City of Chattanooga
Water Quality Management

Illicit Discharge Detection and Elimination
Standard Operating Procedures (SOP)

PW-SWQ-SOP 05

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Introduction

Illicit discharges are untreated, non-storm water, discharges that add to pollutant loadings in receiving streams. Untreated discharges can contribute to high levels of pollutants, including heavy metals, toxics, oil and grease, solvents, nutrients, viruses, and bacteria. Pollutants have contributed to the degradation of many of the nation's waterways and an illicit discharge detection and elimination program is required to identify and eliminate sources of pollutant discharge from the MS4s.

The City of Chattanooga's Municipal Separate Storm Sewer System (MS4) National Pollutant Discharge Elimination System (NPDES) Permit No. TNS068063 requires development and implementation of a program "to detect and remove (or require the discharger to the MS4 to remove) illicit discharges and improper disposal into the storm sewer system". The purpose of Illicit Discharge Detection and Elimination (IDDE) program is to identify and mitigate non-stormwater discharges into the MS4 system. The City of Chattanooga's illicit discharge program includes *inspection*, *enforcement* and *ordinances*.

This guide is to serve as a performance standard by which all Water Quality employees conduct activities associated with illicit discharge and improper disposal. All revisions to this document shall be recorded as "Revision" and be subject to appropriate peer review. All revisions from the Illicit Discharge Detection and Elimination Standard Operating Procedures (SOP) (2009) are documented in Table 1.

Table 1. Record of Revisions

Date	Specific Section or Page	Revision Type (major or minor)	Revision Description
5/10/11	Introduction	Minor	Substitution of the word "contribute" with the word "add".
5/10/11	Introduction	Major	Addition of the "Notice of Revisions Record" Table.
5/10/11	Illicit Discharge Definition	Minor	Clarification of "illicit discharge" definition.
5/10/11	Types of Autho0rized Discharges	Minor	Section title changed to "Types of Authorized Discharges"
5/10/11	Types of Authorized Discharges	Minor	"Uncontaminated ground water infiltration" defined by new NPDES Permit
5/10/11	Appendix	Minor	Addition of IDDE Field Guide

Employee Training, Health and Safety

The employee(s) shall become familiarized with the protocols outlined in this SOP. Water Quality staff shall have a basic working knowledge of:

- Illicit Discharge Detection and Elimination (IDDE) techniques
- Record keeping procedures
- Working knowledge of City of Chattanooga ordinances and enforcement protocols

On a yearly basis the Water Quality Manager, or representative, shall review this document to ensure continuing applicability and shall train employees with regards to proper inspection techniques.

Illicit discharges occur in a variety of areas and under varying circumstances. As a result of the innate hazard potentials, special attention should be paid with regards to employee safety. General safety equipment and protocol shall include:

- Fully equipped first aid kit
- Radio or cell phone
- List of emergency contact names and numbers
- Safety/traffic vests
- Proper footwear (i.e. hiking or rubber boots)
- Use of hazard lights on roadside/shoulder

Illicit Discharge – Defined

For the purpose of this document, the term "illicit discharge", is defined "as any discharge to the municipal separate storm sewer system that is not composed entirely of stormwater, except for discharges allowed under an NPDES permit ….. These non-stormwater discharges occur due to illegal connections to the storm drain system from commercial/residential establishments. As a result of these illicit connections, contaminated wastewater enters into storm drains or directly into local water ways without receiving treatment from a wastewater treatment plant."

The Center for Watershed Protection's Illicit Detection and Elimination: A Guidance Manual (2004) further defines an "illicit discharge":

- Is a storm drain that has measurable flow during dry weather containing pollutants and/or pathogens.

- Each illicit discharge has a unique frequency, composition, and mode of entry into the MS4 system.

- Illicit discharges are frequently caused when the sewage disposal system interacts with the storm drain system. There are a variety of monitoring techniques (such as smoke testing, dye testing, and optical brightener analysis) that can be used to locate and eliminate illegal sanitary connections.

- Illicit discharges of pollutants are produced from specific source areas. Knowledge of potential illicit discharge generating sites can be used to locate non-sanitary illicit discharges.

Types/Sources of Illicit Discharges

There are a variety of different types of discharges, as well as sources from which the discharges may originate. Typically each discharge can be categorized as either direct or indirect. A *direct discharge* is one in which an individual or facility purposely and illegally dumps or drains any "non-stormwater" material (used motor oil, etc.) directly into a stormdrain or catch basin. An *indirect discharge* is one in which a failing system (sewer/septic, grease disposal, etc.) leads to a discharge which eventually makes its way into the stormwater system.

In addition to the mechanism that illicit discharges may enter the MS4 system, the frequency of the discharge provides clues to source identification. Illicit discharges can be separated into three (3) categories based on the frequency of the discharge: transitory, intermittent, and continuous discharge.

1. **Transitory Illicit Discharges:** are typically one-time events. Transitory illicit discharges typically result from spills, illegal dumping, and line breaks. These types of discharges are often the most difficult to track back to the source. Methods for reducing this type of discharge include public education and utilization of the city's service request system (311).

2. **Intermittent Illicit Discharges:** are typically discharges that occur occasionally. An intermittent illicit discharge occurs over a short period of time such as several hours per day, or a few days per year. These types of discharges are often the result of activities such as illegal discharge of waste into water bodies or land, or washing (ie: pressure washing) of exterior areas. These types of discharges are most likely to be discovered and traced to the source.

3. **Continuous Illicit Discharges:** are typically direct connections into the MS4 system. Continuous illicit discharges are most often the result of an illegal connection from a commercial or industrial facility, a direct connection from a sanitary sewer system, or from a malfunctioning septic system. These types of discharges are the easiest to find and eliminate. Elimination of continuous illicit discharges provides the greatest impact as they are constant pollutant loading sources to a water body.

Land use plays a pivotal role in both the types and frequency of illicit discharges (see Tables 2 & 3).

Table 2: Land uses, likely source locations, and activities that can produce *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 Lawn/Landscape watering Septic system maintenance Swimming pool discharges Laundry wastewater Improper plumbing (floor drains)
Commercial	Car dealers/rental cars co Car washes Commercial laundry Gas stations/auto repair shops Marinas Nurseries/garden centers Restaurants	Pressure washing Dumping/spills Landscape watering Outdoor fluid storage Vehicle fueling Vehicle maintenance/repair Vehicle washing Grease traps Dumpsters
Industrial	Construction Distribution centers Food processing Printing Chemical manufacturing	Industrial process water or rinse water Load and un-loading area wash-downs Outdoor material storage
Municipal	Airports Landfills Maintenance/fleet storage area Streets and highways	Pressure washing Dumps/spills Vehicle fueling Vehicle washing Vehicle maintenance/repair Emergency response

Source: IDDE: A Guidance Manual for Municipalities in the State of Ohio, 2006

Table 3: Land uses, likely source locations and activities that can produce *Continuous* Illicit Discharges

Land Use	Condition or Activity Producing Discharge
Residential	Failing septic tanks Sanitary connection into the storm drainage system Failed sanitary service lines
Commercial/Industrial	Failed sanitary service lines Process water connections to the storm drainage system
Municipal	Sanitary inflow/infiltration Sanitary connections into the storm drainage system

Source: IDDE: A Guidance Manual for Municipalities in the State of Ohio, 2006

Mode of Entry

Illicit discharges can also be classified based on how they enter the storm water drainage system. The most typical mode of entry is either via direct or indirect entry. A **direct discharge** is one in which the discharge is directly connected to the storm drainage system via a pipe or some type of conveyance system. Direct entry usually occurs when there is some type of a cross-connection. An **indirect discharge** is one in which the discharge occurs outside of the drainage system and enters the system via overland flow to a storm drainage system or through infiltration.

Examples of types of illicit discharges by mode of entry

1. **Sanitary waste** is commonly observed on private property originating from a cleanout or broken sanitary service line; this includes both residences that are connected to the City's sewer infrastructure as well as those still using septic tanks. Anything that may be washed down the sink or flushed down the toilet is considered sanitary discharge. *Laundry wastewater* is another type of sanitary discharge, as effluent from washing machines is discharged into the sewer system. Blockages and broken cleanouts on private service lines are examples of *indirect discharge*.

Sanitary discharge from clean-out

Discharge of laundry wastewater into storm system via curb line

2. **Sanitary Sewer Overflows** often occur during or after intense rain events. Points of infiltration allow stormwater to enter the sanitary sewer system, which is not designed to handle flow of this measure. Additionally, oil/grease, debris, and other objects frequently make their way into the sanitary sewer system (either by accident or intentionally). These blockages displace wastewater, often leading to an overflow. A sanitary sewer overflow is another example of an *indirect discharge*.

Examples of Sanitary Sewer Overflows

3. **Spills/Emergency Response** occur when an unexpected event results in a non-storm water discharge. There are a variety of activities that result in a spill, including traffic accident or accidental release. Spills/emergency response is most often an example of an *indirect discharge* as the pollutant migrates to a storm drain rather than directly discharging into the system.

Examples of a spill resulting from an emergency response

4. **Intentional Releases** often result in a *direct discharge* into the storm drainage system. Sometimes illicit discharges are directly poured into the storm water drainage system, resulting in direct contamination of the receiving stream.

Examples of direct discharges due to intentional releases

Types of Authorized Discharges

Not all non-storm water discharges are considered illicit discharges. Following is a list of non-storm water discharges that are permitted under the City of Chattanooga's NPDES permit number TNS068063.

- Water line flushing;
- Landscape irrigation;
- Diverted stream flows;
- Rising ground waters;
- Uncontaminated ground water infiltration (infiltration is defined as water other than wastewater that enters a sewer system, including sewer service connections and foundation drains, from the ground through such means as defective pipes, pipe joints, connections, or manholes. Infiltration does not include, and is distinguished from, inflow);
- Uncontaminated pumped ground water;
- Discharges from potable water sources;
- Footing drains;
- Air conditioning condensate;
- Irrigation water;
- Springs;
- Water from crawl space pumps;
- Footing drains;

- Individual residential car washing;
- Flows from riparian habitats and wetlands;
- Dechlorinated swimming pool discharges;
- Street wash water
- Discharges or flows from emergency fire fighting activities.

Illicit Discharge Source Tracking

The City of Chattanooga has identified and mapped the entire storm drainage infrastructure within its judicial boundaries. All data has been stored and maintained on Geographical Information System (GIS) and is updated as needed. Infrastructure mapping is a critical element in the illicit discharge detection and elimination tool box. Infrastructure mapping provides a mechanism by which Water Quality investigators can trace illicit discharges to their source.

Tracing Techniques

Visual inspections – If an illicit discharge has been detected (either through field screening or complaint investigation), then "backtracking" is the primary technique used to locate the source of the discharge. "Backtracking" involves visual inspection from the initial detection location. The investigator works their way "upstream" from the location, raising manholes or walking the channel until either flow is no longer observed or the source of the discharge has been identified. Key inspection annotations include:

- Presence of flow
- Odors
- Color
- Stains or deposits within the structure
- Presence of oil sheen, foam, floatable solids
- Positive analysis of Chlorine, Ammonia, or Detergents

Dye testing – dye testing is an effective method to positively identify the source of many illicit discharges (especially compromised sanitary infrastructure). Most dye testing requires permission and entrance into a private residence. Dye tests are usually conducted by pouring the dye into sinks, toilets, clean-outs, etc. and then monitoring the storm water system to see if dye appears. This technique is most effective in determining direct connections.

Televising/Video Inspection – is a more expensive and labor intensive technique to locate either infiltration or connection into the City's system. Most video inspection is conducted by Moccasin Bend Waste Resource Division (WRD) and is used to locate compromises with the City's sanitary infrastructure.

Smoke testing – is conducted most frequently in cooperation with WRD. Smoke testing is a method used to locate significant areas where inflow and infiltration (I&I) is expected. Smoke testing involves public notification and extensive record keeping. The City of Chattanooga has developed an on-going program aimed at canvassing the entire city to identify and eliminate possible sources of I&I due to residential connections. For further information refer to the Sewer Lateral Assessment Program (SLAP) standard operating procedure.

Indicator monitoring/sampling – is conducted when a dry weather flow has been identified, but the actual pollutant has not been determined. Examples of indicator sampling include:

- Chlorine – presence indicates source is associated with potable water (i.e.: water leak);
- Ammonia – presence indicates source is associated with sanitary wastewater;
- Detergents – presence indicates source is associated with sanitary wastewater or industrial wastewater;
- *E. coli* – elevated levels indicate source is associated with sanitary wastewater.

Optical brightener monitoring – is conducted by strategically installing, unbleached cotton pads, along storm water infrastructure. Detergents contain optical brighteners and if the cotton pads pick up highly concentrated levels of detergents, then they fluoresce in the presence of a black light. Optical brightener monitoring is done to determine if sanitary wastewater is entering the MS4 system.

Eliminating Illicit Discharges

Once the source of the illicit discharge has been identified, Water Quality staff must take action to eliminate the discharge. There are three primary mechanisms available to eliminate illicit discharges:

- Enforcement;
- Notification/Public Education;
- Internal Coordination

Enforcement – The City of Chattanooga has developed and approved policy and procedures associated with enforcement activity (*City of Chattanooga Water Quality/Land Development Office Stormwater Management Enforcement Protocol Adopted November 18, 2004, Amended April 16, 2007).* The Enforcement Protocol provides clear guidance regarding enforcement options available to eliminate illicit discharges.

Notification/Public Education – The City of Chattanooga maintains an avenue by which the public can report any illicit discharge or illegal dumping (**311**). In addition to the

public reporting mechanism, the Water Quality program maintains a web-site that provides links to a number of public education/outreach resources:

(http://www.chattanooga.gov/Public_Works/70_Outreach&Education.htm)
Additional public outreach programs include:

- Storm drain stenciling program;
- Proposed Web-Based Watershed Academy;
- Public event participation (ie: Home Show, Riverbend, etc.);
- Household Hazardous Waste Program;
- Recycling Program.

Internal Coordination – The Water Quality group coordinates with WRD, the Land Development Office, City Wide Services and the Chattanooga Fire Department to eliminate illicit discharges associated with municipal activities. The Water Quality Supervisor serves as the liaison to coordinate interdepartmental communication.

Documentation

Water Quality staff must appropriately document all activities associated with illicit discharge detection and elimination. Documentation consists of:

- Inspection – consisting of photo documentation and completion of the Illicit Discharge Inspection Report (Appendix);
- Quality Assurance/Quality Control – photos and inspection report are reviewed by the Water Quality Supervisor (or designated representative) for accuracy and completeness;
- Data Management – documentation is imported into the appropriate service request (311), folder in the shared file (Illicit Discharges) and GIS. Any enforcement action will result in submittal of a letter and subsequent inspection activity. A copy of each enforcement letter is provided to the Tennessee Department of Environment and Conservation Chattanooga Field Office.

References

Center for Watershed Protection & Pitt, R. (2004). Illicit discharge detection and elimination: a guidance manual for program development and technical assessments.

Cuyahoga County Board of Health & Stark, H. (2006). Illicit discharge detection and elimination manual: A guidance manual for municipalities in the State of Ohio.

Appendix I

Illicit Discharge Inspection Report

Date entered: GIS _____ CSR_____ Scanned _____ Spreadsheet_____

QA/QC Reviewer: _____Date Reviewed: _____Filed_____

Illicit Discharge Inspection Report

City of Chattanooga
Water Quality Program
1250 Market Street, Suite 2100
Chattanooga, Tennessee 37402
(423) 643-5877 Fax (423) 643-5862
SWM@mail.chattanooga.gov

Location of Discharge:

Address _____ SR# _____

Date _____ Watershed _____

Source of Illicit Discharge:

Sanitary Wastewater:	**Automotive Fluids / Fuel / Washing:**
☐ Broken Service Line	☐ Oil
☐ Sewer Cleanout	☐ Antifreeze
☐ Septic Tank	☐ Transmission
☐ Laundry Wastewater	☐ Gasoline
☐ Sewer Overflow	☐ Diesel
	☐ Wash Water (Detergent / Construction)
Household:	
☐ Paints / Rinse Water	**Other:**
☐ Cleaner	☐ Pesticides/Herbicides
☐ Swimming Pool Water	☐ Fertilizer
	☐ Illicit Connection to Storm Drain
Food Service:	☐ Illegal Dumping to Storm Drain
☐ Cooking Oil	☐ Water Leak
☐ Grease	☐

Inspection Type: Initial / Follow-up / Final

Letter Type: Notification / WW / NOV / NOV ĉ Civil Penalty / None

Land Use: Commercial / Residential / Other:_____

Found By: FS / SCORE / Smoke Test / 311 / City Emp: WQ or Other / Other: _____

Comments: _____

_____

_____

_____

Inspector(s): _____ **Photos? Yes ☐ No ☐**

Appendix II

Illicit Discharge Detection and Elimination Field Guide

Illicit Discharge Detection and Elimination Field Guide

An **illicit discharge** is defined by the US EPA's Phase II Storm Water Regulations as "any discharge to an MS4 (Municipal Separate Storm Sewer System) that is not composed entirely of storm water..." with some exceptions. These exceptions include discharges from NPDES-permitted industrial sources and discharges from fire-fighting activities. Illicit discharges are considered "illicit" because MS4s are not designed to accept, process, or discharge such non-storm water wastes.

MS4 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)
(i) Owned or operated by a State, city, township, county, district, association, or other public body (created by or pursuant to State law) including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, that discharges into waters of the state;
(ii) Designed or used for collecting or conveying storm water;
(iii) Which is not a combined sewer; and
(iv) Which is not part of a Publicly Owned Treatment Works

Illicit Discharge Testing Procedure

1. Go to site.
2. Put on flashers, put out cones, and put on orange vest (if needed)
3. Locate the outfall.
4. Gather equipment.
5. Take a picture of the outfall.
6. Make visual observations about the pipe, its condition, and the water flowing out of the pipe including color, odor, turbidity, and floatables.
7. If water sample will be collected, put on gloves.
8. Collect a water sample in a lab supplied bottle for lab analysis or sanitized container for on sight testing.
9. Put sample for lab in cooler with ice, or for on sight testing, rinse test tubes/meters with the water to be tested.
10. Run water quality tests on sample (see back of Field Guide for possible parameters and the testing supplies section for specific test kits).
11. Measure the flow rate using the appropriate sized bucket/container
12. Rinse probes with distilled water.
13. Complete necessary paperwork.
14. Check to make sure all equipment is collected before leaving the site.

Stormwater testing supplies

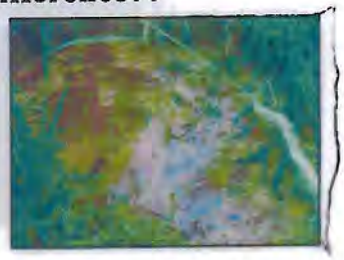
- ❑ **Conductivity Meter**
- ❑ **pH Meter**
- ❑ **Nitrate Test Kit**
- ❑ **Phosphate Test Kit**
- ❑ **Camera**
- ❑ **Latex Gloves**
- ❑ **Hand Cleaner**
- ❑ **Wet Wipes**
- ❑ **First Aid Supplies**
- ❑ **Bug Repellant**
- ❑ **Poison Ivy Cleanser**
- ❑ **Poison Ivy Repellant**
- ❑ **Writing Utensils**
- ❑ **Maps**
- ❑ **Storm Water Forms**
- ❑ **Unopened 100 mL sample bottles**
- ❑ **Extendable Water Sampling Pole w/bottle**
- ❑ **Distilled Water**
- ❑ **Flashlight**
- ❑ **GPS Unit**
- ❑ **Tape Measure**
- ❑ **Cones**
- ❑ **Safety Vest**
- ❑ **Boots**
- ❑ **One Gallon Bucket**
- ❑ **One Pint Container**
- ❑ **Lab Bottles**
- ❑ **Clipboard**

Key Observations:

- Presence of Flow
- Odors
- Colors/Clarity
- Stains/Deposits on the bottom of the stormwater structure
- Oil Sheen, scum or foam on standing water

Know the Difference??

Iron Bacteria



Diesel Fuel

Water Quality Test Parameters and Uses

Water Quality Test	Use of Water Quality Test
1. Conductivity	Indicator of dissolved solids
2. Bacteria (Fecal coliform, *E. Coli*)	Indicates presence of sanitary wastewater
3. Ammonia	May indicate presence of sanitary wastewater
4. Surfactants	Indicates presence of detergents (laundry and car washing)
5. pH	May indicate commercial or industrial discharge
6. Temperature	May indicate industrial cooling/sanitary wastewater
7. Phosphate	High levels indicate presence of sewage and fertilizers
8. Nitrate	May indicate presence of fertilizers
9. Dissolved Oxygen	Low levels may indicate presence of sewage
10. Hardness	Distinguishes between treated and untreated water
11. Total Chlorine	Indicator of inflow from potable water source
12. Fluoride	Indicator of inflow from potable water source
13. Potassium	High levels may indicate presence of sanitary wastewater
14. Optical Brighteners	Indicates presence of laundry detergents
15. Salinity	May indicate commercial or industrial discharge

Outfall Material:

High Density Polyethylene (HDPE)

Vitrified Clay Pipe (VCP)

Corrugated Metal Pipe (CMP)

Reinforced Concrete Pipe (RCP)

Polyvinyl Chloride (PVC)

Ductile Iron Pipe (DIP)