SPARTANBURG COUNTY

DRY WEATHER SCREENING AND FIELD INVESTIGATIONS FOR ILLICIT DISCHARGES GUIDANCE DOCUMENT

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1.0 INTRODUCTION

The State of South Carolina National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Regulated Small Municipal Separate Storm Sewer Systems (SMS4), SCR030000, was issued with an effective date of January 1, 2014. This second cycle permit outlines tasks to be completed for compliance with the terms and conditions of the federal NPDES program and has a five-year term ending December 31, 2018. The Permit requires that Spartanburg County implement, manage, and oversee all provisions of its Storm Water Management Plan (SWMP) to control, to the maximum extent practical (MEP), the discharge of pollutants from its municipal storm sewer system associated with stormwater runoff and illicit discharges, including spills and illegal dumping.

This document presents Spartanburg County's plan for illicit discharge detection and elimination in compliance with NPDES SMS4 Permit. The NPDES SMS4 Permit requires that the County develop an Illicit Discharge Detection and Elimination (IDDE) program that contains a set of standard investigative procedures to identify the source of illicit connections or discharges and enforce their removal. Although the permit does not specifically dictate these procedures, the IDDE program must, to the MEP, increase knowledge of the County's stormwater management system and pollutants of concern. An understanding of the nature of illicit discharges in urban watersheds is essential to find, fix, and prevent them.

An *illicit discharge* is defined by the U.S. EPA as "… any discharge into a separate storm sewer system that is not composed entirely of stormwater, except for discharges allowed under a NPDES permit or waters used for firefighting operations." Typically, illicit discharges enter a storm sewer system either through direct connections, e.g., sanitary sewer piping, or indirectly from cracked sanitary sewer conveyance systems, spills collected by storm drains, or from contaminants dumped directly into a storm sewer inlet. Pollutants from these sources can include heavy metals, toxics, oils and grease, solvents, nutrients, viruses, and harmful bacteria. Substantial levels of these contaminants can damage fish and wildlife habitats, decrease aesthetic value, prevent or eliminate recreational benefits, and more importantly threaten public health.

The field procedures for detecting illicit discharges include:

- Observations at stormwater outfalls for signs of possible contamination from illicit connections,
- Observing the physical characteristics of stormwater outfalls,
- Performing elementary chemical analysis, and
- Collecting samples for comprehensive laboratory analyses (if necessary).

The dry weather screening program is an initial screening process to locate outfalls with dry weather flows within the Spartanburg County MS4 and determine if there is an indication that the flow is a potential illicit discharge. The procedures outlined in this guidance document are used to detect and eliminate illicit discharges. Contact information for Spartanburg County's Stormwater Management Program can be found

on their website: http://www.co.spartanburg.sc.us/govt/depts/pubwrks/envsrv.htm.

The Illicit Discharge Program has two primary components:

1. Dry weather screening program, and
2. Illicit tracking and detection program.

The dry weather screening program is an initial screening process to locate outfalls with dry weather flows and determine if there is an indication that the flow is a potential illicit discharge. The illicit tracking, detection and elimination (IDDE) program represents an additional set of investigative and enforcement procedures to be taken once an outfall screened under the dry weather screening program is determined to have a potential illicit discharge.

Dry weather flow or discharge is generally accepted to be flow present in a Spartanburg County outfall after at least 72 hours with less than a tenth of an inch of precipitation. The presence of dry weather flow does not necessarily indicate the presence of an illicit discharge. Many dry weather flows, including those listed below as the non-stormwater discharges allowed by Spartanburg County, are typically considered allowable dry weather discharges.

Note that according to Spartanburg County Ordinance O-09-02, Spartanburg County allows certain non-stormwater discharges to its Small Municipal Separate Storm Sewer System, SMS4. The following discharges are exempt from discharge prohibitions:

- Water line flushing or other potable water sources,
- Landscape irrigation or lawn watering,
- Diverted stream flows,
- Rising ground water,
- Ground water infiltration to storm drains,
- Uncontaminated pumped ground water,
- Foundation or footing drains (not including active groundwater dewatering systems),
- Crawl space pumps,
- Air conditioning condensation,
- Springs,
- Non-commercial washing of vehicles,
- Commercial carwashes that are in compliance with the NPDES General Permit for Vehicle Wash Water Discharges,
- Natural flows from riparian habitat or wetlands,
- Dechlorinated swimming pool discharges,

- Firefighting activities,
- Street wash water, and
- Any other water source not containing pollutants as designated by the County Engineer or his/ her designee.

Also included are any discharges specified in writing by Spartanburg County as being necessary to protect public health and safety. Dye testing is an allowable discharge, but requires notification to the authorized enforcement agency prior to the time of the test. The prohibition does not apply to any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the EPA or SCDHEC, provided that the discharger is in full compliance and written approval has been granted.

2.0 SELECTION OF INDICATOR PARAMETERS

2.1 Chemical Parameters

The U.S. EPA and South Carolina Department of Health and Environmental Control (SCDHEC) recommend testing for the following parameters to detect the major pollutants found in stormwater runoff from major land use categories:

- pH
- Temperature
- Copper
- Phenols
- Surfactants
- Chlorine

It is also recommended to test for the pollutant of concern (POC) for outfalls discharging to impaired waters or within a TMDL watershed.

pH

The normal pH of ground water typically ranges from 6.0 to 9.0. Values outside of this range may be an indicator of an illicit discharge. pH alone is not a sufficient indicator of an illicit discharge and is only considered in relation to other parameters that are out of range for a particular sample. Water with pH values less than 6.0 is acidic and may indicate discharges from textile mills, pharmaceutical manufacturers, metal fabricators, and companies that produce resins, fertilizers, or pesticides. Wastes containing sulfuric, hydrochloric, or nitric acids are a common source of contamination. Water with pH values greater than 9.0 is alkaline and may indicate discharges from industries such as textile mills, metal plating facilities, steel mills, ready mix concrete plants (including concrete truck wash out areas), and producers of rubber and plastic. Wash water used to clean floors and industrial machinery may also produce alkaline wastewater.

Water Temperature

Water temperature can vary widely and this parameter is best considered in relation to other characteristics. Any extreme temperatures (hot or cold) may indicate the presence of an illicit discharge. Extremely warm temperatures can be indicative of industrial or sanitary sewer discharges.

Copper

Elevated levels of copper may indicate discharges from cooling, boiler, or industrial re-circulation systems. Copper sulfate is typically used as an algaecide in all of these systems. Copper can also be an indicator of discharges from an automobile manufacturing or maintenance facility. The normal/allowable range for copper is 0.0 – 0.5 mg/L.

Phenols

Elevated levels of phenols may indicate industrial wastewater discharges such as those from plastics production, pharmaceuticals, and also herbicides. Consider phenols in relation to other parameters in determining the potential source. The normal/allowable range for phenols is 0.000 – 0.399 mg/L.

Surfactants/Detergents

Typically, the presence of surfactants and detergents indicate a connection to either an automobile wash facility or a laundry facility. High surfactants/detergents combined with elevated temperatures are a good indicator of commercial or institutional laundry facilities. Lower levels of surfactants/detergents may indicate a connection to a residential laundry, industrial facility, or possibly an illicit sewer connection or failing/improperly functioning septic system. A normal range is 0.0 – 0.5 mg/L. Regardless of the results, however, there should be no persistent visible foam at the discharge.

Chlorine

The absence of chlorine may indicate a natural water source. However, due to chlorine's ability to quickly dissipate with exposure to ultra violet light (UV), use caution when making judgments based on its absence. Generally, only potable water sources contain chlorine. Therefore, the presence of chlorine indicates that the source is not a natural water source. Very high levels (above 5.0 mg/l) of chlorine typically indicate connection to a swimming pool or other potable water source. A normal range is 0.0 – 0.5 mg/L.

Table 5 in Appendix C lists additional chemicals that may be associated with a variety of industrial activities. If the industrial activities in an outfall watershed are known, it may be possible to examine the dry-weather (non-stormwater) outfall flow for specific chemicals to identify which industrial activities may be responsible for the dry-weather flow.

2.2 Physical Parameters

The detection of a variety of other parameters during the physical inspection can be useful indicators of outfall problems. The following is a description of these physical parameters:

Odor

The odor of stormwater discharges will vary widely. Odor can be a good indicator of the type of pollutant in the water. For instance, stormwater discharges may smell like sewage, oil, gasoline, or may contain a chemical smell. Decomposition of organic materials can also cause a distinctive sulfur odor. Odors may vary greatly with changes in temperature and time of year.

Color

Color can be an important factor in determining the source of an illicit discharge. The particular color should be noted and tracked upstream as far as possible. Sewage will typically have a gray or brown color, whereas industrial wastes may have a variety of colors.

Turbidity

Turbidity is a measure of the amount of suspended matter in the water and affects the clarity of the discharge, as opposed to the color. Discharges from industrial facilities are often highly turbid. Although erosion can also create highly turbid water, this should not be the case during dry weather flows. Each inspection should note the relative degree of turbidity.

Oil Sheen

An oily sheen on water near a storm water outfall can be an indicator of illicit discharges from petroleum refineries, storage facilities, vehicle service facilities including vehicle wash facilities, and/or dumping of used oil products into the SMS4.

Floatables

Floatables are solids and liquids that float on the surface of the water. Floatables may include substances such as animal fats, food products, trash, oils, plant materials, solvents, foams, hydrocarbons, or gasoline. Floatables can often lead directly to the manufacturing process or other source of the illicit discharge. A full description of the type and quantity of the floatables and a photograph of the discharge should be included in the report.

Residue

Residue left on the conveyance system can be an indicator of an illicit discharge. Discoloration of the pipe or channel should be tracked upstream. It is also important to note the location of the discoloration or stain within the conveyance system. For

example, is it just a line of residue half way up the pipe or is the pipe completely stained for some depth? Harmful and excessive growths of algae are generally caused by excessive nutrients.

Sediment/ Debris

Excessive sediment and debris near a stormwater outfall can be indicative of construction site runoff problems.

Vegetation

Vegetation growing in the immediate discharge area should be noted in relation to vegetation growing in the general vicinity of the outlet. Certain discharges can cause substantial changes in plant growth. Discharges containing a high nutrient content may cause increased growth while discharges with severe changes in pH may cause a decrease in growth. Although vegetation patterns may serve as an indicator of non-stormwater discharges, they are also difficult to interpret. Time of year, rainfall patterns, and exposures to sun all, affect plant growth and may be contributing factors to the changes in vegetation patterns. Caution should be used when considering vegetation as an indicator of an illicit discharge.

Structural Damage

Like residue, structural damage to the conveyance system can also be an indicator of an illicit discharge. Structural damage is typically more noticeable in concrete pipes. Acidic discharges may cause cracking, spalling, or deterioration of the concrete. The location of the damage within the pipe and the distance upstream will be important in determining the type of pollutant and the source of the discharge.

Temperature

Water temperature that varies greatly from the ambient air temperature is a good indicator that there is an illicit discharge to the system.

The types of illicit discharges that can be identified through visual identification and physical data include:

- Sanitary sewer overflows/leaks;
- Broken manholes;
- Septic tank leaks;
- Gray water discharges from residences;
- Erosion and sediment control problems;
- Public dumping of trash; and
- Unnatural volume, temperature, color or odor issues involving drainage flows.

Table 2 in Appendix C describes the physical observation parameters and the potential

associated illicit flow sources.

3.0 DRY WEATHER FIELD SCREENING AND ILLICIT TRACKING

The Standard Operating Procedure (SOP) in Section 3.1 and 3.2 outlines the procedures for Dry Weather Screening and Illicit Discharge Tracking. The IDDE program is composed of investigative procedures to be conducted once a potential illicit discharge is identified under the dry weather screening program.

3.1 DRY WEATHER SCREENING STANDARD PROCEDURES

Dry weather field screening is the examination of dry weather discharge from outfalls to attempt to determine if the discharge is allowable or if it is a potential illicit discharge. Dry weather field screening includes the documentation of the physical parameters of a discharge and may include chemical analysis as well. Dry weather field screening may consist of, but is not limited to:

- Visual observations
- Field screening monitoring
- Analytical monitoring at selected points to the extent necessary to identify and eliminate, to the MEP, an illicit discharge

Dry weather field screening can either be done in conjunction with outfall inventory or separate from an outfall inventory if the locations of discharge points are already available. Conduct dry weather screening at least 72 hours after a storm event greater than 0.1 inch. Dry weather flows must be screened two times with the second screening occurring at least 4 hours but no more than 24 hours after the first.

The following procedures should be used to screen outfalls for dry weather flow:

1. Crews should be familiar with the job hazards associated with dry weather screening. Refer to Appendix B for OSHA and job safety information **before** starting work.
2. Use appropriate Personal Protective Equipment (PPE) when collecting samples.
3. Prepare for screening activities. Crews should have:
    a. PPE such as gloves, safety glasses or goggles, boots, snake chaps, etc. Wear a new set of nitrile gloves at each location to eliminate the possibility of cross contamination. (Persons with latex allergies should use latex-free gloves).
    b. Calibrated handheld unit(s) for measuring pH and temperature.
    c. Sample bottles for all parameters (in case a dry weather discharge is found).
    d. Chain of custody forms for any samples to be analyzed by a contract laboratory.
    e. Dry Weather Screening/ Potential Illicit Discharge Field Sheets
    f. Calibrated portable unit for measuring Chlorine, Copper, Phenols, and Surfactants (Hach DR2800 Portable

Spectrophotometer or similar equipment).

g. Cooler with ice for sample storage and transport (samples must be stored/ transported in a cooler that maintains a temperature of 4˚C +/- 2˚).

4. Screen outfalls for dry weather flow (screen at least 72 hours after a storm event of 0.1 inch).

h. **If there is no flow present** at the outfall, it is considered dry and no further immediate action is necessary.

i. **If there is dry weather flow, then the outfall must be evaluated and categorized with on-site screening procedures.**

a. Collect information for physical characteristics on the Dry Weather Screening/ Potential Illicit Discharge Field Sheet (located in Appendix A) or an approved digital field data collection method. Record (at a minimum) the following information for the physical characteristics:

i. Inspection date and time

ii. Initials or name of inspector

iii. Site description

iv. Outfall size

v. Outfall condition

vi. Presence or absence of flow

vii. Discharge color

viii. Discharge odor

ix. Presence and type of floatables

x. Discharge turbidity (visual not measured)

xi. Deposits/stains

xii. Vegetative condition

b. After the initial sample has been collected, use physical observations and chemical test results to determine if the discharge is illicit in nature. (If dry weather screening suggests a potential illicit discharge, then attempt to track the illicit upstream to its source. See steps g-i below)

c. Determine the best area of the discharge to collect screening samples. An ideal sample is one that is representative of the entire flow (e.g. in the middle of the discharge) and that can be collected without interference from objects or debris in the flow. Avoid entraining leaves, floatable debris, and sediment when collecting samples. Be careful to limit the amount of discharge entering the bottle as to not create splash when filling. Be aware of any added preservatives that may already be in the container. (Refer to Appendix B for information on

proper sample collection techniques).

d. Place the sample bottle directly into the stream, taking care not to touch the inside of the lid or bottle. Be careful to limit the amount of discharge entering the container as to not overfill or create splash when filling. Be aware of any added preservatives that may already be in the container. Fill the container with the sample to the designated sample fill line (if specified) or to the top. Cap container immediately.

e. If necessary, collect samples in laboratory supplied containers for E. coli. (Refer to Appendix B for diagrams and information on proper sample collection techniques).

    i. Using a permanent marker, fill out the label on the sample container with any required information.

    ii. Sample collection for E. Coli (See Appendix B for information and examples). Be careful not to touch the inside of the bottle or lid during sample collection. The inside of the bottle must remain sterile beforehand and uncontaminated afterwards. Take care in re-capping. Note the fill line on the bottle - do not overfill. The vessel also contains a preservative that must remain in the bottle. Take precautions not to overfill the bottle and lose the preservative tablet or powder. E. Coli sample bottles must be delivered on ice to the lab within 6 hours of sample collection.

    iii. After any screening activities have ended, deliver the samples to the lab within the given holding times (if applicable) and on ice (if applicable). Fill out the chain of custody form (see Appendix D) with sample information.

    iv. The lab will check all sample bottle labels and chain of custody forms for completion and accuracy. Keep a copy of the chain of custody form for the County's records.

f. Measure pH and temperature at a flowing outfall using a handheld meter or a thermometer and pH paper. For the Hach SensION pH electrode, use the procedure in Appendix D. To calibrate and operate an equivalent instrument, refer to the instruction manual for procedure. Measure pH samples within 15 minutes of sample collection.

g. Measure Chlorine, Copper, Phenols, and Detergents/Surfactants using a spectrophotometer, handheld meter, or test paper (if appropriate). For the Hach DR2700 Portable Spectrophotometer, use the procedures in Appendix E. If using an equivalent meter, refer to the instruction manual for procedures. Analyze all samples within 15 minutes of collection.

h. Return to the discharge between 4 and 24 hours later to obtain

a second screening sample.

i. Repeat these dry weather screening procedures for all designated Spartanburg County outfalls.

j. If an intermittent discharge is observed from the outfall, the SMS4 Permit requires that it be rechecked to observe the discharge while it is flowing. In the case of intermittent discharges, an outfall is considered dry when there have been non-flowing conditions on two separate visits. Since this is an ongoing program, it is recommended that suspected intermittent discharges be periodically rechecked.

Illicit tracking procedures begin when dry weather screening results indicate a flow is a potential illicit or illegal discharge (through visual or chemical analysis). Illicit discharges may include but are not limited to sanitary wastewater and wash water discharges.

In most cases, the outfall is originally screened for dry weather flow (screened at least 72 hours after a storm event of 0.1 inch). This identifies the potential illicit discharge and prompts illicit tracking activities. Using visual and physical observations, likely sources of the illicit discharge can be identified. Typically, the majority of illicit discharges are either wash water or a sanitary sewer source. Crosscheck these potential sources with known facility information to determine potential illicit discharges. Refer to the tables in Appendix C for additional information on identifying sources of illicit discharges. Some common questions to ask are:

a. Does the discharge have a distinctive/unusual odor or color or quality?

b. Were any of the field analysis results extremely high or low (refer to Appendix C for values)?

c. If the discharge appears to be a natural source (e.g. groundwater) and does not appear to have any negative affect on the receiving water, do not begin illicit tracking. Make a note to return to the outfall at a later time to check the discharge again.

A simple review of the outfall characteristics of a suspected illicit discharge outfall can present key indicators of contamination. Indicators of contamination (negative indicators) are often clearly apparent visual or physical parameters indicating obvious problems and are readily observable at the outfall during the field screening activities. This is the simplest method for identifying potential illicit dry-weather outfall flows.

5. If dry weather screening suggests an illicit discharge, then attempt to track the illicit upstream to its source. Depending on the discharge, a source may or may not be obvious. Crews should use best judgment in tracking activities; common procedures may include:

a. Driving around in the drainage area looking at businesses or

industries that could be potential sources of the illicit. Crews should look for places where the discharge could enter the storm drain directly (e.g. a hose from an industrial building discharging directly into a storm drain).

b. Walking upstream along the storm drainage line and opening manhole covers to follow the discharge. This can be helpful to pinpoint the discharge to a specific area or establishment.

6. After initial analysis has indicated the presence of an illicit discharge, further detailed analyses may be needed to identify and locate the specific source(s) (e.g., residential, commercial, and/or industrial) in the drainage area. Due to the extensive nature of most storm sewer systems, different lines will split off of the main drainage lines. To track illicit flows where there is a split in the line:

    a. Visually assess both flows; do they both have the same characteristics? Visual and olfactory characteristics are the easiest way to track illicits.

    b. Analyze grab samples at several manhole points along the storm drainage system to narrow the location of the contaminating source; this enables crews to delineate which side of the system in contributing to the discharge and eliminate areas that are not.

    c. Test for specific pollutants associated with the discharge at several points along the drainage system; this can clarify the upper area that might be contributing to the discharge.

    d. Measure water flow rate and temperature. For example if crews were tracking an industrial discharge with an elevated temperature, collecting and analyzing grab samples along the drainage line would enable them to test temperature back up the drainage line until a source was identified.

3.1.2 Deadlines for Reporting Illicit Discharge/ Illicit Connection/ Improper Waste Disposal

Spartanburg County has created an Emergency Response Plan containing standard procedures for responding to illicit discharges. This document can be found in Appendix G. The County has also outlined particular response times for certain aspects of their IDDE program.

Documenting Illicit Discharges

The County will document illicit discharges as soon as practicable, but within three (3) business days from discovery. County staff will store documentation of the illicit discharge, and any supporting information, both in hard copy form and electronically

on the their server. See section 3.4 for information on the storage of electronic data.

Tracing the Source of Illicit Discharges

Spartanburg County will follow the standard operating procedures for identifying and tracking any instances of illicit discharges in their SMS4. Once identified, the County will begin tracing the source of the illicit as soon as practicable, but no later than two (2) business days.

Identifying the Source of the Illicit Discharge

Once the source of the illicit discharge has been discovered, the County will notify the discharger as soon as practicable, but no later than one (1) business day. When, and if, elimination will take longer than 30 days, Spartanburg County will require responsible parties to submit a plan with a schedule for elimination. See the Emergency Response Plan in Appendix E for more information.

Notifying Other MS4's

If the County discovers an illicit discharge or connection that originates in a traditional permittee's MS4, they will notify the operator as soon as practicable, but no later than three (3) business days.

Notifying Non-traditional Parties

If illicit connections or discharges are discovered in other areas, the County will notify the other operator as soon as practicable, but no later than three (3) business days.

Citizen Complaints

The County will respond to citizen complaints of illicit discharges, illicit connections and improper disposal as soon as practicable, but no later than two (2) business days from the reporting date. County staff will follow the standard operating procedures for illicit discharge identification, tracking and reporting.

3.2 ENFORCEMENT PROCEDURES

Spartanburg County, by means of ordinance O-09-02, has the enforcement capabilities to deal with instances of illicit discharges within their MS4. The County also incorporates an Enforcement Response Plan (ERP) to outline enforcement guidelines. See Appendix G for the Enforcement Response Plan. In general there are three categories of discharges to the MS4:

1. Pathogenic and toxic pollutants
2. Nuisance pollutants
3. Clean water/ allowable discharge

Pathogenic and toxic pollutants should be considered the most severe since contact or consumption of stormwater contaminated by these pollutants could cause illness

and significant water treatment problems for downstream users. These pollutants may originate from sanitary, commercial, and industrial wastewater sources, inappropriate household toxicant disposal, automobile engine de-greasing, and excessive use of chemicals (pesticides, herbicides, and fertilizers). Pathogenic or toxic pollutants should be prioritized in a manner that ensures prompt action in the source identification process as these types of pollutants have the most harmful effects to the environment. In areas containing no industrial or commercial sources, sanitary wastewater is probably the most severe dry-weather contaminating source of storm drain flows. These discharges should be reported to the Spartanburg County immediately, and SCDHEC will be notified of the discharge and any enforcement action taken.

Nuisance pollutants contribute aquatic life threatening conditions to the storm drainage system. These pollutants can cause excessive dissolved oxygen depletions, tastes, odors, and colors in downstream water supplies, algal blooms, offensive floatables, and noticeably turbid water. These pollutants may originate in residential areas from sanitary wastewaters, laundry wastewaters, lawn irrigation runoff, automobile wash waters, construction site dewatering, and washing of concrete ready-mix trucks. Nuisance pollutants should be reported to Spartanburg County immediately. The County will then decide if SCDHEC should be notified, depending on the severity of the pollution.

Clean water discharged through a storm drainage system is commonly found during dry weather screening. Clean water discharges can originate from natural springs in urban areas that have been piped to a nearby creek or stream, infiltrating groundwater, and infiltration from potable waterline leaks. Section 1.0 of this document lists other allowable non-stormwater discharges within the Spartanburg County MS4. Clean water discharges typically have no negative effect on the environment and do not need to be reported.

Spartanburg County will utilize the ERP upon identification of the source of the illicit discharge or illegal dumping. The responsible party will be notified to cease the improper practices and appropriate regulatory agencies will be notified of the discharge (this may vary depending on the type of discharge and its location). SCDHEC will be notified of enforcement actions taken. Spartanburg County may order compliance by written notice of violation to the responsible person in accordance with Ordinance O-09-02. If abatement of a violation and/or restoration of affected property is required, the notice shall set forth a deadline within which such remediation or restoration must be completed. Said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work will be done by Spartanburg County or by its designated contractor(s). All costs incurred including time, materials, and labor plus a 15 percent penalty shall be charged to the violator. If the property owner or Lessee, as the case may be, fails to reimburse the County, the County is authorized to file a lien for said costs against the property or the Lessee's leasehold interest, as the case may be, and to enforce the lien by judicial foreclosure proceedings.

3.3 DATA MANAGEMENT

All dry weather screening will be collected and recorded in accordance with the Dry Weather Screening/ Potential Illicit Discharge Field Sheet shown in Appendix A. This data may be collected using hard copy paper, or may be collected in a GIS based database, similar to an ESRI Geodatabase, or other digital data collection device.

4.0 CITIZEN COMPLAINTS

Spartanburg County operates a website for disseminating information to its citizens. Contact names and phone numbers for all stormwater staff are listed, as well information on general stormwater issues. The website directs any complaints or reports of illicit discharges to the main stormwater department phone number, (864) 595-5349. Any complaints that are sent in writing, electronically by email, or by phone are logged by stormwater staff on the Engineering Department Work Order Request Form, and sent to the appropriate staff member to be addressed. Complaints will be addressed as soon as possible, but in no more than two business days from the initial complaint. The County website also enables citizens to report a problem by email to any County department, including stormwater. This reporting mechanism is located on Spartanburg County's homepage at:
http://www.co.spartanburg.sc.us/govt/depts/pubwrks/envsrv.htm.

5.0 Resources

1. Brown, Edward, Caraco, Deb, and Pitt, Robert. *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*. USEPA. Washington, DC, 2004.
2. Van der Leeden, Frits, Fred L. Troise and David Keith Todd. *The Water Encyclopedia*. Lewis Publishers. Chelsea, Michigan. 1990.
3. USEPA. 1993b. *Investigation of Inappropriate Pollutant Entries into Storm Drain Systems - A User's Guide*. EPA 600-R-92-238. Washington, D.C.
4. Ventura Countywide Stormwater Quality Management Program. 18 Jan. 2011. 18 Jan. 2011 <http://www.vcstormwater.org/>.
5. State of Washington Department of Ecology. 18 Jan. 2011. 18 Jan. 2011 <http://www.ecy.wa.gov/programs/eap/fw_riv/rv_main.html>.
6. USEPA. 11 April 2011 <http://www.epa.gov/owow/NPS/ordinance/discharges.htm>.
7. SCDHEC, 2014. The State of South Carolina National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges from Regulated Small Municipal Separate Storm Sewer Systems (SMS4), SCR030000, January 1, 2014.

APPENDIX A: DRY WEATHER SCREENING/ POTENTIAL ILLICIT DISCHARGE FIELD SHEET

ENGINEERING DEPARTMENT
WORK ORDER REQUEST

DATE:	ADDRESS:
CITIZEN'S NAME:	CITY:
TELEPHONE:	TAKEN BY:
ROAD NAME:	
LOCATION:	
WORK REQUESTED:	
WORK PERFORMED:	
INVESTIGATED BY:	

Appendix B: Stormwater Sampling Techniques and OSHA Standards / Field Safety

Stormwater Sampling Techniques and Information

1. Sample containers should be stored inside at room temperature when not in use.
2. Note that containers for certain parameters contain preservatives. Handle preserved containers with caution, as preservatives may be an acid (e.g. hydrochloric, nitric). When sampling, take measures to ensure that no preservative is lost during sample collection.
3. Always wear protective gloves when collecting stormwater samples. Wear new gloves at each sample location to eliminate cross contamination. Safety glasses should also be worn to protect the eyes while collecting samples. If using or mixing chemicals, safety goggles should be worn to protect the eyes from inadvertent splashing of chemicals or samples.
4. Always collect a sample in an area of representative flow (e.g. in the middle of the stream or discharge). When possible, fill the container directly from the flow without touching the lip of the bottle to anything in the surrounding environment.

    a. Unless you are purposely sampling stagnated water, do not collect a sample in a stagnant area of the water body.

    b. Do not touch the inside of any bottles or lids. Take precautions to avoid splashing or other contamination when sampling.

5. When sampling from a pool, be careful not to disturb any sediment if you must dip a container into the water.
6. After collection, the sample should be placed in an ice filled cooler. All samples have associated holding times; coordinate with laboratory staff to ensure that samples are returned to the lab, on ice, in time to be analyzed.
7. Fill out a chain of custody form with sample name or location, number, date, time, and other pertinent information. Always retain a copy for the Spartanburg County. A chain of custody form is located in Appendix D for reference.

OSHA Standards/ Field Safety

It is important to remember that any type of fieldwork, including dry weather screening and illicit discharge tracking, can be hazardous. Field crews will be exposed to the elements in varying types of terrain. Common hazards include extreme heat/cold, wildlife (snakes and insects), hazardous waste materials of unknown origins (sanitary wastewater, chemicals, etc.), and potentially dangerous objects and situations (rocks, deep water, manhole lids, confined spaces). Employees should be current on their Bloodborne Pathogens training and have been vaccinated for Hepatitis A and B. A current tetanus vaccination is also recommended.

In order to ensure the safety of field crews, all employees in the field should work as a team of two (or more). Crews should always carry a cell phone or other means of communication and should let a member of management know their daily itinerary. Crews should wear high visibility clothing, long pants, and if appropriate, safety glasses or goggles, snake chaps, and/or safety shoes.

Due to the nature of dry weather screening and illicit discharge tracking, field crews will often encounter circumstances that involve confined spaces. Occupational Safety and Health Administration (OSHA) regulates confined space entry. A confined space is/has:

- Limited or restricted means of entry or exit,
- Large enough for an employee to enter and perform assigned work, **and**
- Is not designed for continuous occupancy by the employee.

Because of the hazards associated with confined space entry, crews should not enter confined spaces. OSHA governs that confined space entry only be performed by certified individuals using prescribed equipment and procedures. At no time should any field crews enter a confined space. This includes manholes, storm drains, storm drainage tunnels, culverts, and pipes. If confined space entry is necessary, crews should consult with a member of management, who can then contact the appropriate County staff members. More information on confined space procedures and regulations can be found on the United States Department of Labor OSHA web page at www.osha.gov/index.html.

APPENDIX C: CHARACTERISTICS OF POTENTIAL ILLICIT DISCHARGE SOURCES

Table 1. Examples of Chemical and Physical Properties of Industrial Non-Stormwater Entries into Storm Drainage System

Industrial Categories Major Classifications SIC Group Numbers		Odor	Color	Turbidity	Floatables	Debris and Stains	Damage to Outfall Structures	Vegetation	pH	Total Dissolved Solids
Primary Industries										
201	Meat Products	Spoiled Meats, Rotten Eggs and Flesh	Brown to Reddish Brown	High	Animal Fats, Byproducts, Pieces of Processed Meats	Brown to Black	High	Flourish	Normal	High
202	Dairy Products	Spoiled Milk Rancid Butter	Gray to White	High	Animal Fats, Spoiled Milk Products	Gray to Light Brown	High	Flourish	Acidic	High
203	Canned and Preserved Fruits and Vegetables	Decaying Products Compost Pile	Various	High	Vegetable Waxes, Seeds, Skins, Cores, Leaves	Brown	Low	Normal	Wide Range	High
204	Grain Mill Products	Slightly Sweet and Musty Grainy	Brown to Reddish Brown	High	Grain Hulls and Skins, Straw & Plant Fragments	Light Brown	Low	Normal	Normal	High
205	Bakery Products	Sweet and or Spoiled	Brown to Black	High	Cooking Oils, Lard, Flour, Sugar	Gray to Light Brown	Low	Normal	Normal	High
206	Sugar and Confectionery Products	N/A	N/A	Low	Low Potential	White Crystals	Low	Normal	Normal	High
207	Fats and Oils	Spoiled Meats, Lard or Grease	Brown to Black	High	Animal Fats, Lard	Gray to Light Brown	Low	Normal	Normal	High
208	Beverages	Flat Soda, Beer or Wine, Alcohol, Yeast	Various	Moderate	Grains and Hops, Broken Glass, Discarded Canning Items	Light Brown	High	Inhibited	Wide Range	High
21	Tobacco Manufacturers	Dried Tobacco, Cigars, Cigarettes	Brown to Black	Low	Tobacco Stems and Leaves, Papers and Fillers	Brown	Low	Normal	Normal	Low
22	Textile Mill Products	Wet Burlap, Bleach, Soap, Detergents	Various	High	Fibers, Oils, Grease	Gray to Black	Low	Inhibited	Basic	High
23	Apparel and Other Finished Products	NA	Various	Low	Some Fabric Particles	N/A	Low	Normal	Normal	Low

Industrial Categories Major Classifications SIC Group Numbers		Odor	Color	Turbidity	Floatables	Debris and Stains	Damage to Outfall Structures	Vegetation	pH	Total Dissolved Solids
Material Manufacturers										
24	Lumber and Wood Products	N/A	N/A	Low	Some Sawdust	Light Brown	Low	Normal	Normal	Low
25	Furniture and Fixtures	Various	Various	Low	Some Sawdust, Solvents	Light Brown	Low	Normal	Normal	Low
26	Paper and Allied Products	Bleach, Various Chemicals	Various	Moderate	Sawdust, Pulp Paper, Waxes, Oils	Light Brown	Low	Normal	Wide Range	Low
27	Printing, Publishing, and Allied Industries	Ink, Solvents	Brown to Black	Moderate	Paper Dust, Solvents	Gray to Light Brown	Low	Inhibited	Normal	High
31	Leather and Leather Products	Leather, Bleach, Rotten Eggs or Flesh	Various	High	Animal Flesh and Hair, Oils & Grease	Gray to Black, Salt Crystals	High	Highly Inhibited	Wide Range	High
33	Primary Metal Industries	Various	Brown to Black	Moderate	Ore, Coke, Limestone, Millscale, Oils	Gray to Black	High	Inhibited	Acidic	High
34	Fabricated Metal Products	Detergents, Rotten Eggs	Brown to Black	High	Dirt, Grease, Oils, Sand, Clay Dust	Gray to Black	Low	Inhibited	Wide Range	High
32	Stone, Clay, Galss, and Concrete Products	Wet Clay, Mud, Detergents	Brown to Reddish Brown	Moderate	Glass Particles, Dust from Clay or Stone	Gray to Light Brown	Low	Normal	Basic	Low

Industrial Categories Major Classifications SIC Group Numbers		Odor	Color	Turbidity	Floatables	Debris and Stains	Damage to Outfall Structures	Vegetation	pH	Total Dissolved Solids
Chemical Manufacturer										
2812	Alkalies and Chlorine	Strong Halogen or Chlorine, Pugnent Burning	Alkalies - N/A Chlorine - Yellow to Green	Moderate	Glass Particles, Dust from Clay or Stone	Gray to Light Brown	Highly Inhibited	Normal	Basic	Low
2816	Inorganic Pigments	N/A	Various	High	Low Potential	Various	Low	Highly Inhibited	Wide Range	High
282	Plastic Materials and Synthetics	Pugnent, Fishy	Various	High	Plastic Fragments, Pieces of Synthetic Products	Various	Low	Inhibited	Wide Range	High
283	Drugs	N/A	Various	High	Gelatin Byproducts for Capsulating Drugs	Various	Low	Highly Inhibited	Normal	High
284	Soap, Detergents, & Cleaning Preparations	Sweet or Flowery	Various	High	Oils, Grease	Gray to Black	Low	Inhibited	Basic	High
285	Paints, Varnishes, Lacquers, Enamels and Allied Products (SB-Solvent Base)	Latex-Ammonia, SB Dependent upon Solvent (Paint Thinner, Mineral Spirits)	Various	High	Latex - N/A, SB - All Solvents	Gray to Black	Low	Inhibited	Latex- Basic, SB-Normal	High
2861	Gum and Wood Chemicals	Pine Spirits	Brown to Black	High	Rosins and Pine Tars	Gray to Black	Low	Inhibited	Acidic	High
2865	Cyclic Crudes, & Cyclic Intermediates, Dyes, & Organic Pigments	Sweet Organic Smell	N/A	Low	Translucent Sheen	N/A	Low	Highly Inhibited	Normal	Low
2873	Nitrogenous Fertilizers	N/A	N/A	Low	N/A	White Crystalline Powder	High	Inhibited	Acidic	High

Industrial Categories Major Classifications SIC Group Numbers		Odor	Color	Turbidity	Floatables	Debris and Stains	Damage to Outfall Structures	Vegetation	pH	Total Dissolved Solids
Transportation and Construction										
15	Building Construction	Various	Brown to Black	High	Oils, Grease, Fuels	Gray to Black	Low	Normal	Normal	High
16	Heavy Construction	Various	Brown to Black	High	Oils, Grease, Fuels, Diluted Asphalt or Cement	Gray to Black	Low	Normal	Normal	High

Industrial Categories Major Classifications SIC Group Numbers		Odor	Color	Turbidity	Floatables	Debris and Stains	Damage to Outfall Structures	Vegetation	pH	Total Dissolved Solids
Chemical Manufacturer										
52	Building Materials, Hardware, Garden Supply, and Mobile Home Dealers	N/A	Brown to Black	Low	Some Seeds, Plant Parts, Dirt, Sawdust, or Oil	Light Brown	Low	Normal	Normal	Low
53	General Merchandise Stores	N/A	N/A	N/A	N/A	N/A	Low	Normal	Normal	Low
54	Food Stores	Spoiled Produce, Rancid, Sour	Various	Low	Fragments of Food, Decaying Produce	Light Brown	Low	Flourish	Normal	Low
65	Automotive Dealers & Gasoline Service Stations	Oil or Gasoline	Brown to Black	Moderate	Oil or Gasoline	Brown	Low	Inhibited	Normal	Low
56	Apparel & Accessory Stores	N/A	N/A	Low	N/A	N/A	Low	Normal	Normal	Low
57	Home Furniture, Furnishings, & Equipment Stores	N/A	N/A	Low	N/A	N/A	Low	Normal	Normal	Low
58	Eating and Drinking Places	Spoiled Foods, Oil & Grease	Brown to Black	Low	Spoiled or Leftover Food	Brown	Low	Normal	Normal	Low
Coal Steam Electric Power		N/A	Brown to Black	High	Coal Dust	Black Emorphous Powder	Low	Normal	Slightly Acidic	Low
Nuclear Steam Electric Power		N/A	Light Brown	Low	Oil, Lubricants	Light Brown	Low	Normal	Normal	Low

Source: Brown, Caraco, and Pitt. *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments.* USEPA. Washington, DC, 2004

Table 2. Interpretations of Physical Observation Parameters and Potential Associated Flow Sources

Physical Observation Parameter	Description
Odor – Most strong odors, especially gasoline, oils, and solvents, are likely associated with high responses to the toxicity screening test. Typical obvious odors include: gasoline, oil, sanitary wastewater, industrial chemicals, decomposing organic wastes, etc.	
Sewage	Smell associated with stale sanitary wastewater, especially in pools near outfall
Sulfide (rotten eggs)	Industries (e.g. meat packers, canneries, dairies, etc.; and stale sanitary wastewater)
Petroleum/Gas	Petroleum refineries or facilities associated with vehicle maintenance and operation or petroleum product storage
Chlorine	Laundries, paper mills, textile bleaching, swimming pool, or other potable water source
Rancid-sour	Food preparation facilities (e.g. restaurants, hotels, etc.)
Color – Important indicator of inappropriate industrial sources. Industrial dry weather discharges may be of various colors, but dark colors such as brown, gray, or black are most common.	
Yellow	Chemical, textile, and tanning plants
Brown	Meat packers, printing plants, metal works, stone and concrete works, fertilizer application, and petroleum refining facilities
Green	Chemical plants and textile facilities
Red	Meat packers
Gray	Dairies
Orange	Iron staining due to construction or other land altering activities
Turbidity – Often affected by the degree of gross contamination. Dry weather industrial flows with moderate turbidity can be cloudy, while highly turbid flows can be opaque. High turbidity is often a characteristic of undiluted dry weather industrial discharges.	
Cloudy	Sanitary wastewater, concrete or stone operations, fertilizer facilities, and automotive dealers
Opaque	Food processors, lumber mills, metal operations, and pigment plants
Floatable Matter – A contaminated flow may contain floating solids or liquids directly related to industrial or sanitary wastewater pollution. Floatables of industrial origin may include animal fats, spoiled food, oils, solvents, sawdust, foams, packing materials, or fuel.	
Oil Sheen	Petroleum refineries or storage facilities and vehicle service facilities
Sewage	Sanitary wastewater
Deposits and Stains – Refer to any type of coating near the outfall and are usually of a dark color. Deposits and stains often will contain fragments of floatable substances. These situations are illustrated by the grayish-black deposits that contain fragments of animal flesh and hair, which often are produced by leather tanneries, or the white crystalline powder that commonly coats outfalls due to nitrogenous fertilizer, wastes.	
Sediment	Construction site erosion
Oily	Petroleum refineries or storage facilities and vehicle service facilities
Vegetation – Vegetation surrounding an outfall may show the effects of industrial pollutants. Decaying organic materials coming from various food product wastes would cause an increase in plant life, while the discharge of chemical dyes and inorganic pigments from textile mills could noticeably decrease vegetation. It is important not to confuse the adverse scouring effects of high stormwater flows on vegetation with highly toxic dry weather intermittent flows.	
Excessive growth	Food product facilities
Inhibited growth	High stormwater flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities and automobile dealers

Physical Observation Parameter	Description
Damage to Outfall Structures – Another readily visible indication of industrial contamination. Cracking, deterioration, and spalling of concrete or peeling of surface paint occurring at an outfall are usually caused by severely contaminated discharges, usually of industrial origin. These contaminants are usually very acidic or basic in nature. Primary metal industries have a strong potential for causing outfall structural damage because their batch dumps are highly acidic. Poor construction, hydraulic scour, and old age may also adversely affect the condition of the outfall structure, which are not indications of upstream contaminating entries.	
Concrete cracking	Industrial flows
Concrete spalling	Industrial flows
Peeling paint	Industrial flows
Metal corrosion	Industrial flows

Source: Brown, Caraco, and Pitt. *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments.* USEPA. Washington, DC, 2004

Table 3. Examples of Potential Sources of Industrial Non-Stormwater Entries into the Storm Drainage System

Industrial Categories			Loading/Unloading		Outdoor Storage/ Processing	Water Usage		Particle Generation Process	Illicit/ Inadvertent Connections
Major Class.	SIC Group	Industrial Description	Dry Bulk	Liquid		Cooling	Process		
Primary Industries									
20		Food & Kindred Products							
20	201	Meat Products	H	L	H	H	H	L	H
20	202	Dairy Products	H	H	N/A	H	H	N/A	H
20	203	Canned, Frozen, and Preserved Fruits, Vegetables, and Food Specialties	H	H	H	H	H	M	H
20	204	Grain Mill Products	H	H	L	H	H	H	H
20	205	Bakery Products	H	M	N/A	N/A	H	M	L
20	206	Sugar & Confectionery Products	H	M	N/A	L	M	H	L
20	207	Fats & Oils	H	H	N/A	M	H	N/A	M
20	208	Beverages	H	H	N/A	H	H	M	L
21		Tobacco Products	H	M	N/A	N/A	M	H	M
22		Textile Mill Products	H	L	N/A	H	H	M	H
23		Apparel & Other Finished Products Made From Fabrics & Similar Materials	H	L	N/A	N/A	M	M	L
Material Manufacture									
24		Lumber & Wood Products, Except Furniture	H	L	H	N/A	M	H	L
25		Furniture & Fixtures	H	M	N/A	N/A	L	M	L
26		Paper & Allied Products	H	H	H	H	H	H	H
27		Printing, Publishing, & Allied Industries	H	M	N/A	N/A	M	H	L
31		Leather & Leather Products	H	H	L	L	H	H	H
32		Stone, Clay, Glass, & Concrete Products	H	M	H	L	H	H	L
33		Primary Metal Industries	H	M	H	H	H	H	H
34		Fabricated Metal Products, Except Machinery & Transportation Equipment	H	H	L	H	H	H	H
37		Transportation Equipment	L	H	L	H	H	L	H
Chemical Manufacture									
28	Chemicals & Allied Products								
	281	Industrial Inorganic Chemicals	H	H	N/A	H	H	H	H
	282	Plastics Materials & Synthetic Resins, Synthetic	H	H	L	H	M	L	H
	283	Drugs	L	L	N/A	H	M	L	L
	284	Soaps, Detergents, & Cleaning Preparations; Perfumes, Cosmetics, and Other Toilet Preparations	H	H	N/A	H	H	H	H
	285	Paints, Varnishes, Lacquers, Enamels & Allied Products	H	H	N/A	L	H	H	L
	286	Industrial Organic Chemicals	H	H	N/A	H	H	H	M
	287	Agricultural Chemicals	L	L	N/A	H	L	L	L
29	Petroleum Refining & Related Industries								
	291	Petroleum Refining	L	H	H	H	L	N/A	H

Industrial Categories			Loading/Unloading		Outdoor Storage/ Processing	Water Usage		Particle Generation Process	Illicit/ Inadvertent Connections
Major Class.	SIC Group	Industrial Description	Dry Bulk	Liquid		Cooling	Process		
	295	Asphalt Paving & Roofing Materials	H	H	H	N/A	M	M	L
30		Rubber & Misc. Plastic Products	H	H	N/A	H	H	H	M
Transportation & Construction									
15		Building Construction General Contractors & Operative Builders	M	L	H	N/A	L	H	L
16		Heavy Construction Other Than Building Construction Contractors	M	L	H	N/A	L	H	L
Retail									
52		Building Materials, Hardware Garden Supply, & Mobile Home Dealers	H	L	H	N/A	L	N/A	L
53		General Merchandise Stores	H	M	L	N/A	L	N/A	L
54		Food Stores	H	H	N/A	N/A	M	L	L
55		Automotive Dealers & Gasoline Service Stations	H	H	H	N/A	M	L	M
56		Apparel & Accessory Stores	H	L	N/A	N/A	L	N/A	L
57		Home Furniture, Furnishings, and Equipment Stores	H	L	L	N/A	L	N/A	L
58		Eating & Drinking Places	H	M	N/A	N/A	M	N/A	M
Other									
		Coal Steam Electric Power	H	L	H	H	L	H	L
		Nuclear Steam Electric Power	N/A	L	N/A	H	L	N/A	N/A

The industrial categories listed in Table 3 were defined according to the 1987 Standard Industrial Classification Manual codes (SIC code). The industries were classified according to six main categories. The category for "Primary Industries" includes facilities involved in the production of food products and other basic goods. The category of "Material Manufacturing" includes those industries producing materials such as lumber, paper, glass, and leather. Similarly, the "Chemical Manufacturing" category includes those industries making products such as plastics, paints, detergents, fertilizers, pesticides, and other related substances. "Transportation and Construction" primarily concerns the discharge of contaminants from building or other types of outdoor development. The "Retail" category includes establishments engaged in the selling of merchandise or offering merchandise related services. Finally, all other industries, which did not fit into any of the above classifications, were placed into an "Other" category. Those industries, which are not specifically listed, should have characteristics resembling the industries of the major groups with which they are classified by SIC code.

High potential (H)

Moderate potential (M),

Low potential (L)

Potential not applicable (N/A) if no relationship evident.

Source: Brown, Caraco, and Pitt. *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments.* USEPA. Washington, DC, 2004.

Table 3 can be used to identify industries in each drainage area most likely to contribute non-stormwater entries into the storm drainage system. The categories considered in this table include loading and unloading of dry bulk or liquid materials, outdoor storage or processing, water usage (cooling and process waters), dust or particulate generating processes, and illicit or inadvertent industrial connections. The likelihood of an industry producing dry weather or wet weather discharges in each of these categories was rated on the basis of high (H), moderate (M), or low (L) potential and not applicable (N/A) if there was no relationship evident.

Table 4. Listing of Industrial Related Chemicals

Chemical	Industry
Acetic Acid	Acetate rayon, pickle and beetroot manufacture
Alkalines	Cotton and straw kiering, cotton manufacture, mercerizing, wool scouring, and laundries
Ammonia	Gas, coke, and chemical manufacture
Arsenic	Sheep-dipping and felt mongering
Chlorine	Laundries, paper mills, and textile bleaching
Chromium	Plating, chrome tanning, and aluminum anodizing
Cadmium	Plating
Citric Acid	Soft drinks and citrus fruits
Copper	Plating, pickling, and rayon
Cyanides	Plating, metal cleaning, case-hardening, and gas manufacturer
Fats, oils	Wool scouring, laundries, textiles, and oil refineries
Fluorides	Gas, coke, and chemical manufacturer, fertilizer plants, transistor manufacturer, metal refining, ceramic plants, and glass etching
Formalin	Manufacture or synthetic resins and penicillin
Hydrocarbons	Petrochemicals and rubber factories
Hydrogen Peroxide	Textile bleaching, and rocket motor testing
Lead	Battery manufacture, lead mining, paint manufacture, and gasoline manufacture
Mercaptans	Oil refining, and pulp mills
Mineral Acids	Chemical manufacture, mines, Fe and Cu pickling, brewing, textiles, photo-engraving, and battery manufacture
Nickel	Plating
Nitro Compounds	Explosives and chemical works
Organic Acids	Distilleries and fermentation plants
Phenols	Gas and coke manufacture, synthetic resin manufacture, textiles, tanneries, tar, chemical, and dye manufacture and sheep-dipping
Silver	Plating, and photography
Starch	Food, textile, and wallpaper manufacture
Sugars	Dairies, foods, sugar refining, and preserves
Sulfides	Textile, tanneries, gas manufacture, and rayon manufacture
Sulfites	Wood process, viscose manufacture, and bleaching
Tannic Acid	Tanning, and sawmills
Tartaric Acid	Dyeing, wine, leather, and chemical manufacture
Zinc	Galvanizing, plating, viscose manufacture, and rubber process

Source: Van der Leeden, et al., 1990

Table 5: The 3 General Categories of Stormwater Pollutants and Discharges

Pathogenic and Toxic Pollutants
Pathogenic and toxic pollutants should be considered the most severe since contact or consumption of stormwater contaminated by these pollutants could cause illness and significant water treatment problems for downstream users. These pollutants may originate from: • Sanitary, commercial, and industrial wastewater, • Inappropriate household toxicant disposal, • Automobile engine de-greasing, and • Excessive use of chemicals (pesticides, herbicides, and fertilizers). Pathogenic or toxic, and nuisance pollutants should be prioritized in a manner that ensures prompt action in the source identification process as these types of pollutants have the most harmful effects to the environment. In areas containing no industrial or commercial sources, sanitary wastewater is probably the most severe dry-weather contaminating source of storm drain flows. The following parameters can be used for quantifying the sanitary wastewater components of the treated potable water portion: • Surfactant analysis may be used in determining the presence of sanitary wastewaters. However, surfactants present in water originating from potable water sources could indicate sanitary wastewaters, laundry wastewaters, car washing wastewater, or any other waters containing surfactants. If surfactants are not present, then the potable water could be relatively uncontaminated (potable waterline leaks or irrigation runoff). • Sanitary wastewaters often exhibit predictable trends during the day in flow and quality. In order to maximize the ability to detect direct sanitary wastewater connections into the storm drainage system, it would be best to survey the outfalls during periods of highest sanitary wastewater flows (mid to late morning hours). • The ratio of surfactants to ammonia or potassium concentrations may be an effective indicator of the presence of sanitary wastewaters or septic tank effluents. If the surfactant concentrations are high, but the ammonia and potassium concentrations are low, then the contaminated source may be laundry wastewaters. Conversely, if ammonia, potassium, and surfactant concentrations are all high, then sanitary wastewater is the likely source. Some researchers have reported low surfactants in septic tank effluents. Therefore, if surfactants are low, but potassium and ammonia are both high, septic tank effluent may be present. • Obviously, odor and other physical characteristics, e.g. turbidity, coarse and floating solids, foaming, color, and temperature would also be very useful in distinguishing sanitary wastewater from wash water or laundry wastewater sources. However, these indicators may not be very obvious for small levels of sanitary wastewater contamination.
Nuisance Pollutants
Nuisance pollutants contribute aquatic life threatening conditions to the storm drainage system. These pollutants can cause excessive dissolved oxygen depletions, tastes, odors, and colors in downstream water supplies, algal blooms, offensive floatables, and noticeably turbid water. These pollutants may originate in residential areas from: • Sanitary wastewaters • Laundry wastewaters • Lawn irrigation runoff • Automobile wash waters • Construction site dewatering • Washing of concrete ready-mix trucks

Clean water

Clean water discharged through a storm drainage system is commonly found during an outfall inventory. Clean water discharges can originate from the following:

- Natural springs in urban areas that have been piped to a nearby creek or stream,
- Infiltrating groundwater, and
- Infiltration from potable waterline leak.

A number of tracer parameters may be useful for distinguishing treated potable water from natural waters:

- Major ions or other chemical/physical characteristics of the flow components can vary substantially depending upon whether the water supply sources are groundwater or surface water, and whether the sources are treated or not. Specific conductance may also serve as a rough indicator of the major water source.
- Fluoride can often be used to separate treated potable water from untreated water sources. Untreated water sources can include local springs, groundwater, regional surface flows or non-portable industrial waters. If the treated water has no fluoride added, or if the natural water has fluoride concentrations close to potable water fluoride concentrations, then fluoride may not be an appropriate indicator.
- Hardness can also be used as an indicator if the potable water source and the base flow are from different water sources. An example would be if the base flow is from hard groundwater, and the potable water is from softer surface supplies.
- If the concentration of chlorine is high, then a major leak of disinfected potable water is likely to be close to the outfall. Because of the rapid dissipation of chlorine in water (especially if some organic contamination is present) it is not a good parameter for quantifying the amount of treated potable water observed at the outfall.
- Water from potable water supplies (that test positive for fluorides, or other suitable tracers) can be relatively uncontaminated, e.g., potable waterline leakage or irrigation runoff, or heavily contaminated, e.g., sanitary wastewater.

Source: Brown, Caraco, and Pitt. *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments.* USEPA. Washington, DC, 2004.

APPENDIX D: HACH SENSION 2 PH/ISE METER PROCEDURES

Procedures for Operation of the SensION 2 pH/ISE meter:

1. Connect the electrode to the SensION 2 pH/ISE meter.
2. Turn on the meter by pressing **I/O**. Press **pH MV** until the display shows pH.
3. Press **Setup**. Press the up arrow three times. Press **ENTER** to move to the desired number of decimal places, then **EXIT** to leave setup.
4. In two 50mL beakers or cups, prepare buffers of 4.00 and 7.00, or 7.00 and 10.00. (Note that the sample should fall within the range of the calibration buffers).
5. Press **CAL**. The display will show: **Standard 1?**
6. Rinse electrode with deionized water and blot dry.
7. Place the electrode in the pH 7.00 buffer. Press **ENTER**. The display shows: **Stabilizing**
8. When a stable pH is determined, the display will show **Standard 2?** Remove the electrode from the cup. Rinse and blot dry.
9. Place the electrode in the 4.00 or 10.00 pH buffer and press **ENTER**.
10. After the last calibration point has stabilized and the display reads **Standard 3?**, press **EXIT**. (Note that a three-point calibration can be performed instead of a two-point. Instead of exiting at Standard 3? Enter the value for the third standard and repeat steps H and J).
11. The display will show **Store?**. Press **ENTER** to store the calibration or **EXIT** to leave the calibration mode without storing the values. Note the slope value displayed on the calibration screen; the electrode is responding properly if the calibration slope is 58+/- 3 mV per pH unit.
12. Rinse the electrode with deionized water followed by a small amount of sample and blot dry.
13. Collect enough sample volume in a container to immerse the electrode in the sample. Gently stir the electrode in the sample. pH samples must be analyzed within fifteen minutes of collection.
14. Store or record the pH and temperature readings when they stabilize.
15. Store the electrode properly when not in use.
16. Intermittent Storage: Between uses, store the electrode in solutions of similar ionic strength and pH to the samples of interest. Carefully rinse the electrode before use to prevent sample contamination.
17. Overnight Storage: Store the electrode in Hach Electrode Storage Solution to keep the electrode hydrated.
18. Shelf Storage: For long-term storage, store the electrode dry. For faster reconditioning in the future, wet the cotton/wool ball located in the vinyl storage cap with storage solution, Place the cap over the electrode. This will help keep the bulb hydrated.

APPENDIX E: HACH DR2700 PORTABLE SPECTROPHOTOMETER

Total Chlorine Test Procedure

Copper Test Procedure

Phenols Test Procedure

Anionic Surfactants (Detergents) Test Procedure

Procedures for Operation of the Hach DR2800 Portable Spectrophotometer

The complete DR2800 Procedures Manual can be found on the Hach website at: http://www.hach.com/dr-2800-portable-spectrophotometer-with-lithium-ion-battery/product-downloads?id=7640439012&callback=qs.

Total Chlorine (0.02 to 2.00 mg/L) Test Procedure

Use the Hach DR2800 Portable Spectrophotometer to test for **Total Chlorine (0.02 to 2.00 mg/L)**. (If using an equivalent meter, refer to the instruction manual for procedure).

1. Press **STORED PROGRAMS**.
2. Select the test.
3. Fill a square sample cell with 10 mL of sample.
4. **Prepared Sample**: Add the contents of one DPD Total Chlorine Powder Pillow to the sample cell. Swirl the sample cell for 20 seconds to mix.
5. Press **TIMER>OK**. A 3-minute reaction period will begin. Perform steps 6 and 7 during this time period.
6. **Blank Preparation**: Fill a second square sample cell with 10-mL of sample.
7. Wipe the blank sample cell and insert it into the cell holder with fill line facing right. Press **ZERO**. The display will show: 0.00 mg/L CL_2
8. Within 3 minutes after the timer expires, wipe the blank sample cell and insert it into the cell holder with fill line facing right. Press **READ**. Results are in mg/L CL_2

***Note: DPD reagent packets deteriorate in the presence of moisture. The packets should be discarded if they have caked or turned brown.**

Total Chlorine (0.1 to 10.0 mg/L) Test Procedure

Use the Hach DR2800 Portable Spectrophotometer to test for **Total Chlorine (0.1 to 10.0 mg/L)**. (If using an equivalent meter, refer to the instruction manual for procedure).

1. Press **STORED PROGRAMS**.
2. Select the test.
3. Insert Adapter B.
4. Fill a square sample cell to the 5-mL line with sample.
5. Wipe the cell and insert it into the cell holder with the 1-cm (flat) path in line with the indicator arrow on the adapter.
6. Press **ZERO**. The display will show: 0.0 mg/L CL_2
7. Remove the cell and add the contents of one DPD Total Chlorine Powder Pillow for 25-mL samples to the sample. Cap and shake the cell for 20 seconds to dissolve reagent. A pink color will develop if chlorine is present.
8. Press **TIMER>OK**. A 3-minute reaction period will begin.
9. Insert the prepared sample into the cell holder with the 1-cm (flat) path in line with the indicator arrow on the adapter. Press **READ**. Results are in mg/L CL_2

Copper (1 to 210 µg/L) Test Procedure

Use the Hach DR2800 Portable Spectrophotometer to test for **Copper (1 to 210 µg/L)**. (If using an equivalent meter, refer to the instruction manual for procedure).

1. Press **STORED PROGRAMS**.
2. Select the test.
3. Fill two square sample cells with 10 mL of sample.
4. **Blank Preparation**: Add the contents of one Copper Masking Reagent Powder Pillow to one of the sample cells. Swirl to dissolve. This cell will be the blank.
5. Add the contents of one Porphyrin 1 Reagent Powder Pillow to each sample cell.
6. Swirl to dissolve.
7. Add the contents of one Porphyrin 2 Reagent Powder to each sample cell.
8. Swirl to dissolve. If copper is present, the sample will momentarily turn blue, then return to yellow.
9. Press **TIMER>OK**. A 3-minute reaction period will begin.
10. When the timer expires, insert the blank into the cell holder with the fill line facing right.
11. Press **ZERO**. The display will show: 0 µg/L CU
12. Insert the prepared sample into the cell holder with the fill line facing right. Press **READ**. Results are in µg/L CU

Copper (0.04 to 5.00 mg/L) Test Procedure

Use the Hach DR2800 Portable Spectrophotometer to test for **Copper (0.04 to 5.00 mg/L)**. (If using an equivalent meter, refer to the instruction manual for procedure).

1. Press **STORED PROGRAMS**.
2. Select the test.
3. **Prepared Sample**: Fill a square sample cells with 10 mL of sample.
4. Add the contents of one CuVer® 1 Copper Reagent Powder Pillow to the sample cell (the prepared sample). Swirl sample cell to mix. Use a CuVer 2 Copper Reagent Pillow for samples containing high levels of aluminum, iron, and hardness. A 25-mL sample cell is required.
5. Press **TIMER>OK**. A 2-minute reaction period will begin.
6. **Blank Preparation**: When the time expires, fill a second square sample cell with 10 mL of sample.
7. Insert the blank into the cell holder with fill line facing right. Press **ZERO**. The display will show: 0 mg/L CU
8. Within 30 minutes after the timer expires, insert the prepared sample into the cell holder with the fill line facing right. Press **READ**. Results are in mg/L CU

Phenols Test Procedure

Use the Hach DR2800 Portable Spectrophotometer to test for **Phenols**. (If using an equivalent meter, refer to the instruction manual for procedure).

1. Press **STORED PROGRAMS**.
2. Select the test.
3. Measure 300 mL of deionized (DI) water in a 500-mL graduated cylinder.
4. **Blank Preparation**: Pour the measured DI water into a 500-mL separatory funnel.
5. Measure 300 mL if sample in a 500-mL graduated cylinder.
6. **Prepared Sample**: Pour the measured sample into another 500-mL separatory funnel
7. Add 500 mL of Hardness Buffer to each separatory funnel. Stopper and shake to mix.
8. Add the contents of one Phenol Reagent Powder Pillow to each separatory funnel. Stopper and shake to dissolve.
9. Add the contents of one Phenol 2 Reagent Powder Pillow to each separatory funnel. Stopper and shake to dissolve.
10. Add 30 mL of chloroform to each separatory funnel. Stopper each funnel.
11. Invert each funnel and temporarily vent. Shake each funnel briefly and vent. Then vigorously shake each funnel for a total of 30 seconds (venting if necessary).
12. Remove the stoppers. Allow both funnels to stand until the chloroform settles to the bottom of the funnel. The chloroform layer will be yellow to amber if phenol is present.
13. Insert a large, pea-sized cotton plug into the deliver tube of each funnel. Filter the chloroform layer through the cotton removes suspended water or particles. The volume of the chloroform extract will be about 25 mL.
14. Drain the chloroform layers into separate sample cells (one for the blank and one for each sample). Stopper the cells. The water phase contains chloroform, which is hazardous. Dispose of properly.
15. Wipe the blank and insert it into the cell holder with the fill line facing right. Press **ZERO**. The display will show: 0.000 mg/L Phenol
16. Wipe the prepared sample and insert it into the cell holder with the fill line facing right. Press **READ**. Results are in mg/L Phenol

****Note:** When venting a separatory funnel, be sure to point the funnel away from yourself and others.

Anionic Surfactants (Detergents) Test Procedure

Use the Hach DR2800 Portable Spectrophotometer to test for **Anionic Surfactants (Detergents)**. (If using an equivalent meter, refer to the instruction manual for procedure).

1. Press **STORED PROGRAMS**.
2. Select the test.
3. Fill a clean 500-mL graduated cylinder to the 300 mL mark with sample. Pour the sample into a clean 500-mL separatory funnel.
4. Add 10 mL of Sulfate Buffer Solution. Stopper the funnel. Shake the funnel for five seconds.
5. Add the contents of one Detergents Reagent Powder Pillow to the funnel. Stopper the funnel and shake until the powder dissolves completely.
6. Add 30 mL of benzene to the funnel. Stopper the funnel and shake gently for one minute.
7. Place the separatory funnel in a support stand.
8. Press **TIMER>OK**. A 30-minute reaction period will begin.
9. After the timer expires, remove the stopper and drain the bottom water layer. Discard this layer.
10. **Prepared Sample**: Drain the top benzene layer into a clean 25-mL sample cell. Do not filter the benzene layer before color measurement. Filtration removes the blue color.
11. **Blank Preparation**: Fill another sample cell to the 25-mL mark with pure benzene.
12. Insert the blank into the cell holder with the fill line facing right.
13. Press **ZERO**. The display with show: 0.000 mg/L LAS
14. Insert the prepared sample into the cell holder with the fill line facing right.
15. Press **READ**. Results are in mg/L LAS

Cleaning Procedures

1. Rinse with tap water.
2. Scrub with non-phosphate detergent and tap water rinse.
3. Tap water rinse.
4. Rinse with deionized water.
5. Air dry.

Appendix F: Environmental Engineering Standard Operating Procedure Regarding Stormwater Illicit Discharge Complaints

Date: **November 14, 2012**

Subject: **Environmental Engineering Standard Operating Procedure Regarding Stormwater Illicit Discharge Complaints**

When a call is received regarding an Illicit Discharge complaint from citizens, the following procedures are generally to be followed:

1. Staff asks the caller for the date and time that the illicit discharge was observed, who was seen discharging the material, the water color and odor if possible. The address and location of complaint is determined. Pictures are requested if available. All information is entered onto an Engineering Department Work Order Request form (Appendix A). If pictures are included, they will be attached to the Engineering Department Work Order Request.
2. The property is located on the County's GIS mapping system, various layers including contours, aerial, storm sewer systems, and streams are turned on, and a map is printed to aid in the investigation. If available, digital maps may be used on a pentop or laptop computer in the field to access pertinent information.
3. A site visit is conducted to access the Illicit Discharge complaint the same day if possible, but at most within 48 hours. A new folder should be created with the supporting information and pictures taken and filed on the County's Network: (Need electronic location from Tim)
4. Once the downstream discharge point is located, staff should review maps and determine potential contributing pipes and stream tributaries.
5. Perform dry weather screening to determine potential illicit discharge.
6. Investigate each of the potential contributing stormwater systems.
7. If the discharge location is found, the person responsible for the illicit discharge is interviewed. If the illicit discharge material is identifiable, staff should determine minimum reportable discharge quantity.
8. If the discharge is considered illicit, then staff issues the discharger a Notice of Violation.
9. For a second offense, the discharger is issued a fine and a citation that requires them to appear in court. Contact Tim Sherbert (864-595-5349) to establish a court date/time.
10. Staff requires that the illicit discharge material be removed from the Stormwater conveyance system or stream. For example, if an industrial cleaning solution is discharged to the Stormwater conveyance system, then the downstream system will be plugged and the system cleaned and vacuumed out by the person/company responsible for the illicit discharge. In the event of a significant discharge which may a cause a detriment to the ecosystem, staff may choose to have operations assist with the clean-up and assess costs to violator.
11. If the illicit discharge incident qualifies as reportable, SCDHEC EQC office is contacted at (864) 241-1090.

APPENDIX G: ENFORCEMENT RESPONSE PROCEDURES