CITY OF VALDOSTA

Illicit Discharge Detection and Elimination Guidance Manual

Dry Weather Screening Manual

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GLOSSARY

The words and terms used in this Manual, unless otherwise expressly stated, shall have the following meaning:

Clean Water Act (CWA) – The Federal Water Pollution Control Act, commonly referred to as the Clean Water Act, is designed to restore and maintain the chemical, physical, and biological integrity of the nation's waters by preventing point and nonpoint pollution sources, providing assistance to publicly owned treatment works for the improvement of wastewater treatment, and maintaining the integrity of wetlands.

Community – Designated boards, commissions, jurisdictions or representatives.

Environmental Protection Agency (EPA) – A government agency concerned with the American environment and its impact on human health.

Environmental Protection Division (EPD) – A state agency charged with protecting Georgia's air, land, and water resources through the authority of state and federal environmental statues.

Floatable Material – Any foreign matter that may float or remain suspended in the water column, and includes but is not limited to, plastic, aluminum cans, wood products, bottles, and paper products.

Geographic Information System (GIS) – Any system that captures, stores, analyzes, manages, and presents data that are linked to a location.

Hazardous Material – Any material including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Household Sewage Treatment System (HSTS) – A system designed to treat home sewage on-site.

Hydrologic Unit Code (HUC) – Are a way of identifying all of the drainage basins in the United States in a nested arrangement from largest (Regions) to smallest (Cataloging Units).

Illegal Connection – Any drain or conveyance, whether on the surface or subsurface, that allows an illicit discharge to enter the Municipal Separate Storm Sewer System (MS4).

Illicit Discharge – Any discharge to an MS4 that is not composed entirely of stormwater, except those discharges authorized under National Pollutant Discharge Elimination System (NPDES) permit – other than the NPDES permit for discharges from the MS4 – and discharges from fire fighting activities.

Illicit Discharge Detection and Elimination (IDDE) – To find, fix and prevent illicit discharges.

Land Development Regulation (LDR) – Local laws that guide and regulate orderly growth, development, redevelopment, and preservation of the City in accordance with the adopted Comprehensive Plan and with long-term objectives, principles and standards deemed beneficial to the public interest.

Material Safety Data Sheets (MSDS) – A form containing data regarding the properties of a particular substance intended to provide workers and emergency personnel with procedures for handling or working with that substance in a safe manner, and includes information such as physical data (melting point, boiling point, flash point, etc.), toxicity, health effects, first aid, reactivity, storage, disposal, protective equipment, and spill-handling procedures.

Municipal Separate Storm Sewer System (MS4) – As defined at 40 C.F.R. 122.26 (b)(8), municipal separate storm sewer system means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

1. Owned or operated by a State, city, town, borough, county, parish, district, municipality, township, county, district, association, or other public body (created by or pursuant to State law) having jurisdiction over sewage, industrial wastes, including special districts under State law such as a sewer district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States;
2. Designed or used for collecting or conveying stormwater;
3. Which is not a combined sewer; and
4. Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 C.F.R. 122.2.

National Pollutant Discharge Elimination System (NPDES) – A permit issued by the EPA (or by a State under authority delegated pursuant to 33 USC § 1342(b)) that authorizes the discharge of pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Notice of Intent (NOI) – A notice that an environmental impact statement will be prepared and considered. The notice shall briefly:

1. Describe the proposed action and possible alternatives.
2. Describe the agency's proposed scoping process including whether, when, and where any scoping meeting will be held.
3. State the name and address of a person within the agency who can answer questions about the proposed action and the environmental impact statement.

Publicly Owned Treatment Works (POTW) – A term used in the United States for a sewage treatment plant that is owned, and usually operated, by a government agency.

Pollutant – Anything that causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, solvents, oil and other automotive fluids, non-hazardous liquid and solid wastes, yard wastes, refuse, rubbish, garbage, litter or other discarded or abandoned objects, floatable materials, pesticides, herbicides, fertilizers, hazardous materials, wastes, sewage, dissolved and particulate metals, animal wastes, residues that result from constructing a structure, and noxious or offensive matter of any kind.

Quality Assurance Management Plans (QAMP) – An organization’s quality system or its systematic approach to quality assurance.

Quality Assurance Project Plans (QAPP) – The activities of an environmental data operations project involved with the acquisition of environmental information whether generated from direct measurements activities, collected from other sources, or compiled from computerized databases and information systems.

Quality Assurance Quality Control (QA/QC) – The planned and systematic activities implemented in a quality system so that quality requirements for a product or service will be fulfilled.

Stormwater Runoff – The flow of water which results from, and which occurs during and following a rainfall event.

Total Dissolved Solids (TDS) – The total amount of mobile charged ions, including minerals, salts or metals dissolved in a given volume of water.

Wastewater – The spent water of a community. From the standpoint of a source, it may be a combination of the liquid and water-carried wastes from residences, commercial buildings, industrial plants, and institutions.

ACRONYMS

ABS – Alkyl Benzene Sulfonate
ATC – Automatic Temperature Compensation
CMP – Corrugated Metal Pipe
CWA – Clean Water Act
DIP – Ductile Iron Pipe
EPA – Environmental Protection Agency
EPD – Environmental Protection Division
FC – Fecal Coliform
GIS – Geographic Information System
GPS – Global Positioning System
HDPE – High Density Polyethylene
HSTS – Household Sewage Treatment Systems
HUC – Hydrologic Unit Code
IDDE – Illicit Discharge Detection and Elimination
LAS – Linear Alkylate Sulfonate
LDR – Land Development Regulation
MS4 – Municipal Separate Storm Sewer System
NOI – Notice of Intent
NPDES – National Pollutant Discharge Elimination System
MSDS – Material Safety Data Sheets
POTW – Publicly Owned Treatment Works
PPM – Parts Per Million
PVC – Polyvinyl Chloride
QAMP – Quality Assurance Management Plans
QAPP – Quality Assurance Project Plans
QA/QC – Quality Assurance Quality Control
RCP – Reinforced Concrete Pipe
SCA – Standard Calibration Adjust
TDS – Total Dissolved Solids
VCP – Vitrified Clay Pipe

INTRODUCTION

This manual is intended to serve as a guidance manual for the City of Valdosta's Illicit Discharge Detection Elimination (IDDE) program, as required by the State of Georgia Environmental Protection Division (EPD) through a General National Pollutant Discharge Elimination System (NPDES) Stormwater Phase II permit. This manual profiles the IDDE minimum control measure, which is one of six Phase II regulated small Municipal Separate Storm Sewer System (MS4) measures required to be included in a stormwater management program.

WHAT IS AN MS4

The State of Georgia defines a MS4 as "a conveyance or system of conveyances including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains owned or operated by a municipality or other public body, designed or used for collecting or conveying stormwater runoff and is not a combined sewer or part of a Publicly Owned Treatment Works (POTW)."

BACKGROUND OF PHASE II

Although the quality of the nation's waters has improved greatly since the passage of the Clean Water Act (CWA) in 1972, many water bodies are still impaired by pollution. According to the United States Environmental Protection Agency (EPA), the top causes of impairment include siltation, nutrients, bacteria, metals, and oxygen-depleting substances. Polluted stormwater runoff, including runoff from urban/suburban areas and construction sites are leading sources of impairment. To address this problem, EPA has put into place a program that regulates certain stormwater discharges.

In 1990, the EPA promulgated Phase I of its stormwater program under the NPDES permit provisions of the CWA. Phase I addressed stormwater runoff from "medium" and "large" MS4s generally serving populations of 100,000 or greater, construction activity that would disturb five or more acres of land, and 10 categories of industrial activity. To further reduce the adverse effects of stormwater runoff, the EPA instituted its Stormwater Phase II Final Rule on December 8, 1999.

The Phase II program regulates discharges from small MS4s located in "urbanized areas" (as delineated by the Census Bureau in the most recent census) and from additional small MS4s designated by the permitting authority.

The EPA's Stormwater Phase II Final Rule states that this stormwater management program must include the following six minimum control measures:

- Public education and outreach on stormwater impacts
- Public involvement and participation
- Illicit discharge detection and elimination
- Construction site stormwater runoff control
- Post-construction stormwater management in new development and redevelopment
- Pollution prevention and good housekeeping for municipal operations

WHY ARE ILLICIT DISCHARGE DETECTION AND ELIMINATION EFFORTS NECESSARY

Discharges from MS4s can often include wastes and wastewater from non-stormwater sources, including illicit discharges, which can enter the stormwater system through various means. The result of this is untreated discharges that contribute to high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria to receiving water bodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic, wildlife, and human health. Now, more than ever, it is necessary to create an awareness of what illicit discharges are doing.

FINDING, FIXING, AND PREVENTING ILLICIT DISCHARGES

The purpose of an IDDE program is to find, fix and prevent illicit discharges, and develop a series of techniques to meet these objectives. This manual is designed to outline the City of Valdosta's dry weather outfall screening procedures.

CHAPTER 1: ILLICIT DISCHARGE DETECTION AND ELIMINATION

WHAT IS AN ILLICIT DISCHARGE

An illicit discharge is defined by the State of Georgia General NPDES Stormwater permit as "any discharge to an MS4 that is not composed entirely of stormwater, except those discharges authorized under NPDES permit (other than the NPDES permit for discharges from the MS4) and discharges resulting from fire fighting activities."

In most communities, the MS4 is directly connected to a waterbody and does not receive any type of treatment prior to its discharge to receiving water bodies of the United States. Because there is little or no treatment, it is vital that only stormwater be discharged from these MS4s.

The general permit received by Phase II regulated communities requires that those communities develop an IDDE program. This program will assist communities in meeting their requirement set forth in their General NPDES Stormwater permit.

Figure 1: Designated MS4 outfall location

TYPES OF ILLICIT DISCHARGES

Illicit discharges can be separated into three (3) categories based on frequency of discharge:

1. **Transitory Illicit Discharge**: These are typically a one-time event. They can result from spills, dumping, and line breaks and are often the most difficult to investigate and trace back to its source.
2. **Intermittent Illicit Discharge**: These are typically discharges that occur occasionally. They can occur several hours per day, week or over the course of a year and can happen as the result of line breaks or cross connections.
3. **Continuous Illicit Discharge**: These direct connections into the MS4 can be from sanitary sewers, cross connections, infrastructure problems with a sanitary sewer system, or malfunctioning household sewage treatment systems (HSTS).

Of these three types, the Continuous Illicit Discharge is the easiest to find, investigate, trace and eliminate from the MS4. This type of discharge also has the greatest impact because of the constant pollutant loading into a water body.

TABLE 1-1
TRANSITORY OR INTERMITTENT ILLICIT DISCHARGES

Land Use	Likely Source Locations	Condition/Activity that Produces Discharge
Residential	· Apartments · Multi-Family · Single Family Detached	· Car Washing · Driveway Cleaning · Dumping/Spills · Equipment Wash-Downs · Lawn/Landscape Watering · Septic System Maintenance · Swimming Pool Discharges · Laundry Wastewater · Improper Plumbing (e.g. garage floor drains)
Commercial	· Campgrounds/RV Parks · Car Dealers/Rental Car Company · Car Washes · Laundry or Dry Cleaners · Gas Stations/Auto Repair Shops · Nurseries and Garden Centers · Oil Change Shops · Restaurants · Swimming Pools · Service Garages	· Dumping/Spills · Landscaping/Grounds Care (e.g. irrigation) · Outdoor Fluid Storage · Parking Lot Maintenance (e.g. power washing) · Vehicle Fueling · Vehicle Maintenance/Repair · Vehicle Washing · Wash-down of Greasy Equipment & Grease Traps
Industrial	· Auto Recyclers · Beverages and Brewing · Construction Vehicle Washouts · Distribution Centers · Food Processing · Garbage Truck Washouts · Metal Plating Operations · Paper and Wood Products · Petroleum Storage and Refining · Printing	· All Commercial Activities · Industrial Process Water or Rinse Water · Loading and Un-loading Area Wash-downs · Outdoor Material Storage (e.g. fluids)
Municipal	· Airports · Landfills · Maintenance Depots · Municipal Fleet Storage Areas · Public Works Yards · Streets and Highways	· Building Maintenance (e.g. power washing) · Dumping/Spills · Landscaping/Grounds Care (e.g. irrigation) · Outdoor Fluid Storage · Parking Lot Maintenance (e.g. power washing) · Road Maintenance · Emergency Response · Vehicle Fueling · Vehicle Maintenance/Repair · Vehicle Washing

Source: Modified from *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments*, Center for Watershed Protection, 2004, p. 12, Table 2.

TABLE 1-2
CONTINUOUS ILLICIT DISCHARGES

Land Use	Condition or Activity that Produces Discharge
Residential	· Failed sanitary sewer infiltrating into stormwater system · Sanitary sewer connection into stormwater system · Failed septic systems discharging to stormwater system
Commercial/Industrial	· Failed sanitary sewer infiltrating into stormwater system · Process water connections into stormwater system · Sanitary sewer connection into stormwater system
Municipal	· Failed sanitary sewer infiltrating into stormwater system · Sanitary sewer connection into stormwater system

Source: *Guidelines and Standard Operating Procedures for Stormwater Phase II Communities in Maine*, Casco Bay Estuary Partnership.

Tables 1-1 and 1-2 examine the likely source locations that contribute illicit discharges to a MS4. Land use can predict the potential for these discharges. By understanding the possible discharges originating from land use activities, it allows for the IDDE inspector to thoroughly utilize this knowledge in identifying illicit discharges and their potential sources. Industrial facilities are regulated by additional permits through the Georgia EPD. For industrial questions please contact Georgia EPD at (404) 675-6240 or visit their website at www.gaepd.org.

MODE OF ENTRY

Illicit discharges can also be classified based on how they enter the stormwater system. This entry can be direct or indirect.

1. **Direct entry:** The discharge is directly connected to the stormwater system via a pipe. This type of entry will produce discharges that are either continuous or intermittent. Direct entry usually occurs when there are sewage cross-connections, or where there are industrial and commercial cross-connections.
2. **Indirect entry:** Flows, which are generated outside the stormwater system, enter through stormwater inlets or by infiltrating through the joints of the pipe. Generally, indirect modes of entry produce intermittent or transitory discharges. This type of entry can include groundwater seepage into the stormwater pipe, spills, dumping, outdoor washing activities, and irrigation from landscaping or lawns that reaches the stormwater system.

WHAT ARE THE ELEMENTS OF AN EFFECTIVE IDDE PROGRAM

At a minimum, the Georgia EPD requires the permittee to incorporate the following:

1. Develop a storm sewer system map showing the location of all outfalls, and the names and location of all surface waters of the state that receive discharges from those outfalls. This also must include the location of all HSTS that discharge directly into the MS4.

2. To the extent allowable under law, effectively prohibit, through ordinance or other regulatory mechanism, non-stormwater discharges into your storm sewer system and implement appropriate enforcement procedures and actions.
3. Develop and implement a plan to detect and address non-stormwater discharges, including illegal dumping to your system, as well as a program for dry weather inspections.
4. Inform public employees, businesses, and the general public of hazards associated with illegal discharges.
5. Develop a list of occasional and incidental non-stormwater discharges.

DOES THE IDDE PROGRAM ADDRESS ALL ILLICIT DISCHARGES

No. The IDDE program does not need to address all illicit discharges unless you identify them as significant contributors of pollutants to your small MS4. Under the Georgia EPD rules for Phase II Stormwater, examples of this include:

- 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
- Flows from riparian habitats and wetlands
- Dechlorinated swimming pool discharges
- Street wash water

Discharges or flows from fire fighting activities are excluded from the effective prohibition against non-stormwater and need only be addressed where they are identified as significant sources of pollutants to the waters of the State of Georgia.

CHAPTER 2: MAPPING AND INVENTORY

MAPPING

The Georgia EPD General NPDES permit requires small MS4s to "develop, if not already completed, a storm sewer system map showing the location of all outfalls and the names and location of all surface waters of the State receiving discharges from those outfalls". The City of Valdosta completed mapping the MS4 in December 2006, using Geographic Information System (GIS). The inventory is maintained and updated by the Engineering Department as needed (e.g. infrastructure upgrades, new, etc); however, the inspection and cleaning of the system is provided by the Utilities Department.

INVENTORY

The stormwater infrastructure for the MS4 was collected by City staff using a Global Positioning System (GPS) unit. The data features collected included catch basins, junction boxes, manholes, storm pipes, outfalls, flumes, driveway pipes, culverts, ponds, etc. For each feature, specific information was gathered including size, material, type, length, date GPS'ed, location, comments, reference number, condition, ownership, etc. All data is housed on a server off-site at the Southern Georgia Regional Commission. As of July 2010, the stormwater data is housed in three main shapefiles:

- Val_storm
- Stormpipes
- Val_pond

The GIS information is used to create the annual Stormwater Map Book, which is used by the Stormwater Division on a daily basis for various tasks including inspections and cleaning of the MS4. As a result of the City maintaining a very extensive GIS database, including roads, parcels, addresses, etc, the Stormwater Division is able to digitally map inspections, cleanings, complaints, etc. By digitally mapping this type of information (e.g. outfall inspections), the City is able to ensure that all outfalls are inspected within a five year time.

To ensure that the City meets the Notice of Intent (NOI) annual requirements of inspecting 20% of the MS4 outfalls, staff is provided a monthly goal. Outfall inspections are dependent on the weather so if the monthly goal is not met, staff must ensure that the inspections are met in the upcoming months and plan accordingly.

CHAPTER 3: INSPECTION AND DEVELOPING PRIORITY AREAS

Another mandatory requirement of a Phase II IDDE program is to "develop and implement a plan to detect and address non-stormwater discharges, including illegal dumping, to your system". The EPA recommends that this plan include the following components:

1. Locate priority areas within your community
2. Trace the source of an illicit discharge
3. Remove the source of the illicit discharge
4. Program evaluation and assessment

Developing priority areas is vital to any community IDDE program. This process can be broken down into three fundamental steps:

1. Use all available information to identify the potential "hot spots" of the community
2. Conduct dry weather field screenings to locate non-stormwater discharges
3. Conduct water quality sampling and analysis to determine what non-stormwater discharges are present

HOT SPOTS

The first step in locating priority areas is to identify possible hot spots within the City of Valdosta. These hot spots are areas where there is a potential for illicit discharges to occur. These can be broken down into a list of commonly high probability locations where illicit discharges may be occurring.

1. Locations where there have been repeated problems in the past. This includes locations with known water quality data, as well as locations where numerous complaints have been received.
2. Older areas of a community may indicate possible locations where there will be illicit discharges detected. These locations in a community may have a higher percentage of illegal connections and/or have deteriorating utility infrastructure leading to infiltration problems.
3. The commercial and/or industrial areas of the community.

DETECTION AND INSPECTIONS

Dry weather screening inspections must be conducted on all known MS4 outfalls. Dry weather inspections are a visual inspection of the outfall location. Dry weather is defined as a minimum of 72 hours of no rainfall (0.1") within an area. When performing an effective dry weather screening process, be sure to do the following:

- Utilize the information obtained in the mapping component. (e.g. Arcview or Stormwater Map Book)
- Fill out the *Dry Weather Outfall Screening Form* (Appendix A). The following is a list of observations needed for this component, and are listed on the field format:
    - Date
    - Time
    - Inspector/Sample performed by
    - Outfall location/ID
    - Weather conditions
    - Outfall Type/Material
    - Receiving stream

    - Hydrologic Unit Code (HUC) 8 watershed name
    - Land use/industries in immediate drainage area
    - Comment section for: Flow, odor, color, turbidity, floatables
- Be aware of the locations where field inspections will occur because specific locations may present safety concerns. If additional field staff is needed, coordinate with your supervisor.
- Notify the office of your field location.

See Appendix B: *Illicit Discharge Detection and Elimination Field Guide* for quick helpful tips on the IDDE program. If an illicit discharge is found, the Dry Weather Outfall Screening Form has a section for water quality sampling that is conducted.

PHYSICAL INDICATORS

During dry weather visual inspections, it is important to indicate the conditions observed at an outfall location. This includes: flow, odor, color, turbidity, etc. if present at the location. The information obtained from the physical characteristics observed are indicators and cannot be fully relied upon by themselves. Floatables are the best physical indicator. The most common floatables are sewage, suds, and oil sheens. The observation of sewage at an outfall location indicates that there is a severe problem with that MS4 and should be looked at as to where the source for the sewage is originating from. Suds can indicate a variety of things. Some suds are naturally formed by the movement of the water. If the suds are located at a water drop off and break up quickly, this may only be water turbulence related. If the suds have a fragrant odor, this can indicate the presence of laundry water or wash water in the waterbody. Oil sheens need to be looked at to try and determine the source of the oil sheen. Some oil sheens are common and occur naturally by in-stream processes. This occurs when an iron bacteria forms a sheet-like film. This can be determined by looking at the sheen and seeing if it cracks when disturbed. Synthetic oil sheens, on the other hand, will swirl when disturbed. If this occurs, then the sheen is from an oil source.

When dry weather flows are observed at an outfall, the flow is considered non-stormwater related. This flow can be an illicit discharge, but it may also be a flow being generated from another action that is not considered illicit (See Chapter 1). Likewise, if no flow is observed at an outfall, it does not mean that there is no problem at that specific outfall. In Chapter 1, different types of illicit discharges including continuous, intermittent and transitory, were discussed. The continuous flows are the easiest to locate while the other two are not. That is why it is important to observe the area at each outfall's location for any type of observable pollution problem that may be the result of an intermittent or transitory illicit discharge.

It is extremely important for IDDE staff to recognize that during field inspections, the outfall is observed as a snapshot in time. To ensure that the City has an effective IDDE program, at a minimum, 20% of the outfalls will be inspected on an annual basis, so that in five years the entire outfall inventory will be inspected. Since the total number of outfalls change due to improvements and/or new development, contact your supervisor for the most accurate number and your monthly goals.

WATER QUALITY SAMPLING AND TESTING

When dry weather flows are observed, it will be difficult to determine if there is a problem with that flow. Obvious problems, such as strong sewage odor, or the presence of raw sewage or toilet paper, will indicate that there is a bacterial problem at that location coming from sanitary sewers, cross connections or septic systems. However, in most circumstances, water that is observed during dry weather conditions will not have those visual indicators. That is why water quality testing and sampling is a vital component for an IDDE program.

Certain water quality parameters can serve as indicators of the likely presence or absence of a specific type of discharge. Some of these parameters can be measured in the field with specific instrumentation and field sample kits, while others will need to be analyzed at a laboratory. The City of Valdosta uses the following parameters:

TABLE 3-1
WATER QUALITY TEST PARAMETERS AND USES

Water Quality Test	Use of Water Quality Test	Comments / Suggested Ranges
Conductivity	Used as an indicator of dissolved solids	Measured in the field with a probe / Less than 300 micromhos (µmhos/cm). If greater than 300 µmhos/cm, take grab sample and provide to POTW laboratory for fecal coliform testing.
Surfactants	Indicate the presence of detergent (e.g., laundry, car washing)	Measured with detergent test / Less than 0.2 mg/l. If found to be significantly high, send sample to contract laboratory
pH	Extreme pH values (low or high) may indicate commercial or industrial flows; not useful in determining the presence of sanitary wastewater (which, like uncontaminated base flows, tends to have a neutral pH, i.e., close to 7)	Measured in the field and laboratory with a probe / pH is (6-9) standard units (su)
Temperature	Sanitary wastewater and industrial cooling water can substantially influence outfall discharge temperatures. This measurement is most useful during cold weather	Measured in the field with a probe / Temperature should be near or below ambient conditions for groundwater or stormwater runoff
Fluoride	Used to indicate potable water sources in areas where water supplies are fluoridated	Measured in the field with a meter / Less than 0.2 mg/L

*In addition to these parameters, the following field observations are conducted:
Flow, Odor, Color, Turbidity, and Floatables

QUALITY ASSURANCE MANAGEMENT PLANS AND PROJECT PLANS

The use of a Quality Assurance Management Plan (QAMP) or Quality Assurance Project Plan (QAPP) is extremely important in ensuring that when water samples are obtained, there is a consistent and approved protocol used. This is to ensure that the data you collect is accurate. This should include where to collect samples, when to collect, how to collect, calibration of equipment (e.g. meters), storage of samples, holding times, chain of custody and transportation of samples to the POTW laboratory (See Appendix C: *Chain of Custody Record* Form). Refer to 40 CFR part 136 Table II on the EPA website for the most up to date sampling parameters.

DRY WEATHER MONITORING FIELD CHECKLIST

When performing water quality sampling, it is important to have adequate equipment. This includes, but not limited to:

- Bottles (e.g. These will depend on the parameter being sampled for and are provided by the POTW laboratory to prevent cross contamination from occurring)
- Cooler
- Disposal waste containers
- Field forms
- Ice
- Labels for bottles
- Latex gloves
- Meters
- Permanent marker for bottles
- Test kits

Whenever a water sample is taken at MS4 outfall location, fill out the inspection form and make sure the time of sample is indicated. This is important when delivering samples to the POTW laboratory which has a Quality Assurance/Quality Control (QA/QC) policy in place and routinely performs this type of analysis for consistency purposes.

SAMPLING PROCEDURES AND SUBMISSION

Field Screening

The field screening part of dry weather monitoring consists of a series of qualitative field observations and field analyses of selected water quality parameters. General site observations (e.g. weather conditions, outfall type/material, etc.) are recorded on the Dry Weather Outfall Screening Form. Field measurements will be taken and recorded on the data sheet where there is flowing water, provided there has been no rain event during the last 72 hours. If no flow is observed during the outfall screening, the "Flow from outfall" field should be checked "No" and the screening is complete. This result will be counted towards the total number of outfalls screened. If flow is observed during the outfall screening, the "Flow from Outfall" field should be checked "yes" and both the Field Observations and Measurements and the Water Quality Sampling portions of the screening form should be completed.

Field Sample Collection

Water quality sampling of a dry weather flow is performed to look for chemical indicators which may detect, characterize or confirm the presence of an illicit discharge or illegal connection. Sampling may be undertaken either using field test kit equipment or by collecting grab samples for laboratory analysis. Follow the kit manufacturer's procedures for obtaining a test sample and completing the field analysis. Record the field analysis results on the screening form.

<u>Performing a grab sample</u>

- Label sample containers before sampling event
- Take a cooler with ice to the sampling point
- Take the grab from the horizontal and vertical center of the channel
- Avoid stirring up bottom sediments in the channel

- Hold the container so the opening faces upstream
- Avoid touching the inside of the container to prevent contamination
- Keep the sample free from uncharacteristic floating debris
- Transfer samples into proper containers (e.g., from bucket to sample container), however, FC should remain in original containers
- If taking numerous grabs, keep the samples separate and labeled clearly
- Use safety precautions

FIELD TESTING PROCEDURES

Conductivity

Conductivity is a measure of the ability of the water to pass an electrical current and is affected by the presence of dissolved solids. Dissolved substances in water dissociate into ions with the ability to conduct electrical current. As the level of total dissolved solids (TDS) rises, the conductivity will also increase. Conductivity is measured in micromhos per centimeter (µmhos/cm) or microsiemens per centimeter (µmS/cm). Micromhos (µmhos) and microsiemens (µmS) are equivalent units of measure and can be used interchangeably. If conductivity is greater than 300 umho/cm, proceed with the fecal coliform testing.

Calibrating the Conductivity Meter

Prior to testing, calibrate your meter using the method recommended by the manufacturer of your particular meter. For the AP85 Portable Waterproof Accumet meter, follow the instructions below:

1. Make sure conductivity probe is connected to meter.
2. Press ON/OFF to start meter.
3. Press MODE to select conductivity measurement mode (µs).
4. Rinse the probe thoroughly with deionized water or rinse solution, and then rinse with a small amount of calibration standard.
5. Dip the probe in to the calibration standard. Immerse the probe tip beyond the upper steel band. Stir the probe gently to create a homogenous sample.
6. Wait for the measured conductivity value to stabilize.
7. Press CAL/MEAS to enter conductivity calibration mode. The CAL indicator will appear above the display.
8. Press the UP or DOWN keys to change the value on the primary display to match the value of the calibration standard. The secondary display shows the factory calibrated value.
9. Press ENTER to confirm the calibration value. The meter returns to the MEAS (measurement) mode. (To exit calibration mode without confirming calibration, do not press ENTER in this step. Press CAL/MEAS instead.)
10. Repeat steps 1-9 for other ranges.

Measuring for Conductivity

1. Rinse the probe with deionized or distilled water before use to remove any impurities adhering to the probe body. Shake or air dry. To avoid contamination or dilution of your sample, rinse probe with a small volume of your sample liquid.
2. Press ON/OFF to start meter.
3. Press MODE to select conductivity measurement mode (µs). The MEAS annunciator appears on the top center on the meter screen, while the Automatic Temperature Compensation (ATC) indicator appears in the lower right hand corner.

4. Dip the probe into the sample. When dipping the probe into the sample, the tip of the probe must be immersed above the second steel band. Stir the probe gently in the sample to create a homogenous sample.
5. Allow time for the reading to stabilize.
6. Record reading in the space provided on your data form.
7. If the reading is greater than 300 μmho/cm, begin investigation.

Temperature

Although temperature may be one of the easiest measurements to perform, it is probably one of the more important parameters to be considered. It dramatically affects the rates of chemical and biochemical reaction within the water. Many biological, physical, and chemical principles depend on the temperature. Some of the most common of these are the solubility of compounds in water, distribution and abundance of organisms living in the water, rates of chemical reactions, density inversions and mixing, and current movements.

Shallow bodies of water, such as small streams and stormwater ditches are much more susceptible to temperature changes because their capacity to store heat over time is also relatively small.

In a stormwater system, unusual temperature variations could indicate thermal pollution introduced by illegal discharges into the system.

Measuring for Temperature[1]

When you have collected the water sample in the appropriate container, remove the container from direct sunlight and wind. Do not hold the body of the bottle in your hands because your hands might begin to warm the water, instead hold it by its lid. Put the conductivity meter in the container to record the value to the nearest 0.5 degrees C. Record reading in the space provided on your data form. The temperature should be near or below ambient conditions for groundwater or stormwater runoff.

TABLE 3-2
CELSIUS / FAHRENHEIT CONVERSIONS

˚C	˚F	˚C	˚F	˚C	˚F
0	32.0	13	55.4	26	78.8
1	33.8	14	57.2	27	80.6
2	35.6	15	59.0	28	82.4
3	37.4	16	60.8	29	84.3
4	39.2	17	62.6	30	86.0
5	41.0	18	64.4	31	87.8
6	42.8	19	66.2	32	89.6
7	44.6	20	68.0	33	91.4
8	46.4	21	69.8	34	93.2
9	48.2	22	71.6	35	95.0
10	50.0	23	73.4	36	96.8
11	51.8	24	75.2	37	98.6
12	53.6	25	77.0	38	100.4

[1] If the conductivity meter is not available and a thermometer is used to determine temperature, do not remove the thermometer from the container to read the temperature to ensure accuracy.

pH

pH is a measure of how acidic or basic (alkaline) a solution is. The pH scale ranges from 0 to 14 and is a means of showing which ion has the greater concentration. At a pH 7.0, the concentration of both ions is equal and the water is said to be neutral, neither acidic nor alkaline. Pure water has a pH of 7.0. When the pH is less than 7.0, there are more hydrogen ions than hydroxyl ions and the water is said to be acidic. When the pH is greater than 7.0, there are more hydroxyl ions than hydrogen ions and the water is said to be basic or alkaline.

Water's ability to resist changes in pH, or its buffering capacity, is critical to aquatic life. Generally, an aquatic organism's ability to complete a life cycle greatly diminishes as pH becomes greater than 9.0 or less than 5.0. There are several activities in water that can severely affect the pH. Mineral substances are dissolved, aerosols and dust from the air are picked up, and manmade wastes are dumped into the water.

A pH meter is an electronic instrument used to measure the pH of a liquid. A typical pH meter consists of a special measuring probe (a glass electrode) connected to an electronic meter that measures and displays the pH reading. The pocket pH meter is most appropriate for use out in the field. It is a small handheld device that can be easily transported from place to place. This type of meter provides quick and accurate pH readings.

Calibrating the pH Meter

These steps should be performed at least 24 hours before pH testing is performed. Prior to testing, calibrate your meter using the method recommended by the manufacturer of your particular meter. For the pocket Waterproof pHTestr 10 meter, follow the instructions below:

1. Remove the protective cap off your pH meter.
2. Rinse the beaker and meter twice with a small volume of 7.0 pH buffer solution.
3. Put enough buffer solution in the beaker to reach the immersion level of the meter when it is submerged in the solution. Dip the tip of the meter in the buffer solution so that the glass electrode is submerged; however, do not exceed a depth of 2 inches.
4. Press ON/OFF to start meter. Hold the tip of the meter in the beaker and swirl gently. When the display stabilizes, check the meter reading. If the reading is 7.0, rinse the bulb with deionized water, shake off excess water, and proceed to step #8. If the reading is not 7.0, proceed to step #5.
5. Begin calibration by pressing CAL. The number displayed should begin flashing and will approach 7.0. It will rest on a number and stop changing. The number will continue flashing.
6. Calibrate the meter by pressing HOLD. The reading should immediately change to 7.0.
7. Turn the meter off.
8. Rinse the beaker and meter twice with a small volume of 10.0 pH buffer solution.
9. Put enough buffer solution in the beaker to reach the immersion level of the meter when it is submerged in the solution. Dip the pen in the buffer up to the immersion level. Do not immerse the meter above the brown line.
10. Press ON/OFF to start meter. Hold the tip of the meter in the beaker and swirl gently. When the display stabilizes, check the meter reading. The reading should be near 10.0. Do not readjust the meter.
11. Repeat the same process with the 4.0 buffer solution.

Measuring for pH

1. Remove protective cap.
2. Press ON/OFF to start meter.

3. Dip the glass electrode into the sample. Stir and let the reading stabilize.
4. Record reading in the space provided on your data form. If you need to freeze the reading, press HOLD/ENT. To release the reading, press HOLD/ENT again.
5. Press ON/OFF to turn the meter off. If you do not press a button for 8.5 minutes, the meter will automatically shut off to conserve batteries.
6. If the pH is outside of the allowable parameters of 6-9 standard units, begin investigation.

Fluoride

Most water supplies contain some naturally occurring fluoride, such as sodium fluoride and fluorosilicates, which dissolves easily into ground water as it moves through gaps and pore spaces between rocks. Many communities add fluoride to their drinking water to promote dental health.

Fluoride can also enter drinking water in discharge from fertilizer or aluminum factories. It can be used to detect the intrusion of drinking water or wastewater in groundwater samples.

<u>Calibrating the Fluoride Meter</u>

The Pocket Colorimeter II instrument is factory-calibrated and ready for use without user calibration. Use of the factory calibration is recommended unless the user is required to generate a calibration. To calibrate the meter with a known standard, see instruction manual for symbology and follow the instructions below:

1. Press POWER to start meter.
2. Place the blank (deionized water) in the meter, and then press ZERO/SCROLL.
3. Place the reacted standard in the meter, then press READ/ENTER.
4. Press MENU, then press ZERO/SCROLL until the display shows “SCA” (Standard Calibration Adjust).
5. Press READ/ENTER to display the SCA.
6. Press READ/ENTER to adjust the curve to the displayed value. The meter will return to the measurement mode and the Calibration Adjusted icon will appear in the display window.
7. If an alternate concentration is used, or if a standard concentration is not given, repeat steps 1-5.
8. Press ZERO/SCROLL to access the Edit function, then press READ/ENTER to begin editing. The digit to be edited will flash. Use the ZERO/SCROLL key to change the entry, then press READ/ENTER to accept and advance to the next digit. When the last digit is entered, press READ/ENTER and the meter will adjust the curve to the value entered. The meter will return to measurement mode and the Calibration Adjusted icon will appear in the display window.
9. To turn off SCA, press MENU.
10. Press ZERO/SCROLL until SCA appears in the display.
11. Press READ/ENTER, and then press ZERO/SCROLL until OFF appears in the display.
12. Press READ/ENTER to turn off SCA.

<u>Measuring for Fluoride</u>

1. Press POWER to start meter. The arrow should indicate channel 2.
2. Collect at least 40 mL of sample in a 50 mL beaker. Fill another 50 mL beaker with at least 40 mL of deionized water.
3. Fill a SPADNS Fluoride AccuVac Ampule with sample. Fill another SPADNS Fluoride AccuVac Ampule with the blank. Keep the tip of the Ampule immersed until it fills completely.
4. Quickly invert the Ampules several times to mix. Wipe off any liquid or fingerprints.
5. Wait 1 minute.

6. Place the blank in the cell holder.
7. Cover the blank with the instrument cap.
8. Press ZERO/SCROLL. The display will show "- - - -", then 0.0. Remove the blank from the cell holder.
9. Place the prepared sample in the cell holder.
10. Cover the sample cell with the instrument cap.
11. Press READ/ENTER. The display will show "- - - -", followed by results in mg/L fluoride. If the instrument shows a flashing 2.2 (over range), dilute the sample with an equal volume of deionized water and repeat the test. Multiply the result by 2.
12. Record reading in the space provided on your data form.
13. If the reading is greater than 0.2 mg/l, begin investigation.

Surfactants

Detergents contain synthetic or organic surface active agents called surfactants, which are derived from petroleum product precursors. They have the common property of lowering the surface tensions of water thus allowing dirt or grease adhered to various articles to be washed off. Industrial facilities use detergents to clean machinery. Soap manufacturers and households will also discharge anionic detergents into the surface water. The problem with these types of discharges is that surfactants can present significant environmental pollution problems. In aquatic environments, surfactants may form a surface film and reduce oxygen transfer at the water surface. Some surfactants may be acutely toxic to aquatic organisms. Detergents can damage fish gills by stripping them of their natural oils, thus interrupting oxygen transfer. Surfactants and detergents may also cause suds or foam to form on surface waters, which is aesthetically displeasing. Furthermore, this foam often contains nutrients such as nitrogen and phosphorous which can, in turn, provoke algae blooms. Surfactants can also alter the hydraulic characteristics of soils, affecting the movement of contaminants through soils and into groundwater. Surfactants are very slow to biodegrade and have carcinogenic and reproductively toxic byproducts such as nonylphenol, which is currently regarded as a potent endocrine disrupter.

Measuring for Surfactants

The Hach Stormwater Detergents test[2] is used as an indicator for the presence of surfactants. Follow the instructions below to determine whether further testing needs to occur.

1. Fill one test tube to the upper mark (20 mL) with the water to be tested.
2. Add 12 drops of Detergent Test Solution, insert stopper, and shake to mix.
3. Remove stopper and add chloroform to the lowest mark (5 mL) on the test tube. (Chloroform is heavier than water and will sink.) Insert stopper, shake vigorously for 30 seconds and allow to stand for one minute to allow the chloroform to separate.
4. Using the draw-off pipet, remove the water from the tube and discard.
5. Refill the test tube to the upper mark with the Wash Water Buffer and, using the draw-off pipet, remove the Wash Water Buffer and discard. This step washes away the remaining water sample.
6. Refill the test tube to the upper mark with the Wash Water Buffer, insert stopper, and shake vigorously for 30 seconds. Allow to stand for one minute to slow the chloroform to separate.
7. Insert the test tube containing the prepared sample in the right opening of the color comparator.
8. Fill the other test tube with deionized water and place it in the left opening of the comparator.
9. Hold the comparator up to a light, such as the sky, and view through the two openings in the front. Rotate the Detergents Color Disc until a color match is obtained. Read the parts per million

[2] If a different meter is used, follow the method recommended by the manufacturer of your particular meter.

(ppm) Detergents, Linear Alkylate Sulfonate (LAS) and/or Alkyl Benzene Sulfonate (ABS), from the scale window.

10. If the color is darker than the highest reading on the color disc, the original sample may be diluted 20-to-1 by adding 1 mL of sample to the test tube, using the plastic dropper filled to the top, or 1-mL mark, and filling the test tube to the upper mark (20 mL) with deionized water. Repeat Steps 2 through 9 and multiply the results by 20.
11. If the reading is less than 0.2 mg/l, record your results as "none detected".
12. If the reading is greater than 0.2 mg/l, follow the steps under the Analytical Laboratory Sample Collection section and begin investigation.

Analytical Laboratory Sample Collection

The remaining samples to be collected include FC and Surfactants (if the reading is greater than 0.2 mg/l). Use appropriate containers for the parameter being tested, as directed by the POTW laboratory.

Complete the following tasks:

- Fill out the chain-of custody form making sure that all sample bottles are correctly labeled
- Carefully pack the sample bottles in the cooler
- Transport the samples to the POTW laboratory
- Complete the chain-of-custody form

Sampling for Bacteria - Fecal Coliform or E. Coli

Bacteria samples are collected from water flowing directly from the discharging outfall by leaving the lid on the sample bottle and lowering the bottle to the mid-depth position, then removing the lid and allowing the container to fill. Store samples in an ice chest at ≤ 6˚ C until custody is transferred to the POTW laboratory. Samples collected for laboratory analysis should be submitted to the POTW as soon as possible after collection. **Bacteria samples must be delivered to the laboratory within 6 hours of collection.** The grab sample bottle type, preservation requirements, and holding time requirements should be met for each sample collected. If the results from the sample are greater than 1,000 per 100mL, begin investigation.

Sampling for Surfactants

Samples are collected from water flowing directly from the discharging outfall by leaving the lid on the sample bottle and lowering the bottle to the mid-depth position, then removing the lid and allowing the container to fill. Store samples in an ice chest at ≤ 4˚ C until custody is transferred to the contracted laboratory. **Surfactant samples must be delivered to the laboratory within 48 hours of collection.** See supervisor for steps to sending off contracted samples.

Recording Data

Record all qualitative observations and field testing results on the *Dry Weather Outfall Screening Form* (Appendix A) and the *Sample Data Tracking Form* (Appendix D). If a discharge is found, record investigation procedures on the Investigation Notes section of the *Dry Weather Outfall Screening Form* (Appendix A). Also note any changes to standard procedures, for whatever reason, and describe any unusual or noteworthy conditions or results in detail on the bottom of the form.

Disposal

Dispose of all spent reagents, reacted samples, and rinse solutions in the appropriate waste containers. Upon returning to the office or laboratory, pour these wastes into the sanitary sewer system of the office or laboratory. Be sure to clean all equipment, recheck calibration if any results were questionable, and restock reagents if necessary.

SPECIAL MONITORING

If an outfall location shows physical signs of a problem, but no flow is observed, then that illicit discharge is either an intermittent or transitory discharge. These do not flow continuously and may be difficult to observe.

Once an outfall is determined to have a possible illicit discharge associated with it and no flow is observed, then an alternate inspection and sampling program must be used. This can include the following:

<u>Odd hours of monitoring</u>: Perform inspections either later in the evening, early morning, or on the weekends. Since many types of intermittent discharges probably occur when occupants are present, then the inspection needs to be performed during these times as well. Make sure that if samples will be collected during odd times, the POTW laboratory needs to be notified to ensure they can accept and analyze the sample since there are specific holding times for each type of parameter.

<u>Sampling at the outfall plunge pool</u>: A sample would be collected directly from the plunge pool below the outfall, if one is present. An upstream sample will also be taken to compare the results. This can be affected by dilution and time so it is not always that accurate and effective.

EQUIPMENT MAINTENANCE

In order to ensure the quality of field results, maintenance of equipment must be given a high priority.

- All equipment must be cleaned and serviced at the end of a field shift.
- All water quality meters must be calibrated in the laboratory or office before field use. Calibration solutions should remain uncontaminated and not be used after their expiration dates.
- Field meters and cameras must be in proper working order. Make sure that batteries have sufficient voltage to power the equipment for the entire field trip. Recharge or replace them as necessary. Keep extra batteries in case they are needed. Probes should be inspected, cleaned and reconditioned regularly.
- Clean and rinse all other sampling equipment after returning from the field. Store clean equipment in storage cases.
- Glassware used in the field (e.g. graduated cylinders for sample dilutions, test kit flasks and/or beakers) should be cleaned immediately after usage. Rinse three to four times with deionized water and wipe the outside of the glassware dry with a white paper towel. Dry in an inverted position.

HEALTH AND SAFETY

Dry weather water sampling may occur when the sampling environment and discharges create hazardous conditions. Use safety precautions at all times when conducting dry weather monitoring.

- Keep a first aid kit and fire extinguisher in the vehicle.
- Watch out for traffic along the access road when sampling or making observations.
- Park vehicle off-road, if possible, and turn hazard lights on.
- Do NOT remain in open areas or stand under trees if lightning is occurring in the vicinity.
- Watch your step. The ground may be wet, slippery, steep, or unstable. Do not attempt to climb down unsafe slopes.
- Always wear clean latex rubber gloves when sampling.
- Protect eyes and skin against contact with acids and preservatives.
- Wear appropriate attire (i.e., hat, safety boots, gloves, and long pants).
- Be aware of your environment. Watch for snakes, ticks, bees, poison oak, etc.
- Use common sense when deciding whether to sample during adverse weather conditions. This program is intended to assess dry weather conditions. Do not sample during dangerous conditions such as high winds, lightning storms, or flooding conditions that might be unsafe.
- Do not enter channels during periods of high flow. The general rule of thumb is: If the product of the water depth in feet and the velocity in feet per second is greater than 10, or the level is above your waist, don't go in.
- Do not enter confined spaces.
- Follow all analytical procedures as prescribed in the equipment manuals. Give careful attention to warnings and precautionary statements.
- Be familiar with Material Safety Data Sheets (MSDS) for all chemicals used in the field and when calibrating instruments. Know the health hazards and emergency medical treatments, and follow proper disposal instructions.

Safety Equipment

The following safety equipment is recommended for use during dry weather sampling:

- First aid kit
- Latex gloves
- Rubber boots or waders
- Safety vest

CHAPTER 4: TRACING FOR THE SOURCE OF AN ILLICIT DISCHARGE

Once an illicit discharge has been identified and detected, the next step is to locate the source of discharge. The development of a plan to locate and address illicit discharges is required under the Phase II Stormwater Rules. “EPA recommends that the plan include the following five components:”

1. Locate the priority areas
2. Sample or screen the outfall
3. Trace the source of an illicit discharge
4. Remove the source of the illicit discharge
5. Program evaluation and assessment

During the inspection process, illicit discharges may be located and detected. Once these outfall locations are determined to have an illicit discharge, staff must start the tracing protocol to determine where the source of illicit discharge is originating from. Once located, this discharge needs to be eliminated from the community’s MS4 system.

TRACING TECHNIQUES

There are a number of different techniques that can be utilized to trace for an illicit discharge. When a dry weather flow or illicit discharge is documented, the City will initiate source tracing. Each technique listed must be fully understood and its limitations.

Visual Inspections of Stormwater Network

Figure 2: Removing a catch basin manhole lid

Once a dry weather flow is observed and it has been determined to be an illicit discharge, inspections along the specific MS4 conveyance system must occur. Typically, if the conveyance system is an open ditch, this is an easier process then if it is within an enclosed stormwater system. The inspection process utilizing this method needs to start at the initial detection location – the MS4 outfall where the illicit discharge has been observed and noted. The next step is to work “upstream” from this location – that is moving up the stormwater system to the first manhole. Check this manhole to see if there is evidence of flow. If flow is present, you may wish to sample the manhole; however, it is not required. If flow is observed at this manhole, move to the next upstream manhole. Keep moving upstream until no flow or low flow is observed. Keep in mind that as you move upstream, there may be junction lines entering the stormwater system at other locations. Utilize the stormwater maps to determine if this is the case. In these circumstances, you will need to check these manholes as well.

During this inspection process, key observations are necessary, including:

- Presence of flow
- Odors
- Colors/clarity
- Stains or deposits on the bottom of structure(s)
- Oil sheen, scum or foam on any standing water

During this process, sampling can be utilized to assist in this tracing process. Once areas are determined to have possible illicit source flows, sampling these individual locations and manholes can assist in directing where the source of the illicit discharge is located. Specific parameters can be used when looking for the illicit discharge. Refer to Chapter 3, Table 3-1 for sample parameters that can be used for specific sources of illicit discharges. Typically, you will use the same parameter that was used when the initial sample was taken to determine if an illicit discharge was present at that flow.

Dye Testing

Once the area has been determined where the potential illicit discharge source is located, the utilization of dye testing will assist in determining the exact location of the illicit discharge. Permission is required on private property prior to starting a dye test procedure. If a dye test is needed on the inside of a building, written permission is required. Once permission is granted, the dye testing will begin. The dye needs to be put into the suspect location. This is done by pouring the dye into sinks, toilets, etc and then flushed through the sanitary sewer system. The stormwater and sanitary sewers need to be monitored to observe where the dye discharges to. This procedure is effective in determining direct connections of sanitary lines to storm lines.

Televising/Video Inspection

Another method in determining where the illicit discharge source is located, is televising the storm line. Video cameras can be used by either pushing or using a mobile video unit. Both cameras will provide detailed information as to where the infiltration or connection is located within the MS4 system.

Indicator Monitoring / Sampling

When dry weather flow is observed at an outfall location, and the sample reveals that there is a problem with this flow, further monitoring can be done to assist in the location of the illicit discharge. As manholes are opened and dry weather flow is observed, samples can be taken and analyzed. During this process, we are looking for a pattern within the sample analysis, depending on the parameter sampled for. During this type of tracing, monitoring will allow staff to determine if the dry weather flow observed is the source of the flow at the outfall location. There can be circumstances where dry weather flow occurs and it is not "illicit" due to its source (See Chapter 1). This flow can combine with an illicit source in the stormwater system making it difficult to trace. By monitoring the water observed, it will assist in the tracing of the illicit source discharging into the stormwater system.

Automatic Samplers can also be used during the investigation of intermittent flows. These samplers can be placed at specific locations within the stormwater system of a community. These samplers can be triggered by dry weather flows. This type of sampling and monitoring is not the best method for most communities due to the cost of the sampling equipment. This type of monitoring can be effective however, in areas with a large intermittent discharge problem and/or very complex stormwater system.

These samplers will provide the date and time the sample was collected which will assist the community in locating the source of this discharge.

Smoke Testing

This method should be used during special circumstances when a good storm sewer map is not available for a location and there are known problems of connection issues. Smoke is introduced into the storm drainage system and will emerge at locations that are connected to that system. It is recommended that qualified personnel be used for this method to ensure accurate test results.

CHAPTER 5: ELIMINATION OF AN ILLICIT DISCHARGE

Once an illicit discharge has been identified, staff must then determine who is responsible for the removal of the discharge. On January 1, 2009 the Illicit Discharge and Illegal Connection regulations went into effect as part of the City of Valdosta Land Development Regulations (LDR). Example situations may include:

- Internal Plumbing Connection
- Service Lateral
- Infrastructure Failure
- Transitory Discharge

Once the removal of the illicit discharge has occurred, it must be confirmed to ensure the correction has been made.

There are various methods that can be used to remove an illicit discharge and to fix the problem, see Table 5-1.

TABLE 5-1
METHODS TO ELIMINATE DISCHARGES

Technique	Application	Description
Service Lateral Disconnection/ Reconnection	Lateral is connected to the wrong line	Lateral is disconnected and reconnected to appropriate line
Cleaning	Line is blocked or capacity diminished	Flushing (sending a high pressure water jet through the line); pigging (dragging a large rubber plug through the lines); or rodding
Excavation and Replacement	Line is collapsed, severely blocked, significantly misaligned or undersized	Existing pipe is removed, new pipe placed in same alignment; Existing pipe abandoned in place, replaced by new pipe in parallel alignment
Manhole Repair	Decrease ponding; prevent flow of surface water into manhole; prevent groundwater infiltration	Raise frame and lid above grade; install lid inserts; grout, mortar or apply shortcrete inside the walls; install new precast manhole
Corrosion Control Coating	Improve resistance to corrosion	Spray- or brush-on coating applied to interior of pipe
Grouting	Seal leaking joints and small cracks	Seals leaking joints and small cracks
Pipe Bursting	Line is collapsed, severely blocked, or undersized	Existing pipe used as guide for inserting expansion head; expansion head increases area available for new pipe by pushing existing pipe out radially until it cracks; bursting device pulls new pipeline behind it

TABLE 5-1 (CONTINUED)
METHODS TO ELIMINATE DISCHARGES

Slip Lining	Pipe has numerous cracks, leaking joints, but is continuous and not misaligned	Pulling of a new pipe through the old one
Fold and Formed Pipe	Pipe has numerous cracks, leaking joints	Similar to slip lining but is easier to install, uses existing manholes for insertion; a folded thermoplastic pipe is pulled into place and rounded to conform to internal diameter of existing pipe
Inversion Lining	Pipe has numerous cracks, leaking joints; can be used where there are misalignments	Similar to slip lining but is easier to install, uses existing manholes for insertion; a soft resin impregnated felt tube is inserted into the pipe, inverted by filling it with air or water at one end, and cured in place

Source: Modified from *Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments,* Center for Watershed Protection, 2004

If the illicit discharge is originating from outside the Valdosta city limits, it is important that the community where the discharge is coming from be notified by the appropriate supervisor. This should be done in a letter format where you can document that it was sent. The letter should include where the illicit discharge was detected and where it was traced to by staff. Keep records of all actions, and ask the neighboring community to inform you when the correction has been made. Include all of your documentation with your annual Phase II Stormwater Report to the Georgia EPD.

CHAPTER 6: EDUCATION TO CITY EMPLOYEES, GENERAL PUBLIC AND BUSINESSES

The Georgia EPD requires that communities must inform public employees, businesses and the general public of hazards associated with illegal discharges and improper disposal of waste. This chapter provides some suggestions as to how to provide this information to the targeted audience.

CITY EMPLOYEES

The Phase II Stormwater rules require that municipal employees be trained on pollution prevention techniques. This is located under Minimum Control Measure # 6: "Pollution Prevention/Good Housekeeping for Municipal Operations" of the City's stormwater NOI.

Service department employees can look for signs of illegal dumping in catch basins and other locations. Building inspectors can ensure that illegal connections to the storm sewer system do not take place during construction projects. Staff whose jobs keep them outside and mobile can help spot illegal dumpers. Fire and police department personnel who respond to hazardous material spills can help keep these spills out of the storm sewer system and adjacent water bodies.

GENERAL PUBLIC AND BUSINESSES

It is important to get the public involved and educated on environmental and water quality issues. Some examples of what can be done include:

- Provide outreach materials
- Encourage the public to report illicit discharges/dumping when they are observed
- Partner with local volunteers to conduct storm drain stenciling projects
- Promote household hazardous waste disposal/recycling program
- Speak at public/private engagements

For more specific information on the City of Valdosta stormwater education programs, please see the approved NOI or visit the City website at www.valdostacity.com.

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APPENDIX

APPENDIX A

DRY WEATHER OUTFALL SCREENING FORM

APPENDIX B

Illicit Discharge Detection Elimination Field Guide

APPENDIX C

CHAIN OF CUSTODY RECORD

APPENDIX D

DRY WEATHER OUTFALL SCREENING – SAMPLE DATA TRACKING FORM