HORRY COUNTY
STANDARD OPERATING PROCEDURES FOR USE IN FIELD INVESTIGATIONS FOR ILLICIT DISCHARGES

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1. INTRODUCTION

An understanding of the nature of illicit discharges in urban watersheds is essential to find, fix and prevent them. This document presents Horry County's initial plan for illicit discharge detection and elimination in compliance with NPDES requirements for Phase II Municipal Separate Storm Sewer System (MS4) communities. The NPDES Phase II MS4 permit requires that Horry 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 maximum extent practical (MEP), increase knowledge of the County's stormwater management system and pollutants of concern.

The remaining portion of this chapter provides the specific requirements from the NPDES Phase II permit and definitions. Chapter 2 provides a summary of the County's IDDE program processes and procedures. There are also appendices which provide supplemental and detailed information for the selection of sampling parameters, sampling procedures and IDDE notification letters.

1.1 Permit Requirements

In the regulation, EPA recommends that the plan to detect and address illicit discharges include procedures for:

- Locating priority areas likely to have illicit discharges (which may include visually screening outfalls during dry weather and conducting field tests of selected pollutants).
- Tracing the source of an illicit discharge.
- Removing the source of the discharge.
- Program evaluation and assessment.

Table 1 outlines the NPDES Phase II MS4 permit requirements for illicit discharge detection and elimination (IDDE).

Table 1. Phase II MS4 Permit Requirements – Minimum Measure #3

4.2.3.2.1	Permittee must develop (if not already completed) a storm sewer system map showing the location of all outfalls, and names and location of all waters of the U. S. that receive discharges from those outfalls.
4.2.3.2.2	Permittees must identify priority areas for more detailed screening of the system based on higher likelihood of illicit connections (e.g. areas with older sanitary sewer lines) or by conducting ambient sampling to locate impacted reaches.
4.2.3.2.3	Permittees must implement, or continue to revise as applicable, a written dry weather field screening and analytical monitoring procedures to detect and eliminate illicit discharges to the MS4.
4.2.3.2.4	Develop written procedures for conducting investigations into the source of all identified illicit discharges, including approaches to requiring such discharges to be eliminated.
4.2.3.2.5	At a minimum, after becoming aware of the illicit discharge, the permittee is required to initiate an investigation(s) to identify and locate the source of any continuous or intermittent non-stormwater discharge within a timeframe that is consistent with the procedures found in the permittees' SWMP.
4.2.3.2.6	Permittees are required to determine and document through their investigations the source of all documented illicit discharges.
4.2.3.2.7	Once the source of the illicit discharge has been determined, permittees shall implement a Corrective Action plan to eliminate illicit discharges.
4.2.3.2.8	Permittees must promote, publicize, and facilitate a reporting mechanism for the public and staff to report illicit discharges and establish and implement citizen request response procedures.
4.2.3.2.9	Permittees must implement a training program for all appropriate municipal field staff, which, as part of their normal job responsibilities, may come into contact with, or otherwise observe, an illicit discharge or illicit connection to the storm sewer system.

1.2 Important Terminology and Key Concepts

Pollutants of Concern

The three major categories of illicit discharges most commonly found are as follows:

The ***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)
- Accidental spills or illegal dumping

Nuisance pollutants may contribute to aquatic life threatening conditions in 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 trucks.

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 leaks.

Pathogenic 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 potential for harmful effects to the environment. Any future outfall inventories or illicit tracking efforts should make use of the following illicit tracking procedures. Additional outfall inventory or illicit tracking projects, already in progress, can enter the procedural flowchart at any time and work towards completion.

Allowable Discharges

Non-stormwater discharges that discharge less than significant sources of pollutants to the MS4, due to either the nature of the discharges or because there are conditions Horry County has established for allowing these discharges to their MS4, are allowed. The County is authorized (in their Phase II MS4 Permit) to discharge the following non-stormwater sources provided that DHEC has not determined these sources to be substantial contributors of pollutants to the County's MS4:

- water line flushing
- landscape irrigation

- diverted stream flows
- rising ground waters
- uncontaminated ground water infiltration
- uncontaminated pumped ground water
- discharges from potable water sources
- foundation drains
- air conditioning condensation
- irrigation water
- springs
- water from crawl space pumps
- footing drains
- lawn watering
- individual residential car washing
- natural flows from riparian habitats and wetlands
- de-chlorinated swimming pool discharges
- street wash water
- discharges or flows from firefighting activities

Illicit Discharge

The term illicit discharge is defined in four parts.

1. Illicit discharges are defined as a storm sewer or conveyance that has measurable flow during dry weather containing pollutants and/or pathogens. A storm sewer or conveyance with measurable flow but containing no pollutants is simply considered a discharge.
2. Each illicit discharge has a unique frequency, composition and mode of entry in the storm sewer system.
3. Illicit discharges are frequently caused when the sewage disposal system interacts with the storm drain system. A variety of monitoring techniques are used to locate and eliminate illegal sewage connections. These techniques trace sewage flows from the stream or outfall, and require going back up the pipes or conveyances to reach the problem connection.
4. Illicit discharges of other pollutants are produced from specific source areas and operations known as "generating sites". Knowledge about these generating sites can be helpful to locate and prevent non-sewage illicit discharges. Depending on the regulatory status of specific "generating sites," education, enforcement and other pollution prevention techniques may be the most appropriate way to manage this class of illicit discharges.

MS4

Horry County's MS4 includes all conveyances or systems of conveyances (including roads with drainage systems, highways, rights-of-way, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, storm drains, detention ponds, and other stormwater facilities) which inlets, transports, stores, or treats stormwater runoff and which is (a) owned or operated by Horry County; (b) designed or used for collecting or conveying stormwater; (c) not a combined sewer system; and (d) not part of a Publicly Owned Treatment Works (POTW).

The Horry County regulated area refers to the boundaries of Horry County's urbanized areas as determined by Decennial Census Data from the United States Bureau of the Census. Note that Horry County has entered into Inter-local Agreements with the Towns of Atlantic Beach and Briarcliffe Acres to assist with NPDES Phase II permit compliance, including assistance with illicit discharge detection and elimination.

Source Identification

These are the office and field tasks used to track potential illicit discharges to the source, and determine if the discharge is in fact an illicit based on an analysis of samples taken.

Discharge Frequency

The **frequency** of dry weather discharges in storm sewers or conveyances is important and can be classified as c*ontinuous, intermittent or transitory.*

Continuous discharges occur most or all of the time, are usually easier to detect, and typically produce the greatest pollutant load.

Intermittent discharges occur over a shorter period of time (e.g., a few hours per day or a few days per year). Because they are infrequent, intermittent discharges are hard to detect, but can still represent a serious water quality problem, depending on their flow type.

Transitory discharges occur rarely, usually in response to a singular event such as an industrial spill, ruptured tank, sewer break, transport accident or illegal dumping episode. These discharges are extremely hard to detect with routine monitoring, but under the right conditions, can exert severe water quality impacts on downstream receiving waters.

Discharge Flow Types

Dry weather discharges are composed of one or more possible **flow types**:

- *Sewage and septage* flows are produced from sewer pipes and septic systems.
- *Washwater* flows are generated from a wide variety of activities and operations. Examples include discharges of gray water (laundry) from homes, commercial carwash wastewater, fleet washing, commercial laundry wastewater, and floor washing to shop drains.
- *Liquid wastes* refers to a wide variety of flows, such as oil, paint, and process water (radiator flushing water, plating bath wastewater, etc.) that enter the storm drain system.
- *Tap water* flows are derived from leaks and losses that occur during the distribution of drinking water in the water supply system. Tap water discharges in the storm drain system may be more prevalent in communities with high loss rates (i.e., greater than15%) in their potable water distribution system. (source of 15% is from National Drinking Water Clearinghouse)
- *Landscape irrigation* flows occur when excess potable water used for residential or commercial irrigation ends up in the storm drain system.
- *Groundwater and spring water* flows occur when the local water table rises above the bottom elevation of the storm drain (known as the invert) and enters the storm drain either through cracks and joints, or where open channels or pipes associated with the MS4 may intercept seeps and springs.

Water quality testing is used to identify flow types found in storm drains. Testing can distinguish illicit flow types (sewage/septage, washwater and liquid wastes) from cleaner discharges (tap water, landscape irrigation and ground water). Each flow type has a distinct chemical fingerprint. The chemical fingerprint for each flow type can differ regionally, so it is a good idea to develop your own "fingerprint" library by sampling each local flow type.

Mode of Entry

Illicit discharges are classified based on the owner of the system to which the potential illicit discharge drains and how the discharge enters the storm drain system. The **mode of entry** can either be **direct** or **indirect.**

Direct entry means that the discharge is directly connected to the storm drain pipe through a sewage pipe, shop drain, or other kind of pipe. Direct entry usually produces discharges that are continuous or intermittent. Direct entry usually occurs when two different kinds of "plumbing" are improperly connected. The three main situations where this occurs are:

1. Sewage cross-connections: A sewer pipe that is improperly connected to the storm drain system produces a continuous discharge of raw sewage to the pipe. Sewage cross-connections can occur in catchments where combined sewers or septic systems are converted to a separate sewer system, and a few pipes get "crossed." The term "Straight pipe" refers to relatively small diameter pipes that intentionally bypass the sanitary connection or septic drain fields, producing a direct discharge.

2. Industrial and commercial cross connections*:* These occur when a drain pipe is improperly connected to the storm drain system producing a discharge of wash water, process water or other inappropriate flows into the storm drain pipe. Older industrial areas tend to have a higher potential for illicit cross-connections.

Indirect entry means that flows generated outside the storm drain system enter through storm drain inlets or by infiltrating through the joints of the pipe. Generally, indirect modes of entry produce intermittent or transitory discharges, with the exception of groundwater seepage. The five main modes of indirect entry for discharges include:

1. Groundwater seepage into the storm drain pipe*:* Seepage frequently occurs in storm drains after long periods of above average rainfall, particularly in areas with underdrains for roadbed drainage. Seepage discharges can be either continuous or intermittent, depending on the depth of the water table and the season. Groundwater seepage usually consists of relatively clean water that is not an illicit discharge by itself, but can mask other illicit discharges. If storm drains are located close to sanitary sewers, groundwater seepage may intermingle with diluted sewage.

2. Spills that enter the storm drain system at an inlet: These transitory discharges occur when a spill travels across an impervious surface and enters a storm drain inlet. Spills can occur at many industrial, commercial and transport-related sites. A very common example is an oil or gas spill from an accident that then travels across the road and into the storm drain system.

3. Dumping a liquid into a storm drain inlet*:* This type of transitory discharge is created when liquid wastes such as oil, grease, paint, solvents, and various automotive fluids are dumped into the storm drain. Liquid dumping occurs intermittently at sites that improperly dispose of rinse water and wash water during maintenance and cleanup operations. A common example is cleaning deep fryers in the parking lot of fast food operations.

4. Outdoor washing activities that create flow to a storm drain inlet: Outdoor washing may or may not be an illicit discharge, depending on the nature of the generating site that produces the wash water. For example, hosing off individual sidewalks and driveways may not generate significant flows or pollutant loads. On the other hand, routine washing of fueling areas, outdoor storage areas, and parking lots (power washing), and construction equipment cleanouts may result in unacceptable pollutant loads.

5. Non-target irrigation from landscaping or lawns that reaches the storm drain system: Irrigation can produce intermittent discharges from over-watering or misdirected sprinklers that send tap water over impervious areas. In some instances, non-target irrigation can

produce unacceptable loads of nutrients, organic matter or pesticides. The most common example is a discharge from commercial landscaping areas adjacent to parking lots connected to the storm drain system.

2. SUMMARY OF COUNTY IDDE PROCEDURES

This section provides a summary of the County's IDDE program. There are several major topics that will be discussed that provide a systematic approach to eliminating illicit discharges. These include notification to the Stormwater Department of a potential illicit discharge, determination and notification of the owner of the system receiving the discharge, source identification of the discharge, and enforcement. Figure 1 provides a flowchart summarizing the County's IDDE program.

2.1 Report of Potential Illicit Discharges to the County Stormwater System

The process begins through the identification of a potential illicit discharge. Identification is expected to be achieved through outfall screening by Stormwater Department personnel, internal reporting from other County personnel, external reporting/citizen complaints, or other watershed planning efforts by the field investigations of prioritized land uses.

2.1.1 Internal Reporting

The Stormwater Department is expected to find potential illicit discharges through system inventory efforts for the County's MS4 Permit. In addition, the Department expects reporting of potential illicit discharges through other County Departments (e.g. Law Enforcement, Public Works, Code Enforcement, etc.).

2.1.2 Caller Notification

County citizens, visitors, and others should notify the Stormwater Department of any suspected illicit discharges by calling the Road and Drainage Hotline (843-381-8000) or by submitting a service request online at http://stormwater.horrycounty.org.

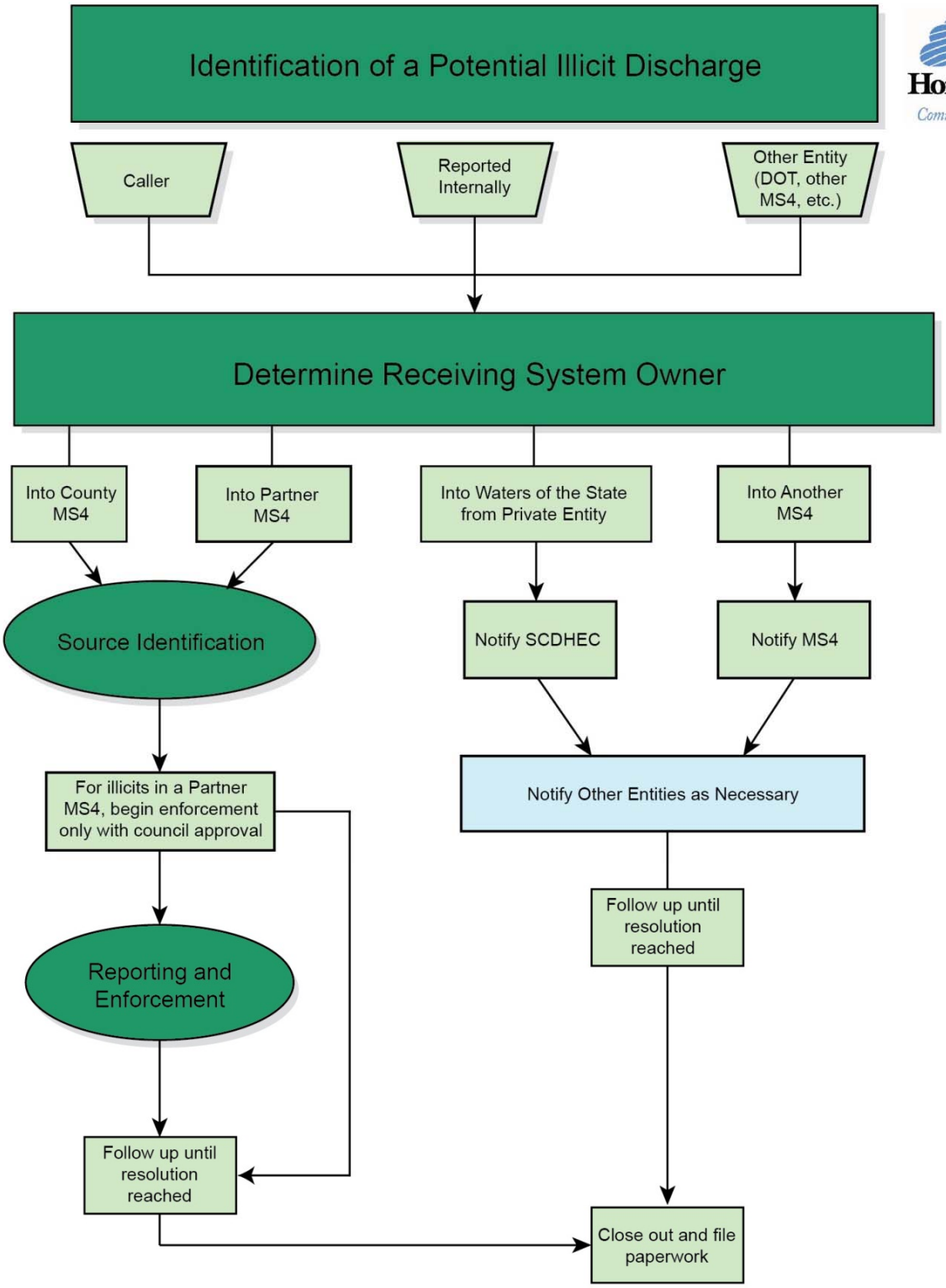
2.1.3 Other MS4 Reporting

The Stormwater Department should be notified by other MS4s of any suspected illicit discharges that are entering County systems.

2.1.4 Watershed-Based Planning

The County is currently exploring other potential ways of identifying possible illicit discharges. These would include watershed planning and prioritization tasks to systematically address potential illicit discharges at perceived "hotspots" such as restaurants, dry cleaners, and auto shops.

Figure 1: Horry County IDDE Program



2.1.5 Follow-up Procedures

The Stormwater Department will routinely follow-up on notifications sent to other entities. Follow-up procedures will include a periodic check of the potential IDDE location database to see which locations may need to be addressed, phone calls to the appropriate entities to check for resolution, and if necessary, re-visiting locations to clarify ownership and/or source. For more detail, see Section 2.2.4.

2.2 Illicit Source Identification

The next step has three primary components: illicit tracking to identify the source, dry weather flow screening to determine if the discharge is truly an illicit and to assist with source identification, and finally illicit elimination through enforcement or notification. These steps apply only to the instances in which the potential illicit discharge is flowing into the MS4 owned either by Horry County or a partner MS4.

Figure 2 (on following page) is a flowchart summarizing the illicit discharge source identification procedures.

2.2.1 Potential Illicit Discharge Tracking

The first step in the source identification process is to track the discharge up to the source. The source can either be the actual pollution causing event (e.g. sanitary sewer overflow or leak, illegal connection of car wash drain to storm system) or a system owned by another entity.

Field crews will begin the tracking process of the potential illicit discharge during a dry weather condition, unless the potential illicit discharge is deemed to be toxic or acutely hazardous in which case the tracking will begin immediately. The procedure is the same regardless of how the discharge was discovered (screening, internal, or external reporting). A dry weather condition is defined as one in which no rain event exceeding 0.1" of precipitation has occurred in the past 72 hours. The following steps should be generally followed:

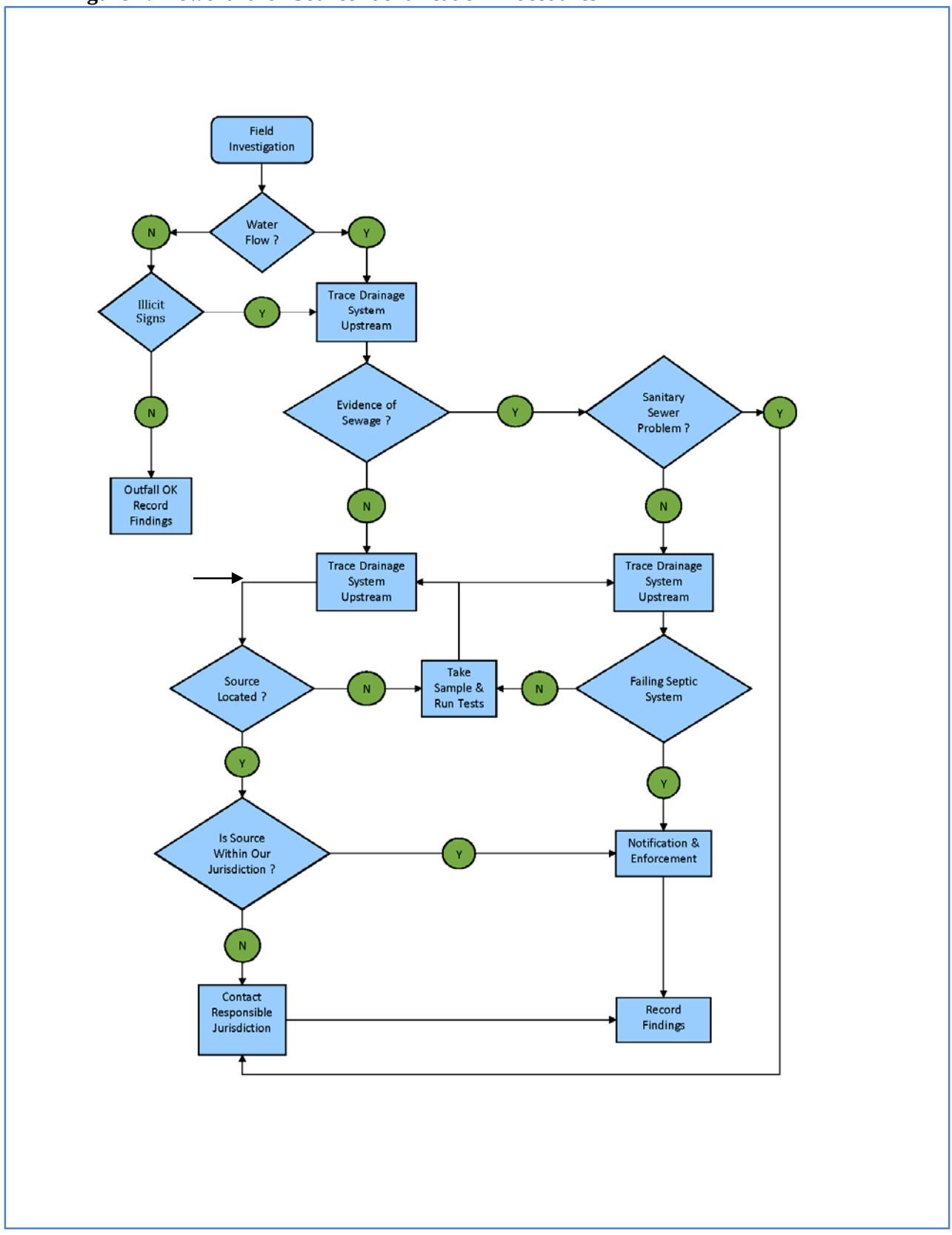
1. At an outfall in which a dry weather flow was found or at the initial point of discovery of the discharge, field crews will record physical data from visual inspections. Field crews should note algae, scum, solids, or oil sheen, as well as odor, color, flow depth, and flow quantity.

2. If the discharge continues upstream and can be tracked, move upstream in the direction of the discharge. Repeat step 1 at each intersection until 1) the source is found, 2) the discharge can no longer be tracked upstream (e.g. underground), or 3) another entity is encountered. No sample should be taken at any intermediate point if the discharge can be tracked further upstream.

3. If the source is raw sewage, and this should be immediately apparent, tracking will hopefully lead to a determination of whether the source is a sanitary sewer system or a septic tank. If the source is a sanitary sewer system, a phone call should be placed as soon as possible to the proper sewer authority. If the source is a septic system, SCDHEC Environmental Affairs should be contacted (843-915-8801).

4. Once the discharge has been tracked as far upstream as possible, the discharge should be sampled and analyzed to determine the pollutant levels and if the flow is truly an illicit discharge.

Figure 2: Flowchart for Source Identification Procedures



2.2.2 Illicit Discharge Detection

Once a potential illicit flow has been tracked up either to the source or where no further visual evidence can be collected, field crews must determine if the flow is an illicit discharge. Below is an overview of the illicit discharge investigation procedures.

1. At the source of the illicit discharge or last accessible area with dry weather flow, record visual inspection information. If the nature or source of the discharge is obvious, then enforcement and abatement procedures may begin. If the nature or source of the discharge is not obvious, a grab sample will be taken using a clean sample bottle.

2. Perform a field and/or analysis of the sample taken for appropriate parameters, which may include some or all of the following: water temperature; pH; dissolved oxygen; fluoride; ammonia; phosphate; total chlorine; copper; surfactants/detergents; and phenols. Compare the analysis results to the allowable limits and note any exceedances for the various parameters (see Appendix A).

3. If the field analysis results in elevated levels of any of the sampled parameters, and the source of the discharge can be identified, then begin enforcement and abatement procedures. If the source of the discharge cannot be identified, then another sample should be taken for laboratory analysis. The laboratory analysis should occur no longer than four (4) hours after the sample was taken.

4. If the laboratory analysis results in an exceedance of the limits in Appendix A for the same parameters as identified in the field, then the flow is considered an illicit discharge. Begin enforcement and abatement procedures.

2.2.3 Additional Illicit Tracking Efforts - Dry Weather Screening

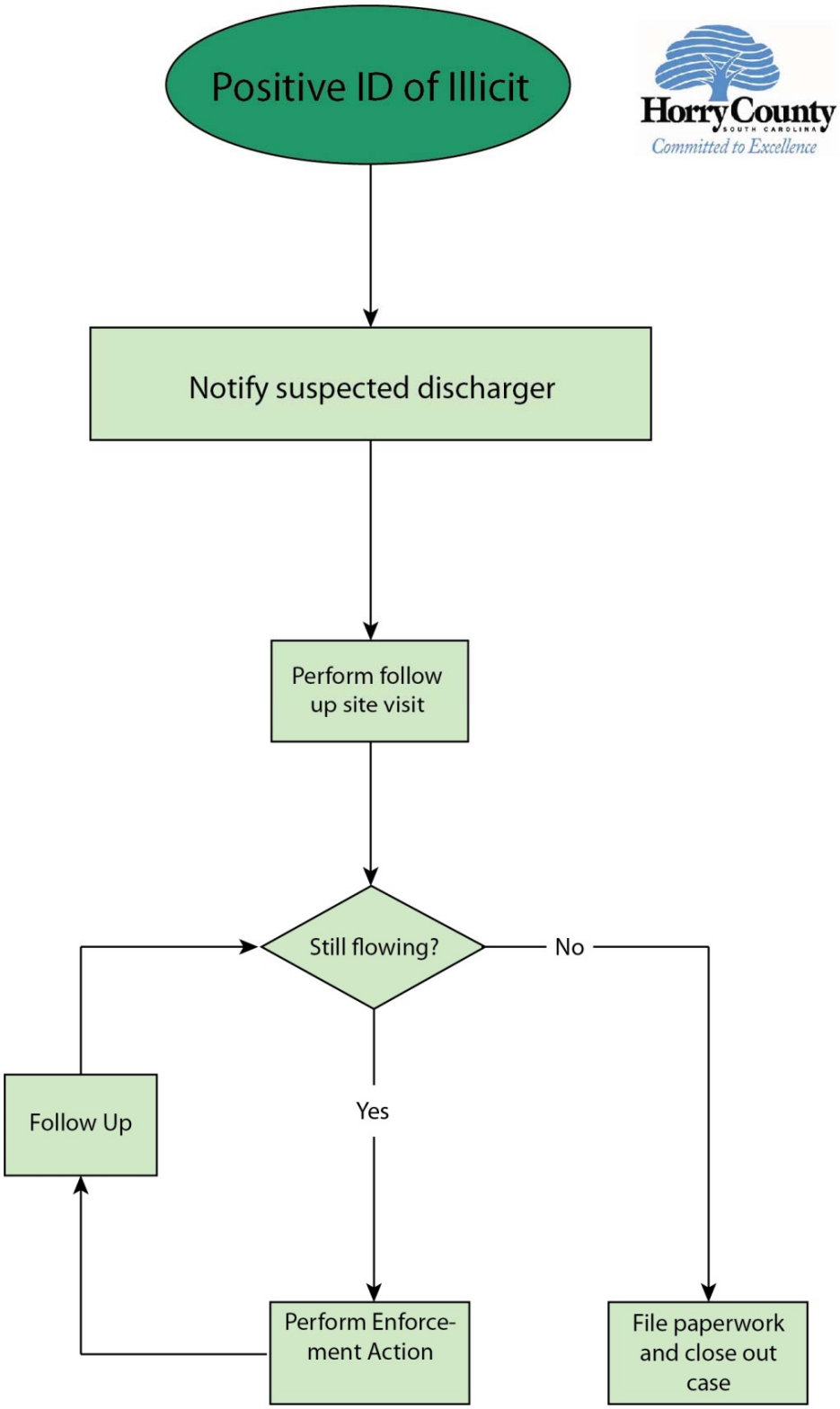
If a given discharge has been identified as an illicit, some additional illicit tracking options should be considered. These include the use of a crawler camera, tracer dyes, or smoke tests.

2.2.4 Reporting and Enforcement

Reporting and enforcement are the final steps to removing illicit discharges. At this point, a discharge is known to be an illicit and the source has been positively identified or the discharge was tracked as far as possible. Template notification letters are provided in Appendix B.

Figure 3 (on the following page) is a flowchart summarizing the illicit discharge reporting and enforcement procedures.

Figure 3: Flowchart of Reporting and Enforcement



Appendix A

Selection of Tracer Parameters

A.1 Selection of Tracer Parameters

Chemical Parameters

As previously mentioned, Regulation 61-9 122.26(d)(1) requires that only major outfalls with observed dry weather flow be sampled. It has been determined that the following chemical parameters are sufficient in helping to detect the major pollutants found in the stormwater runoff from the major land use categories, and thus enabling identification of sources of polluted stormwater.

- pH;
- Phenols;
- Fluoride;
- Total chlorine;
- Copper; and
- Surfactants.

pH

The normal pH of ground water typically ranges from 6.6 to 8.8. Values outside of this range are an indicator of an illicit discharge. Water with values less than 6.6 are acidic and may indicate discharges from textile mills, pharmaceutical manufacturers, metal fabricators, mining operations, and companies that produce resins, fertilizers, or pesticides. Wastes containing sulfuric, hydrochloric, or nitric acids are a common source of contamination. Water with values greater than 8.8 may indicate discharges from industries such as the following: textile mills, metal plating facilities, steel mills, and producers of rubber and plastic. Wash water used to clean floors and industrial machinery may also produce alkaline wastewater.

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.

Phenols

Are defined as hydroxy derivatives of benzene and its condensed nuclei, may occur in domestic and industrial wastewaters, natural waters, and potable water supplies. Chlorination of such waters may produce odorous and objectionable-tasting chlorophenols. Phenols removal processes in water treatment include super chlorination, chlorine dioxide or chloramine treatment, ozonation, and activated carbon adsorption. Caution should be exercised, however, since phenols may also be present in other waste streams. Phenols should be considered in relation to other parameters in determining the potential source.

Surfactants/Detergents

Typically, the presence of surfactants and detergents will indicate a connection to either an automobile wash facility or a laundry facility. High surfactants/detergents and elevated temperatures are a good indicator of laundry facilities. Lower levels of surfactants/detergents may indicate a connection to a residential laundry or industrial facility. Per the SCDHEC, normal ranges of surfactants/detergents are 0.0 to 5.0 mg/l.

Chlorine

The absence of chlorine may indicate a natural water source. However, due to chlorine's ability to quickly dissipate, caution should be used when making judgments based on its absence. Generally,

only potable water sources will contain chlorine. Therefore, the presence of chlorine insures that the source is not a natural water source. Very high levels (above 5.0mg/l) of chlorine typically indicate connection to a swimming pool or other potable water source.

Fluoride

Past field testing procedures did not include testing for the presence of Fluoride in stormwater discharge. It is recommended that any field testing in the future include testing for Fluoride, which is a good indicator of potable water where fluoride levels in the raw water supply are adjusted to consistent levels and where groundwater has low to non-measurable natural fluoride levels. It is common practice for communities to add fluoride to their drinking water in order to improve dental health. Typical fluoride levels in fluoride treated potable waters are usually in the range of 1.0 to 2.5 mg/L.

A.2 Physical Parameters

Furthermore, 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 also 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. 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.

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, 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?

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, exposure 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, spauling, 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.

A.3 Further Descriptions of Physical Parameters

Table A.1 provides additional information on the physical characteristics that should be recorded. Interpretive information is also provided.

Table A.1: Interpretations of Physical Observation Parameters and Likely 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.
Oil and gas:	Petroleum refineries or facilities associated with vehicle maintenance and operation or petroleum product storage.
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

Physical Observation Parameter	Description
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
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 which 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, septic system failure, excessive fertilizer use
Inhibited growth:	High stormwater flows, beverage facilities, printing plants, metal product facilities, drug manufacturing, petroleum facilities, vehicle service facilities and automobile dealers.
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

A.3.1 Treated Potable Water

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 baseflow are from different water sources. An example would be if the baseflow 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.

A.3.2 Sanitary Wastewater

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 (or fluorescence) are not present, then the potable water could be relatively uncontaminated (potable waterline leaks or irrigation runoff).
- The presence of fabric whiteners (as measured by fluorescence using a fluorometer in the laboratory or field) can also be used in distinguishing laundry and sanitary wastewaters.
- 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 washwater or laundry wastewater sources. However, these indicators may not be very obvious for small levels of sanitary wastewater contamination.

Appendix B

Standard IDDE Notification Letters

INFRASTRUCTURE &
REGULATION DIVISION-
STORMWATER DEPARTMENT

4401 Privetts Road
Conway, South Carolina 29526

Post Office Box 1236
Conway, South Carolina 29528-1236

Phone: (843) 915-5160
Fax: (843) 365-2208
www.horrycounty.org

Date

Name
Address

RE: [Nature of Complaint]

Dear ___:

The Horry County Stormwater Management Department recently conducted an investigation of the drainage system to which your property drains. County staff discovered [nature of violation].

The State of South Carolina NPDES General Permit for Storm Water Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s) #SCR030000 effective January 1, 2014 in accordance with the Federal Clean Water Act, 33 U.S.C. §1251 et. seq., and the SC Pollution Control Act, S.C. Code Sections 48-1-10 et seq., authorizes only clean storm water or potable water to be discharged to a storm sewer system that discharges to the waters of the State. We find the non-storm water discharge from your property to be in violation of these provisions, as well as the Horry County Stormwater Management and Sediment Control Ordinance, Horry County Code Section 17.7-26 et seq.

Please discontinue this unauthorized discharge immediately and take corrective action to ensure that no further violations occur. Within [X] days after receipt of this letter, please provide documentation to the Horry County Stormwater Management Department that you have taken the necessary corrective actions and conducted any cleanup that may be warranted. If unauthorized discharge continues, or documentation of corrective action is not received, the Department reserves the right to pursue enforcement action.

If you have any questions, please contact me at 843-915-6952 or . cogliano.chelsea@horrycounty.org.

Sincerely,

Chelsea Cogliano
Watershed Planner
843-915-6952

INFRASTRUCTURE &
REGULATION DIVISION-
STORMWATER DEPARTMENT

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Conway, South Carolina 29526

Post Office Box 1236
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Phone: (843) 915-5160
Fax: (843) 365-2208
www.horrycounty.org

Date

Name
Address

RE: [Nature of Complaint]

Dear ___:

In a letter dated [date], the Horry County Stormwater Management Department informed you of unauthorized discharges to the storm sewer system in accordance with the Horry County Stormwater Management and Sediment Control Ordinance, Horry County Code Section 17.7-26 et seq., the State of South Carolina NPDES General Permit for Storm Water Discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4s) #SCR030000, the Federal Clean Water Act, 33 U.S.C. §1251 et. seq., and the SC Pollution Control Act, S.C. Code Sections 48-1-10 et seq. The unauthorized discharges were [nature of violation].

You have not provided documentation, as requested, that you have taken the necessary corrective actions and conducted any cleanup that may be warranted. The Stormwater Management Department has initiated enforcement action, which may consist of penalties, fines, stop work order, withholding of plan approval or other authorizations, or rescinding certificate of occupancy. Furthermore, if you do not conduct cleanup activities, Horry County may initiate cleanup, the costs of which will be billed to you. Please take corrective action to avoid additional enforcement measures.

If you have any questions, please contact me at 843-915-6952 or cogliano.chelsea@horrycounty.org

Sincerely,

Chelsea Cogliano
Watershed Planner
Horry County Stormwater
843-915-6952