dips in the creek bed.
- Remaining in close proximity to each other at all times
- Being aware of teammate's state of being. For example, if they look flushed and hot, advise them to take a break.

3.2.3 Health and Safety Plan

PROJECT NAME:	City of Birmingham MS4 Program
ORGANIZATION:	Watershed Management Program
Program Administrator:	Edwin Revell
Program Administrator Phone Number:	(205) 254-2470

SITE TYPE: *Check as many as applicable. Add more if needed.*

☐ Active ☐ Inactive ☐ Secure ☐ Unsecured ☐ Enclosed Space ☐ Landfill ☐ Uncontrolled ☐ Industrial ☐ Recovery ☐ Well Field ☐ Unknown ☐ Military ☐ Other (Specify) _____ ☒ Other (Specify) Surface Water, Outfall Reconnaissance & Spill Response

Contact	Name	*Phone*
Health & Safety Director		
Program Supervisor	George Putman	*(205) 254-2822*
Occupational Physician		
Fire Department	Local	*911*
Police Department	Local	*911*
State Police	State Capitol Police	*(334) 242-0700*
Health Department	Jefferson County	*(205) 324-4133*
Poison Control Center	Children's Hospital	*(800) 292-6678*

Local Spill Number	ADEM	*(205) 942-6168*
National Response Number	*NRC*	*(800) 424-8802*

Stormwater Management Program Staff

PERSONNEL	Vaccinations	TRAINING	PROJECT OR SITE RESPONSIBILITIES	Medical Alerts
Direcus Cooper	Hepatitis B Series	On-Site/Field	Outfall Reconnaissance, Surface Sampling & Spill Response	
Troy Perry	Hepatitis B Series	On-Site/Field	Outfall Reconnaissance, Surface Sampling & Spill Response	
Alexcia Moore	Hepatitis B Series	On-Site/Field	Outfall Reconnaissance, Surface Sampling & Spill Response	
Angela Moss	Hepatitis B Series	On-Site/Field	Outfall Reconnaissance, Surface Sampling & Spill Response	

HEALTH & SAFETY PLAN APPROVALS (*Not valid if not signed by Program Administrator and Health & Safety Coordinator)*

	PRINTED NAME	SIGNATURE
Program Administrator:	**Joshua Yates**	
Health & Safety Coordinator:	**Michelle Taylor**	

Safety & Prevention Guidelines

In the field, safety and prevention is the first priority. The following are some safety and prevention guidelines.

Check as many as applicable					
☒ **Animal/ Plants** ***(See Appendix B)***	☒ **Dust, Harmful**	☒ **Heat Stress**	☐ **Ionizing Radiation**	☐ **Overhead Objects**	☒ **Slips & Falls**
☐ **Asbestos/ Lead**	☒ **Dust Nuisance**	☐ **Heavy Equipment**	☐ **Light Radiation** ***(i.e., Welding, High Intensity)***	☐ **Oxygen Deficient**	☒ **Terrain**
☒ **Biological**	☐ **Electrical**	☒ **Heavy Lifting**	☐ **Limited Contact**	☐ **Poor Visibility**	☒ **Traffic** ***(Struck by)***
☒ **Chemical Exposure**	☐ **Excavations**	☐ **Heavy Machinery**	☐ **Motorized Traffic**	☐ **Powered Platforms**	☐ **Other: (Print)**
☐ **Confined Space**	☐ **Explosive/ Flammable**	☐ **Hot Work**	☐ **Moving Parts** ***(LO/TO)***	☐ **Radiological**	☐ _____
☐ **Demolition**	☒ **Extreme Cold**	☐ **Hunting Season**	☐ **Noise** ***(>85cB)***	☐ **Rolling Objects**	☐ _____
☐ **Drilling**	☐ **Fall, >6' Vertical**	☐ **Immersion**	☐ **Non-Ionizing Radiation**	☐ **Scaffolding**	☐ _____
☐ **Drum Handling**	☐ **Falling Objects**	☐ **Inorganic Chemicals**	☐ **Organic Chemicals**	☒ **Sharp Objects**	☐ _____

SURROUNDING POPULATION:		
☒ **Residential** ☒ **Rural**	☒ **Commercial** ☒ **Industrial**	☒ **Urban** ☐ **Other**
ANTICIPATED WASTE TYPES:		
☒ **Liquid** ☒ **Solid**	☐ **Sludge** ☐ **Gas**	☐ **Unknown** ☒ **Other: pH & ammonia strips**

On-Site Hazardous Materials

Preservatives		*Decontamination*		*Calibration*	
☒ Hydrochloric Acid	☐ Zinc Acetate	☐ Alconox ™	☐ Mineral Spirits	☐ 100 ppm isobutylene	☐ Hydrogen Sulfide
☒ Nitric Acid	☐ Ascorbic Acid	☐ Liquinox ™	☐ Hexane	☐ Methane	☐ Carbon Monoxide
☒ Sulfuric Acid	☐ Acetic Acid	☐ Acetone	☐ Isopropanol	☐ Pentane	☐ pH Standards
☒ Sodium Hydroxide	☐ Other: ___	☐ Methanol	☐ Nitric Acid	☐ Hydrogen	☐ Conductivity
		☐ Other: _____	☐ Other: _____	☐ Propane	☐ Other: _____

Protective Equipment

Respiratory	☐ Not Needed	**Protective Clothing**	☐ Not Needed
☐ SCBA		☐ Fully Encapsulating Suit	
☐ Airline		☐ Splash Suite	
☐ Full Face		☐ Tyvek Coverall	
Specify Cartridge:	_____	☐ Saranex Coverall	
☐ Escape Mask		☒ Reflective Vest	
☐ Other: *Specify*	_____	☐ Other: *Specify*	_____
Head and Eye	☐ Not Needed	**Gloves**	☐ Not Needed
☒ Safety Glasses		☒ Nitrile	
☐ Face Shield		☒ Work Gloves	
☐ Goggles		☐ Latex	
☒ Hard Hat		☐ Viton	
☒ Other: *Specify*	Boonie Hats	☐ Other: *Specify*	_____

Protective Equipment Cont'd

Boots	☐ Not Needed	**Miscellaneous**	☐ Not Needed
☐ Leather/Steel Toe		☒ Insect Repellent	
☐ Rubber Overboots		☐ USCG *Personal Flotation Device*	
☐ Steel Shank		☐ Hearing *Specify NRR* _____	
☒ Other: *Specify*	Cleated Chest Waders	☒ Sun Screen	
		☒ Other: *Specify*	First Aid Kit

Field Work Objectives

OBJECTIVES OF FIELD WORK: *(e.g. collect surface soil samples)*	
1.	Monitor outfalls during dry weather screening as necessary in Birmingham.
2.	Monitor 20 screening sites every other month in Birmingham. (wet weather and dry weather screening)
3.	Collect grab samples from monitoring sites for IDDE events as necessary.
4.	Collect, handle, preserve, ship and analyze samples.
5.	Sample bottles are pre-preserved. (Detail regarding personal protection equipment for handling preservatives is provided in section.)
6.	

SAFETY NARRATIVE:

Proper Safety and Sampling Precaution are taken while performing outfall reconnaissance, surface water sampling & spill response.

Hazard Evaluation

SPECIFIC TASK DESCRIPTIONS	TASK – SPECIFIC HAZARDS	CONTROL MECHANISM
1. Monitoring of outfalls as necessary in Birmingham.	Animals & Plants, Traffic, Rough Terrain, Falling Hazards. Other:	Steel Toe Boots, Wadders, Buddy System
2. Monitoring of 20 screening sites every other month in Birmingham. Wet weather and dry weather screening.	Heat Stress, Traffic, wildlife, weather, rough terrain. Other:	Protective clothing and proper use Traffic Barriers. Avoid Sampling in High Traffic Areas. Field personnel must stay hydrated and avoid rough terrain when possible. All Sampling Proceedures shall be

		conducted using the Buddy System.
3. Collecting grab samples from monitoring sites after storm events.	Slips & Falls, Hazardous Weather Conditions, Other:	Walking Stick (wooden stake) & choosing the path of least resistance. Weather Monitoring
4. Collection, handling, preservation, shipping, and analysis of samples	Other: Nitric Acid, Hydrochloric Acid, Sulfuric Acid, & Sodium Hydroxide	Protective clothing and eye protction.
5. Sample bottles are pre-preserved. (Detail regarding personal protection equipment for handling preservatives is provided in section.)	Other: Nitric Acid, Hydrochloric Acid,& Sulfuric Acid.	Nitrile Gloves & Sodium Hydroxide
6.	Other:	

Hazard Evaluation Cont'd

SPECIALIZED TRAINING REQUIRED:	**SPECIAL MEDICAL SURVEILANCE REQUIEREMENTS:**
On-Site/Field Training	Annual Medical Examination

OVERALL HAZARD EVALUATON: *(Evaluate each Hazard)* ☐ High ☐ Medium ☒ Low ☐ Unknown

1. Animals & Plants, Traffic (see Appendix B)
2. Heat Stress
3. Slip & Falls
4. Nitric Acid, Hydrochloric Acid, Sulfuric Acid, & Sodium Hydroxide
5. Nitric Acid, Hydrochloric Acid, Sulfuric Acid, & Sodium Hydroxide
6. Hazarous Weather Conditions

Justification: *(ie – Why is the task(s) a low, medium, high hazard?)*

Careful planning, preparation, and selection of the proper personal protective equipment.

HEALTH AND SAFETY PLAN (HASP) SIGNATURE FORM

Health and Safety Plan

All on-site personnel must sign this form indicating receipt of the HASP. Keep this original on site as part of the permanent project files. Send a copy to the Health and Safety Director for your BACKUP.

SITE NAME: City of Birmingham

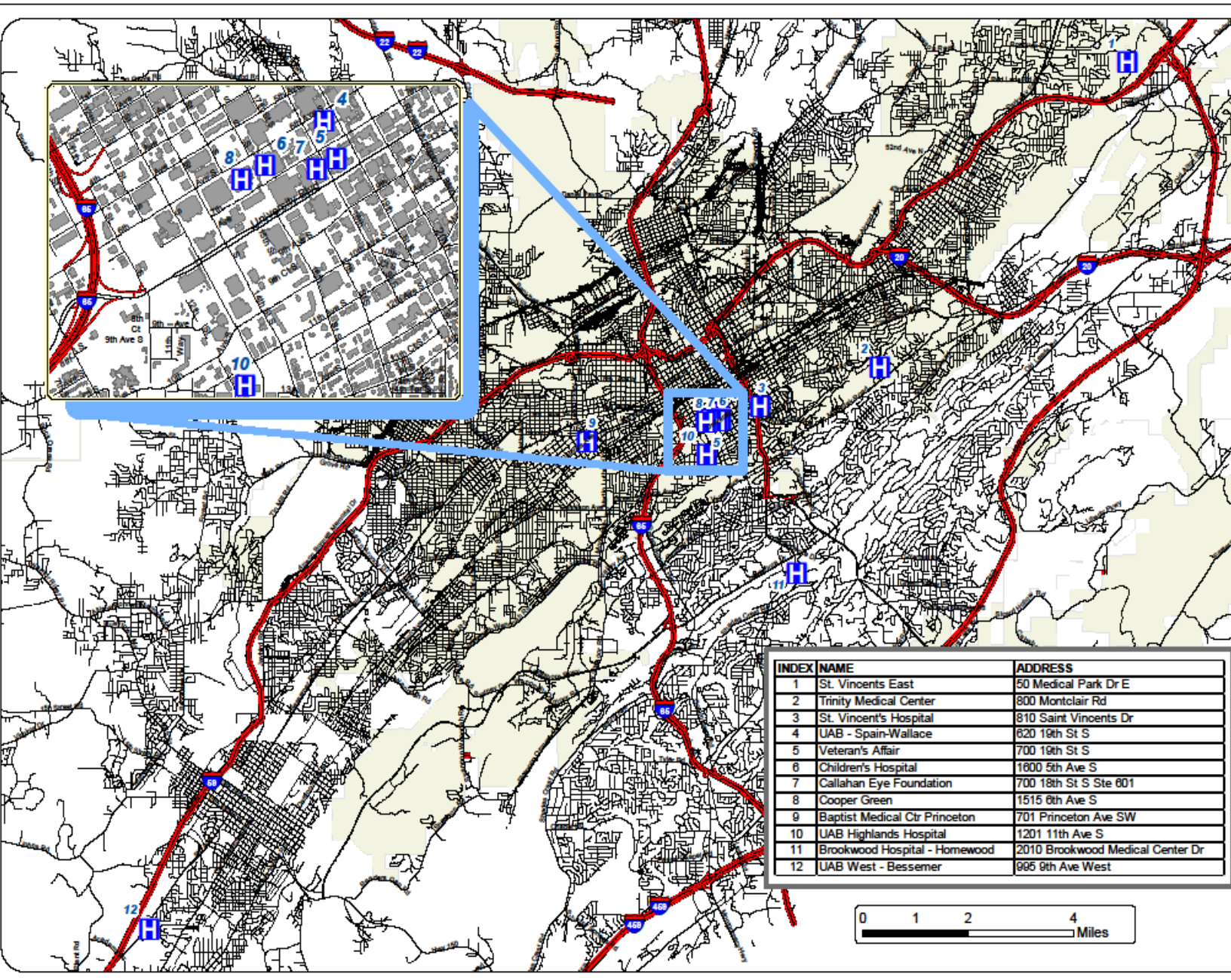
SITE LOCATION: Birmingham

CERTIFICATION

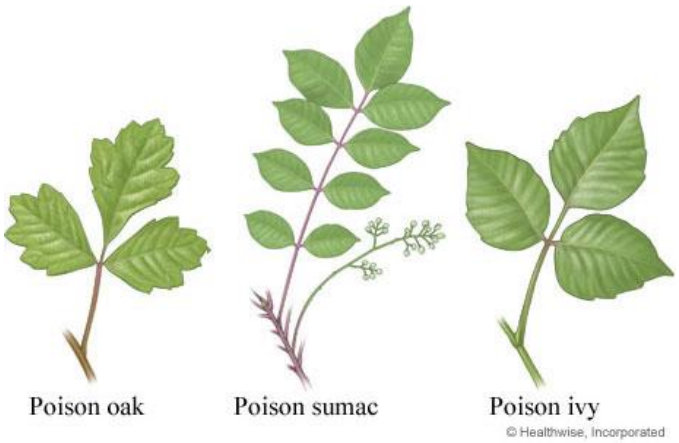
I understand that I am responsible for my safety and that of others. I agree to comply with the provisions of this HASP for work activities on this project. I agree to report any injuries, illnesses or exposure incidents to the Program Supervisor.

Printed Name	Signature

Map of Hospitals



Avoiding Hazardous Plants



Poison Oak

Poison Oak

•Poison oak has leaves that look like oak leaves, usually with three leaflets but

sometimes up to seven leaflets per leaf group. It grows as a vine or a shrub.

•Poison Oak grows alongside trails, in forests and wooded areas. Poison Oak causes

your skin to itch, and you will definitely want to scratch. You can only wait for the

process to run its course and treat the symptoms. The symptoms are non-contagious

rashes and non-poisonous blisters. Contaminated clothing should be washed

thoroughly.

•Because it is a small plant, Poison oak sometimes can't be seen if you are not attentive

so you get a nasty rash.

Poison Sumac

Poison Sumac

•Poison sumac has 7 to 13 leaflets per leaf stem. The leaves have smooth edges and

pointed tips. Poison sumac grows as a shrub or small tree found in wooded, flooded

soils, and swampy areas.

•Poison sumac leaves are arranged in pairs with a single leaf on the end. They have

small yellowish green flowers that mature into berries that resemble poison oak and

poison ivy. Out of the three itchy plants, poison sumac is far more dangerous than

poison ivy and poison oak.

•Poison sumac is a woody shrub or small tree growing to 9 m to 30 ft. tall. When

burned, inhalation of the smoke may cause the rash to appear on the lining of the

lungs, causing extreme pain and possibly fatal respiratory difficulty.

Poison Ivy

Poison Ivy

•Poison ivy usually has three broad, spoon-shaped leaves or leaflets, but it can have

more. It may grow as a climbing or low, spreading vine that sprawls through grass or

as a shrub.

•Poison Ivy in the early spring. Leaves are arranged in groups of three. The leaves may

be a dark red on very young plants and also in the fall.

•Please be mindful that poison ivy grows as a vine or shrub.

Fuel Site Locations/Vehicle Assistance

Site	Address	Fuel Type
Southside – Site # 11	515 6th Avenue South	Unleaded, Diesel & E85
Downtown – Site #12	1700 1st Avenue North	Unleaded
North – Site #13	2413 27th Street North	Unleaded, Diesel & E85
East Site - #14	301 96th Street North	Unleaded & Diesel
Ensley – Site #15	1044 Avenue W	Unleaded & Diesel
Legion Field – Site #16	800 Graymont Avenue	Unleaded
5 Points West – Site #17	2200 Avenue W Ensley	Unleaded & Diesel
New Georgia – Site #18	2500 47th Avenue North	Diesel
Eastern Area	2787 Alton Road	Diesel
Botanical Gardens	2612 Lane Park Road	Unleaded

Vehicle Assistance

Contact Person - Jerry Brooks (205) 254-6329

3.2.4 Site Access

Samplers should wear reflective vests at all times during a sampling event and be advised of the following:

- Do not enter an unsafe area (unstable ground or overgrown with vegetation). If the area is hard to access or appears dangerous, report this information to Site Supervisor.
- Do not enter private commercial, industrial, or private property, unless given permission to do so. If not, report situation to Site Supervisor.
- Do no enter private residential property without the express consent of the owner.
- Drown Proofing Training is conducted in the Cross-Plex swimming pool with full waders and safety procedures for all new employees.

3.2.5 Adverse Weather

Sampling should not be conducted in the event of adverse conditions such as lightning, swift current, or flooding. In such an event, samplers should:

- Return to the vehicle and wait a minimum of 20 minutes from the last visible lightning flash before returning to the water, if lightning is present.
- Refrain from wading into the water if the stream depth (in feet) multiplied by its velocity (feet per second) exceeds your height (in feet).
- Do not enter the stream if the bottom cannot be observed.

3.3 Site Specific Conditions

The equipment necessary for sample collection depends on the site location, accessibility, and geographical features. If a site can be accessed safely, the samples can be collected upstream of the person wading into the water. If the site is not easily accessible, samples may be taken from a bridge within the sampling site.

3.4 Instream Sampling

Adhering to clean sampling techniques in the field is necessary to avoid contaminating samples and ultimately skewing laboratory results. Care must be taken to avoid contacting the inner surfaces of the lid, bottle, and sampling equipment to reduce the chance of sample contamination, especially for bacteria sampling. The following precautions aid in providing pristine samples that are representative of the condition of a water body. Correct sampling procedures are demonstrated in Figures 3.2 and 3.3.

Figure 3.2 Correct Way to Hold Sampling Bottle

Always

- Face upstream when collecting samples.
- Collect samples just below surface level.
- Use powder-free latex glove when handling sample bottle and cap sampling for E.coli first.
- Allow particles and sediment to settle to their natural state before sampling.

When Possible

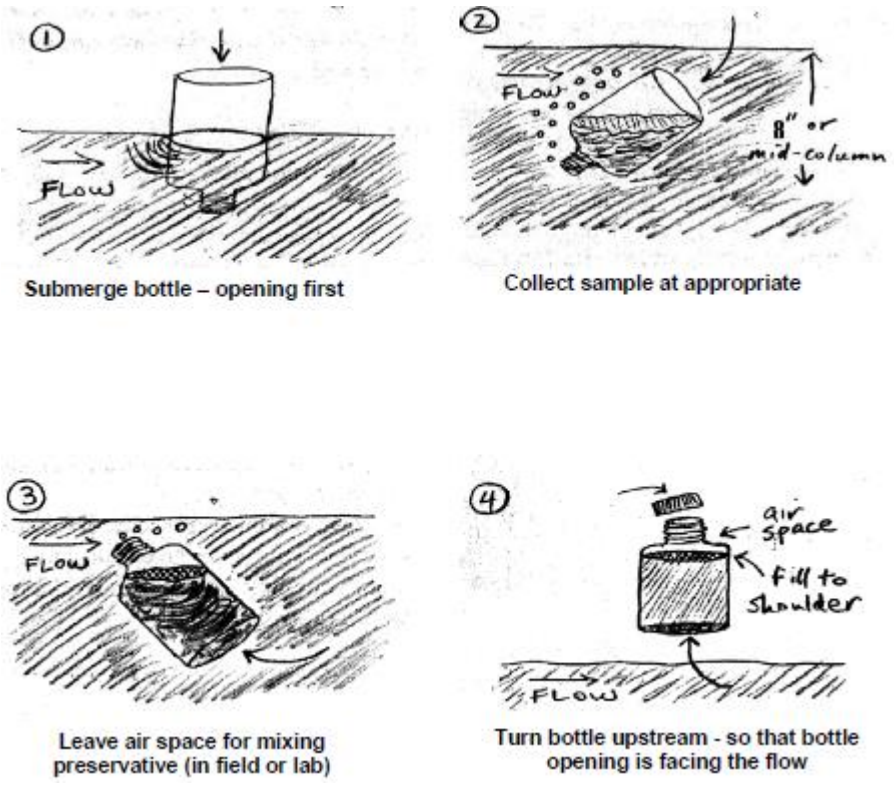
- When wading to the sampling point, enter the stream downstream from the sampling site (to avoid contaminants and particles from other sites that may be on waders, gear, etc.).
- Avoid sampling near structures such as dams, bridges, and banks.
- Sample in a location with a minimum depth of 6 inches and where the stream is flowing and well mixed.

Never

- Continue using a bottle that has hit the bottom of the stream. Discard it and begin with a new bottle.

- Do not let sampling bucket come in contact with anything but water in stream.
- Do not let anything come into contact with the inside of the cap.
- Collect floatables, trash, etc.

Figure 3.3 Correct Sampling Method



3.4.1 Instream Sampling- Wading

1. Enter the stream downstream of the sampling location with the bucket or bottles, including *E.coli* bottle.

2. Walk upstream to the sampling location.

3. Remove the lid from the sample bottle.

4. Avoid touching the lid to prevent contamination.

5. Holding the bottle near its base, lower the bottle opening first into the stream.

6. Invert the bottle below the water surface (elbow depth) and turn toward the current to allow it to fill.

7. When the bottle is 85% full, raise it to the surface, taking care to avoid any surface material.

8. Cap the bottle, avoiding touching the inside of the cap.

9. Repeat steps 3 through 7 for any additional bottles.

10. Take field meter measurements with the Hydrolab/YSI, ensuring that the sensors are not obstructed by vegetation or sediment and allow all readings to stabilize.

11. Return to the vehicle from the sampling site and complete field test.

3.4.2 Instream Grab Sampling – Using Bucket from a Bridge

1. Lower the YSI / Hydrolab to collect field meter measurements. Place the sensors in a well-mixed, flowing portion of the stream at or near the sampling location.

2. Bring bucket sampler and necessary bottles to the bridge above the sampling location. (**Figure 3.4**) Only plastic buckets are used for sampling.

Figure 3.4

3. Rinse the sampler three times in the stream by lowering the bucket, collecting a water sample and emptying out the bucket.

4. Lower the bucket into the stream. Be sure to carefully uncoil the rope, so that it does not scrape against the bridge wall or pick up excess debris from the bridge deck. (**Figure 3.5**)

Figure 3.5

5. Once filled, retrieve the sample bucket, taking care to avoid scraping the rope against the bridge and shaking particles from the rope into the sample.

Figure 3.6

6. Without touching the inside of the bottle or lid, pour the contents of the bucket into the analysis bottles before sediment has time to settle to the bottom of the bucket. (**Figure 3.6**)
7. Repeat steps 3 through 5 if additional samples are needed.

3.5 Sampling Meters

When using the Hydrolab / YSI sampling meter, allow the sensors to stabilize before recording the reading. This can be accomplished by leaving the meter in the water while collecting the sample. Meter readings should be taken using water collected with the sample bucket from the bridge if the cables will not reach the water surface, and only bridge access is possible. (**Figure 3.7**)

Figure 3.7 Hydrolab Surveyor HL with attached HL4 Sonde.

3.6 LaMotte Stormwater Test Kit

Samples are then evaluated using the Stormwater Test Kit at the time samples are collected. Following procedures described in **Appendix B,** water samples are subjected to chemical analysis following LaMotte testing procedures to determine sample results. These results are then recorded on the City of Birmingham Field Work Sheets (**Figure 3.4**). All samples bottles are cleaned immediately after use at each sampling site using 10% HCL (by volume) and rinsing using deionized water. All waste from the cleaning process is collected in waste bottles and disposed of properly.

3.7 Completing Field Sheets

One member of the team can fill out field sheets for the site while the other member is collecting the samples. Equipment needed to measure each parameter is listed in the “equipment” column of the City of Birmingham Field Worksheet (**Figure 3.8**).

CITY OF BIRMINGHAM FIELD WORKSHEET

Section 1: Background Data

Today's date:	Field Objective (circle): (In-Stream) Screening ORI'S		Time (Military):
Site ID: FMC19.5		Sub-Water: Five Mile Creek	HUC 12 CODE: 031601110406
Investigators: D. Cooper, T. Perry		Form completed by: D. Cooper, T. Perry	
Air Temperature (°F): ____	Rainfall (in.): Last 72 hours: ____ Day of Event:____		Total Rainfall (in.): ____ Rain Code:____
Latitude: 33.597546	Longitude: -86.867996	Nearest Address: 3009 Wilkinson Rd., Mt. Olive, AL 35117	
Land Use in Drainage Area (Check all that apply): ☐ Industrial ☐ Ultra-Urban Residential Other: Forest land ☐ Open Space ☐ Institutional ☐ Commercial ☐ Suburban Residential			Photo Log Id #:
Total Rain Fall Code System: 0in. (No Rain Code # 1) 0.01-0.05in. (Trace of Rain Code # 2) 0.06-0.09in. (Light Rain Code # 3) 0.10-0.15in. (Moderate Rain Code # 4) 0.16-0.49in. (Moderate Heavy Rain Code # 5) 0.50-1.00in. (Heavy Rain Code # 6) ≥1.01in. (Very Heavy Rain Code # 7)			

Section 2: Physical Indicators

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Red ☐ Yellow ☐ Green ☐ Orange ☐ Other: (Notes)	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in flow
Floatable -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 3: Quantitative Water Quality Characterization (Flow is needed for all Head Water, Tail Water and Screening Sites)

PARAMETER		RESULT	UNIT	EQUIPMENT
☐ Pipe or Culvert	AVG Flow depth	____ ____ ____ = Avg. ____ Bi-annual/ Fixed	CM	Ruler
	AVG Flow width	____ ____ ____ = Avg. ____ Bi-annual/ Fixed	M	Tape measure
☐Stream	AVG Flow	____ ____ ____ =Avg. ____ Bi-annual/ Fixed	M/S	Pygmy Current Meter
	AVG Flow	____ ____ ____ =Avg. ____ Bi-annual/ Fixed	L/S	1 Liter Sample Bottle
Illicit Discharge Notes :				

Section 4: Qualitative Water Quality Characterization

PARAMETER	RESULT	EQUIPMENT	PARAMETER	RESULT	EQUIPMENT
Water Temperature	°F	YSI	Barometric Pressure	mmHg	YSI
DO%	%	YSI	DO	mg/L	YSI
Conductivity	µS/cm	YSI	pH	Units	YSI
Oxidation Reduction Potential	MV	YSI	Turbidity	NTU	Oakton Meter
Total Hardness	mg/L	Test Strip	Chlorine, Total Residual	mg/L	Stormwater Kit
Chlorine, Total	mg/L	Test Strip	Phenols	mg/L	Stormwater Kit
Chlorine, Free	mg/L	Test Strip	Copper, Total	mg/L	Stormwater Kit
Total Alkalinity	mg/L	Test Strip	Detergents	mg/L	Stormwater Kit
Ammonia	mg/L	Test Strip			

Section 5: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Section 6: Are Lab Samples Collected? ☐**Yes** ☐**No**

Sample Bottles : Mark next to all samples that are collected for lab analysis requested

_____	**BOD**	_____	**TKN**
_____	**TSS**	_____	**TP**
_____	**Ortho PO4**	_____	***E. coli* -E9222D**
_____	**NO_2/NO_3**	_____	**Other:**_____

City of Birmingham Stormwater Management Last Modified:7/5/2016

Figure 3.8 City of Birmingham Field Worksheet

3.7 Taking Photos

Photos can be taken to illustrate problematic stream conditions at the sampling site such as bank erosion, sedimentation, or excessive vegetation. Photos should be labeled with the site ID, date, and photo number from the camera. (**Example: FMC03.6_4.27-17_photo number**). Photos should be loaded onto a photo log and recorded and kept in a computer file for future reference.

An example of a completed Photo Log is shown below **Figure 3.9**

PHOTOGRAPHIC LOG

Project: **City of Birmingham MS4 Program** **IDDE Inspection/Outfall Inspections**	**Location:FMC03.6** **Creek Five Mile** **Outfall ID:FMC03.6- 4.27.2017-001**	**Project No.** **FY2016-2017** **Year 2017 Quarter 3**

Photo No.	**Date:**
001	4/27/2017

Direction Photo Taken:

Latitude:

Longitude:

Township:

Range:

Section:

Description:

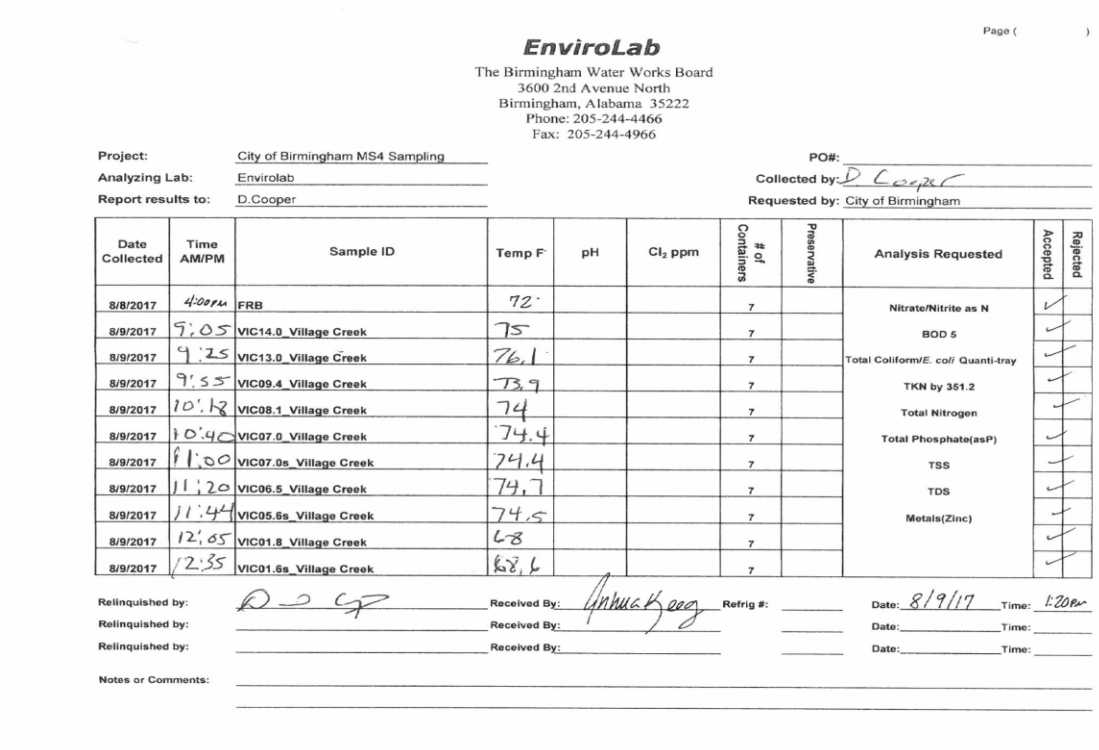
Close up visual of Outfall ID:

4. Post-Sampling Procedures

4.1 Completing Lab Chain of Custody

The chain of custody form (**Figure 4.1**) provides a record and a means to track samples from collection through analysis. Each sample kit will come with a chain of custody form; the original will be kept by the lab and a copy given to the City. The following information should be completed in black pen on the chain of custody form by a City employee: date and time of sample collection, temperature of sample, pH, relinquishing signature, and time and date of relinquishing samples for analysis.

(Figure 4.1)



Page ( )

EnviroLab

The Birmingham Water Works Board
3600 2nd Avenue North
Birmingham, Alabama 35222
Phone: 205-244-4466
Fax: 205-244-4966

Project: City of Birmingham MS4 Sampling — PO#:
Analyzing Lab: Envirolab — Collected by: D. Cooper
Report results to: D.Cooper — Requested by: City of Birmingham

Date Collected	Time AM/PM	Sample ID	Temp F°	pH	Cl_2 ppm	# of Containers	Preservative	Analysis Requested	Accepted	Rejected
8/8/2017	4:00pm	FRB	72			7		Nitrate/Nitrite as N	✓	
8/9/2017	9:05	VIC14.0_Village Creek	75			7		BOD 5	✓	
8/9/2017	9:25	VIC13.0_Village Creek	76.1			7		Total Coliform/*E. coli* Quanti-tray	✓	
8/9/2017	9:55	VIC09.4_Village Creek	73.9			7		TKN by 351.2	✓	
8/9/2017	10:18	VIC08.1_Village Creek	74			7		Total Nitrogen	✓	
8/9/2017	10:40	VIC07.0_Village Creek	74.4			7		Total Phosphate(asP)	✓	
8/9/2017	11:00	VIC07.0s_Village Creek	74.4			7		TSS	✓	
8/9/2017	11:20	VIC06.5_Village Creek	74.7			7		TDS	✓	
8/9/2017	11:44	VIC05.6s_Village Creek	74.5			7		Metals(Zinc)	✓	
8/9/2017	12:05	VIC01.8_Village Creek	68			7			✓	
8/9/2017	12:35	VIC01.6s_Village Creek	68.6			7			✓	

Relinquished by: D C — Received By: Joshua Keeg — Refrig #: — Date: 8/9/17 — Time: 1:20pm
Relinquished by: — Received By: — Refrig #: — Date: — Time:
Relinquished by: — Received By: — Refrig #: — Date: — Time:

Notes or Comments:

4.2 Completing Post-Checklist

The “post” section of the City of Birmingham Stormwater Field Supplies Checklist should be completed upon returning from a sampling event. Re-stocking of chemicals if necessary and clearing of equipment.

4.3 Cleaning Equipment

Equipment should be cleaned and maintained according to instruction manuals. All instruments are checked for calibration the day before the sampling event.

Preventative maintenance is performed on equipment as recommended by the owner's manuals in house as necessary. Replacing used batteries, cleaning and minor equipment evaluation are performed on an ongoing basis.

Occasionally, equipment has to be sent to the manufacturer for more extensive evaluation or repair. All repair information along with shipping information can be found in the owner's manuals or at company web-sites.

4.4 Retrieving Weather Data from Weather Underground

After returning from a sampling event, weather data regarding air temperature, rainfall on the day of sampling, and rainfall 72 hours prior to sampling is collected via Weather Underground.

- Enter http://www.wunderground.com into the web browser.
- Enter zip code from the nearest physical address of the sampling site.
- Click on the weather station for that zip code.
- Locate time from the weather data that is closest to the time sample was taken.
- Record temperature from that time.
- Review rainfall for the sampling day and for the last three days by locating "Precipitation" in the weather summary box (**Figure 4.2**).

Figure 4.2 Weather Summary Box

	High	Low	Average
Temperature	**88.5** °F	**67.1** °F	**77.8** °F
Dew Point	**76.6** °F	**66.2** °F	**71.4** °F
Humidity	**97%**	**60%**	**87%**
Precipitation	**0.02** in	--	--

4.5 Entering Lab Data into Online System

Upon return from a sampling event, field data should be entered into the Microsoft Excel spreadsheet prepared for the current reporting year. There are two separate spread sheets entitled "working" and "final". The "working" spread sheet is where corresponding charts and graphs will be created. The program cannot compute less than (<) or greater than (>) symbols; therefore, the values that would ordinarily contain these symbols are color coded and designated on the spread sheet for less than and greater than color values. The "final" spread sheet is what will be presented in the annual report; therefore it does contain the actual less than and greater than symbols. Lab data is usually received approximately 2-3 weeks from the sample date and should be entered into the spread sheet at that time. Individual data values are reviewed for correctness and for anomalies. If data values are in question the lab is notified for confirmation of values reviewed.

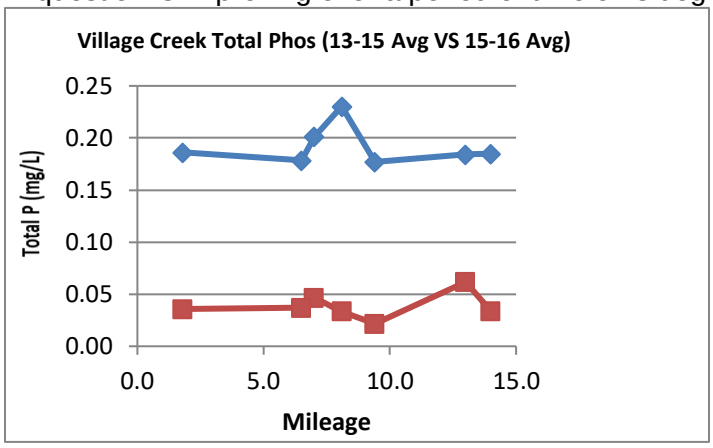
4.6 Calculating Water Quality Data

4.6.1 Determining Pollutant Load:

The water quality calculations used by the City of Birmingham are calculated from field data obtained from flows measured at USGS monitoring sites entering and exiting the City of Birmingham and the actual water quality sample results for each site. The pollutant loads are averaged out over a known period of time, (usually the physical year), to determine what is entering the City and what is exiting the City. The difference in pollutant load is calculated for the flows and for the known period, to determine the concentrations or load contributed by the City of Birmingham's MS4.

4.6.2 Determining Anti-degradation Limits

The actual pollutant concentrations are compared to known concentration ranges that are pre-determined by ADEM for each designated stream type. The field data measured at these sites is compared and averaged and high and low pollutant concentrations are determined in order to compare with known anti-degradation levels. Also geo-mean averaging is used to determine an average pollutant load and the results are compared to know geo-mean average limits that are also determined by ADEM over a known time constraint. These results are indicated on the Anti-degradation portion of the annual report and are used to determine whether the watershed in question is improving over a period of time or is degrading over the same period. After all data is input into the online filing system, graphs are then formulated to analyze results. Graphs such as rainfall data, turbidity, nitrates, conductivity, and total suspended solids (TSS) are created to determine peaks that will later be analyzed through outfall reconnaissance.



In the example of Village Creek Phosphorous **(Figure 4.3)** compairing graphs from FY 2013-2015 to FY 2015-2016 an apparent peck in the data occures for 13-15 at sampling point 7.0. With this information, plans would be made to conduct a outfall dry weather recconnaissance upstream to determine if there is an occurance or discharge entering the MS4 at sampling site 7.0 that may be affecting phoporous levels in Village Creek.

4.6.3 Water Quality Calculations

Water Quality Volume is the treatment volume required to remove a large % (80%) of the average annual, post-development total suspended solids (TSS) load. Storm Water runoff is intercepted by the use of various structural controls. Treatment occurs for various pollutants by

capturing the pollutants in volumes of water that are detained or retained for treatment and then discharge into the water bodies after settling and chemical reactions help reduce pollutant concentrations.

$$WQ_v = 1.1R_vA / 12$$

Where: WQ_v = water quality volume (acre-feet)

1.1 = the 85th percentile annual rainfall depth

R_v = volumetric runoff coefficient

A = total drainage area (acres)

The volumetric runoff coefficient (R_v) is directly proportional to the percent impervious of the drainage area. $R_v = 0.015 + 0.0092(I)$

I = percent (%) of impervious cover

Percentages of land use and impervious surfaces and determined in the watershed in question have to be determined so that Water Quality Volume can be determined. USGS streamstats can be helpful in the process of determining drainage sub-basins.

4.7 Investigating Peaks from Graph

Once peaks are identified through graphing water quality data, Stormwater personnel will go out into the field to do outfall reconnaissance, focusing on pipes with 36” or greater diameter. Outfall reconnaissance shall be conducted before the next bi-monthly sampling event, during a dry period in which there has been no rainfall within the past 72 hours. In the event that a wet pipe is discovered during outfall reconnaissance, field tests will be completed using the Hydrolab or YSI and the Stormwater Kit and an City of Birmingham Field Worksheet (ORI) will be completed (**Figure 3.8**). A separate sheet should be filled out for each wet pipe. Completed ORI worksheets should be turned in to the Investigation Team IDDE of the Stormwater section for follow up and compliance activities.

If an illicit discharge is identified entering the creek, then the investigation is turned over to IDDE staff for further evaluation. Please see IDD&E SOP for additional details.

5.0 Summary:

The water quality sampling program for the City of Birmingham drives Stormwater Management and sets the direction in which the program needs to go. Without proper water sampling procedures in place, it is difficult to obtain reliable results and credible information. Shortcuts should never be taken with sampling protocols and consistency should always be maintained.

MAJOR FINDINGS: WATER QUALITY monitoring is the most critical element when establishing a Stormwater Program. Determining the extent of pollution in a creek or river determines the direction of the program. Consistency and accurate information such as outlined in this Water Quality SOP will help the Stormwater Program for the City of Birmingham maintain a level of profession accuracy and industry performance that will assure good data.

MAJOR ACCOMPLISHMENTS: OVERALL MONITORING IN THE FIVE CITY OF BIRMINGHAM WATERSHEDS HAS SHOWN THROUGH SAMPLING OVER A PERIOD OF TIME (ALMOST 5 YEARS OF DATA) THAT TMDL LEVELS HAVE ETHER IMPROVED OR HAVE REMAINED THE SAME OVER THIS 5 YEAR PERIOD. STORMWATER MANAGEMENT WAS ABLE TO CONDUCT 6 SAMPLING (BIMONTHLY) EVENTS AT SCREENING AND SAMPLING SITES THAT ARE REPRESENTATIVE OF EACH WATERSHED. METHODS DESCRIBED IN THIS SOP WERE CONSISTENTLY USED TO OBTAIN DATA AND THIS INFORMATION WAS RECORDED AND CERTIFIED BEFORE BEING EVALUATED AND REPORTED TO ADEM. The evaluation helps to establish where resources for the City of Birmingham need to be concentrated to improve water quality. Communication between Water Quality and IDD&E programs allows the City to find illicit discharges and to help eliminate these discharges from the MS4.

PROGRAM STRENGTHS/WEAKNESSES: The strengths of providing consistent and accurate sampling events throughout the City allows the Stormwater Program to assure the data collected is correct. Recent equipment problems have been at issue during sampling events, but additional training with new equipment allows for data collection to continue to be complete and accurate.

FUTURE DIRECTION: Further reduction of pollutant loads in the MS4 rely on accurate information and consistency of data collection. Following this Water Quality SOP should maintain consistency and safety while conducting field operations during data collection.

Calibration and documentation should always be thorough and complete. Using this document as a guide to maintain consistency.

Appendix A

Explanation of Field Sheets

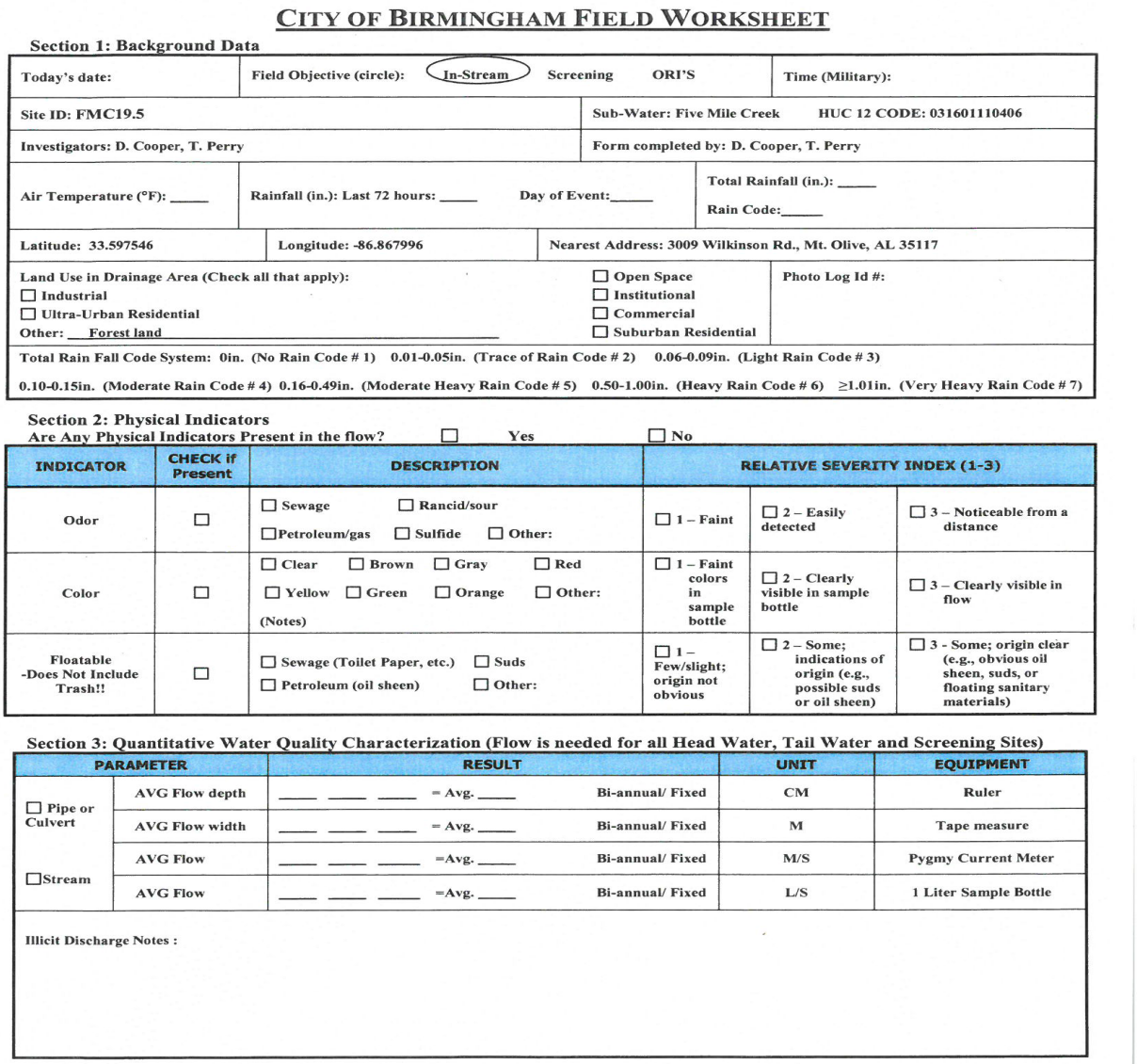
➢ City of Birmingham Field Worksheet

Section 1: Background Data

- **Today's date**- sampling date
- **Field objective**- sampling category (Instream, Screening, or ORI's)
- **Time (Military)**- sampling time in military format
- **Site ID**- unique site identifier
- **Sub-water**- major contributing body of water
- **HUC 12 code**- 12 digit hydrologic unit code
- **Investigators**- names of each sampler
- **Form completed by**- name of sampler completing form
- **Air temperature**- air temperature at time of sampling
- **Rainfall (in.) last 72 hours**- accumulation of rain 72 hours prior to sampling
- **Rainfall (in.) day of event**- current accumulation of rain
- **Total** rainfall- combination of rainfall 72 hours prior and current rainfall accumulation
- **Rain code**- category of rainfall based on inches of rain accumulated
    - **Code #1**: 0 in. (No Rain)
    - **Code #2**: 0.01 - 0.05 in. (Trace of Rain)
    - **Code #3**: 0.06 - 0.09 in. (Light Rain)
    - **Code #4**: 0.10 - 0.15 in. (Moderate Rain)
    - **Code #5**: 0.16 - 0.49 in. (Moderate Heavy Rain)
    - **Code#6**: 0.50 - 1.00 in. (Heavy Rain)
    - **Code#7**: ≥1.01 in. (Very Heavy Rain)
- **Latitude**- latitudinal coordinate
- **Longitude**- longitudinal coordinate
- **Nearest address**- physical address closest to sampling site
- **Land use in drainage area**- category(ies) of what land is used for
    - Industrial
    - Ultra-urban residential
    - Open space
    - Institutional
    - Commercial
    - Suburban residential
- **Photo log ID**- identification of photos taken at site during sampling (See Figure 3.5)

Section 2: Physical Indicator

- **Odor**- any smells coming from the water (sewage, rancid smell, gas, sulfide)
- **Color**- color or discoloration of water (clear, brown, gray, yellow, green, orange, other)
- **Floatable**- objects in water (sewage, suds, petroleum, other)
- **Relative severity index**- severity of indicator on a scale of 1-3



CITY OF BIRMINGHAM FIELD WORKSHEET

Section 1: Background Data

Today's date:	Field Objective (circle): (In-Stream) Screening ORI'S	Time (Military):
Site ID: FMC19.5	Sub-Water: Five Mile Creek	HUC 12 CODE: 031601110406
Investigators: D. Cooper, T. Perry	Form completed by: D. Cooper, T. Perry	
Air Temperature (°F): ____	Rainfall (in.): Last 72 hours: ____ Day of Event:____	Total Rainfall (in.): ____ Rain Code:____
Latitude: 33.597546	Longitude: -86.867996	Nearest Address: 3009 Wilkinson Rd., Mt. Olive, AL 35117
Land Use in Drainage Area (Check all that apply): ☐ Industrial ☐ Ultra-Urban Residential Other: Forest land ☐ Open Space ☐ Institutional ☐ Commercial ☐ Suburban Residential		Photo Log Id #:
Total Rain Fall Code System: 0in. (No Rain Code # 1) 0.01-0.05in. (Trace of Rain Code # 2) 0.06-0.09in. (Light Rain Code # 3) 0.10-0.15in. (Moderate Rain Code # 4) 0.16-0.49in. (Moderate Heavy Rain Code # 5) 0.50-1.00in. (Heavy Rain Code # 6) ≥1.01in. (Very Heavy Rain Code # 7)		

Section 2: Physical Indicators

Are Any Physical Indicators Present in the flow? ☐ Yes ☐ No

INDICATOR	CHECK if Present	DESCRIPTION	RELATIVE SEVERITY INDEX (1-3)		
Odor	☐	☐ Sewage ☐ Rancid/sour ☐ Petroleum/gas ☐ Sulfide ☐ Other:	☐ 1 – Faint	☐ 2 – Easily detected	☐ 3 – Noticeable from a distance
Color	☐	☐ Clear ☐ Brown ☐ Gray ☐ Red ☐ Yellow ☐ Green ☐ Orange ☐ Other: (Notes)	☐ 1 – Faint colors in sample bottle	☐ 2 – Clearly visible in sample bottle	☐ 3 – Clearly visible in flow
Floatable -Does Not Include Trash!!	☐	☐ Sewage (Toilet Paper, etc.) ☐ Suds ☐ Petroleum (oil sheen) ☐ Other:	☐ 1 – Few/slight; origin not obvious	☐ 2 – Some; indications of origin (e.g., possible suds or oil sheen)	☐ 3 - Some; origin clear (e.g., obvious oil sheen, suds, or floating sanitary materials)

Section 3: Quantitative Water Quality Characterization (Flow is needed for all Head Water, Tail Water and Screening Sites)

PARAMETER		RESULT		UNIT	EQUIPMENT
☐ Pipe or Culvert	AVG Flow depth	____ ____ ____ = Avg. ____	Bi-annual/ Fixed	CM	Ruler
	AVG Flow width	____ ____ ____ = Avg. ____	Bi-annual/ Fixed	M	Tape measure
☐Stream	AVG Flow	____ ____ ____ =Avg. ____	Bi-annual/ Fixed	M/S	Pygmy Current Meter
	AVG Flow	____ ____ ____ =Avg. ____	Bi-annual/ Fixed	L/S	1 Liter Sample Bottle

Illicit Discharge Notes :

Figure 3.4 City of Birmingham Field Worksheet

Section 3: Quantitative Characterization

- **AVG flow depth**- average flow taken with ruler
- **AVG flow width-** average flow taken with tape measure
- **AVG flow**- average flow taken with Pygmy current meter
- **AVG flow**- average flow taken with 1 Liter sample bottle
- **Water temperature**- temperature of water
- **DO**- level of oxygen present in the water
- **DO%**- percentage of dissolved oxygen in water
- **Barometric pressure**
- **Conductivity**- capability of a solution such as water in a stream to pass an electric current
- **Oxidation reduction potential**- ability to break down contaminants

Section 4: Quantitative Water Quality Characterization (continued)

- **Nitrates (NO_3)**- measure of nitrogen in water
- **Total hardness**- sum of calcium and magnesium present in water
- **Chlorine, Total**- measure of both free and combined forms of chlorine
- **Chlorine, Free**- dissolved chlorine in water
- **Total alkalinity**- the buffering power of the water to keep its pH from changing
- **Ammonia**- amount of ammonia in water
- **Turbidity**- cloudiness of water caused by suspended particles
- **Chlorine, Total residual**- sum of free chlorine and combined chlorine in fresh water
- **Phenols-** measure of industrial chemicals in water
- **Copper, Total**- measure of copper in water
- **pH-** measure of the acidity or alkalinity of water
- **Detergents-** measure of detergents in water

Section 5: Non illicit discharge comments. This may be trash removal or a possible repair needed to the culvert or another comment.

Section 6: Lab analysis and lab samples collected.

Figure 3.8 City of Birmingham Field Worksheet

Section 4: Qualitative Water Quality Characterization

PARAMETER	RESULT	EQUIPMENT	PARAMETER	RESULT	EQUIPMENT
Water Temperature	°F	YSI	Barometric Pressure	mmHg	YSI
DO%	%	YSI	DO	mg/L	YSI
Conductivity	µS/cm	YSI	pH	Units	YSI
Oxidation Reduction Potential	MV	YSI	Turbidity	NTU	Oakton Meter
Total Hardness	mg/L	Test Strip	Chlorine, Total Residual	mg/L	Stormwater Kit
Chlorine, Total	mg/L	Test Strip	Phenols	mg/L	Stormwater Kit
Chlorine, Free	mg/L	Test Strip	Copper, Total	mg/L	Stormwater Kit
Total Alkalinity	mg/L	Test Strip	Detergents	mg/L	Stormwater Kit
Ammonia	mg/L	Test Strip			

Section 5: Any Non-Illicit Discharge Concerns (e.g., trash or needed infrastructure repairs)?

Section 6: Are Lab Samples Collected? ☐**Yes** ☐**No**

Sample Bottles : Mark next to all samples that are collected for lab analysis requested

_____ **BOD** _____ **TKN**

_____ **TSS** _____ **TP**

_____ **Ortho PO4** _____ ***E. coli* -E9222D**

_____ **NO_2/NO_3** _____ **Other:**_____

Lab Sheets

Figure 4.3

EnviroLab
3600 Second Avenue North
Birmingham, AL 35222
(205) 244 - 4466

EnviroLab

Stormwater for the City of Birmingham

System: BWWB
Laboratory: EnviroLab
Site: Trip Blank
Sample ID: 2017080712-006
Date Collected: 8/9/2017

EPA ID: AL00028
State ID: 30010
PWS ID: 0000738
Matrix: Raw Water
Collector: J.Keedy

Parameters	Results	Units	Analyst	Date	MCL	Method
BOD - 5	<1.00	mg/L	DGesualdo	8/15/2017		SM 5210 B
E-Coli	<1.00	mpn/100ml	DGesualdo	8/11/2017		SM 9223B QT
Nitrate as N	<0.23	mg/L	RBanks	8/10/2017		EPA 300.0
Nitrite as N	<0.30	mg/L	RBanks	8/10/2017		EPA 300.0
TKN	<0.5	mg/L	Mstoudemire	8/22/2017		EPA 351.2
Total Coliform	<1.00	mpn/100ml	DGesualdo	8/11/2017		SM 9223B QT
Total Nitrogen	<0.23	mg/L	RBanks	8/24/2017		EPA 300.0/ 351.2
Total Phosphorus	<0.01	mg/L	MJefferson	8/10/2017		Hach 10210
Total Suspended Solids (TSS)	<1.00	mg/L	DGesualdo	8/11/2017		SM 2540-D

Approved By: OKelly 8/11/2017

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METHOD REFERENCES

(1) Methods for Chemical Analysis of Water. EPA-500 Series (Organic Compounds in Drinking Water)
(2) Methods for Chemical Analysis of Water and Wasters. EPA 200 (Water and Waste)
(3) Methods for Chemical Analysis of Water and Wasters. EPA-600/4-79-20, revised March 1983, August 1993, May 1994
(4) Standard Methods for the Examination of Water, 18th, 19th, and 20th Edition, 1998
(3) Code of Federal Regulations, Title 40, Part 136 Appendix A, Revised July 1995

Parameters and results are taken directly from lab results as seen in (**Figure 4.3**) and entered into Excel Water Quality spread sheet for statistical evaluation and graphing.

Appendix B

Testing Procedures

LaMotte STORM DRAIN KIT MODEL SSDK CODE 7446

This portable field kit was specifically designed and manufactured to meet the U.S. EPA requirements specified in Federal Register, November 16, 1990 Vol. 55 No. 217. Read this and all other accessory instructions before use to familiarize yourself with the test procedures. Be sure to read all MSDS sheets and safety instructions prior to use. ***WARNING:** Reagents marked with an * are considered to be potential health hazards. To view or print a Material Safety Data Sheet (MSDS) for these reagents go to www.lamotte.com. To obtain a printed copy, contact LaMotte by e-mail, phone or fax. To order individual reagents or test kit components, use the specified code number.

MISCEL LANEOUS ACCESSORIES

QTY. CONTENTS CODE

1 Beaker, plastic 250 mL, 0609

1 Graduated Cylinder, 10 mL, plastic 2-2296

1 Octa-Slide Viewer 1100

1 Test Tube Brush 0514

USE OF THE OCTA-SLIDE VIEWER

The Octa-Slide Viewer (1100) should be held so non-direct light enters through the back of the comparator. With sample tube inserted at top, slide the Octa-Slide bar through the viewer and match with color standards.

GLASSWARE CLEANING PROCEDURE

It is important to rinse test tubes using 10% HCL (by volume) once and then with Deionized Water, once, after each test procedure is completed. At the end of each day, all sampling and test glassware should be brushed with the test tube brush (0514) and 10% HCL or detergent and

rinsed three times in succession with Deionized Water. This procedure can best be performed in your laboratory. To avoid possible detergent test interference, do not use detergent to clean Detergent Bottle (0800), rinse three times in succession with Deionized Water only.

TOTAL RESIDUAL CHLORINE PROCEDURE

METHOD - DPD

ACCURACY ±10%

QTY. CONTENTS CODE

100 *Chlorine DPD #4R Tablet *6899A-J

2 Test Tubes, plastic, w/caps 0106

1 Chlorine Octa-Slide Bar,

0.2-3.0 ppm

3401

PROCEDURE

1. Fill test tube (0106) to 5 mL line with water sample.

2. Add one *Chlorine DPD #4R Tablet (6899A). Cap and shake until dissolved.

3. Insert test tube into Octa-Slide Viewer (1100). Match color with a standard on the Chlorine Octa-Slide Bar (3401). Record as ppm Total Residual Chlorine.

PHENOLS PROCEDURE

METHOD - AMINOANTIPYRINE

ACCURACY ±10%

QTY. CONTENTS CODE

10 g Aminoantipyrine Reagent 7825-D

60 mL *Ammonium Hydroxide Solution *7826-H

2 x 100 mL *Potassium Ferricyanide Solution *7827-J

1 Spoon, 0.1 g 0699

1 Pipet, plain, glass, w/cap 0344

1 Pipet Assembly, 1.0 mL, plastic, w/cap 0330

2 Test Tubes, plastic, w/caps 0106

1 Phenols Octa-Slide Bar, 0-5 ppm 3434

1 Sample Reaction Tube 0837

PROCEDURE

1. Fill Sample Reaction Tube (0837) to line with sample water.

2. Use 0.1 g spoon (0699) to add 1 measure of Aminoantipyrine Reagent (7825). Cap and mix.

3. Use the unmarked pipet (0344) to add 4 drops of *Ammonium Hydroxide Solution (7826). Cap and mix.

4. Use the 1.0 mL pipet (0330) to add 2 mL (2 measures) of *Potassium Ferricyanide Solution (7827). Cap and mix. Solution will turn orange/pink if phenols are present.

5. Fill test tube (0106) to 10 mL line with solution. Insert test tube into Octa-Slide Viewer (1100). Match sample color to a color standard on Phenols Octa-Slide Bar (3434). Record as ppm Phenols.

TOTAL COPPER PROCEDURE

METHOD - DIETHYLDITHIOCARBAMATE

ACCURACY ±10%

QTY. CONTENTS CODE

30 mL *Copper 1 *6446-G

2 Test Tubes, plastic, w/caps 0106

1 Copper Octa-Slide Bar, 0-4.0 ppm 3435

PROCEDURE

1. Fill two test tubes (0106) to 10 mL line with sample water.

2. Add 5 drops of *Copper 1 (6446) to one test tube. Cap and invert to mix. If more yellow than second test tube, copper is present.

3. Insert each test tube into Octa-Slide Viewer (1100). Match color with a standard in Copper Octa-Slide Bar (3435).

4. Subtract the unreacted sample result from the reacted sample result. Record result as ppm Copper.

DETERGENTS PROCEDURE

METHOD - SOLVENT EXTRACTION/

BROMPHENOL BLUE INDICATOR

ACCURACY ±0.1 ppm

QTY. CONTENTS CODE

60 g *Detergent Reagent #1 *7444-H

3 x 100 mL *Detergent Reagent #2 *6037-J

100 mL *Detergent Reagent #3 *7445-J

1 Pipet, 0.5 mL, glass, w/cap 0335

1 Spoon, 1.0 g 0697

1 Bottle, French,

Calibrated to 65 & 75 mL 0800

PROCEDURE

1. Fill Bottle (0800) to 65 mL line with sample water.

2. Use the 1.0 g spoon (0697) to add 2 measures of

*Detergent Reagent #1 (7444). Shake until dissolved

3. Fill to 75 mL line with Detergent Reagent #2 (6037).

4. Use pipet (0335) to add 0.5 mL Detergent Reagent #3

(7445). Shake vigorously for 15 seconds. Wait until layers separate (20-30 seconds). If the top layer is light blue, less than 0.1 ppm detergent is present and no further testing is necessary. If the top layer is colorless, continue adding Detergent Reagent #3 (7445), 0.5 mL at a time, shaking vigorously for 15 seconds after each addition , allowing the layers to separate until the top layer is light blue. Count the number of additions of

0.5 mL additions of Detergent Reagent #3 (7445) required to change the top layer in the Bottle from colorless to light blue.

5. Detergent concentrations in ppm = (Number of pipets Detergent #3 (7445) - 1) x 0.1.

EXAMPLE: If it takes 9 pipets to turn top layer light blue. (9-1) x 0.1 = 0.8. The amount of detergent is greater than 0.7 ppm but less than 0.9 ppm detergent.

Appendix C

Outfall Types and Potential Illicit Discharges

Figure 0-1: Typical Outfall Types Found in the Field (Brown, Caraco and Pitt 2004)

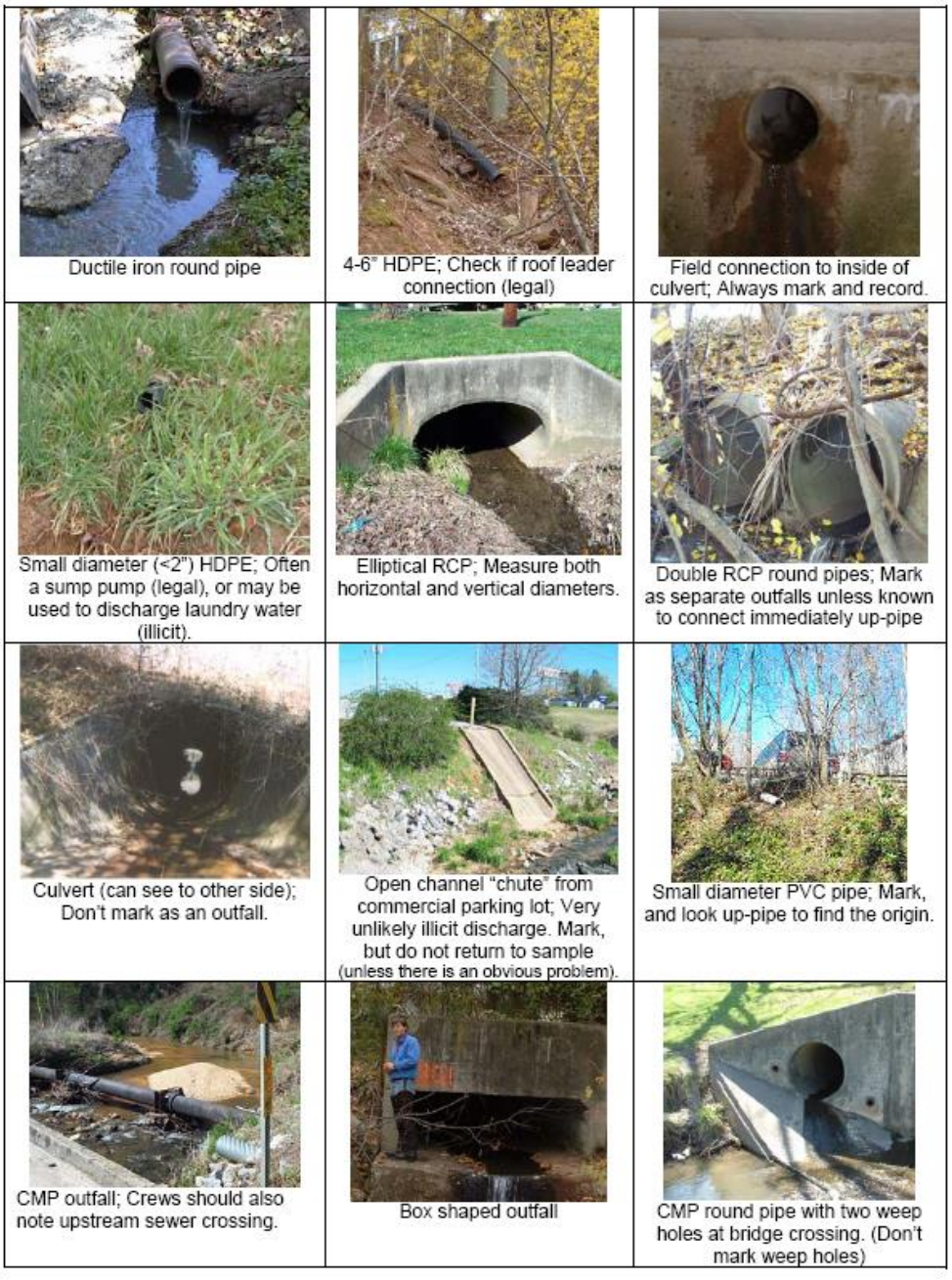


Figure 0-2: Characterizing Submersion and Flow (Brown, Caraco and Pitt 2004)

Figure 0-3: Measuring Flow (Brown, Caraco and Pitt 2004)
(as velocity times cross-sectional area)

Figure 0-4: Interpreting Color and Turbidity (Brown, Caraco and Pitt 2004)

Color: Brown; Severity: 2
Turbidity Severity: 2

Chromium Spill
Color: Green; Severity: 3
Turbidity Severity: None

Highly Turbid Discharge
Color: Brown; Severity: 3
Turbidity Severity: 3

Sewage Discharge
Color: 3
Turbidity: 3

Paint
Color: White; Severity: 3
Turbidity: 3

Industrial Discharge
Color: Green; Severity: 3
Turbidity Severity: 3

Blood
Color: Red; Severity: 3
Turbidity Severity: None

Failing Septic System:
Turbidity Severity: 3

Turbidity in Downstream Plume
Turbidity Severity: 2
(also confirm with sample bottle)

High Turbidity in Pool
Turbidity Severity: 2
(Confirm with sample bottle)

Iron Floc
Color: Reddish Orange; Severity: 3
(Often associated with a natural source)

Slight Turbidity
Turbidity: 1
(Difficult to interpret this observation; May be natural or an illicit discharge)

Construction Site
Discharge
Turbidity Severity: 3

Discharge of Rinse from Floor Sanding (Found during wet weather)
Turbidity Severity: 3

Figure 0-5: Determining the Severity of Floatables (Brown, Caraco and Pitt 2004)

<table>
<tr><th colspan="3">SUDS</th></tr>
<tr>
<td> 
Natural Foam
Note: Suds only associated with high flows at the “drop off”
Do not record.</td>
<td> 
Low Severity Suds
Rating: 1
Note: Suds do not appear to travel; very thin foam layer</td>
<td> 
High severity suds
Rating: 3
Sewage</td>
</tr>
<tr><th colspan="3">OIL SHEENS</th></tr>
<tr>
<td> 
Low Severity Oil Sheen
Rating: 1</td>
<td> 
Moderate Severity Oil Sheen
Rating: 2</td>
<td> 
High Severity Oil Film
Rating: 3</td>
</tr>
</table>

Figure 0-6: Interpreting Benthic and Other Biotic Indicators (Brown, Caraco and Pitt 2004)

Bacterial growth at this outfall indicates nutrient enrichment and a likely sewage source.

This bright red bacterial growth often indicates high manganese and iron concentrations. Surprisingly, it is not typically associated with illicit discharges.

Sporalitis filamentous bacteria, also known as "sewage fungus" can be used to track down sanitary sewer leaks.

Algal mats on lakes indicate eutrophication. Several sources can cause this problem. Investigate potential illicit sources.

Illicit discharges or excessive nutrient application can lead to extreme algal growth on stream beds.

The drainage to this outfall most likely has a high nutrient concentration. The cause may be an illicit discharge, but may be excessive use of lawn chemicals.

This brownish algae indicates an elevated nutrient level.

Appendix D

Equipment Manuals

YSI Professional Plus Manual:

https://www.ysi.com/.../Manuals/605596-YSI-ProPlus-User-Manual-RevD.pdf

Hydrolab HL Surveyor Manual:

www.ott.com/download/survey-hl-handheld-manual

Hydrolab Sonde HL 4 Manual:

www.ott.com/download/hydrolab-hl4-manual/

Oakton Turbidity Meter t-100:

www.4oakton.com/Assets/manual_pdfs/35635-00.pdf

pHTestr 10 PROCEDURE:

INSTRUCTION MANUAL

pHTestr 10, 20, 30, 10BNC, Spear

Large Screen

Waterproof pH / Temperature Tester

Double Junction

Introduction

Thank you for selecting our microprocessor waterproof pH tester with USA or NIST buffer set selection. You have one of five models:

• pHTestr10

• pHTestr20

• pHTestr30

• pHTestr10BNC

• pHSpear

This manual provides a step-by-step guide to operate the testers.

Before you begin:

Condition your pHTestr 10, 20, 30 electrodes by immersing it in electrode storage solution or tap water for at least 30 minutes before use. DO NOT use de-ionized water.

Ensure that your pH Spear electrode is always soaked in the electrode storage solution or tap water via its protective cap.

Note: For pHTestr10BNC, please refer to the pH electrode's instruction manual.

pH Buffer Set Selection

Your tester features USA (pH 4.01, pH 7.00 and pH 10.01) or NIST (pH 4.01, pH 6.86, and pH 9.18) standards. Select either one to suit your requirements.

1. While pressing the HOLD/ENT button, switch on the tester by pressing the ON/OFF button.

2. Release the HOLD/ENT button. The display will flash either USA or NIST.

3. Press CAL button to toggle between the two buffers set standards.

4. Press the HOLD/ENT button to confirm the selection of the buffer set.

With meter powered off, press HOLD/ENT and ON/OFF at the same time. First release ON/OFF button, then HOLD/ENT button. After buffer selection, whole LCD segment lights up and goes back to measurement mode

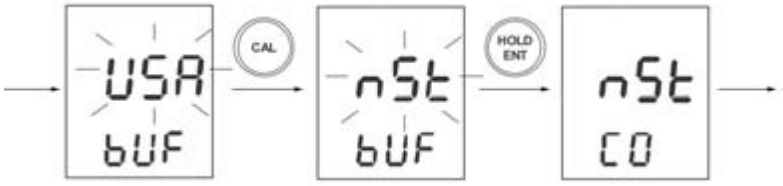


Figure 1: Buffer Selection Sequence

pH Calibration

Calibration should be done regularly, preferably once a week. You can calibrate up to three points using either the USA or the NIST buffer set standards.

1. Press ON/OFF button to switch unit on.

2. Dip electrode about 2 to 3 cm into the pH standard buffer solution.

3. Press the CAL button to enter calibration mode. The ‘CAL’ indicator will be shown. The upper display will show the measured reading based on the last calibration while the lower display will indicate the pH standard buffer solution.

Note: All testers have dual display during calibration mode

Note: To abort calibration, press the ‘CAL’ button.

4. Allow about 2 minutes for the tester reading to stabilize before pressing the HOLD/ENT button to confirm the first calibration point. The upper display will be calibrated to the pH standard buffer solution and the lower display will then be toggling in between readings of the next pH standard buffer solution.

5. Repeat with other buffers if necessary. Rinse electrode in tap water before dipping into next buffer.

Note: The calibration mode allows you to perform up to three calibration points before returning to the measurement mode automatically. However, if you opted to have only one or two calibration points, simply skip the remaining calibration points by exiting to the measurement mode by pressing the CAL button.

To do a 1 point calibration only, press CAL button at this point to exit to the measurement mode. Otherwise, proceed to second buffer for a second buffer for a second point calibration.

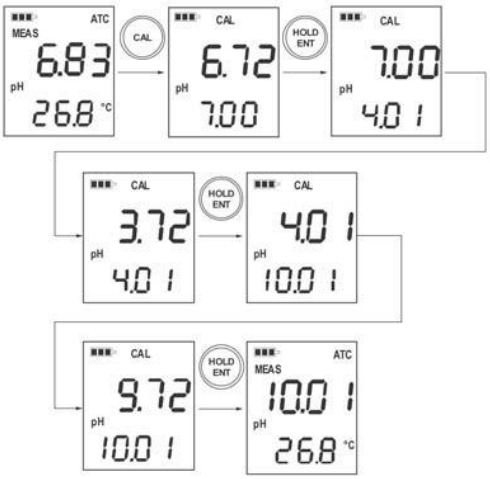


Figure 2: Example of pH Calibration Sequence

To do a 2 point calibration only, press CAL button at this point to exit to the measurement mode. Otherwise, proceed to third buffer for a third buffer for a third point calibration. After the third point calibration, the meter will automatically return to the measurement mode. At any point, an error message ‘Er. 1’ will be displayed momentarily if the confirmed pH value is not within the pH calibration window.

pH Measurement

1. Press the ON/OFF button to switch the tester on.

2. Dip the electrode about 2 to 3 cm into the test solution. Stir and let the reading stabilize. For pHSpear, pierce the penetrating tip electrode through your semi solid sample as per the desired depth. Rotate left and right several times and tilt to ensure sample contact.

3. Note the pH value or press HOLD/ENT button to freeze the reading. To release the reading, press HOLD/ENT again.

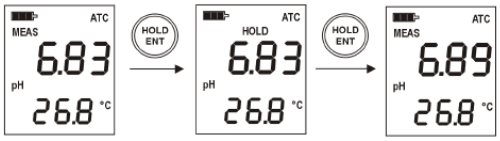
4. Press ON/OFF to turn off tester. If you do not press a button for 8.5 minutes, the tester will automatically shut off to conserve batteries.

HOLD Function

This feature lets you freeze the display for a delayed observation

1. Press HOLD/ENT button to freeze the measurement. A ‘HOLD’ indicator will be displayed and the measurement will be frozen.

2. Press HOLD/ENT again to release the measurement. The ‘HOLD’ indicator will not be displayed anymore indicating the held measurement is released.



User Reset

You can reset the pH calibration to the factory default by using the user reset function.

Buffer set selection and temperature user calibration (pHTestr30) are not affected by the user reset function.

1. Switch off the tester.

2. While pressing the ‘CAL’ button, press and release the ON/OFF button to enter the ‘User Reset’ selection menu. The screen will display ‘rSt’ on the bottom display with a flashing ‘nO’ selection.

3. Use the ‘CAL’ button to toggle between ‘nO’ and ‘YES’ selection.

• nO deactivates reset selection

• YES activates the reset selection

4. Press the HOLD/ENT button to confirm the selection made.

5. If you have selected ‘YES’, the unit will show ‘CO’ momentarily and proceed to the measurement mode with the calibration reset back to factory default value.

6. If ‘nO’ is selected, the unit will proceed to the measurement mode without any calibration reset performed.

With meter powered off, press CAL and ON/OFF at the same time. First release ON/OFF button, then CAL button, after reset, whole LCD segment lights up and goes back to measurement mode.

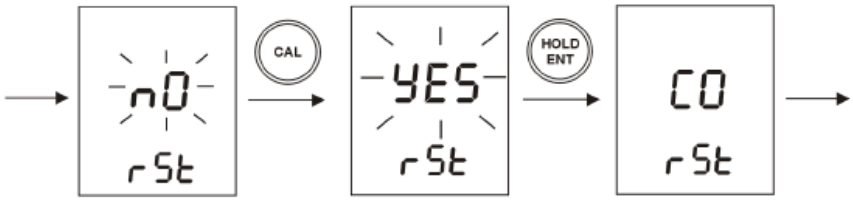


Figure 5: User Reset Sequence

Automatic Temperature Compensation (ATC)

ATC feature is available only in pHTestr 10, pH Testr 20 and pH Testr 30. Through its inbuilt temperature sensor, the measurement error due to the changes in electrode sensitivity due to changes in temperature is compensated to give the actual pH reading of the sample measured. pH Testr10BNC and pH Spear has no ATC function and therefore the error should be calculated to derive the actual pH reading of the sample. For these testers, the impact on temperature compensation is 0.003 pH /°C / pH away from pH 7. For example, if pHSpear is calibrated at room temperature (25 °C) and is measuring sample around pH 4 at around 5 °C. Temperature difference: 25°C - 5°C = 20 °C pH away from neutral: 7pH - 4pH =3 pH Total error: 0.003 x 20 x 3 = 0.18 pH this error value of 0.18 pH should be taken into consideration to derive the actual pH reading of the sample.

Temperature Calibration (Only for pHTestr 30)

From the measurement mode,

1. Press the HOLD/ENT button to bring the tester to the ‘HOLD’ mode.

2. Press the CAL button for seconds to switch to the °C or °F mode setting selection screen. Pressing the CAL button continuously for 3 seconds allows you to toggle in between the °C and °F mode setting selection screen.

3. Release the CAL button to confirm your mode selection and the display will go to the temperature calibration mode with the upper display flashing. The upper display shows the current measured temperature reading based on the last set offset and the lower display shows the current measured temperature reading based on factory default calibration.

4. Dip the tester into a solution of known temperature and allow time for the built in temperature sensor to stabilize.

5. Press the HOLD/ENT button to set the upper display to the temperature value of the solution.

6. Once the new temperature setting is reached, the new value is automatically confirmed and returns to the measurement mode if no button is pressed after 5 seconds.

Notes: To exit this program without confirming the calibration, press the CAL button before the automatic confirmation takes place.

Continuous pressing of CAL button (about 3 seconds) to toggle between temperature setting of degrees Celsius and Fahrenheit. Release CAL button to start entering the new temperature during calibration, upper display will flash. Press HOLD/ENT to increase offset up to +5 °C (+9 °F) from default value. It will roll over to -5 °C (-9 °F) from default value and start increasing again. When the temperature offset value is reached, the new value is automatically confirmed if no key is pressed for 5 seconds.

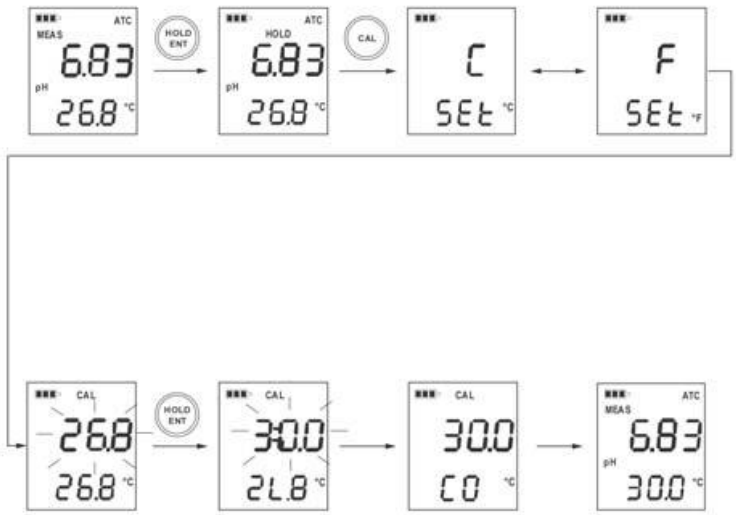


Figure 6: Temperature Calibration Sequence (Only for pHTestr 30DJ)

Electrode Maintenance

1. Rinse the electrode with tap water or electrode storage solution after each measurement. Care has to be taken not to damage the sensor's glass electrode especially while rinsing the pHSpear penetrating tip electrode.

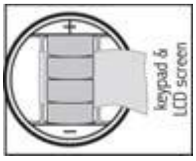
2. In aggressive chemicals, dirty or viscous solutions, and solutions with heavy metals or proteins, take readings quickly and rinse electrode immediately afterward. For the pHSpear, the remnants of the semi solid samples on the penetrating electrode can be removed by rubbing it with some table salt and then rinsing. Mild detergent can be used to wash the penetrating electrode clean.

3. If possible, keep a small piece of paper or sponge in the electrode cap – moistened with clean water or electrode storage solution (NOT de-ionized water) – and close the cap over the electrode. For pHSpear, ensure that the electrode is kept soaked in electrode storage solution or tap water via its protective cap.

Changing Batteries

1. Open battery compartment lid (with attached lanyard loop).

2. Remove old batteries; replace with fresh ones. Note polarity



Self-Diagnostic Messages

Low battery indicator

3 Bars indicates Battery is full (100%)

2 Bars indicates 50% of the battery life is left 

1 Bar indicates 25% of the battery life is left 

Blinking battery casing indicates the need to replace batteries with fresh ones as specified by manufacturer

Over range / Under range signal

Or / Ur(Still)

Electrode is not in contact with solution or electrode is failing.

Replacement sensor is not connected properly to the tester during sensor replacement

Measured pH value or temperature value (pHTestr30) exceeds its specified maximum or minimum value

ATC / Or / Ur (Blinking)

Blinking ‘ATC’, ‘Or’ or ‘Ur’ indicates that there is a short or open circuit at the built in temperature sensor

Error Message

E r. 0

Temperature calibration error of attempting to calibrate tester to a value which is out of range or under range pH calibration error of attempting to confirm a calibration value which is not within the specified calibration window.

E r. 1

pH calibration error of attempting to confirm a calibration value which is not within the specified calibration window

Electrode Replacement

You can replace the electrode module at the fraction of the cost of a new tester. When the tester fails to calibrate or gives fluctuating readings in calibration standards, you need to change the electrode.

1. With dry hands, grip the ribbed tester collar with electrode facing you. Twist the collar counter clockwise (see picture A). Save the ribbed tester collar and O-ring for later use.

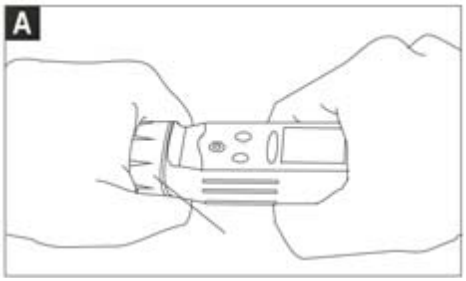
2. Pull the old electrode module away from the tester.

3. Align the four tabs on the new module so that they match the four slots on the tester (see picture B).

4. Gently push the module onto the slots to sit it in position. Push the smaller O-ring fully onto the new electrode module. Push the collar over the module and thread it into place by firmly twisting clockwise.

Note: It is necessary that you recalibrate your tester prior to measurement after an electrode replacement.

Rotate collar away from you

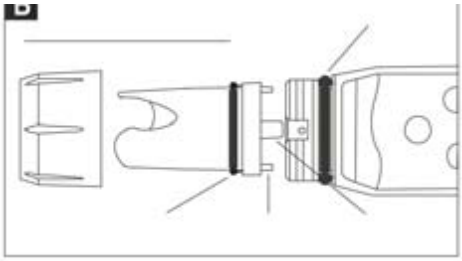


Ribbed collar

Figure 7: Removal of collar from tester

Insert Electrode Module

Electrode Module **Large O-ring**



Small O-ring **Small Tab** **Large Tab**

Figure 8: Example of electrode module fitting alignment

Applications

Water quality testing • pools • spas • aquariums • aquaculture • hydroponics •ecology studies • water and wastewater treatment • boilers • steam generators •car washes • sanitation plants • labs • food sectors and more!

Warranty

The waterproof pHTestr10, pHTestr20, pHTestr30, pHTestr10BNC and pH Spear are warranted to be free from manufacturing defects for 2 years and electrode module for 6 months. If repair, adjustment or replacement is necessary and has not been the result of abuse or misuse within the time period, please return the tester – freight prepaid – and correction will be made without charge. Out of warranty products will be repaired on a charge basis.