Charlotte - Mecklenburg Storm Water Services

Illicit Discharge Detection and Elimination Manual

Version 2.2

Updated September 2022

Developed for Compliance with Phase I and Phase II Storm Water Permit Requirements

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Revision History:

Version	Effective Date	Lead Authors	Summary of Changes
1.0	February 2008	Rusty Rozzelle, Craig Miller	Original Draft
1.1	January 2009	John McCulloch, Craig Miller	Minor Revisions
1.2	February 2010	John McCulloch, Craig Miller	Minor Revisions
1.3	October 2010	John McCulloch, Craig Miller	Minor Revisions
1.4	June 2012	John McCulloch, Craig Miller	Minor Revisions
1.5	February 2014	John McCulloch, Craig Miller	Minor Revisions
2.0	March 2021	Ryan Spidel, Craig Miller	Major Document Revisions – updated document to reflect the latest procedures and techniques that CMSWS staff utilize.
2.1	March 2022	John Thao, Ryan Spidel, Craig Miller	Revisions and updates to procedures
2.2	September 2022	John Thao, Ryan Spidel, Craig Miller	Revisions and updates to procedures for PAH guidelines.

Section 1: Introduction

1.1 Regulations

This Illicit Discharge Detection and Elimination (IDDE) Policies and Procedures Manual documents the current Standard Operating Procedures (SOP) for CMSWS' IDDE Program. This is intended to satisfy Part II, Section D of the Phase I National Pollutant Discharge Elimination System (NPDES) Storm Water Permit (Permit No. NCS000240) issued to the City of Charlotte and the Phase II NPDES Storm Water Permit (Permit No. NCS000395) issued to Mecklenburg County and the Towns.

1.2 Goal and Objectives

The goal and objective of Charlotte-Mecklenburg Storm Water Services' (CMSWS') IDDE Program is to find and eliminate illicit discharges of pollution and restore the quality and usability of Charlotte-Mecklenburg's surface water resources. Activities initiated and implemented by CMSWS personnel to meet this goal and objective include:

- Detect and eliminate illicit discharges, including preventable spills and illegal dumping to the Municipal Separate Storm Sewer Systems (MS4s) for the City of Charlotte, Mecklenburg County and the Towns.
- Address significant contributors of pollutants to the MS4s.
- Implement appropriate enforcement procedures and actions.
- Develop and maintain a map displaying the major MS4 outfalls to State waters receiving discharges.
- Inform and educate employees, businesses, and general public of hazards associated with illegal discharges and improper disposal of waste.

1.3 Location and Geography

The IDDE Program is implemented throughout Mecklenburg County, the City of Charlotte, and the Towns. The Towns include Cornelius, Davidson, Huntersville, Matthews, Mint Hill and Pineville. A map depicting IDDE activity coverage areas is provided as **Figure 1-1**.

Mecklenburg County covers approximately 525 square miles in the Piedmont physiographic province of North Carolina and characterized by an undulating topography consisting of alternating valleys and rounded hills, which lends itself to a highly segmented stream network. The drainage divide between the Catawba and Yadkin River basins runs through the County. Approximately one-third of the land area of the County drains eastward to the Yadkin and two-

thirds drains westward to the Catawba. The County has over 3,000 miles of streams with year-round flow and approximately 190 miles of shoreline along its western border in three (3) of the 11 reservoirs that comprise the Catawba River system. The Catawba River system includes Lake Norman, Mountain Island Lake and Lake Wylie. A map of these areas is provided as **Figure 1-2**.

There are also approximately 3,000 miles of storm drainpipe and over 150,000 catch basins and drop inlets in the City of Charlotte's MS4. Storm water flows are redirected through the storm water infrastructure, from developed areas within the City to the streams and lakes. The MS4 serving the outlying areas of the County and the Towns includes several hundred miles of ditches and/or pipes depending on land development conditions. At a minimum, pipe systems in Charlotte-Mecklenburg are 15 inches in diameter and are designed for the ten-year storm event. The MS4s for all jurisdictions are designed to carry only storm water flows.

1.4 Program History

Charlotte-Mecklenburg has long recognized the adverse effects that illicit discharges have on receiving waters. Charlotte-Mecklenburg 's program for the identification and elimination of illicit discharges has existed since 1970. During the initial years of the program, thousands of illicit discharges were eliminated within the vicinity of uptown Charlotte and the nearby surface water bodies (Sugar Creek, Little Sugar Creek, and their tributaries). In 1969, aquatic life surveys were performed in these creeks and discovering the absence of aquatic life. 30 years later, a survey was conducted at the same locations and revealing significant aquatic populations. This was largely due to restored water quality conditions resulting from the elimination of illicit discharges.

In November 1993, the City of Charlotte was issued a Phase I Storm Water Permit which requires the development of an IDDE Program. To meet this requirement, the current program was significantly modified to ensure effective coverage of the City's growing storm drainage system and compliance with permit requirements. In July 2005, Mecklenburg County and the Towns were issued a Phase II Storm Water Permit and the IDDE Program was modified again to ensure coverage of the streams and storm drains in the Towns and County outside the City of Charlotte.

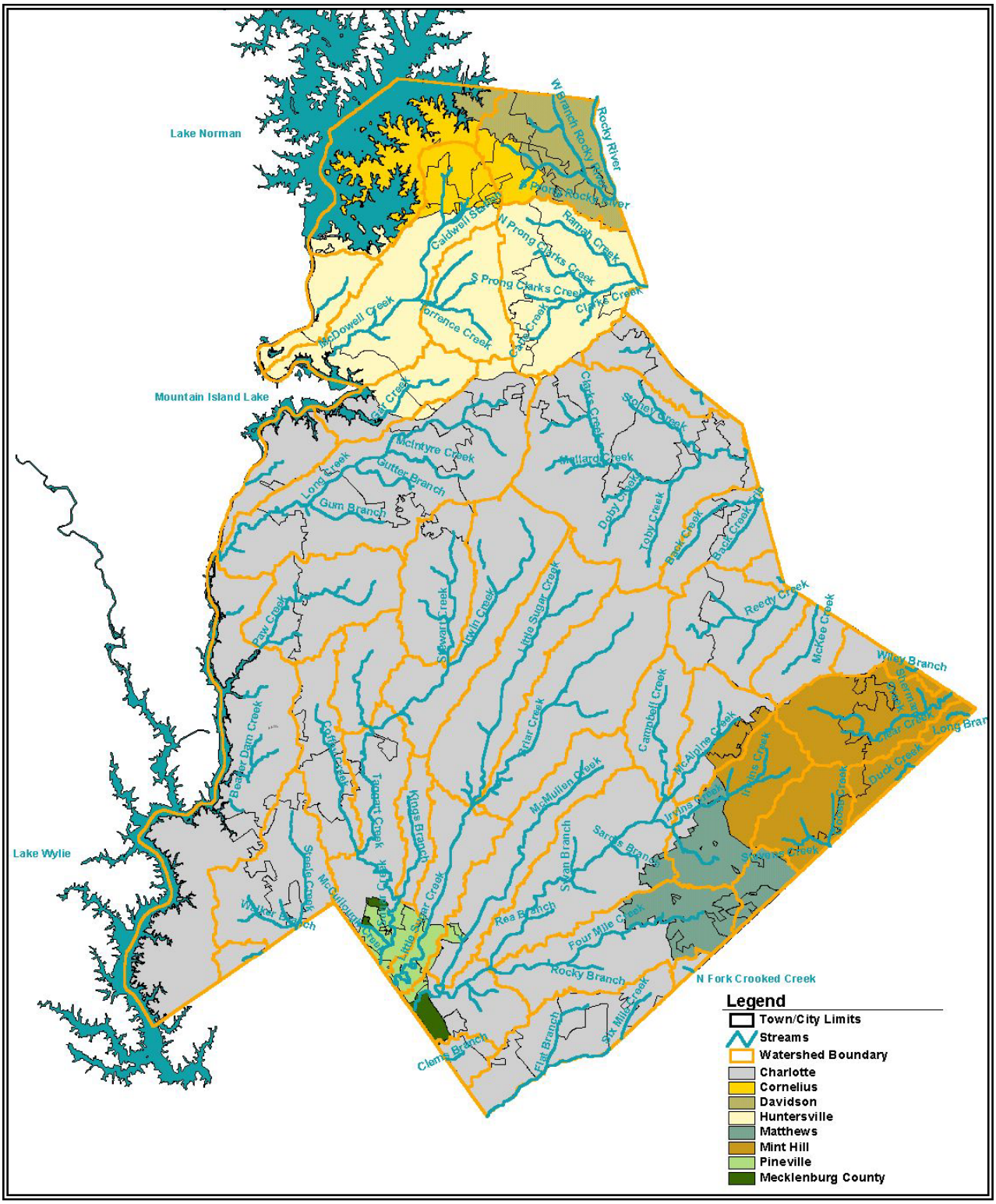


Figure 1-1: Coverage Area for the IDDE Procedures

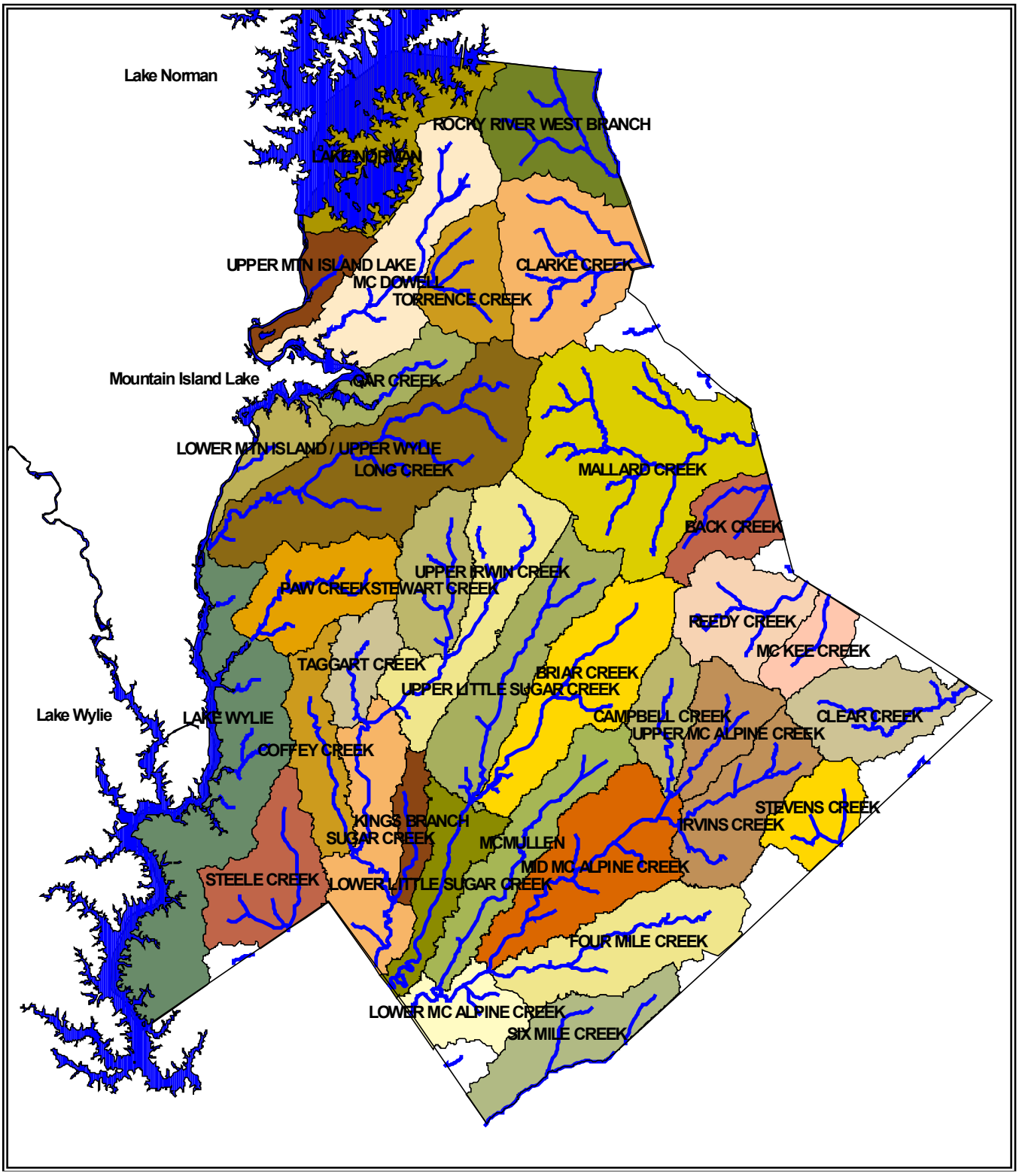


Figure 1-2: Mecklenburg County Watersheds and Reservoirs.

1.5 Legal Authority

The City of Charlotte, Mecklenburg County and the Towns are authorized to adopt an IDDE ordinance pursuant to North Carolina law, including but not limited to Article 14, Section 5 of the Constitution of North Carolina; Rules promulgated by the Environmental Management Commission pursuant to North Carolina General Statute 143-214.7; Session Law 2004-163; and North Carolina General Statute 153A-121. The following ordinances have been developed and are in use in Charlotte-Mecklenburg to provide the authority necessary to eliminate illicit discharges:

1. Charlotte Storm water Pollution Control Ordinance: Effective Date: January 30, 1995; updated May 26, 2020. Applies within the corporate limits of the City of Charlotte (see **Appendix A**).
2. Mecklenburg County Surface Water Pollution Control Ordinance: Effective Date: May 5, 2004; updated May 21, 2020. Applies in all unincorporated areas of Mecklenburg County as well as within the corporate limits of Cornelius, Huntersville, Mint Hill and Pineville (see **Appendix B**).
3. Town of Davidson Surface Water Pollution Control Ordinance: Effective Date: January 2004; updated August 25, 2020. Applies within the corporate limits of the Town of Davidson (see **Appendix C**).
4. Town of Matthews Surface Water Pollution Control Ordinance: Effective Date: November 27, 2000; updated January 14, 2020. Applies within the corporate limits of the Town of Matthews (see **Appendix D**).

Right-of-Entry Section 18-82 of the Charlotte Storm Water Pollution Control Ordinance and Section 6 of the Surface Water Pollution Control Ordinances for Mecklenburg County and the Towns stipulate that City of Charlotte and Mecklenburg County personnel or other duly authorized representative(s), bearing proper identification, shall be permitted to enter upon all properties for the purpose of inspection, observation, measurement, sampling and testing in accordance with ordinance provisions.

1.6 Coordination between the City, the County and the Towns

In coordination with the City of Charlotte, Mecklenburg County, and the Towns, CMSWS is responsible for implementing the IDDE Program and administering pollution control regulations. CMSWS consists of staff from both the City of Charlotte and Mecklenburg County. The City of Charlotte is responsible for compliance with its Phase I Storm Water Permit but participates with Mecklenburg County in the performance of certain duties required by the

Permit, including the implementation of its IDDE Program. The specific duties performed by the County in the City of Charlotte are described in the annual Work Plan.

The Towns of Cornelius, Davidson, Huntersville, Matthews, Mint Hill and Pineville have individually entered into a legally binding inter-local agreement with Mecklenburg County that describes the specific storm water management responsibilities of each participating MS4. This agreement, called a "Storm Water Management Program Inter-Local Agreement," describes the specific duties and responsibilities of Mecklenburg County and the Towns for fulfillment of Phase II Storm Water Permit requirements. The agreements specify that the Towns are responsible for protecting the quality of storm water runoff and surface waters within their jurisdictions to the extent required by applicable laws and regulations. However, on behalf of the Towns, the County will fulfill the NPDES Phase II Storm Water Permit requirements for the Towns and the County provided the Towns adopt and enforce the regulations necessary to support specific permit requirements, including but not limited to pollution control ordinances.

In addition to coordinating with local jurisdictions, CMSWS also works cooperatively with the State in the implementation of the IDDE Program. In August 1986, Mecklenburg County entered into a Memorandum of Agreement (MOA) with the N.C. Department of Environment and Natural Resources (NCDENR), now known as N.C. Department of Environmental Quality (NCDEQ), to protect and restore water quality conditions throughout Mecklenburg County. As of November 2021, the MOA is not active and is currently awaiting review and signatures by NCDEQ Central Office staff.

1.7 Allowable Discharges of Non-Storm water

All jurisdictions within Mecklenburg County have provisions for allowable discharges of non-storm water within their ordinances. Storm water is the only discharge permitted in the stormwater system or the waters of the State with exception of the following allowable incidental non-stormwater discharges, provided that said discharges do not negatively impact surface water quality or violate surface water quality standards. Allowable incidental non-stormwater discharges include:

(1) Water line flushing, provided the discharge does not cause an exceedance of surface water quality standards;
(2) Landscape irrigation;
(3) Diverted stream flows;
(4) Uncontaminated groundwater infiltration (as defined at 40 CFR §35.2005(20));

(5) Uncontaminated, pumped groundwater;
(6) Rising groundwaters;
(7) Discharges from Uncontaminated Potable Water sources;
(8) Collected infiltrated Storm water from foundation drains or footing drains;
(9) Air conditioning condensate from residential or commercial units;
(10) Irrigation water (does not include reclaimed water as described in 15A NCAC 2H .0200);
(11) Uncontaminated springs;
(12) Uncontaminated, collected groundwater and infiltrated Storm water from basement or crawl space pumps;
(13) Lawn watering;
(14) Swimming pool and hot tub/spa Discharges, provided that the Discharge does not contain chlorine, bromine, salt, or any other treatment chemicals. These Discharges do not include swimming pool or hot tub/spa filter backwash Discharge or saltwater pool Discharge, which are expressly prohibited;
(15) Street Washwater only when Unmodified Potable Water is used;
(16) Flows from emergency fire and rescue operations other than those resulting from negligence on the part of the Person who owned or controlled the Pollutant. This allowance does not include discharge flows from fire and rescue training operations.
(17) Single-family residential and Charity Vehicle Washing (*see note below);
(18) Flows from riparian habitats and wetlands;
(19) NPDES permitted discharges authorized by NCDEQ, EPA, or delegated local authority, provided said discharges are in compliance with the requirements, conditions and discharge limitations of the permit;
(20) Dye testing, using suitable dyes, for verifying cross-connections, tracing plumbing lines, determining flow direction or rate and for similar purposes, provided that verbal notification by non-governmental entities is provided to the Director prior to testing;
(21) Water used for removal of Storm water System blockages only when Unmodified Potable Water is used; and
(22) Splash pad (spray ground) water from a Potable Water source only; refer to Sec. 18-81(14) if the water is treated with chemicals used similarly for a swimming pool or hot tub/spa.

1.8 Updates for the IDDE Manual

CMSWS will review and update the IDDE Manual once every five (5) years. The date of the most recent review will be recorded on the front cover. The IDDE Manual includes numerous Standard Operating Procedures (SOPs) that provide additional details regarding the IDDE process. These SOPs are reviewed and updated annually.

Section 2: Monitoring to Detect Illicit Discharges

CMSWS collects and evaluates qualitative and analytical monitoring data to identify significant contributors of pollution in order to focus IDDE activities in priority areas. The following sections provide a general overview of monitoring activities, such as data collection and analysis.

All water quality monitoring activities described in this section are performed in accordance with a Quality Assurance and Project Plan (QAPP). The QAPP and additional detailed procedures can be found in **Appendix E**.

2.1 Fixed Interval Monitoring

Fixed Interval Monitoring (FIM) activities include data collection (sampling) on the second Tuesday/Thursday of every month at 32 designated stream sites throughout Mecklenburg County. Water quality parameter readings are collected using a YSI Multiprobe unit and surface water grab samples are collected and delivered to a certified laboratory for analysis for each sampling location (**Table 2-1**). Monitoring activities occur regardless of weather conditions although events may be postponed if unsafe conditions exist in the streams.

The designated long-term FIM sites are located at publicly accessible, fixed locations, generally at bridge crossings and USGS stream flow gauging stations across Mecklenburg County to monitor a specific watershed. The following criteria were considered during the site selection process:

- Sites must drain >1 square mile.
    - Sites draining <1 square mile have been excluded due to concerns they will not support diverse macroinvertebrate and fish populations.
- Fairly uniform coverage of all watersheds.
    - Sites are not focused up and downstream of treatment plants, nor are they placed at restoration or BMP sites.
- Sites with established USGS Stream Gages are given greater importance.
- Sites corresponding to NC-DEQ compliance points are given greater importance.
- Single geographic features, such as the airport, are not given greater importance.

Table 2-1 FIM Parameters (*Italics parameters are instantaneous measurements collected with a handheld device*)

Water Quality Parameters	Analytes	
Dissolved oxygen	Dissolved Metals*	$N\text{-}NH_3$
pH	E. Coli	TP
Specific Conductivity	Fecal Coliform	Hardness
Temperature	$NO_2\text{-}NO_3$	TSS
Turbidity	TKN	SSC
	Total Metals*	SSC

Notes:
* Parameters that are site specific and subject to change based on current year's workplan.

2.2 Lake Monitoring

Lake Monitoring activities includes collecting water quality parameters, sample collection, and depth integrated samples across Lake Norman, Mountain Island Lake, Lake Wylie, Lake Cornelius, and Lake Davidson (Mecklenburg County Lakes).

Majority of lake monitoring stations are established at publicly accessible, fixed locations that can be accessed by boat. Where launching a boat is inaccessible, samples are collected using self-propelled kayaks (Lake Cornelius and Lake Davidson). The following criteria are considered during the site selection process:

- Sites indicative of overall water quality.
- Sites located along the primary flow path through the reservoirs. Additionally, sites that are in major coves along the Mecklenburg County shoreline.

Grab and depth integrated samples are collected at 28 lake monitoring sites across the Mecklenburg County Lakes, during the months of January, March, May, July, September, and November. Water quality parameters are also measured at the time of sample collection using a YSI EXO_2 multi-parameter monitoring unit. All samples are submitted to a certified laboratory for analysis of analytes listed in **Table 2-2**.

During the summer recreational season (May – September), surface grab samples are collected at fourteen (14) sites across the Mecklenburg County Lakes. Samples are obtained for fecal

coliform and E. coli bacteria to help ensure the lakes are safe for public recreation and to identify possible sources of contamination.

Table 2-2 Lake Monitoring Analytes and Parameters

Water Quality Parameters	Analytes
Dissolved oxygen[1]	Chlorophyll a
pH[1]	E. coli
Specific Conductivity[1]	Fecal Coliform
Turbidity	NO_2-NO_3
	TKN
	Total Metals (Jan/July only) *
	TP

Notes:

[1]Italicized text indicates water quality parameters that are collected with a handheld YSI device.

* Parameters that are site specific and subject to change based on current year's workplan.

2.3 Continuous Monitoring and Alert Notification Network (CMANN)

The Continuous Monitoring and Alert Notification Network (CMANN) is a network of automated monitoring devices deployed across the County at thirty-four (34) fixed surface water monitoring locations. Surface water quality parameters are collected once per hour, 24 hours a day. CMANN assists with identifying pollution problems that require a quick response and provides data for evaluating long and short-term water quality trends. Twenty-four (24) of the thirty-four (34) stations are located so that they are monitoring waters that drain the City of Charlotte's MS4. The remaining ten (10) stations are located along the lakes or in the Towns. There are two (2) mobile stations that are moved throughout the City of Charlotte to monitor known water quality "Hot Spots" for pollution problems.

CMANN data is collected on a fixed time interval (usually every hour, with several higher priority sites collecting data in 15-minute intervals) using automated equipment. CMANN uses EXO_2 multi-parameter sondes to measure turbidity, pH, temperature, conductivity, and dissolved oxygen. All data is collected by a datalogger and transmitted via a wireless modem to CMSWS servers for storage and display on the CMANN website (https://cmann.mecknc.gov).

2.4 Analysis of Monitoring Data

2.4.1 Watch and Action Levels

All FIM, Lake Monitoring, and CMANN data are continually evaluated by CMSWS staff to assist in the detection of potential pollution sources. The NC State Water Quality Standards and Local Watch and Action Levels identified for each parameter and analyte are listed below in **Table 2-3**.

Table 2-3: State Water Quality Standards and Local Watch/Action Levels

Parameter/Analyte	State Standard	Local Watch Level	Local Action Level
Streams			
Fecal coliform	200 col./100 ml[(1)]	400 col./100 ml[(2)]	3000 col./100 ml[(2)]
pH	<6.0 and >9.0 SU	< 6.5 or > 8.5 SU	< 6.0 or > 9.0[(2)] SU
Temperature	Narrative Standard	28° C	32° C[(2)]
Total phosphorus	No Standard	0.05 ppm	0.10 ppm
Turbidity	50 NTU	25 NTU	50 NTU[(2)]
Dissolved oxygen	5.0 ppm	5.0 ppm	4.0 ppm[(2)]
Conductivity	No Standard	250 uS/cm	550 uS/cm [(3)]
Lakes			
Fecal coliform	200 col./100 ml[(1)]	100 col./100 ml	200 col./100 ml[(2)]
pH	<6.0 and >9.0 SU	<6.5 or >8.5 SU	<6.0 or >9.0[(2)] SU
Temperature	Narrative Standard	28° C	32° C
Chlorophyll a	40 ppb	12 ppb	40 ppb[(2)]
Secchi Disk Depth	No Standard	2 meters	1 meter
Total phosphorus	No Standard	0.02 ppm	0.04 ppm
Turbidity	25 NTU	15 NTU	25 NTU[(2)]
Dissolved oxygen	5.0 ppm	5.0 ppm	4.0 ppm[(2)]
Conductivity	No Standard	125 uS/cm	250 uS/cm [(3)]
Nitrate/Nitrite	No Standard	0.4 ppm	0.65 ppm

(1) N.C. Water Quality Standards states the following: "Fecal coliforms shall not exceed a geometric mean of 200/100ml. (MF count) based upon at least five consecutive samples examined during any 30 day period, nor exceed 400/100ml. in more than 20% of the samples examined during such period; violations of the fecal coliform standard are expected during rain events and, in some cases, this violation is expected to be caused by uncontrollable nonpoint sources; all coliform concentrations are to be analyzed using the membrane filter technique unless high turbidity or other adverse conditions necessitate the tube dilution method; in case of controversy over results, the MPN 5-tube dilution technique shall be used as the reference method."

(2) Violation of N.C. Water Quality Standards.

(3) These are "Secondary" Action and Watch Levels, meaning that an exceedance of these levels detected through routine monitoring activities will not result in an automatic notification to the Supervisor as does an exceedance of a "Primary" Action or Watch Level. These Secondary levels are used in field monitoring (using the YSI) in conjunction with other indicators to identify pollution sources as discussed in Sections 2 and 3 of this document.

All data collected from FIM and Lake monitoring are delivered to a Quality Assurance and Quality Control (QA/QC) Officer with CMSWS, who is responsible for the compilation, review, verification, validation, and warehousing of all water quality monitoring data products. The Data Analyst position with CMSWS is the designated QA/QC Officer for CMSWS. On at least a monthly basis, the QA/QC Officer compiles, assures quality, and compares samples collected during baseflow conditions for exceedances of local Watch/Action Levels and State water quality standards (**Table 2-3**). Within one business day from receipt of data, the QA/QC Officer reports all exceedances to Supervisors for the initiation of follow up actions.

CMANN units have thresholds input into their systems for select parameters and an email "Alert" is issued to an assigned staff person when CMANN detects an exceedance of one or more of these thresholds. This Alert directs the field staff to review and evaluate the data to determine if there is an anomaly or if additional investigation is needed to determine potential pollution problems. CMANN data is also proactively analyzed for trends that may indicate potential water quality impacts even though an alert has not been issued. Field staff review data routinely to identify long-term trends that could be indicative of a pollution problem. If a possible pollution problem is detected, field staff initiate steps to begin verifying and tracking the potential problem. Bi-weekly, the assigned Environmental Specialist III reviews and verifies the CMANN data for quality assurance and control.

2.4.2 Stream Use and Lake Use Support Indices

All FIM, CMANN and Lake Monitoring data are also evaluated quarterly through the calculation and analysis of the locally developed water quality indices called the Stream Use Support Index (SUSI) and the Lake Use Support Index (LUSI).

These water quality indices transform large quantities of water quality data into non-technical or quasi-technical terms that can be easily graphed and mapped for water quality managers, policy makers and the public. A water quality index also allows comparison of water quality in a body of water over space and time, which enables CMSWS staff to establish trends and evaluate the effectiveness of watershed management efforts.

Stream Use Support Index (SUSI)

The SUSI index is constructed around categories of parameters determined to have the greatest impact on the quality and usability of surface waters in Charlotte-Mecklenburg. Parameters are equally weighted by five broad categories called sub-indices as follows:

1. Bacteria (fecal coliform bacteria),
2. Metals (chromium, copper, lead and zinc),
3. Biological (Ephemeroptera, Plecoptera, Trichoptera Index (EPT), North Carolina Biotic Index (NCBI) and Mecklenburg Habitat Assessment Protocol (MHAP)),
4. Physical (temperature, dissolved oxygen, pH and turbidity), and
5. Nutrients (total phosphorus).

SUSI incorporates three time horizons as follows:

1. Short Term – Includes the most recent month of data collected for the physical sub-index. Approximately 30% of data used to calculate SUSI originates from the current month.
2. Middle Term – Includes data collected over the past 12 months for the bacteria, metals and nutrients sub-indices. Approximately 45% of data used to calculate SUSI is collected over the previous 10 – 12 months. An ancillary benefit of using longer term data is to attenuate short-term spikes or lows. Furthermore, one of the goals of the index is to provide an indication of water quality trends.
3. Long Term – Includes data collected over the past one to two years for the biological sub-index. Approximately 25% of the data used to calculate SUSI is collected over a one to two-year period.

Table 2-4 shows the process for aggregating each of the sub-indices into a larger overall SUSI Score.

Table 2-4: Overall SUSI Score for MC49a, September 2019

Sub-Index	Weight	Sub-Index Score	Score (base 20)
Bacteria	20%	33.3	6.7
Metals	20%	100	20
Macroinvertebrate/Habitat	20%	70.1	14
Physical Parameters	20%	100	20
Nutrients	20%	0	0
Final SUSI Score for MC49a, September 2019			*60.7*

The SUSI Score is represented by the Rating Scale shown in **Table 2-5 SUSI Rating Scale** which is used to assign ratings to the score.

Table 2-5: SUSI Rating Scale

Overall SUSI Score	Assigned Rating	Map Color
100 – 90	Supporting	Green
70 – 89	Partially Supporting	Yellow
50 – 69	Impaired	Orange
0 – 49	Degraded	Red

The overall SUSI Score for each site is assigned to the appropriate watershed. The watershed is then colored using the Rating Scale shown in **Table 2-5** and maps are produced as illustrated in **Figure 2-1 SUSI Map**. Maps show each of the five SUSI sub-index ratings by watershed. These sub-index maps identify specific watershed areas that are supporting, partially supporting, impaired or degraded. The most significant indicator of pollution problems in Charlotte-Mecklenburg is fecal coliform bacteria, which constitutes one of the five sub-indices in SUSI. The fecal sub-index is based upon fecal coliform samples collected during monthly fixed interval sampling at select sites. The index compares the current month's sample result along with the sample results from the previous 11 months to determine the overall score on a 100-point scale. Each month's fecal result is compared against the 400 cfu/100 ml portion of the State water quality standard and if the sample result is less than or equal to 400, the month is assigned a score of 8.33 (100 ÷ 12); if the result is greater than 400, the month is assigned a score of 0.

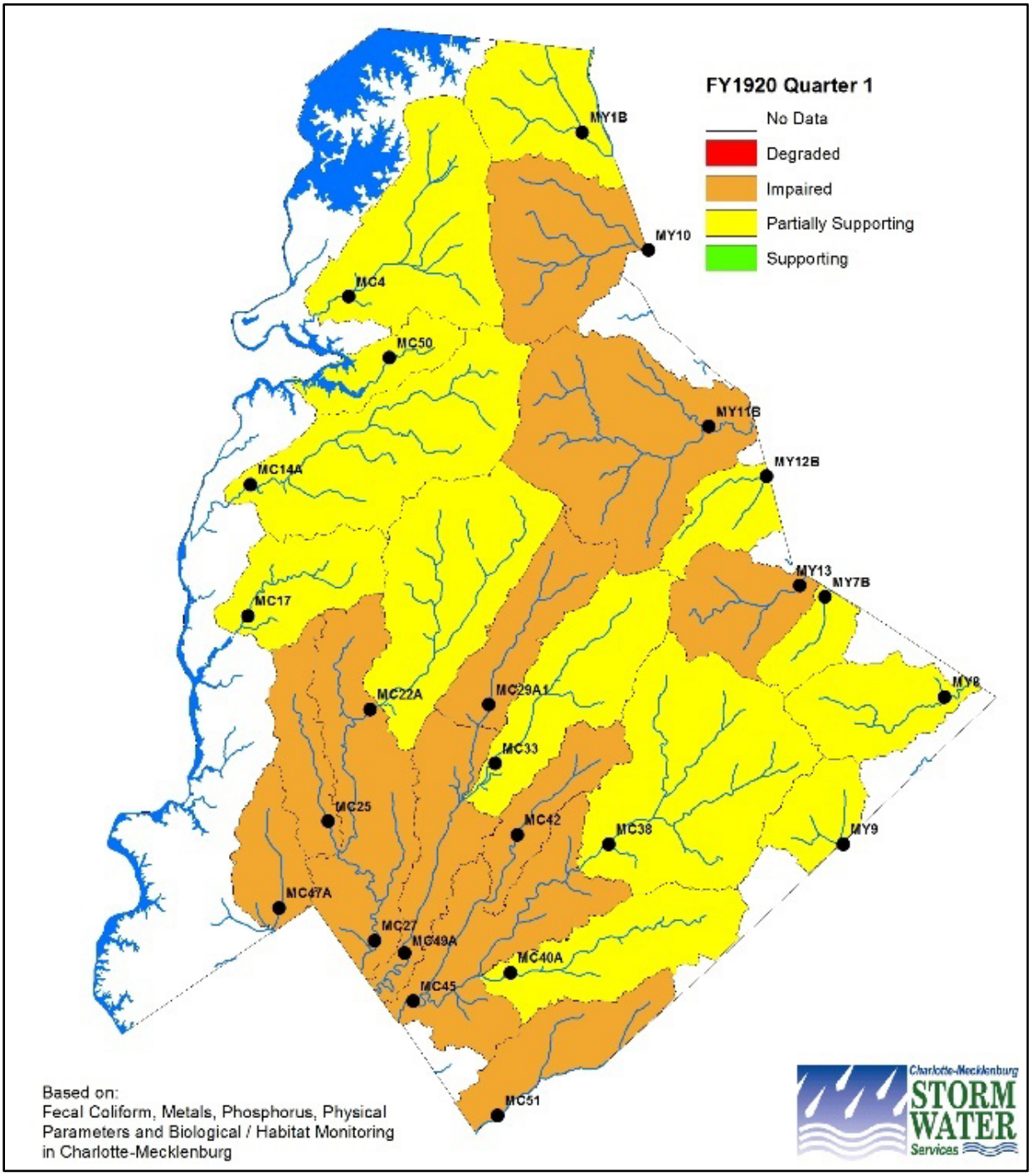


Figure 2-1: SUSI Map for FY19-20 Q1

These scores are totaled for the past 12 months to calculate the overall SUSI score. **Table 2-6** is presented as an example calculation for a SUSI sampling site.

Table 2-6: Fecal Coliform Sub-Index Score

Month	Month Number	Fecal Result	Monthly Score
October 2018	1	3650	0
November 2018	2	2800	0
December 2018	3	640	0
January 2019	4	230	8.33
February 2019	5	3100	0
March 2019	6	200	8.33
April 2019	7	22000	0
May 2019	8	640	0
June 2019	9	1530	0
July 2019	10	500	0
August 2019	11	350	8.33
September 2019	12	220	8.33
Overall SUSI Score (out of 100 points)			**33.33**

The other primary contributors of stream impairment in Charlotte-Mecklenburg in order of priority are turbidity (physical sub-index), biological, metals and nutrients. This priority is based on an analysis of twenty years' worth of data collection in Charlotte-Mecklenburg as well as an evaluation of the State's 303(d) list of impaired water bodies. Similarly, to fecal coliform, each of these priority pollutants represents a sub-index in SUSI and was calculated based on 12 months of data. Sub-index results are made available to Supervisors quarterly using sub-index maps. These maps and underlying index data are useful for identifying trends in degraded water quality conditions, which trigger follow-up actions to identify and eliminate pollution problems.

Lake Use Support Index *(*LUSI*)*

A separate water quality index is used for the lakes called the Lake Use Support Index (LUSI). LUSI is very similar to SUSI in how it is structured, it has five (5) sub-indices most of which are based on a trailing average of data from the last 12 months. The five (5) sub-indices for LUSI are as follows:

- Human Health - fecal coliform bacteria
- Sediment - turbidity
- Eutrophication (algae growth) - North Carolina Trophic State Index (NCTSI)
- Physical/Chemical - field data (temperature, dissolved oxygen and pH)
- Metals - 12 mineral and toxic metals

Maps are produced every other month from the LUSI index using a colored coded key ranging from “Degraded” to “Supporting” as illustrated in **Figure 2-2**. Each lake monitoring site is colored based on its water quality index rating. The Lake Water Quality Index and fecal coliform bacteria results from lake monitoring are presented to the local marine commissions on a routine basis.

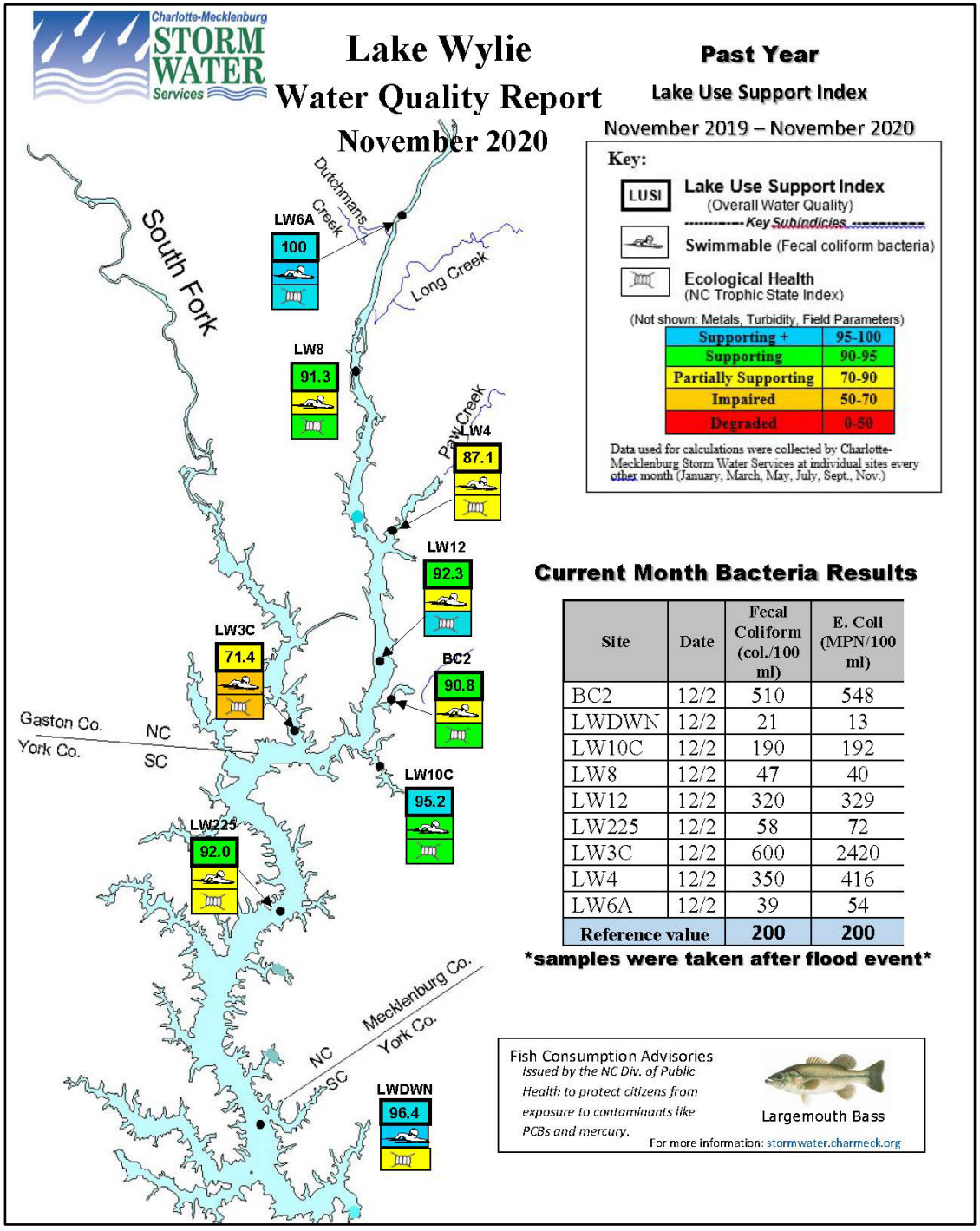


Figure 2-2: LUSI Map for Lake Wylie from November 2020.

Section 3: Identification of Illicit Discharges

This section describes programs and activities employed by CMSWS to proactively identify illicit discharges beyond the monitoring activities described in Section 2.

3.1 Field Observations

Illicit discharges are identified through field observations. **Figure 3-1** includes images of typical field observations that indicate illicit discharges except for the picture of iron bacteria, which is oftentimes reported as a water quality problem but is naturally occurring. Iron bacteria is a result of iron rich groundwater intruding into a surface water body. Iron bacteria is very similar in appearance to sewage fungus (gray) but orange in color. Sewage fungus often indicates a long-term sewage discharge. Unusual odors are another field observation that can indicate an illicit discharge. Steam from a storm drain and/or surface waters caused by a temperature differential as well as the accumulation of foam on surface waters can also indicate the presence of an illicit discharge; however, some foam on the water can be naturally occurring. Oil staining or other discoloration of the soil is another indication of an illicit discharge as well as other visible alterations of the natural environment due to the influence of a foreign chemical or substance.

If any of the above field observations are made there is a very strong likelihood that an illicit discharge is involved and actions must be immediately taken to identify and eliminate the source. These actions take priority over all other work being performed. If necessary, staff should contact their Supervisor and obtain backup but under no circumstances are staff to leave an active illicit discharge. If the discharge is intermittent in nature, it may never be observed. Illicit connections can be more difficult to detect. They are usually observed as pipes, ditches or over land flow. When inactive, the connections often cannot be distinguished from the storm drain system. It is important to look for residue, discolored soil, odors or other indicators of a previous discharge. If in doubt, all suspected illicit connections must be traced to their source for confirmation of illegal activity using the techniques specified in Section 4.

The challenge with detecting an illicit discharge is to be in the right place at the right time to make the necessary field observations described above. The more observations made, the more likely problems will be detected, making citizen education and involvement important. The following subsections describe the techniques used by CMSWS to identify illicit discharges.

Figure 3-1: Field observations indicating an illicit discharge.

3.2 Stream Walk Program

Stream walks are conducted throughout the City, Mecklenburg County and the Towns. The Stream Walk Program aims to accomplish the following activities:

- Collect new storm water outfall inventory and confirm previously documented inventory;
- Screen storm water outfalls for dry weather flows (DWF) and potential illicit discharges and connections; and
- Identify areas of severe stream bank erosion, blockages, potential reference reaches.

Streams in each six-square mile basin with stream drainages of 50 acres or more, and/or areas with industrial land use and drainages of 2 acres or more, are walked at least once every five-years. Storm water outfalls twelve inches or larger are surveyed for DWFs during these walks (see **Figure 3-2**)

The Stream Walk Basin Schedule shows the schedule for walking basins and surveying storm water outfalls for DWFs during fiscal years 2018 through 2022 (**Figure 3-3).**

Figure 3-2: Dry weather flow sampling by CMSWS staff during stream walk.

Stream walks are conducted during ambient conditions, 72 consecutive hours of no antecedent measurable rainfall (<0.10”), so that dry weather flows are more easily detected. If flow is detected in the storm sewer system under dry conditions, then there may be an illicit discharge to the system. However, the DWF may be originating from groundwater intrusion, a piped stream, or an allowed discharge as listed in **Section 1.6**. Samples are collected from DWFs and analyzed for fecal coliform, total phosphorus and physical water measurements (DO, pH, specific conductivity) with a handheld YSI sonde. Qualitative observations of DWFs for signs of pollution (sheen, discoloration, foam, odor, etc.) are also done to help determine if an illicit discharge is occurring.

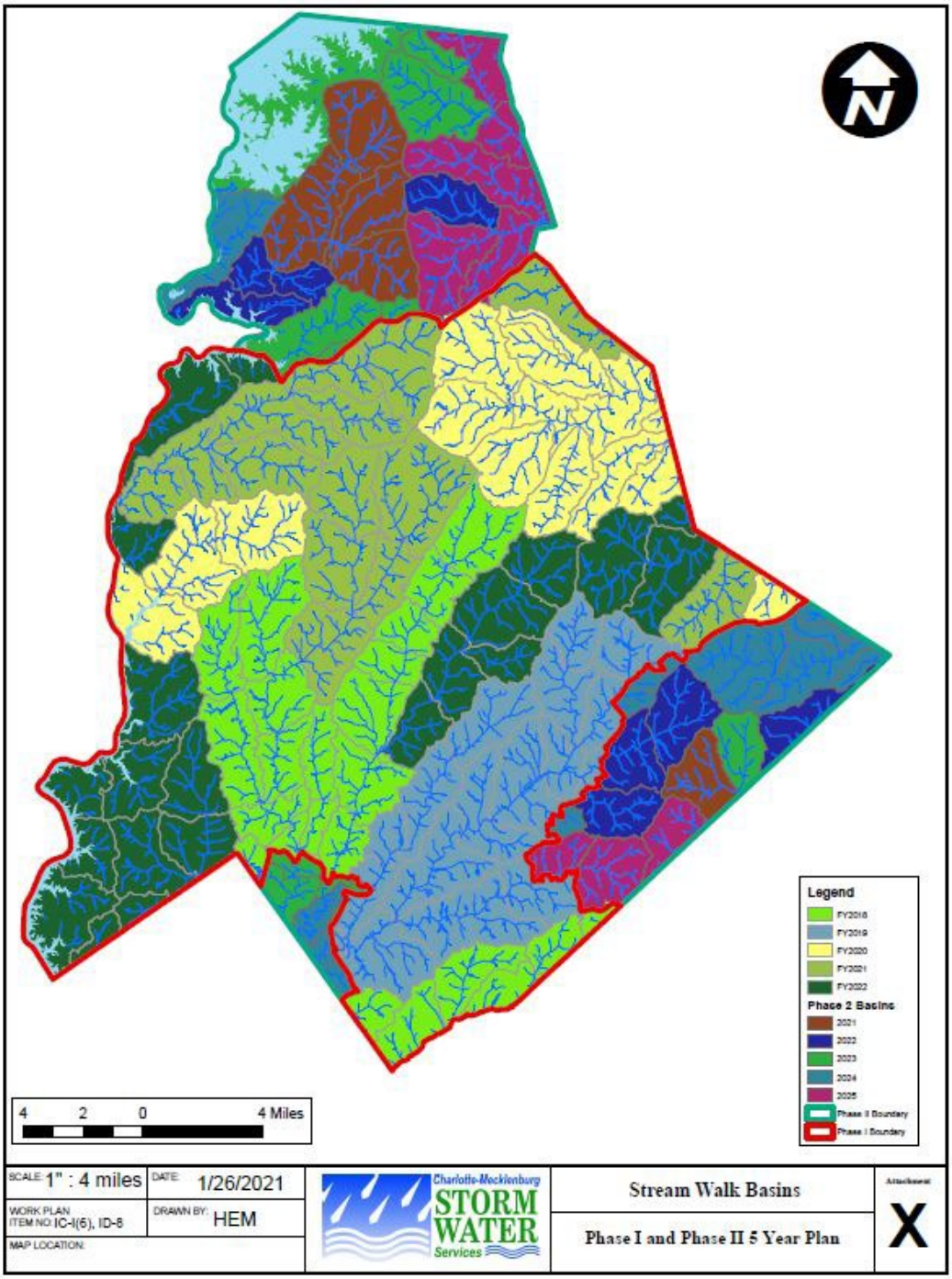


Figure 3-3: Stream Walk Basin Schedule

The purpose of inventorying and sampling dry weather flows is to create a Geographic Information System (GIS) inventory of the DWF locations for potential follow-up action and to determine if the flow is causing a pollution problem. This data is used to eliminate illegal discharges.

Some basins may be walked more than once every five years. In 2013 – 2018, specific basins (Briar, Taggart, Little Sugar, Upper Little Sugar and McMullen) were targeted as priority basins and walked once every two years. These basins were prioritized based on monitoring data results and the significant number of illicit discharges and service requests that had occurred in these areas. In 2018, staff changed this strategy as they developed a new basin schedule. For 2018 – 2022, the Program established a "slush fund" of approximately 20 extra miles each year. Annually, staff conduct an analysis of data across the City and County related to illicit discharges, monitoring data and service requests and use this data to decide if the extra miles will be used and which basin(s) will be targeted.

Data from the Stream Walk Program is also used to generate a map of the storm sewer system. A more detailed description can be found in the next section, 3.2 Storm Sewer Inventory Program.

More detailed procedures for the Stream Walk Program can be found in the Quality Assurance/ Quality Control Plan and Procedures for Stream Walks and Outfall Inventory Collection/ Inspection (**Appendix F**) and Stream Walks & Storm Water Outfall Inventory Collection/ Inspection Procedures (**Appendix G**).

3.3 Storm Sewer Inventory Program

The Storm Sewer Inventory Program includes activities performed in the City, Mecklenburg County and the Towns that help build and maintain a comprehensive GIS map of each municipality's storm sewer system including inlets, outfalls, pipes, culverts and other storm water structures as well as drainage areas and receiving streams. During all Storm Sewer Inventory activities, if a dry weather flow is identified, it is reported, and follow-up investigations are conducted to determine if it is an illicit discharge.

The City of Charlotte, Mecklenburg County and the Towns all collect information about their storm sewer systems during the previously described Stream Walk Program, but the City of Charlotte and Mecklenburg County also implement additional programs to map other assets of the storm sewer system detailed in separate operating procedures. These programs are described separately below.

3.3.1 City of Charlotte Storm Sewer Inventory Program

Summary

The Charlotte Storm Water Services Inventory Program manages a GIS inventory (or geodatabase) of more than 500,000 active storm water assets within the city limits. The database includes:

- Structures – points representing inlets, junctions, outlets
- Pipes – lines represent 12"+
- Open drainage – lines represent roadside ditches, wet/dry channels, streams
- Connectivity – lines represent undefined or inaccessible pipes and open drainage, to connect all systems to outfall in major streams

History

The initial inventory data was collected between 1992-1998. The effort resulted in a complete inventory of systems 36" and larger, and 20% completion of systems 12" to 36". The current inventory program was created in 2004 with two staff persons. The program objectives were to collect newly constructed assets, collect systems missing in the initial data collection effort, and verify the existing inventory. Data collection was performed by program staff and construction inspectors. More staff were slowly added over the years for data collection and maintenance. The data collection effort remained in-house until 2019 when a contractor was hired. The effort was completed October 2021.

Current Status

The Inventory Team is comprised of seven staff persons, including one GIS supervisor, one GIS Analyst, and five GIS Technicians. As of July 1, 2021, the inventory database included nearly 503,000 active assets broken down as follows:

- Structures = 250,570
  - *Inlets = 167,882*
  - *Junctions = 47,608*
  - *Outlets = 35,080*
- Pipes = 207,353 (~3,418 miles)
- Open Drainage = 44,943 (~1,948 miles)

Again, the major data collection effort was completed October 2021, and the contractor data is still being delivered. Going forward City staff will now concentrate on the following tasks:

- Review all data by work zone for quality assurance, prioritized by the initial data collection date
- Input data on new construction as projects are closed in the work order management system
- Input data from approved Land Development plans, in order of construction
- Fulfill data maintenance and asset ID requests

3.3.2 Mecklenburg County Storm Sewer Inventory Program

The County jurisdiction was initially mapped in 2006 using a large collection effort by Water Quality staff. Since that initial collection effort, Water Quality staff collects new inventory while conducting stream walks and the Permitting and Compliance Program of Storm Water Services has been responsible for updating the map as new infrastructure is built in the permitted jurisdictions.

Beginning in December 2020, the Water Quality Program identified a need to update the inventory map in a more efficient manner. In doing so, the Water Quality Program enlisted the help of the Mecklenburg County GIS department. The GIS department is utilizing its staff to identify potential areas of missing inventory by examining the existing inventory layers overlaid with aerial photography (which is updated quarterly by GIS). Staff then manually adds the missing inventory (inlets and outfalls) that is identified on the aerial photography to the feature class. The above process was completed in January 2021.

To update the inventory layer as new development occurs, a process has been incorporated into the daily work responsibilities for GIS staff who update impervious surface coverage for recalculating the storm water fee billing rate. These staff are now looking for new storm sewer inventory (inlets and outfalls) while updating this impervious surface coverage. On a quarterly basis, GIS staff provides the Water Quality Program a list of the newly collected outfalls. Water Quality staff subsequently complete a field validation to add attribute information using the ArcGIS Collector application. Staff will collect the outfall type (FES, endwall, exposed pipe, etc.), outfall shape, outfall material, and endwall material, and

record the diameter of the outfall. Staff will also complete an outfall inspection using the Cityworks Mobile App to record the condition of the outfall, DWFs and any other potential illicit discharges.

3.4 Service Requests

Most illicit discharges and connections are identified through Citizen's Requests for Service or Service Requests. Service Requests are reports from other government agencies, businesses and the general public about potential storm water pollution that needs investigation. Requests are reported/received in various ways. The most common method is through the City and County's 311 Customer Contact Center where citizens call 311 to report a variety of issues including illicit discharges and storm water pollution. Citizens can also report issues through an online reporting form, through the CLT+ phone app, or by calling or emailing Storm Water staff directly if they have direct contact information. All citizen reports are entered into Cityworks and assigned to staff for investigation.

CMSWS responds to between 300-700 service requests a year. CMSWS' response to these requests is extremely important not only from a customer service standpoint, but also from a health, safety and environmental standpoint. All staff members receive annual training regarding responses to service requests and providing proper customer service. For detailed procedures related to responding to Service Requests, refer to the Procedures for Responding to Citizens' Requests for Service (**Appendix H**).

3.5 Emergency Response

CMSWS receives an average of 60 reports annually that require staff to respond to after-hour spills and emergencies that threaten surface water quality. The purpose of the Emergency Response Program is to ensure that detailed response procedures are in place and that staff are properly trained and prepared to effectively and efficiently respond to after-hour emergencies so that pollution sources can be quickly eliminated and negative water quality impacts minimized (see **Figure 3-4**).

Figure 3-4: Example of Emergency Response call.

For more detailed procedures, refer to the Emergency Response Guidelines for CMSWS' Water Quality Program (**Appendix I**).

3.6 Illicit Discharge Elimination Program (IDEP)

The purpose of the Illicit Discharge Elimination Program (IDEP) is to support and enhance the Illicit Discharge Detection and Elimination (IDDE) Program and proactively use a variety of methods to locate and prevent illicit discharges. IDEP activities are conducted throughout the City, County, and the Towns. For details regarding the current program focus and actions as well as implementation procedures, see the IDEP SOP (**Appendix J**)..

The IDEP Program has a long history of employing various methods to proactively search for and prevent pollution sources. As such, some elements of the program have been discontinued due to their overall ineffectiveness at identifying illicit discharges while some continue to be used because of their successes. Examples of discontinued IDEP program elements are as follows:

- Use of CHEMetrics K-1510 Ammonia Sampling during stream walks.
- Aerial Infrared Surveys
- Optical brighteners

The current IDEP Program includes the following activities which are described in more detail in the IDEP SOP:

- Watershed Basin Inspections
- Problem Area Investigations
- Multi-Family Residential Inspections
- Past Violator Re-inspection Program
- Business Sector Investigations

For details regarding the current program focus and actions as well as implementation procedures, see the IDEP SOP (**Appendix J**) and the Multi-family Residential Sanitary Sewer Overflow Prevention Program SOP (**Appendix K**).

3.7 Education and Outreach

The CMSWS ongoing public education campaign targets businesses and residents in the City of Charlotte and Mecklenburg County. For residents, the campaign seeks to increase public awareness of illicit discharges and connections, the negative impact on their quality of life, and how to report suspected storm water pollution problems. A broad range of education activities

and media outlets are utilized in this campaign including television, radio and print advertisements, social media , website, newsletters, postcards, brochures and flyers, utility bill inserts, banners, vehicle wraps, in-person presentations for schools and community organizations, and attendance at special events. Efforts have been highly successful as indicated by an increase over time in the number of reports received from citizens regarding suspected illicit discharges. For more detailed procedures related to the public education programs please see the Public Education SOP (**Appendix L**).

For businesses in the City of Charlotte and Mecklenburg County, the CMSWS ongoing public education campaign includes the selection of commercial business sectors each year for the distribution of educational materials regarding common illicit discharges and the Best Management Practices (BMP) that should be used to prevent these discharges. Business sectors are selected based on observations and trends encountered during service requests and inspections. Common methods of outreach include letters, postcards, social media posts, presentations, and workshops targeting the specific business sector. CMSWS has developed BMP flyers for the following business sectors to support this effort as well as for use in response to service requests.

- Landscaping
- Pressure Washers, Vehicle Detailers and other Surface Cleaning Operations
- Food Service
- Indoor Cleaning
- Commercial Property Management
- Concrete
- Horizontal Directional Drilling
- Painting
- Swimming Pools and Spas
- Rooftop Work
- Stone Cutting
- Vehicle and Equipment Repair
- Breweries
- Well Drilling

The public education program not only targets specific identified primary pollutants such as sediment and bacteria, but education is also provided on numerous pollution issues common to various land uses and specific times of year. For example, during the fall, the social media campaign highlights how to properly dispose of leaves without impacting the storm drain

system. There are also numerous education materials available to staff and the public on the CMSWS website regarding best management practices for a variety of topics such as swimming pool maintenance, lawn debris disposal, car washing, etc.

Each year, CMSWS conducts training, education and outreach targeting internal municipal employees of the City of Charlotte, Mecklenburg County, all six towns, CMS and CPCC who work in areas that have the greatest potential to impact water quality such as mechanics, shop workers, utility workers, etc. Education includes information about pollution prevention, spill response and cleanup, and common illicit discharges and how to report them. This outreach is performed via in-person presentations, online training, displays at employee events, and unique campaigns. For more detailed procedures related to Mecklenburg County and the City of Charlotte's internal education efforts, please see the Mecklenburg County Employee Training Plan (**Appendix M**) and the City of Charlotte Employee Training Plan for IDDE and Municipal Pollution Prevention (**Appendix N**).

CMSWS has also developed a short, 3-minute video titled *Water Pollution, What To Do* which illustrates how to identify pollution in the field and how to report it. The video is targeted at municipal employees who are routinely in the field and driving around as part of their jobs where they may witness an illicit discharge. This group of employees may be code inspectors, social workers, tax assessors, etc. and are not included in the groups mentioned above.

3.8 Public Involvement

The Public Involvement Program engages individuals, families, organized groups, schools, businesses and industries of Charlotte-Mecklenburg in activities that help protect and restore surface water resources, including the identification of illicit discharges and connections and how to report them. These include the following three (3) volunteer programs.

- Adopt-A-Stream
- Storm Drain Marking
- Volunteer Monitoring

Volunteers for each of the activities are trained to identify illicit discharges and connections and are encouraged to report illicit discharges immediately. Each volunteer group must also complete a data sheet where problems or potential illicit discharges are reported to CMSWS staff for review. If an illicit discharge or connection is indicated, staff are sent to the specified location within four (4) hours of receipt of notification from their supervisor. A detailed description of these programs can be found in the Public Involvement SOP (**Appendix O**).

3.9 Facility Inspections

CMSWS inspects and conducts monitoring of storm water discharge locations at both municipal and industrial facilities in the City of Charlotte and Mecklenburg County to evaluate operations, identify pollution problems and/or illicit discharges, to assist with pollution prevention and to ensure compliance with Phase I and Phase II Storm Water Permit requirements. Facilities are selected for inspection and monitoring based on their potential to cause negative water quality impacts and NPDES industrial storm water permit monitoring requirements. Facility inspections include a detailed records review, an on-site inspection, evaluation of discharge locations, and completion of comprehensive inspection reports. For more detailed procedures related to these inspections please see the Phase II Pollution Prevention and Good Housekeeping Inspection Program SOPs (**Appendix P**), Phase II Industrial and Vehicle Maintenance Inspection SOP (**Appendix Q**), City of Charlotte Municipal Facility Inspection and Monitoring SOP (**Appendix R**), and the City of Charlotte Industrial Facility Inspection and Monitoring SOP (**Appendix S**).

Section 4: Tracking Illicit Discharges and Connections to a Source

When an illicit discharge, connection, or pollution problem has been detected, actions must be taken to determine the source. This section describes the various techniques used by CMSWS to track illicit discharges to a source.

4.1 Records Review

The first step to confirm the source of an illicit discharge or connection is to conduct a Records Review. This includes identifying the search area and any obvious pollution sources that are immediately upstream of the discharge.

Staff begin the Records Review process by locating the storm sewer systems and assessing aerial photos of properties upstream of an illicit discharge or connection. This information is accessed primarily through two GIS tools: Mecklenburg County Property Ownership Land Records Information System (POLARIS) and Charlotte Explorer. POLARIS and Charlotte Explorer are designed for access and retrieval of maps, aerial photos, and GIS data layers associated with real estate property in Mecklenburg County and the City of Charlotte. Charlotte Explorer also houses the most up-to-date Storm Water Inventory for the City of Charlotte.

The second step of the Records Review process is to research water quality related data upstream of the illicit discharge or connection via the Environmental Data Management System (EDMS) (**Figure 4-1**). EDMS is an online database used by CMSWS to house and access all water quality related data and staff activities with records dating back to 2011. EDMS also stores all information about historic Service Requests and NOVs making this an exceptional resource to help identify previously documented problems at an address or facility. EDMS has a direct database connection to Cityworks software. Cityworks is an online accessible software that CMSWS utilizes to document all activities. Cityworks contains a GIS platform where staff can overlay multiple feature classes to help identify a search area and potential pollution sources. Historical water quality compliance records are also available for some facilities. Cityworks displays the most up-to-date Storm Water Inventory for the Phase 2 jurisdictions.

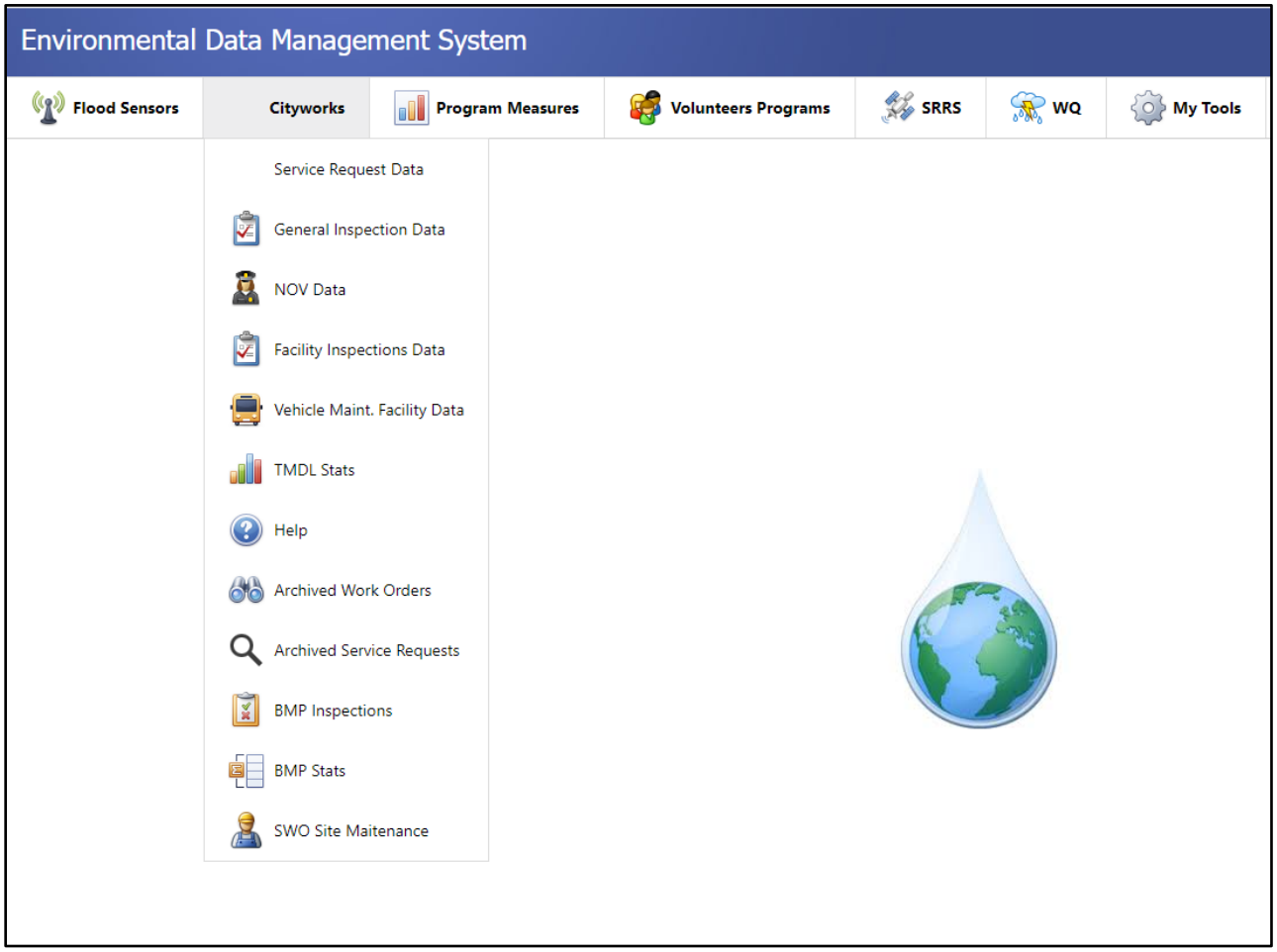


Figure 4-1: Environmental Data Management System – online database produced and maintained by CMSWS.

4.2 On-Site Inspection

Once the Records Review process is complete, staff inspect the area around and upstream of the discharge, connection or pollution problem to narrow the search area and locate the source. On-site inspection requires the use of various equipment that may include but not limited to:

- iPhone to geocode locations for data entry into Cityworks and taking photographs;
- YSI Multiparameter Sonde to collect field measurements for dissolved oxygen, temperature, pH, turbidity, and conductivity;
- Bottles for collection of laboratory samples;
- Safety equipment including waders, boots, gloves, glasses, hard hat, safety vest, etc.;

- Tape measure to measure pipe sizes and estimate flow rates; and
- Boat for collection of lake samples.

Detailed procedures for all monitoring activities, including the use of the YSI Multiparameter Sonde, are performed in strict accordance with SOPs outlined in the CMSWS Water Quality Monitoring Program QAPP (**Appendix E**).

The following general procedures are followed during on-site Inspections:

1. Identify the search area upstream of the illicit discharge or connection.
2. Travel to the location of the discharge or connection and determine if an active discharge is occurring.
3. Conduct a "windshield" survey of the search area using an automobile or walking the area. Make note of all businesses, industries and other activities that may be a potential pollution source. Check the storm drains for discoloration and the presence of dry weather flow. Make note of anything suspicious such as an accumulation of drums, stained soil, and unusual odors. If a pollution source is confirmed during the windshield survey, immediately undertake corrective measures.
4. If the windshield survey fails to confirm a pollution source, but a potential source was identified during the records review, initiate an on-site inspection at this potential source.
5. If the windshield survey and records review failed to confirm or identify a pollution source, then on-site inspection activities should begin at the most downstream location where the pollution problem(s) was identified which will usually be in a stream or lake. Staff use field observations or short-term monitoring measurements to work their way upstream until the source is confirmed as illustrated in **Figure 4-2**. By starting at the most downstream end, you avoid contaminating samples or obstructing visual observations caused by the sediment disturbance and plume from walking instream.
6. If the pollution source is confirmed, immediately undertake corrective measures.

Visual field observations are often a very effective tool for identifying pollution sources when a continuous discharge is occurring. If field observations are unsuccessful, short-term monitoring with the YSI Multiparameter Sonde are used to measure pH, temperature, dissolved oxygen, and conductivity. Staff begin at the confirmed discharge point or connection and record field measurements at regular intervals (typically every 100 feet) while moving upstream.

For tracking the location of a problem, the instantaneous data provided by the YSI Multiparameter Sonde can be more useful than the delayed data results provided by a laboratory. There are times when laboratory analysis may be needed at which time staff should consult with a Supervisor and develop a monitoring plan before collecting samples. An example sampling plan is illustrated in **Figure 4-2** following the exceedance of the fecal coliform bacteria Action Level reported from a routine FIM monitoring event.

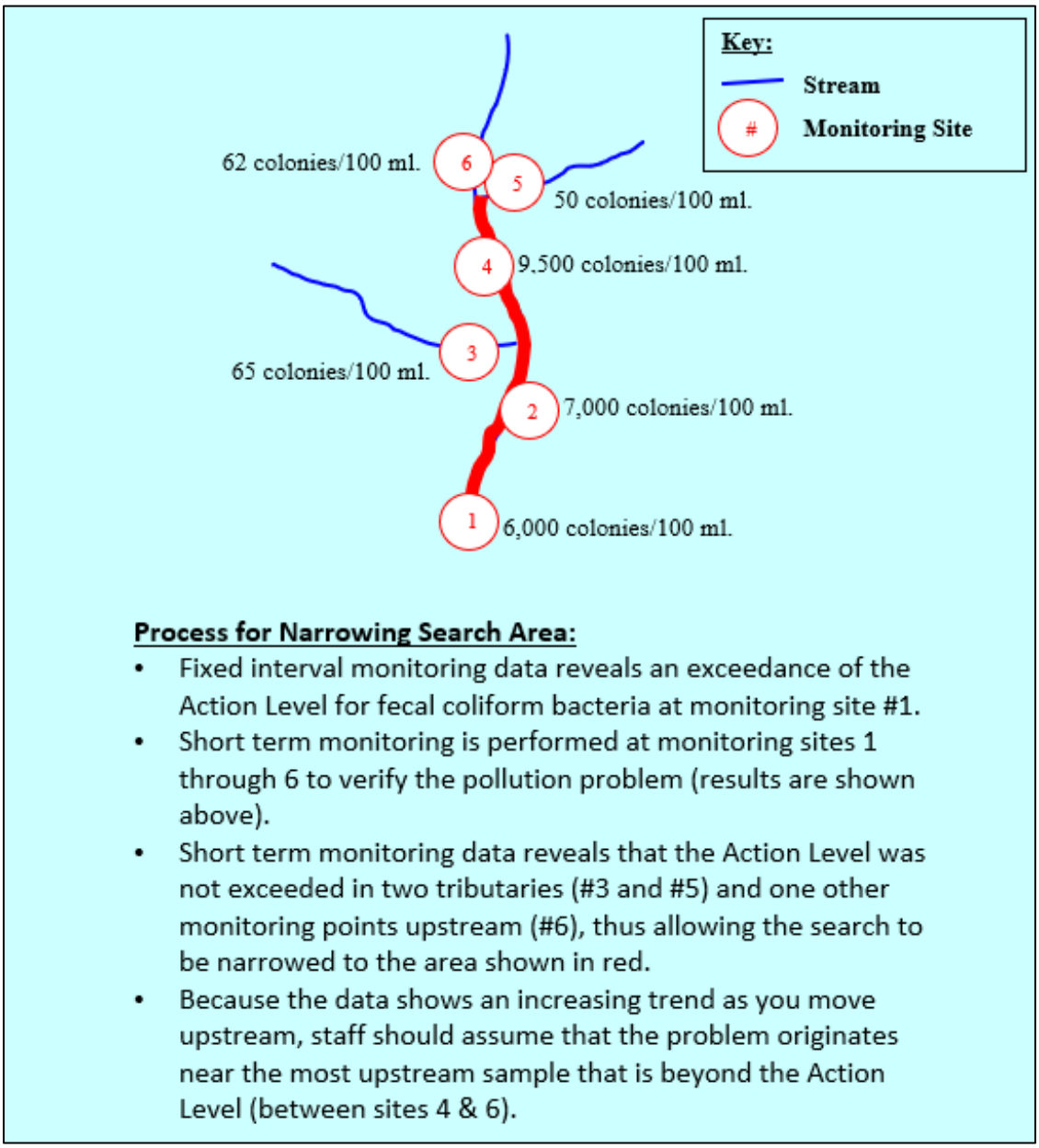


Figure 4-2: Short-term monitoring plan used to help identify an illicit discharge/connection following an elevated stream sample.

If the above techniques are unsuccessful at tracking the source of the discharge, connection or pollution problem, the techniques described in Sections 4.3 through 4.7 are utilized, typically in the order presented below. Transitory and intermittent discharges are often extremely difficult to track to their source, in which case the techniques described below can be very helpful.

4.3 Storm Drain Inspections

An inspection of the storm drain system upstream of an illicit discharge or connection can be an effective technique for tracking a pollution source when other inspection techniques as previously described are unsuccessful. In some circumstances, an inspection of the storm drain system may be required in conjunction with the previous techniques.

Never enter any pipe to conduct an inspection. This is considered “confined space” and without the proper training and protective equipment confined space entry violates numerous regulations and is extremely dangerous. If confined space entry is necessary, CMSWS will contract with an outside agency, which requires that you consult with your Supervisor.

Conduct your inspection of the storm drain system from outside the pipe being sure to carefully observe all inlets and outlets looking for any of the field observations that are indicative of an illicit discharge or connection. Be cognizant of topographic conditions and always being sure to track the discharge or connection upstream.

The following are conditions that can be observed in the pipe system which indicate a potential illicit connection:

- Any pipes smaller than 10 inches in diameter or unusually shaped pipes or pipes made of different material connected to the storm drain system.
- A pipe connected at the top of the storm drainpipe or at an unusual angle.
- A metal pipe entering a concrete storm drain system.
- Dry weather flow.

4.4 Sanitary Sewer System Inspections

An inspection of the sanitary sewer system may be necessary when tracking a surface water pollution source. Examples of how a sanitary sewer system inspection can assist pollution source tracking in the storm drain system are:

- A white discharge is observed in the creek and a white discoloration is observed in the upstream sanitary sewer system.
- A wastewater line is reportedly piped to the sanitary sewer, but an inspection reveals there is no pipe.

To inspect the sanitary sewer system, use a manhole puller to carefully raise the manhole cover. From outside the pipe, visually assess the sewer water for discoloration and/or unusual flow conditions. Never enter any pipe or other confined spaces to conduct an inspection. Entry of confined spaces is extremely dangerous without the proper training and PPE. Mecklenburg County employees are **not allowed** to enter a confined space. As mentioned above, discoloration in the stream and similar discoloration in the sanitary sewer system indicates a potential cross connection and can be confirmed using Dye Testing.

Another visual indicator of a potential problem in the sanitary system is an orange, muddy tint which can indicate an intrusion of clay soil from a sewer break.

4.5 Dye Testing

Dye testing involves placing liquid powder tracing dye into a pipe to see where it leads. It is very helpful for identifying outlets. All field staff with CMSWS are equipped with multiple 16-ounce bottles of tracing dye. The most used color is fluorescent green because of its high visibility but a multitude of colors are available including red, blue, orange, and yellow. When dyeing multiple pipes, it is important to use different colors so that the flows can be distinguished.

Dye testing is often used in conjunction with the storm drain and sanitary sewer system inspections already described. For example, if a pipe outlet is observed as a potential illicit connection but the source of that pipe is unknown, different colored dyes can be injected at the upstream inlets of the suspected sources followed by a flush of water. By observing the dye discharging from the outlet, it is possible to confirm the source. Dye testing can also be used to

Figure 4-3: A successful dye test reveals a discharge of sewage from apartments.

identify sewer leaks by injecting dye into the sewer system and observing whether it discharges to an adjacent storm drain or creek.

Although the dye is safe for use in surface waters and will not cause negative water quality impacts, be sure to use a minimal amount of dye and always inform your Supervisor of a dye test. Too much dye can cause the discoloration to linger for extended periods generating calls from citizens, which may lead to unnecessary follow-up activities.

Avoid allowing the dye to contact your skin or clothing. The dye is not harmful to your health, but it will stain your skin and clothing. It is extremely important that when you insert the dye into a drain you do not allow it to contact plumbing fixtures (sinks, toilets, washing machines, etc.) because this will result in staining that is very difficult to remove.

4.6 Smoke Testing

In most cases, it is best to use a dye test when attempting to track the source of a discharge. Smoke testing involves injecting smoke into a sanitary sewer manhole to help identify any potential illicit connections or discharges from the sanitary sewer lines to the storm drain infrastructure. The benefit of using smoke as the test media as opposed to dye is that the smoke will penetrate through small cracks in pipes that would impede the flow of the dye. Another benefit is that the smoke will rise in a pipe and exit cracks above the water flow that dye would not reach. This can be a significant benefit if you are attempting to detect a discharge that only occurs during high flow conditions from a break in the top of a sewer pipe. If a dye test is performed during low flow conditions, the discharge will not be detected; whereas, if a smoke test is performed, the rising smoke will exit the break and confirm the discharge. The smoke also does not cause a discoloration of surface waters that can lead to complaints from citizens.

Always obtain approval from your Supervisor prior to performing any smoke tests. CMSWS does not have the necessary equipment to perform a smoke test. This test is almost always done in cooperation with Charlotte Water who does have the proper equipment and are responsible for the sanitary sewer infrastructure.

Figure 4-4: Smoke exiting a manhole while conducting a smoke test in the area.

4.7 Pipe Video Inspection

A pipe video inspection can be helpful for inspecting the confined space of a storm drain or sanitary sewer system when all other investigative methods have been exhausted.

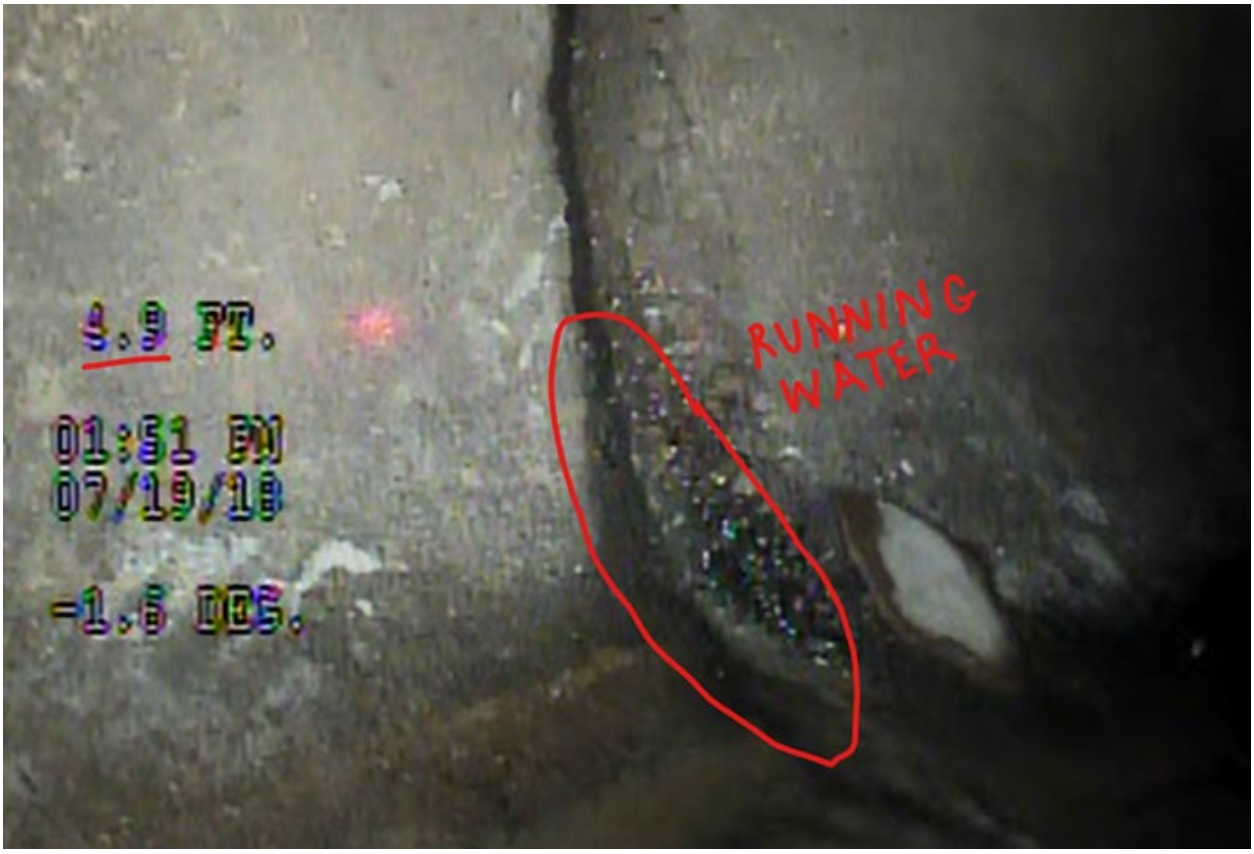


Figure 4-5: Storm system pipe video identifies an illicit discharge entering the MS4.

In most cases, a dye or smoke test is enough to confirm an illicit connection or discharge; however, in some circumstances, the flow in the sanitary sewer pipe is too great causing the dye to dilute and lose its visibility. In other circumstances, a significant accumulation of soil between the sewer leak and the creek or storm drain system prevents the dye or smoke from being detected. In both these examples, a pipe video of the storm or sanitary system may be needed.

City SWS has a CCTV team that can be used for conducting pipe video inspections in storm drains in the City jurisdiction. Mecklenburg County staff should first talk to the City's Water Quality Specialist responsible for the IDDE program should they want to schedule an inspection by the SWS CCTV crew. Outside the city, CMSWS can retain a contractor to perform a pipe video for storm drain inspections. Charlotte Water also has a pipe video team that can be used

for inspecting the sanitary sewer. Prior to requesting any video inspections, staff must obtain their Supervisor's approval.

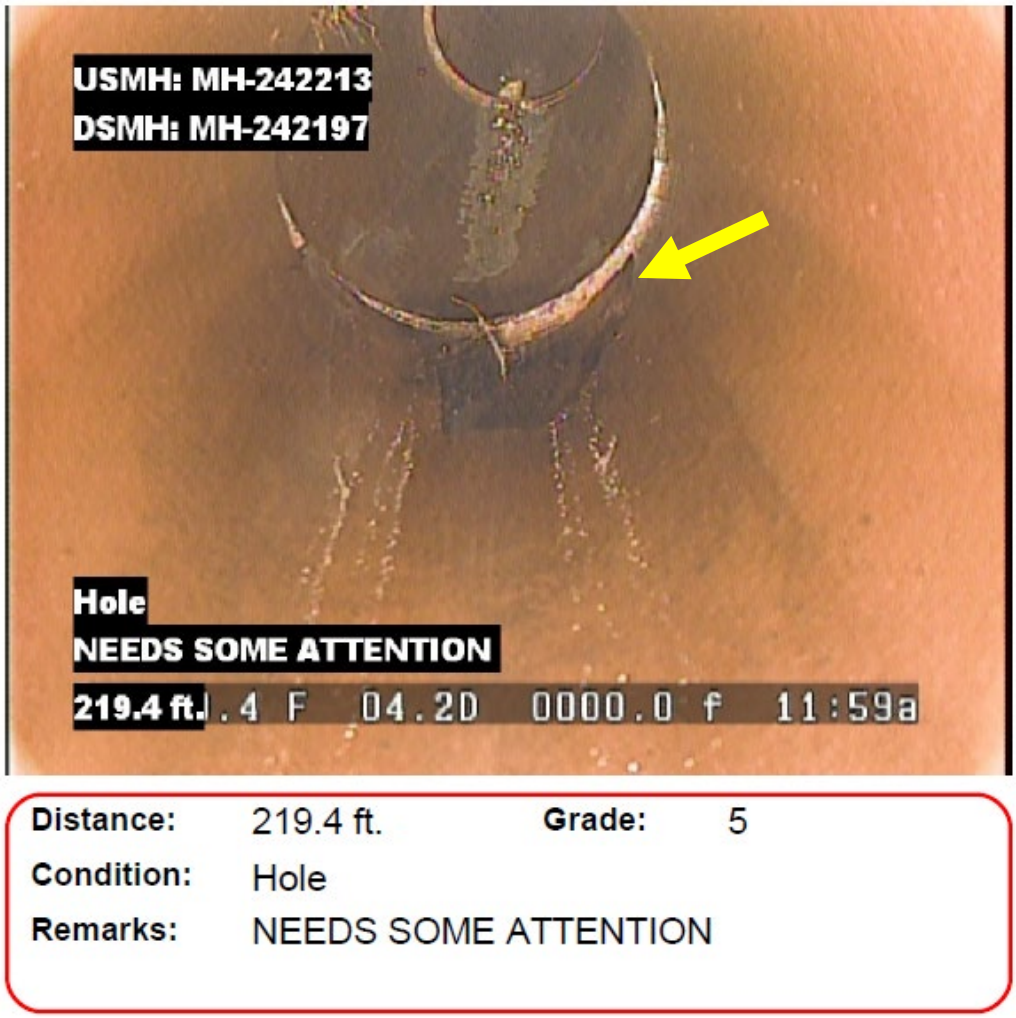


Figure 4-6: Sanitary sewer pipe video identifies a broken pipe that was leaking into a storm drain system directly below the pipe.

Pipe video inspection shows the exact location of all pipe defects and illicit connections using a closed-circuit television and computer data logging technology. A high-quality video image at close range of the interior of the pipe can be viewed in real-time, and a videotape is provided for viewing later and documenting conditions. The video is a very non-destructive, non-intrusive technique for viewing the interior of all shapes, sizes, and types of underground pipe greater than 6 inches in diameter.

Dye testing is often used in combination with pipe videos. Once an illicit connection is detected using the video equipment, suspected sources are usually dyed, and the camera is used to document whether the dye exits the illicit connection. If it does, the illicit discharge is confirmed.

Figure 4-7: Illicit connection verified using a dye test and stationary camera setup in a drop inlet to monitor the progression of dye.

Video pipe tests are also a very valuable tool for use in verifying cracks or leaks in sanitary sewer pipes causing discharges to a storm drain system or creek. In both these situations, a video of the sanitary sewer system is the most effective tool for identifying the discharge.

4.8 Fish Kills

Sometimes, as a result of an illicit discharge, a fish kill can occur. Fish kills most often occur from depleted oxygen levels associated with the breakdown of organic material in the discharge (see **Figure 4-8**). In rarer situations, a toxicant in the discharge results in a fish kill.

All fish kills, as well as the destruction of any other aquatic life, must be thoroughly documented in an Activity Report. The responsible party must immediately eliminate the source causing the fish kill and remove all dead fish and other dead aquatic organisms from surface waters and dispose of them properly at the sanitary landfill. If these organisms remain in the surface waters, significant negative water quality impacts could result. The NCDEQ fish kill investigation form contained in **Appendix T** must be completed for all observed fish kills (>50 dead fish) in waters of the State, which includes everything except private ponds not connected to a stream. This form requires the identification of affected fish to the species level. This work is performed by Water Quality staff with help from a fisheries biologist for CMSWS. The Activity Report narrative documenting the inspection activities associated with the fish kill and a map are attached to this form and the package is forwarded to the NCDEQ in Raleigh. For kills that exceed 500 fish, notify the Mooresville regional office of NCDEQ-DWR at 704-663-1699 during normal work hours. If the fish kill exceeds 1,000, report the incident to the N.C. Wildlife Resources Commission at 704-986-6109.

Figure 4-8: Image of a fish kill resulting from a sewer leak.

If the fish kill occurs in an impounded water body such as a lake or pond, aeration of the water using a large pump can sometimes raise oxygen levels and stop the fish kill. This should be recommended to pond owners. Immediate aeration can often save a large quantity of fish. In the long term, it is good for all pond owners to maintain an aeration system.

4.9 High Polycyclic Aromatic Hydrocarbons (PAH) Product Investigations

In January 2020, the City and County jurisdiction adopted the High PAH Product prohibition under Section 18-80(f). High PAH pavement products are prohibited for use in all jurisdictions of Mecklenburg County according to the following definition, as specified in their respective Stormwater Pollution Control ordinances:

High PAH Pavement Product means a product, material or substance that contains greater than 0.1% (1000 ppm) PAH by weight and is intended for use on an asphalt or concrete surface. High PAH pavement product may contain coal tar, coal tar pitch volatiles, RT-12, refined tar, steam cracked petroleum residues, heavy pyrolysis oil, steam-cracked asphalt, pyrolysis fuel oil, heavy fuel oil, ethylene tar, ethylene cracker residue, or a variation of those substances assigned the chemical abstracts service (CAS) numbers 65996-92-1, 65996-93-2, 65996-89-6, 8007-45-2, 64742-90-1, or 69013-21-4.

A list of compliant products that may be used within Mecklenburg County can be referred to at the following web link:
https://charlottenc.gov/StormWater/Documents/Approved%20product%20list.pdf

When initially investigating a potential violation of the high PAH product Ordinance, staff must obtain the following information from the responsible party:

1. What is the specific address for the possible application?
2. Is the sealant application actively occurring and ongoing?
3. Is there a strong odor similar to moth balls?
4. If the contractor is on-site, what is the name of the company?
5. What is the product name and is there an SDS sheet available?

If the product name is not listed within the compliant product list, a coffee-tea test of the product is required to determine if the product conducts high PAH. An example of the coffee/tea test is shown below in **Figure 4.9**.

Figure 4-9: Coffee/tea Test

If the results of the coffee/tea primarily dissolved (vial No. 1) and appears to be black or "coffee" in appearance, then it is an asphalt-based product. If the results of the coffee/tea test appear to be semi-dissolved and reddish in color as shown in vial No. 2, the product maybe a blend. If the sample does not dissolve readily and color appears to resemble "tea", it is an indicator that the product contains high PAHs.

If the results from the coffee/tea test indicate the subject product is a blend or inconclusive, a laboratory sample may be warranty for further analysis. If the results from the coffee/tea test determine the subject product is an asphalt-based product, the responsible party may resume application and no additional sampling is required. In addition, if the subject product is an asphalt-based product and not listed within the compliant product list, please notify the CMSWS program lead so the product may be included within the compliant list.

When a product is positive for high PAHs (coffee/tea test), inform the responsible party to cease the application process (if applicable) and pursue enforcement actions as detailed in the City's Enforcement Response Plan (ERP) **Appendix U.**

When enforcement actions are implemented, the responsible party is required to notify the investigating CMSWS staff regarding remediation within 30-days of receipt of the NOV. Remediation of the affected area must be completed by the responsible party within 60-days of receipt of the NOV. Remediation of the affected area may include shot blasting and product removal by the responsible party.

Section 5: Eliminating Sources of Illicit Discharges and Connections

5.1 Purpose

The purpose of eliminating the source of an illicit discharge and/or connection is to remove a source of pollution and restore water quality conditions. This section contains the procedures for conducting investigations of identified illicit discharges to eliminate the pollution source.

5.2 Procedures for Conducting Investigations of Identified Illicit Discharges

For investigations conducted in the City of Charlotte corporate limits, staff should follow the procedures shown in Sections 4 and 5 of the City's (ERP) which is shown in **Appendix U**, otherwise for the Phase II jurisdictions the below procedures are followed when investigating illicit discharges for elimination as described in more detail in the following sections.

1. Identify the responsible party (see Sections 5.3 and 5.4).
2. Issue Notice of Violation (NOV) (see Sections 5.5 and 5.6).
3. Conduct follow up investigations to ensure compliance (see Section 5.7).

4. Initiate enforcement actions in accordance with established criteria (see Sections 5.8 and 5.9).
5. Complete all documentation (see Section 7).

5.3 Identify the Responsible Party

For investigations conducted in the City of Charlotte corporate limits, staff should follow the procedures shown in Section 5.2 of the City's ERP document, which is shown in Appendix U, otherwise for the Phase II jurisdictions the first step to eliminate the source of a pollution problem, illicit discharge and/or connection is to identify the responsible person and provide them with a "Notice of Violation" or NOV. The responsible person is required by State and local laws to immediately cease the discharge, illicit connection and/or illegal dumping and take whatever steps are necessary to restore the affected area and prevent future discharges from occurring. Local and State regulations specify that the responsible person is the one who ***caused*** the discharge or connection to occur. A "person" is defined as any individual, partnership, co-partnership, firm, company, corporation, association, commission, institution, utility, joint stock company, trust, estate, governmental entity or other legal entity, or their legal representative, agents or assigns.

In most cases the property owner is the responsible person, but not in all cases. For example, in a situation where an illicit discharge originates from rental property, the renter, not the owner of that property, is responsible if the renter caused the discharge to occur. It is extremely important to collect as much information as possible regarding the responsible person during the field investigation. For example, be sure to interview witnesses and obtain license tag numbers, names, addresses, etc. If the property owner is the responsible party, confirm the name and address using POLARIS.

In cases where a discharge enters a storm drain that leads to a drinking water supply (Lake Norman, Mountain Island Lake, or Lake Wylie) or enters the water supply directly, a NOV is issued to the responsible party. If the responsible party is a contractor working on Charlotte Water infrastructure and causes a discharge to a storm drain or surface waters, the contractor is issued a NOV and not Charlotte Water. If it is determined that Charlotte Water and not a contractor is responsible for the discharge, NCDEQ and not CMSWS is responsible for enforcement actions. Staff and supervisors should examine the circumstances pertaining to the discharge and determine the type of NOV (Illicit Discharge, Accidental Discharge, etc) to be issued.

5.3.1 Additional Notification to State and Federal Regulatory Agencies

When investigating an illicit and/or accidental discharge(s) that has directly affected or has the potential to affect Waters of the State or to the ground surface, notification to State (NCDEQ) and Federal (EPA Region 4) agencies is required. The responsible party is required to submit a National Response Center (NRC) Report either electronically through the EPA website (https://www.epa.gov/emergency-response/national-response-center) or via telephone (800-424-8802) as soon as reasonably possible.

Once the NRC report has been completed by the responsible party, an electronic notification will be automatically delivered to all local, State, and Federal environmental agency stake holders. Staff will then coordinate jointly with State and Federal agencies as needed and correspondence with State and Federal agencies should be documented in CityWorks. Additional information regarding the notification process to State and Federal agencies can be referred to in the Emergency Response Guidelines for Charlotte-Mecklenburg Storm Water Services Water Quality Program (**Appendix I**).

5.4 Unknown Spillers

Investigating staff is responsible for interviewing other agency representatives at the scene of an illicit discharge, as well as by-standers, neighbors or other parties that are possible witnesses to the incident in order to obtain as much information as possible regarding the responsible party. This task is second in priority only to efforts to ensure that the discharge has been ceased and all spilled materials properly contained. If the responsible person cannot be identified after all reasonable efforts have been undertaken, a contractor can be contacted to perform the necessary cleanup. The Program Manager (County or Town spills) or Supervisor (City of Charlotte NPDES Permit Supervisor) must approve the contractor prior to issuance of authorization to proceed. Investigating staff must remain on-scene and supervise all cleanup activities.

When a responsible party cannot be identified, the investigating staff is also responsible for immediately notifying the National Response Center (NRC) at 1-800-424-8802 and receiving an NRC case number for an incident when the spill has impacted a jurisdictional waterway. This may allow for the reimbursement of cleanup costs.

5.5 Issuing a Notice of Violation (NOV)

For investigations conducted in the City of Charlotte corporate limits, staff should follow the procedures shown in Section 5.6 of the City's ERP document, which is shown in Appendix U, otherwise for the Phase II jurisdictions once the responsible person has been identified, staff verbally notifies them of the violation and directs them to immediately cease the discharge and

take steps to contain and remediate the discharge. A written NOV is then issued as soon as possible and no later than two (2) business days from detection of the violation. The NOV identifies the nature of the violation, sets forth the measures necessary to comply with the Ordinance and provides a specific period for compliance.

A written NOV may be issued in the field or served by certified mail, hand delivery or any other means. Refusal to accept the notice does not relieve the violator's obligation to comply with the Ordinance or to pay a penalty.

Written NOVs are issued to ensure compliance when there has been a violation of one of the Stormwater Pollution Control Ordinances. The Supervisor must approve all written NOVs prior to issuance. Always review records for documentation of previous violations prior to the issuance of an NOV. If there is a history of non-compliance within the past three (3) years, enforcement action is typically recommended. Civil penalties are the most commonly used enforcement remedy; however, Charlotte-Mecklenburg's ordinances include other compliance mechanisms that may be warranted depending on circumstances, including a compliance agreement, compliance order, cease and desist order, and withholding inspections, permits or other approvals. The determination for recommending enforcement is made after consulting with your Supervisor, the City's Ordinance Administrator when the violation is in the City, and if necessary, the Program Manager. NOVs with recommendation for enforcement (NREs) must be reviewed by the Program Manager.

The template letter or shell that staff use for writing an NOV depends on the jurisdiction, section of ordinance applicable, and whether there is a recommendation for enforcement. See **Table 5-1** for a list of the local ordinances and NOV shells which are also contained in the file: \\Luestwfs01\stw\Water Quality\WQ_Xfer\WQ\IDDE\Notices of Violation.

Table 5-1: Applicable Local Ordinances and NOV Shells

Jurisdiction	Violation	Town Code	Shell Name
City of Charlotte	Illicit Discharge(s)	Section 18-80(a)	Charlotte – SWPCO (Sec 18-80a) – 1st NOV
	Illicit Connection(s)	Section 18-80(b)	
	Accidental Discharge(s)	Section 18-80(c)	
	Improper Storage, Handling, or Processing of Materials.	Section 18-80(d)	
	Failure to Comply	Section 18-80(e)	
	Use of High PAH Pavement Products Prohibited.	Section 18-80(f)	

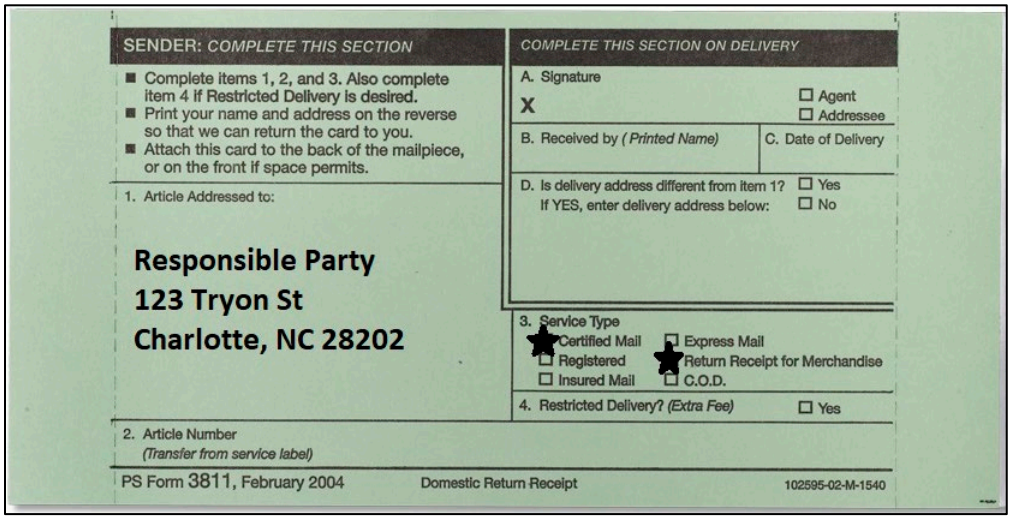
Jurisdiction	Violation	Town Code	Shell Name
	Obstruction	Section 18-80(g)	
Mecklenburg County (Cornelius, Huntersville, Mint Hill, Pineville, & Unincorporated areas)	Illicit Discharge(s)	Section 5(a)	Mecklenburg County NOV
	Illicit Connection(s)	Section 5(b)	
	Accidental Discharge(s)	Section 5(c)	
	Improper Storage, Handling, or Processing of Materials.	Section 5(d)	
	Failure to Comply	Section 5(e)	
	Use of High PAH Pavement Products Prohibited.	Section 5(f)	Mecklenburg County High PAH NOV
	Obstruction	Section 5(g)	Mecklenburg County NOV
Town of Davidson	Illicit Discharge(s)	Sec. 30-175(a)	Town of Davidson NOV
	Illicit Connection(s)	Sec. 30-175(b)	
	Accidental Discharge(s)	Sec. 30-175(c)	
	Improper Storage, Handling, or Processing of Materials.	Sec. 30-175(d)	
	Failure to Comply	Sec. 30-175(e)	
	Use of High PAH Pavement Products Prohibited.	Sec. 30-175(f)	Town of Davidson High PAH NOV
	Obstruction	Sec. 30-175(g)	Town of Davidson NOV
Town of Matthews	Illicit Discharge(s) and Improper Disposal(s)	52A.05(a)	Town of Matthews NOV
	Illicit Connection(s)	52A.05(b)	
	Accidental Discharge(s)	52A.05(c)	
	Obstruction	52A.05(d)	
Town of Matthews	Coal Tar Sealant and High PAH Sealant Limitations.	52A.05(e)	Town of Matthews High PAH NOV

5.6 Documentation, Review and Mailing

In Cityworks, staff create an NOV Activity Report for all NOVs (field and written) which is linked to a Service Request or Activity Report as appropriate. All attachments relating to the NOV, including the signed NOV and written response letter, must be attached to the NOV Activity Report. Carefully review all documentation for spelling and punctuation before forwarding to a Supervisor for review.

If the person committing the offense is different from the property owner, send a copy of the written Notice of Violation to the property owner. In some situations, both the person committing the offense and the property owner may be held responsible for the violation. Consult with your Supervisor, and the City's Ordinance Administrator if in the City, to make this determination.

All NOVs are signed by the generating staff person's Supervisor. The Supervisor reviews the report for content, punctuation, and proper documentation and work with the staff person to correct any errors. Once it is finalized and signed, it is scanned and attached to the NOV Activity Report. Only the final signed copy of the NOV should be attached in Cityworks. The generating staff person is then responsible for sending NOVs by "Certified Mail Return Receipt Requested." This is not required by local Ordinances but in the event a case goes to enforcement, proof that the letter was received via the return receipt is important. The return receipt (green card – **Figure 5-1**) is mailed back to the investigating staff member. This staff person is responsible for retaining this return receipt, scanning it, and attaching it to the NOV Activity Report. If the NOV is issued under the City's ordinance, notify the City's Ordinance Administrator by email and include the Activity Report number.


SENDER: COMPLETE THIS SECTION

- Complete items 1, 2, and 3. Also complete item 4 if Restricted Delivery is desired.
- Print your name and address on the reverse so that we can return the card to you.
- Attach this card to the back of the mailpiece, or on the front if space permits.

1. Article Addressed to:

Responsible Party
123 Tryon St
Charlotte, NC 28202

COMPLETE THIS SECTION ON DELIVERY

A. Signature
X
☐ Agent
☐ Addressee

B. Received by (Printed Name) | C. Date of Delivery

D. Is delivery address different from item 1? ☐ Yes
If YES, enter delivery address below: ☐ No

3. Service Type
☐ Certified Mail ☐ Express Mail
☐ Registered ☐ Return Receipt for Merchandise
☐ Insured Mail ☐ C.O.D.

4. Restricted Delivery? (Extra Fee) ☐ Yes

2. Article Number
(Transfer from service label)

PS Form 3811, February 2004 Domestic Return Receipt 102595-02-M-1540

Figure 5-1: Example return receipt for certified mail.

Service Requests and/or inspection/NOV Activity Reports remain open until corrective actions have been implemented and a written response received. Once that has been done, the service request is forwarded to the Supervisor for review and closure.

5.7 Follow Up Investigations

It is extremely important to conduct a timely and effective follow up field investigation to ensure compliance with a Notice of Violation. Investigations must be conducted on the compliance date specified in the field or written notice (typically 10 working days) to ensure that all violations have been addressed and the prescribed remedial actions have occurred.

Follow up inspections are required for field and written NOVs to confirm that the violation has been corrected. The completed corrective actions and inspection results are documented in the Cityworks report, including whether the NOV has been resolved.

5.8 Enforcement Procedures

For investigations conducted in the City of Charlotte corporate limits, staff should follow the procedures shown in Section 5.7 of the City's ERP document, which is shown in **Appendix U**, otherwise for the Phase II jurisdictions any person who violates local or state water quality ordinances is subject to a civil penalty, which can be assessed from the date the violation first occurs. No penalty is assessed until the person alleged to be in violation has been notified of the violation.

The maximum civil penalty for each violation is $10,000 per day of violation within the corporate limits of the City of Charlotte and the Towns as well as outside these corporate limits in Mecklenburg County, except for within Matthews' corporate limits where the maximum penalty is $5,000 per day for each violation. The ordinances specify that in determining the amount of a civil penalty, all relevant mitigating and aggravating factors shall be considered including, but not limited to the following:

- the degree and extent of harm caused by the violation;
- the cost of rectifying the damage;
- whether the violator saved money through noncompliance;
- whether the violator took reasonable measures to comply with this Ordinance;
- whether the violator voluntarily took reasonable measures to restore any areas damaged by the violation;
- whether the violation was committed willfully;
- whether the violator reported the violation to CMSWS; and
- the prior record of the violator in complying or failing to comply with this Ordinance or any other local or State water pollution control ordinance or regulation.

In addition to the per diem civil penalty, penalties for costs to restore damaged property may be assessed based on restoration costs, which include but are not limited to cleanup costs, devaluation of the property, value of animal and plant life damaged and administrative costs incurred by CMSWS. In most circumstances, the person responsible for a violation is directed by CMSWS to restore all areas affected by the violation to the conditions existing prior to the violation. This authority is in addition to any other enforcement authority. The Director of the Mecklenburg County Land Use & Environmental Services Agency sets the penalty amount for Mecklenburg County and the Towns except for the Town of Matthews where the Town Manager sets the amount. In the City of Charlotte, the Storm Water Services' Water Quality Program Manager establishes the penalty amount.

Once the penalty amount is set, the person responsible for the violation is notified of the penalty and the reason it is being assessed. The notice of penalty is issued in writing and sent via certified mail or other means reasonably calculated to give actual notice to the person responsible for the violation. The notice directs the violator to either pay the assessment or appeal within thirty (30) days of receipt of notice. If the violator does not pay a civil penalty or file an appeal within 30 days after it is due, the case is turned over to the appropriate legal staff for initiation of collection actions, including but not limited to filing a civil action in Mecklenburg County General Court of Justice or in any other court of competent jurisdiction. A civil action must be filed within three years of the date the assessment was due.

Civil penalties collected pursuant to local ordinances and State law are credited to the Charlotte-Mecklenburg school system. Ordinance violations do not constitute a misdemeanor or infraction punishable under North Carolina General Statute 14-4. In addition to the imposition of a civil penalty, local ordinances may be enforced by an appropriate equitable remedy issuing from a court of competent jurisdiction as authorized by North Carolina General Statute 153A-123(d) or by injunction issued pursuant to authorization contained in N.C. General Statute 153A-123(e). For Mecklenburg County and the Towns, **Table 5-2** provides guidance for assessing civil penalty amounts.

Table 5-2: Guidance for Assessment of Civil Penalties for Mecklenburg County and Towns

*All discharges to recreational and water supply surface waters classified as Class B, WS-IV or WS-V, are doubled and not to exceed the maximum allowable daily penalty of $10,000. Determination of the civil penalty sum issued for discharges to recreational and water supply surface waters will be evaluated on a case-by-case basis by the County Water Quality Program Manager, Environmental Supervisor, and the responding Environmental Specialist (*effective August 19, 2021*).

Violation Category	Examples	Penalty
Class I Minor unintentional/non-willful violation not resulting in any detrimental impacts to surface water quality	a) Improper disposal of yard waste b) Improper disposal of pet/animal waste c) Private vehicle leaking excessive fluids	**1st Offense** - Written NOV + Educational material + Restore the affected area - No penalty **2nd Offense** - Written NOV/NRE + $100/occurrence + Restore the affected area **3rd Offense** - Written NOV/NRE + $500/occurrence + Restore the affected area

Violation Category	Examples	Penalty
	d) Improper disposal of cooking oil on ground	**4th Offense and beyond** - Written NOV/NRE + Fine incrementally increases $1,000/occurrence up to the max + Restore the affected area
Class II Minor intentional/willful violation not resulting in any detrimental impacts to surface water quality	a) Discharge from commercial car wash b) Discharge of chlorinated swimming pool water c) Improper disposal of latex paint waste d) Washing machine discharge	**1st Offense** – Written NOV + Educational material + Restore the affected area - No penalty **2nd Offense** – Written NOV/NRE + $500 fine/day + Restore the affected area **3rd Offense** – Written NOV/NRE + $1,000 fine/day + Restore the affected area **4th Offense and beyond** – Written NOV/NRE + Fine incrementally increases $1,000/day up to the max of $10,000 + Restore the affected area

Class III Unintentional/non-willful violation resulting in documented detrimental impacts to surface water quality	a) Leaking private sewage system b) Improper fertilizer/pesticide c) Illicit connection to the storm system or surface waters unknown to the responsible party d) Accidental discharge to storm system	**1st Offense** – Written NOV + Educational material + Restore the affected area - No penalty **2nd Offense** – Written NOV/NRE + $1,000 fine/day + Restore the affected area **3rd Offense** – Written NOV/NRE + $2,500 fine/day + Restore the affected area **4th Offense and beyond** - Written NOV/NRE + Max fine/day of $10,000 + Restore the affected area
Class IV Intentional violation resulting in documented detrimental impacts to surface waters	a) Willful discharge of harmful substances b) Willful connection to the storm system or surface waters c) Willful dumping of waste materials directly to storm drain or surface waters.	**1st Offense** – Written NOV/NRE + Educational material + Restore the affected area + $1,500 fine/day **2nd Offense** – Written NOV/NRE + $2,500 fine/day + Restore the affected area **3rd Offense –** Written NOV/NRE + Maximum fine/day + Restore the affected area **4th Offense and beyond** - Written NOV/NRE + Max fine/day of $10,000 + Restore the affected area

5.9 Civil Penalty Assessment Process – Mecklenburg County and Towns

The following process is to be used when assessing penalties in Mecklenburg County and the Towns, which includes the ETJ area for the City of Charlotte.

1. For all violations resulting in measurable negative water quality impacts, the inspector consults with the Supervisor for possible initiation of immediate enforcement action. For all other violations, the inspector consults with the Supervisor if the 1st NOV fails to achieve compliance in which case a 2nd NOV is issued. The Supervisor also contacts the violator prior to the issuance of this 2nd NOV to discuss the necessary compliance measures and the fines associated with a failure to comply.

2. If the violator has failed to correct the violation in response to the 2nd NOV, additional NOVs are issued and the violator is consulted as necessary by the Supervisor until compliance is achieved. It is important to achieve compliance prior to assessment of civil penalties because compliance measures and their associated costs are important mitigating factors in determining the penalty amount as well as the violator's degree of cooperation. In some rare circumstances, it may not be possible to achieve compliance. If a discharge is ongoing as a result of failure to comply, the following options are available in the ordinance and should be discussed with the Supervisor and Program Manager for immediate implementation: Compliance Agreement; Compliance Order; Cease and Desist Order; Withholding of Inspections, Permits, or Other Approvals; and Injunctive Relief. In some circumstances, violators fail to properly restore an affected area, in which case the ordinance includes a provision whereby the County can complete the restoration and recover all costs from the violator, including cleanup costs, costs associated with permanent devaluation of the property, value of animal and plant life damaged, and County administrative costs.

3. When it has been determined by the Supervisor that compliance has been achieved or that it is otherwise appropriate that enforcement action be taken, the Inspector and Supervisor consult with the Program Manager and upon receipt of approval to proceed, the enforcement process begins.

4. The Supervisor makes verbal contact with the violator to discuss the corrective actions required and the consequences of noncompliance, including the assessment of a civil penalty.

5. The Inspector completes the Notice of Civil Penalty Assessment (NOCP) and Penalty Assessment Worksheet & Report (see **Appendix V** for all jurisdictions), which includes the Case Number, and forwards to the Supervisor for review and approval. Digital versions of these documents are available in the following file: \\Luestwfs01\stw\Water Quality\WQ_Xfer\WQ\IDDE\Enforcement. For the Town of Matthews, a special penalty assessment notification has been developed to replace the NOCP (see **Appendix W**). This document is also available digitally in the above referenced file. Upon completion of these documents, the inspector forwards them to the Supervisor for review and approval. The inspector logs the penalty into the Meck Co Penalty Assessment Tracking Table located at the link above.

6. The Supervisor reviews the NOCP and Penalty Assessment Report and returns them to the inspector for any necessary revisions. Following approval of revisions, the Supervisor forwards the documents to the Program Manager for review.

7. The Program Manager reviews the NOCP and Penalty Assessment Report and returns them to the inspector for any necessary revisions. The Program Manager forwards the documents to the Division Manager for review. The final version of both the Penalty Assessment Report and NOCP, or in the case of Matthews the Penalty Assessment Notification, is attached to the Cityworks report.

8. Following approval from the Division Manager, the digital documents are emailed to the Department Head if the penalty is for the County or Towns or to the City Engineer for the City of Charlotte. Following review and approval, the Department Head signs the NOCP and the digital documents are forwarded to the inspector attaching to the Cityworks' report. For the Town of Matthews, the Town Manager is forwarded this information for review, approval and mailing.

9. The inspector mails the NOCP to the responsible party via "Certified Mail Return Receipt Requested." The Penalty Assessment Report is **not** mailed but is maintained in the digital file along with a copy of the NOCP. The "Green Receipt" for the mailing is also placed in the digital file. The Penalty Assessment Spreadsheet discussed in #5 above is also updated by the inspector with the date of the mailing, etc.

10. The "Green Return Receipt" is received from the post office and provided to the inspector who scans it and adds it to the Cityworks' report. The penalty is to be appealed or paid within 30 days of receipt of the NOCP. The inspector adds 30 days to the date the NOCP was received based on the Green Return Receipt and enters this into the spreadsheet as the penalty due date. **It is the Inspector's responsibility to follow up to ensure that within the 30-day time period the penalty is paid, or an appeal filed.**

11. When the penalty payment is received, a copy of the check is scanned and attached to the Cityworks' report. The check is sent to Finance for depositing. An email is sent to the inspector, Supervisor and Program Manager indicating that the penalty has been paid.

12. The responsible party has the right to contact the Program Manager within the 30 days prior to penalty payment and request a penalty conference during which the penalty can be negotiated based on information provided regarding aggravating and/or

mitigating factors. Negotiations cannot occur until all violations are corrected. The inspector and Program Manager or Supervisor must attend this meeting. The inspector is responsible for documenting the results of this meeting on the Penalty Assessment Conference form contained in **Appendix X**, including information provided and decisions made. A digital version of this form is contained in the following file: \\Luestwfs01\stw\Water Quality\WQ_Xfer\WQ\Policies & Procedures\IDDE\Enforcement. If the penalty is reduced and hearing waived, then the Request for Penalty Remission and Waiver of Right to Appeal form contained in **Appendix Y** is completed during the Penalty Conference and signed by the Program Manager or Supervisor and the responsible party. A digital version of this document is maintained in the following file: \\Luestwfs01\stw\Water Quality\WQ_Xfer\WQ\Policies & Procedures\IDDE\Enforcement. All completed forms are attached to the Cityworks report. The responsible party must submit payment of any negotiated amount within 30 days of signing the form. If a negotiated penalty is not reached, payment must be made within 30 days of receipt of the NOCP.

13. If the responsible party does not pay the civil penalty or file an appeal within 30 days after it is due, the case is referred to the attorney's office for initiation of appropriate civil action to recover the amount of the assessment. The civil action shall be brought in Mecklenburg County General Court of Justice or in any other court of competent jurisdiction. A civil action must be filed within three (3) years of the date the assessment was due.

Section 6: Sanitary Sewer System Failures

6.1 Purpose

The purpose of this section is to address the importance of eliminating sources of sewage from failing or improperly installed sanitary sewer systems. Discharge of raw sewage to creeks and lakes from failing sanitary sewer systems is the one of the biggest sources of water pollution in Charlotte-Mecklenburg. These discharges pose a significant human health threat, making them important to identify and eliminate.

6.2 Background on Fecal Coliform

Discharge of raw sewage to creeks and lakes poses a significant human health threat because human contact with surface waters contaminated with sewage can result in the transmission of a variety of diseases. These pathogenic (disease-causing) organisms pass through the human body in fecal excrement. The threat of such disease transmission becomes more serious as the population density increases and more sewage pollutes public water supplies, carrying human intestinal pathogens. This threat is particularly significant in surface waters used for swimming and as a raw drinking water supply, which includes the three lakes on Mecklenburg County's western border.

6.3 Action and Watch Levels

To monitor for fecal bacteria levels that could indicate potential sewage sources, CMSWS has developed "Action" and "Watch" Levels based on fecal coliform bacteria data collected locally over a span of 20 years (see Table 2-3 in Section 2). These levels provide a more accurate representation of local surface water conditions than do the State standard. In addition, the State standard requires the collection of five consecutive samples over a 30-day period, which is difficult and time consuming, whereas the local levels are based on one sampling event. For these reasons, the local Action Level is used to trigger follow up activities for the identification and elimination of pollution sources as opposed to the State standard.

Despite its limitations, fecal coliform bacteria serve as the primary indicator of failing sanitary sewer systems in Charlotte-Mecklenburg. On occasion, other tests as described above are performed in combination with the fecal coliform testing to narrow down the fecal source, but most often follow-up field screening is used for this purpose.
CMSWS performs routine monitoring for fecal coliform bacteria monthly at 33 designated sites in streams throughout Charlotte-Mecklenburg. In addition, fecal coliform monitoring is performed every other month from October - April at 28 sites on Lake Norman, Mountain

Island Lake, Lake Wylie, Lake Davidson, and Lake Cornelius. From May through September (swimming season), these sites with an additional 14 sites are sampled monthly and 2 sites are sampled twice/week in September (Ramsey Creek Swim Beach and Lake Norman YMCA Swim Area). All results from these monitoring activities are delivered to a Quality Assurance and Quality Control (QA/QC) Officer with CMSWS, who is responsible for the compilation, review, verification, validation, and warehousing of all water quality monitoring data products. The primary laboratory used by CMSWS for analysis of water quality samples is owned and operated by Charlotte Water. This laboratory provides finalized data electronically and in hard copy to the QA/QC Officer within 5 days of sample collection.

On at least a monthly basis, data is compiled, quality-assured and added to the Water Quality Database (WQD). During this process, fecal coliform data is carefully assessed for exceedances of local Watch / Action Levels and State water quality standards. Within one workday from receipt of data, the QA/QC Officer reports all exceedances to Supervisors. Supervisors dispatch field staff to confirm pollution problems. Once confirmed, staff initiates the procedures contained in Sections 4 and 5 above to identify and eliminate the pollution source. Staff conducting field monitoring activities using the YSI Multiprobe sonde are responsible for immediately initiating procedures to ensure sources are tracked and corrections are made when measurements indicate an exceedance of an Action or Watch Level. Oftentimes, when an Action Level for pH, dissolved oxygen or conductivity has meet a threshold, this can indicate a sewer discharge.

6.4 Field Indicators for Sewage

Field observations are often the quickest and easiest way to identify a sanitary sewer system failure. If you are close to the sewer discharge, the physical observations are much more profound, including odors, discoloration, solids, etc. If you are far from the source, physical observations are often subtle. The following is a list of field observations that indicate a sewer system failure:

1. Broken sewer line or lateral: If a broken sewer line is found, a sewer source has been confirmed. However, the broken line may not be actively discharging. It is common for sewage to discharge from a broken line under high flow conditions, which may not always be occurring. Peak flows vary depending on where you are in the collection system, but usually they occur between 7:00 a.m. and 11:00 a.m., and 5:00 p.m. and 9:00 p.m. It may be necessary to investigate the broken line during these times to confirm an active discharge. You can also place a minor obstruction in the pipe such as leaves or a rag and check back to determine if it has been dislodged, which would indicate an active discharge. Other

methods can be used such as dye and smoke testing, deployment of a mobile CMANN unit, and/or a camera.

2. Colored surface waters: Sewage can turn surface waters a variety of colors. It typically takes on a grey tint when discharged to surface waters.

3. Debris in surface waters: Whatever is flushed down the toilet will likely end up discharged to surface waters when there is a break or leak in the sewer system, including toilet paper, tampons, condoms, cigarette butts, feces, grease, food particles, etc. The heavier material will settle out first such as tampons, condoms and food particles. If you see this material in the surface water, you are likely very near the discharge point. The lighter material settles out much later. Oftentimes very small, almost invisible flecks of toilet paper are visible many miles downstream of a sewer leak, particularly in larger, swiftly flowing streams. Attention to detail is required or these tiny flecks will go unnoticed.

4. Sewage fungus: Sewage fungus (*Fusarium aquaedutunna*) is a filamentous growth occurring on solid surfaces in a water body when organics become elevated, such as with a sewer discharge. It is often described as “lamb’s tails” and appears very slimy or furry. Fast moving stream flow reduces the ability of sewage fungus to attach to solid surfaces but enhances oxygenation which promotes fungal growth. Sewage fungus usually occurs very near (within 100 feet) of a sewer discharge; however, larger discharges or discharges with an abundance of biodegradable substances may result in significant sewage fungus growth for long distances downstream. Sewage fungus looks very similar to iron bacteria, which are naturally occurring and not indicative of a sewer discharge. The best way to distinguish between the two is by their color. Iron bacteria have an orange tint whereas sewage fungus is normally grey.

5. Unusual odors: Sewer discharges omit foul odors that might smell like rotten eggs, a musty odor, or even a soapy smell. However, sewer manholes will also vent odors into the air making odors somewhat of an unreliable indicator of a sewer discharge. Odors typically don’t carry for long distances so if you are close enough to smell the discharge, the other field observations will probably have been readily apparent.

6. Dead fish and/or other aquatic life: If a sewer discharge is ongoing for a week or more, or if it is occurring in a slow-moving body of water, the organic material contained in the sewer will begin to decay, pulling oxygen from the water which can lead to a fish kill. Toxicants in a sewer discharge can also cause a fish kill. The type and quantity of dead fish is significant. If

only dead adult fish are observed, the discharge may be less significant. Generally, adult fish require more oxygen. If all age groups of fish have died, then a more significant oxygen depletion is indicated, which could mean a larger spill or one that has been ongoing for a long period of time. Also, dead, air breathing aquatic organisms, such as turtles and crayfish, can indicate that a toxicant in the sewer discharge and not oxygen depletion is the cause of the die off. The toxicant could also originate from an illicit discharge other than a sewer leak. When fish are stressed from oxygen depletion, they will come to the surface and gasp for air, which is called piping. A fish kill is likely to follow within less than 24 hours of such an occurrence. After fish have been dead for a few days they turn white in color (see Figure 4-8), which can provide some indication as to the period of time when the discharge occurred.

7. Unusual vegetative growth: The organic material in sewer can cause the unusually rapid or prolific growth of terrestrial plants around a discharge. In some cases, tomato plants will germinate from the seeds in human waste at a sewer discharge. If such unusual plant growth is observed immediately around a sewer system, a sewer discharge is highly suspect.

8. Algae blooms and/or other aquatic plant growth: The organic material in sewer can cause the unusually rapid or prolific growth of aquatic plants around a discharge. If such aquatic plant growth is observed in a free-flowing stream, a sewer or another discharge rich in organic material is highly suspect.

9. Overflowing manholes or debris: When grease, roots or other obstructions create a blockage in a sewer line, a discharge will occur along the path of least resistance, usually the manhole. If a manhole is actively discharging, a source of sewage has been found. If a manhole is not actively discharging sewage at the time of your observation, it may still be a source. Sewer discharges may be intermittent, only occurring during peak flow conditions. In such a case, you may observe a variety of debris around a manhole such as tampons, condoms, cigarette butts, toilet paper, feces, food particles, etc. If such evidence is fresh, a sewer discharge has occurred and should be reported so the obstruction can be removed. If the evidence is old, the blockage has probably been freed and the discharge is no longer active, but this should be confirmed with Charlotte Water or the property owner.

6.5 Identifying and Eliminating the Source of Sewer System Failures

Once a sewer system failure has been confirmed as an illicit discharge and/or connection, it must be tracked to its source and eliminated. This involves screening the area for field indicators as previously described. It may also involve dye, smoke and video testing which are commonly used. With the source confirmed, the next step involves identifying the responsible party. The owner of the sanitary sewer system is responsible for all repairs and for restoring areas affected by the discharge, including the removal of solids and debris from the ground and surface waters. In Charlotte-Mecklenburg, the owner and operator of the municipal sanitary sewer system is Charlotte Water. All other systems are privately owned by a business, property owner or private utility. Septic systems can also be a source of a sanitary sewer system failure and they are always privately owned. A description of the process for eliminating sanitary sewer system failures and restoring affected areas is provided in the flowchart in **Figure 6-1**.

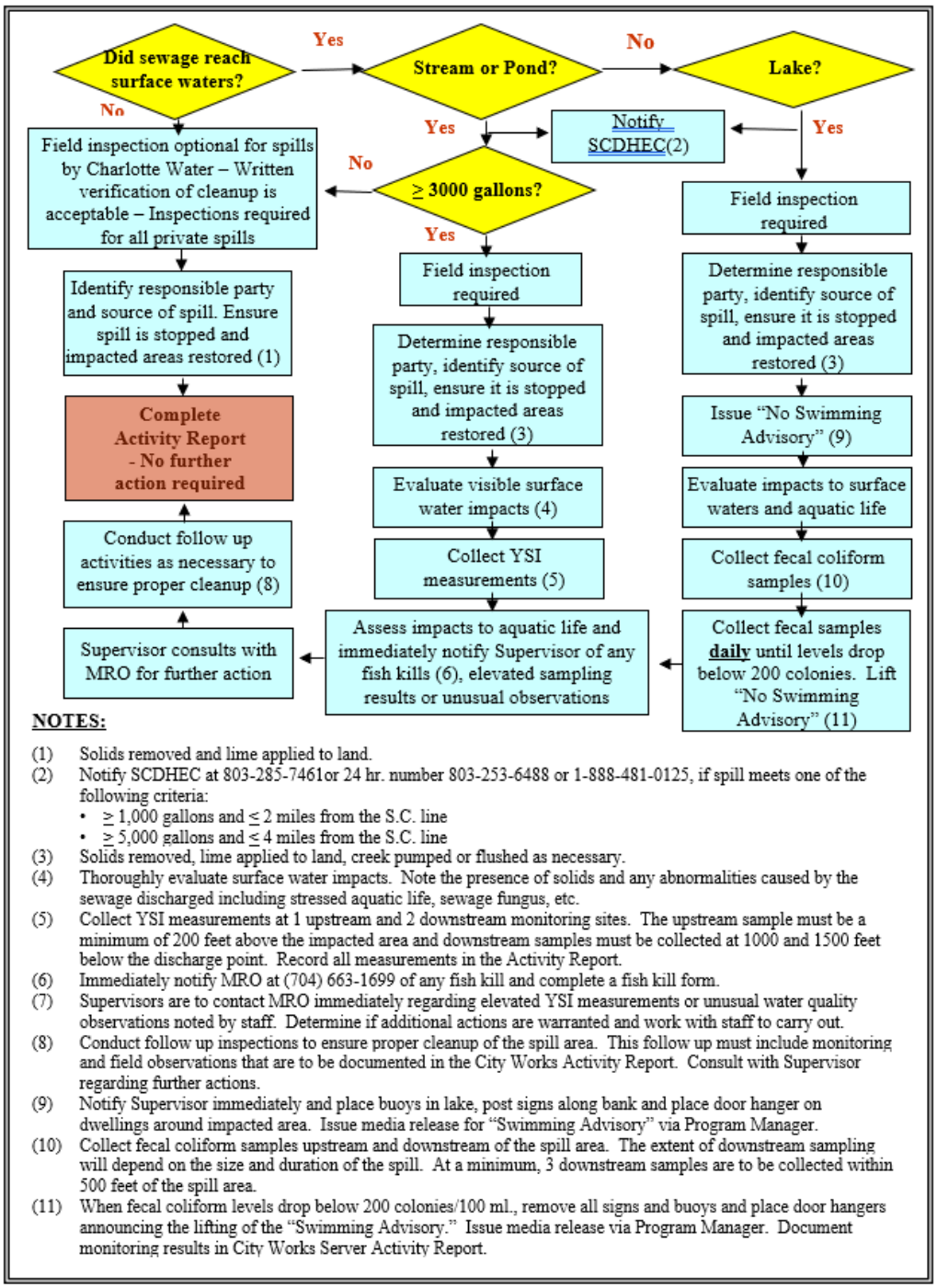


Figure 6-1: Flowchart for Identifying and Eliminating Sanitary Sewer Failures

6.6 Sewer Discharges in Lake Norman, Mountain Island Lake, or Lake Wylie

When a sewer discharge reaches Lake Norman, Mountain Island Lake, Lake Wylie, Lake Davidson, Lake Cornelius, drinking water supply reservoirs and swimming areas, the process for eliminating the discharge varies significantly. This modification is necessary due to heightened

concerns regarding waterborne disease transmission. One of the primary functions of our lake monitoring program is to protect the citizens of Charlotte-Mecklenburg from exposure to elevated bacteria levels in these lakes and to prevent the outbreak of waterborne diseases. In 2002, Mecklenburg County developed a "Waterborne Disease Outbreak Prevention Policy" to achieve this goal (**Appendix Z**). The following procedures are included in this Policy for implementation by CMSWS:

1. Review all fecal coliform data collected from lake monitoring activities immediately upon receipt from the lab and always within 5 working days of collection. If bacterial contamination is suspected in an area, notify the lab to ***RUSH*** the sample analyses and to contact you immediately when results are available, which should be within 24 hours of delivery to the lab. If you don't hear from the lab in 24 hours, call them.

2. If one or more of the following conditions are observed, notify your Supervisor or Program Manager immediately. If the observation is made in the field, contact should be made immediately by cell phone.
    a. Any unusual observations are made during lake monitoring activities (i.e. fish kill, odors, unusual colors).
    b. A sewer discharge to the lake is confirmed. Sampling results indicate fecal coliform bacteria concentrations ≥200 colonies/100 millimeters for one or more samples.
    c. Sampling results indicate an exceedance of ***any*** of the established Action Levels for the lakes.

3. The Supervisor is to immediately notify the Program Manager of staff notifications as described in 2 above. The Program Manager will immediately notify the Health Director of any sampling results indicating greater than 200 colonies/100 milliliters for any one or more samples collected as specified in "c" above. Conditions reported in "a, b or d" will be relayed to the Health Director as is deemed necessary by the Program Manager. Through consultation with the Health Director, the Program Manager will decide whether a ***"SWIMMING ADVISORY"*** will be issued and for what area(s).

4. Upon receipt of notification from the Supervisor and/or Program Manager, staff will immediately post ***"SWIMMING ADVISORY"*** signs along the shore to adequately mark the affected area and place a buoy in the lake to warn boaters. If you are going into the field to investigate a possible pollution problem (i.e. reported sewer overflow, etc.), be sure to take the ***"SWIMMING ADVISORY"*** signs with you and notify the Supervisor if one or more of the

conditions in 2 above are confirmed. Following approval from the Program Manager, signs can be posted prior to leaving the site.

5. Carefully document all activities in your Service Request or Cityworks Server Activity Report. This documentation shall include a complete description of all observations and lab results. The report must also contain the date and time when the ***"SWIMMING ADVISORY"*** was issued and the area posted. You must also document all follow up activities and monitoring results and indicate the date and time when the advisory was lifted. Get copies of all "Media Releases" from the Program Manager and attach to your report.

6. The Program Manager will immediately notify all interested parties by way of email including CMSWS leadership, the Outlook group Storm water Media, the Mecklenburg County Health Department, the Catawba Riverkeepers, Mecklenburg County Public Service and Information, DEQ Mooresville Regional Office, Gaston County Environmental Health, Chairman of the Marine Commission where the discharge occurred and SCDHEC.

7. The Program Manager will immediately consult with staff and issue a "Media Release."

8. Within 24 hours of receiving lab results, resampling must be performed in the area where elevated fecal coliform levels were detected (or other Action Level Exceedances) under direction from the Supervisor and Program Manager. The sampling area will be expanded to determine the full extent of contamination and all potential sources. For all resampling, notify the lab to ***RUSH*** the sample analyses and to contact you immediately when results are available which should be within 24 hours of delivery to the lab. If you don't hear from the lab in 24 hours, call them. This resampling will continue at 24 hours intervals until results fall below the Action Level and the Program Manager has lifted the ***"SWIMMING ADVISORY."***

9. Immediately upon receipt of results, notify the Supervisor and Program Manager who will make the determination, after consulting with the Health Department, as to whether the ***"SWIMMING ADVISORY"*** will be lifted at which time the signs will be removed and another media release will be issued by CMSWS. The Program Manager will also send an email containing all resampling results and the status of the swimming advisory to the above listed contacts.

10. If in doubt as to if a **"SWIMMING ADVISORY"** should be lifted or not, error on the side of caution and leave it in place until additional information can be provided.

6.7 Municipal Sanitary Sewer System

Charlotte Water owns and operates the municipal sanitary sewer system in Mecklenburg County and beyond. As of 2021, the system includes six wastewater treatment plants (one is a neighborhood-level package plant), 4,475 miles of collection pipe and 78 sewage lift stations that collect and treat an average of 91 million gallons of wastewater a day from approximately 277,000 service connections for businesses and residents throughout the region.

Charlotte Water owns and operates all sewer lines located in public streets, all feeder lines, most manholes along stream banks and sewer aerials. If staff encounter a leak or any other type of failure in any part of the sewer system owned by Charlotte Water, they are to immediately contact the Charlotte Water dispatch office at 704-378-6632 and follow the steps described in Figure 6-1 to eliminate the discharge and restore the affected area. This discharge violates both State and local ordinances; however, all notices of violation to Charlotte Water are issued by the State.

Charlotte Water provides a 1-hour response maximum time to all sewer spills, which is half the 2-hour response guideline set by the State. In accordance with State regulations, Charlotte Water maintains a record of all spills of any amount. For all spills that reach surface waters, Charlotte Water notifies CMSWS and the State by telephone within 24 hours and files a written report within five days. For all spills greater than 1,000 gallons regardless of whether they reached surface waters, Charlotte Water notifies CMSWS and the State by telephone within 24 hours and files a written report within five days. For all spills where 1000 gallons or more reaches surface waters, Charlotte Water issues a news release within 48 hours*. For all spills where 15,000 gallons or more reaches surface waters,* Charlotte Water issues a news release within 48 hours and publishes a legal ad in the Charlotte Observer *within 10 days.* By September 1 of every year, Charlotte Water produces a wastewater performance report detailing their wastewater collection and treatment system performance during the previous fiscal year, including details of all spills. The report is available on Charlotte Water's website.

6.8 Private Sanitary System Repairs

Figure 6-2: Discharge from sewer clean out.

Businesses and dwellings abutting public streets are connected to the municipal sewer system by a pipe called a lateral, which is privately owned and maintained by the property owner. The wastewater from the home or business runs into this lateral and flows to the municipal line, usually by gravity, where it is carried to a municipal wastewater plant for treatment prior to being discharged to a creek. In some cases, the municipal line is higher than the lateral and the sewage must be pumped. This pump as well as any other device connected to the lateral is also owned and maintained by the property owner. The property owner is responsible for making repairs and eliminating sewer discharges originating from any part of a private sewer system. There is usually a small pipe (4 inches in diameter) called a clean out (see Figure 6-2) that exits the ground vertically and is connected to the lateral between the house and municipal sewer line. The clean out is used to clean the lateral and free blockages and is supposed to be capped to prevent sewage from flowing out of the line in the event of a blockage. Oftentimes a property owner will remove this cap or break off the clean out pipe to allow the sewage to flow into the yard instead of back up into their home. This clean out is part of the private sewer system and the property owner is responsible for removing the blockage and replacing the cap. Sometimes the blockage is in the municipal line, but the leak occurs from a cleanout. If the blockage is in the municipal line, Charlotte Water is responsible for removing the blockage from their line and the property owner is responsible for repairing the cleanout.

Sanitary sewer collection systems located in private roads for apartment complexes, and some townhomes and condominiums, are usually privately owned. Some large commercial facilities or business parks and schools may also have privately owned sewer collection systems. These systems carry significant quantities of sewage to the municipal sewer system from multiple households or businesses or from large facilities and can include large pipes, manholes or even sewage lift stations. It is sometimes difficult to distinguish these private systems from the municipal system. Staff can access the Charlotte Water sewer infrastructure map using the ArcCollector application for verification of manholes, lines, and ownership. If the sewer discharge is originating from a private system, the owner of the apartment, townhome,

condominium, business park, etc. is responsible for the repairs. In some cases, this will be a property management company.

There are three (3) wastewater treatment plants and accompanying sanitary sewer collection systems in Charlotte-Mecklenburg that are owned by private utilities and are not connected to the municipal sewer system. These systems are permitted and inspected by the State. Any sanitary sewer system failure at these facilities is the responsibility of the private utility company that owns the system. There are two such companies operating in Charlotte-Mecklenburg, including Aqua North Carolina, Inc. and Carolina Water Service. There are two systems operated by homeowners associations and one at Berryhill Elementary that is owned by Charlotte-Mecklenburg Schools. State law requires that contact information be posted at the wastewater treatment plant. These systems are all located outside the City of Charlotte and Towns in the unincorporated area of the County. The steps described in Figure 6-1 are followed to eliminate discharges from privately owned sanitary sewer systems and restore all affected area. All sewer discharges from private systems violate both State and local ordinances and the process previously described will be used for notifying the owner of the system and issuing the appropriate Notices of Violation.

6.9 Septic System Repairs

A private wastewater treatment and disposal system called a “septic system” is often used for individual homes when municipal sewer or sewer service from a private utility is not available. In a typical septic system, wastewater flows from the house into a septic tank where settling occurs. The heavier solids (e.g., organic waste) sink to the bottom of the tank to form a sludge layer, while the lighter solids (e.g., grease, soapsuds) float to the top to form a scum layer. The clear liquid in the middle layer is the effluent (Figure 6-3).

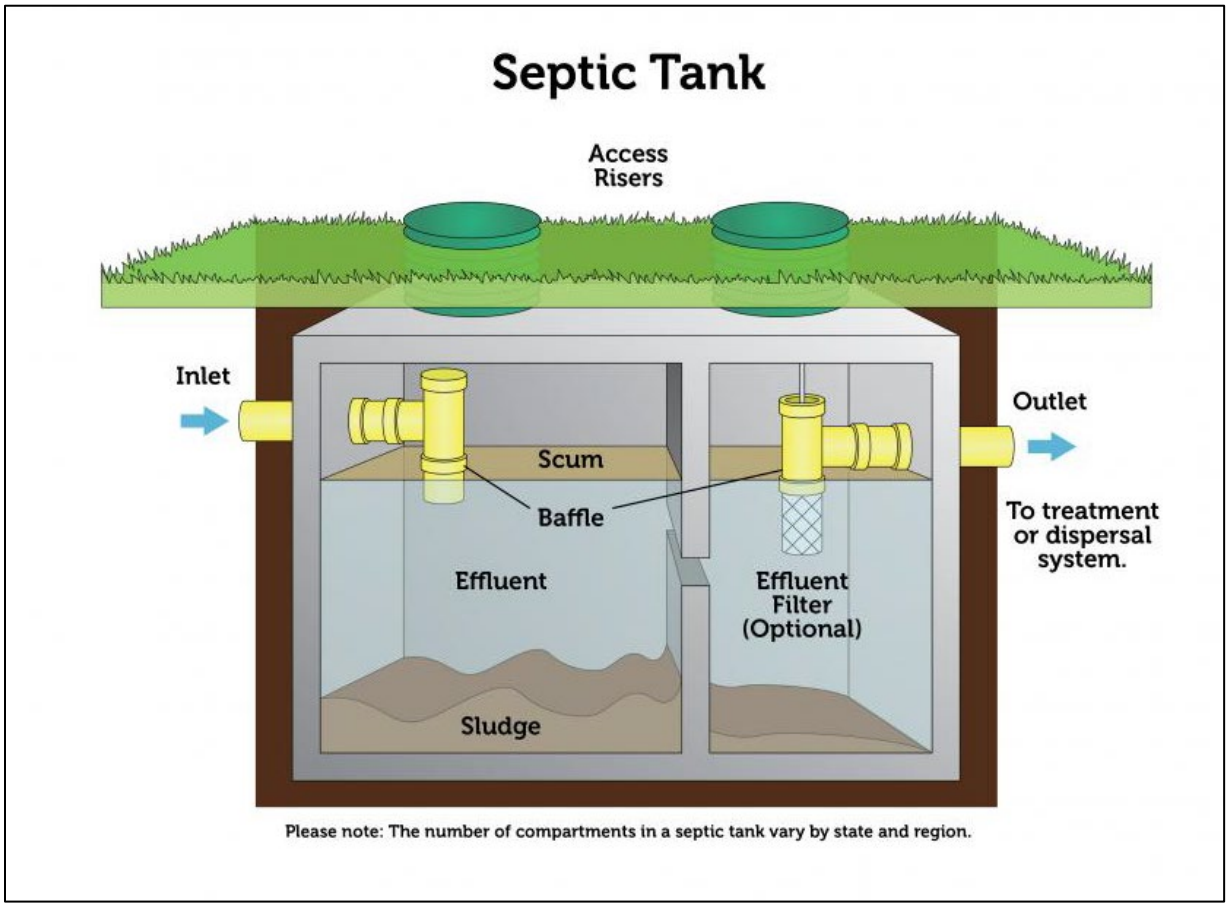


Photo from: https://www.epa.gov/septic/types-septic-systems

Figure 6-3: Common septic tank design and components.

After settling out for 24 or more hours, the effluent flows out of the septic tank to a leachfield, where it is discharged into the soil for final treatment and disposal (see Figure 6-4). If properly installed and maintained, septic systems will provide effective treatment of household sewage. However, when septic system failures occur, they can result in discharges of sewage to the surface of the ground or surface waters.

Septic systems are regulated by Mecklenburg County Groundwater and Wastewater Services (MCGWS), which is a component of the Environmental Health Division, in the Mecklenburg County Department of Public Health. CMSWS coordinates with MCGWS to identify areas where septic system failures result in discharges to surface waters and then work together to eliminate these discharges. On a quarterly basis, CMSWS maps MCGWS' data regarding locations of failures and compare it to fecal coliform monitoring data. If elevated fecal levels are occurring in areas where septic system failures are identified, then immediate follow up actions are conducted by CMSWS to identify and eliminate discharges. In addition, MCGWS will notify CMSWS if their staff observes a discharge of sewage to surface waters and work with them to

identify responsible party(s), issue a Notice of Violation and ensure correction. All sewer discharges from septic systems violate both State and local ordinances. The owner of the property is responsible for all repairs.

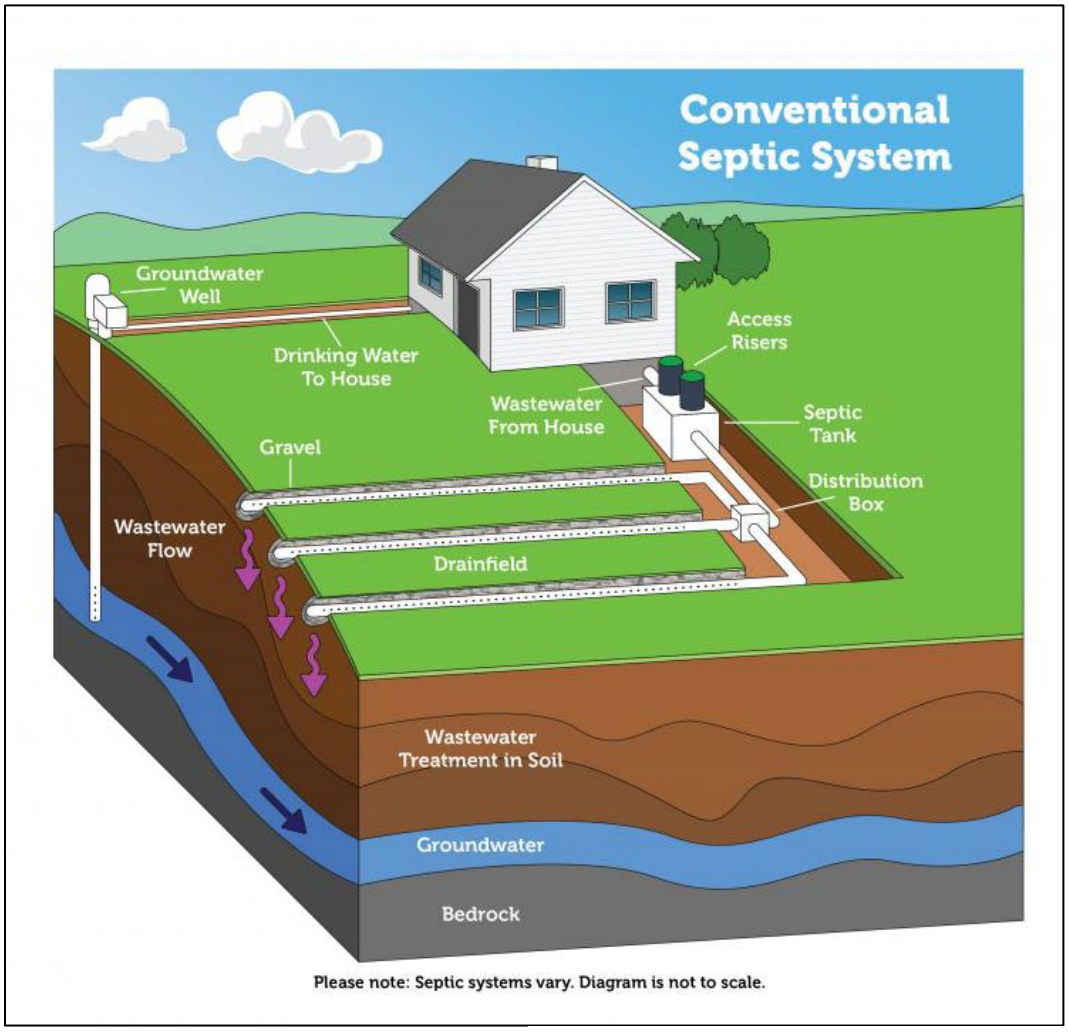


Photo from: https://www.epa.gov/septic/types-septic-systems

Figure 6-4: Conventional septic system, with a traditional drain field network.

Section 7: Documentation

7.1 Purpose

This Section describes the documentation performed by CMSWS for the Illicit Discharge Detection and Elimination Program. This includes different types of documentation, the specific information required for each, and the reports that can be generated from the Cityworks Server. Additional details about documentation are in the City of Charlotte's Enforcement Response Plan in **Appendix U**.

Proper documentation serves many purposes. It provides the information necessary to ensure the proper follow up and elimination of an illicit discharge and/or connection. It provides documentation for assessment of penalties and for taking other administrative actions to eliminate an illicit discharge such as injunctive relief by a court, etc. It provides a historical record of violators for use in the implementation of measures that discourage repeat offenders such as increased penalties, etc. It documents activities for compliance with NPDES Phase I and Phase II Storm Water Permits. Finally, it helps to assesses the effectiveness of the Illicit Discharge Detection and Elimination (IDDE) Program.

7.2 Cityworks Server

All IDDE Program documentation is stored in Cityworks Server. Cityworks Server is a "suite" of GIS-based applications and databases used by CMSWS to house and access all water quality related data, provide mobile tools for use by staff in solving environmental problems, schedule and track work load and provide a platform for report generation.

Cityworks is typically used following the identification of a discharge or connection for the purpose of accessing data and information regarding the prior history of a suspected facility that might be identified through POLARIS. The GIS component of Cityworks allows for the mapping of monitoring sites, inspection locations, citizens requests for service received and other important information for identifying potential sources. Monitoring data is also linked to Cityworks through a data repository.

Supervisors assign work related to IDDE activities using Cityworks and all data and information collected is geocoded and entered into the system by the investigator.

7.3 Inspection Report

All activities associated with the detection and elimination of illicit discharges must be thoroughly documented in Cityworks. This is extremely important if penalties or other forms of legal or administrative actions are involved. A complete Inspection Report will include the following components: inspection reports, copies of Notices of Violation, photos, maps, and sampling data.

At a minimum, Inspection Reports must include the information highlighted in red font on the inspection report template. Additional information relevant to the incident will be captured in the "General" section, along with a brief description written in the "Comments" fields. The Inspection Reports must generally include:

- How the incident was detected, including the name, address and phone number of others involved in reporting (including citizens, staff, etc.);
- The dates, exact place, and time of all inspections (a new Inspection Report should be generated for each site visit);
- The first and last name of the inspector(s) and always refer to them in the 3rd person;
- The actions taken during the investigation such as sampling, field investigation, etc.;
- The full names, titles and contact information for all contacts made during the inspection and any other activities associated with the illicit discharge or connection;
- The full names, titles and contact information for all witnesses to the incident;
- A detailed description of what was observed during the inspection, including specific locations, etc.;
- The names and locations of all surface waters impacted and locations of impacted storm sewer systems as well as the exact location(s) of the discharge point;
- The material discharged and specify the amount (attach SDS if available);
- Any techniques used to track the source of the discharge (dye test, smoke test, etc.);
- Any other information pertinent to the investigation; and
- Repeat the above steps for all follow up inspections.

7.4 Notices of Violation

The following is the process followed to create and enter an NOV into Cityworks.

Creating an NOV:

- If the NOV is generated due to a service request, then create the NOV from the Service Request so that the NOV is linked to it. Click on Create from the Service Request, and then follow the steps below.
- If NOV is not associated with a Service Request, then you will still create the NOV by clicking on Activity, then New. Under Entity Group click on Administration, under Template click on Administration, then double click on Notice of Violation. If the NOV is being issued to an entity (facility, business, etc.) that is already set up as an attribute within a shapefile in the Cityworks Server GIS mapping service, then you can select/highlight the attribute and create the NOV.
- Once the Notice of Violation template has opened, an NOV Activity Report # will automatically be generated.
- If the NOV was created from the Service Request or from an attribute within a shapefile, then the NOV should automatically geolocate to the location address, business/facility, etc. If it was not created from a Service Request or an attribute within a shapefile, then you can use the Locate tool in your Cityworks Server GIS mapping service along with the "Get from Map" function under Assets in the NOV Activity Report template.
- NOVs need to be associated with all corresponding General Inspection Activity Report(s) by entering the NOV Activity Report # into the NOV field of the General Inspection report.

Notice of Violation Activity Reports

If the title of a field in an NOV Activity Report is highlighted in red, completion of the field is required. Otherwise the field should be completed if applicable. The following describes the fields available for filling in an NOV Activity Report.

- Location: The Basin No., District, and Municipality should automatically fill in once it's geolocated. The Location Name is the actual place (facility, business, etc.) the violation occurred. The Resp. P. Name/Contact/Address is information for the Responsible Party.

- Inspected By: This field should be filled out with the inspector's name after all activities associated with the NOV are complete.

- Status: The field should be changed to say To Review or To Close upon completion and prior to submittal to be reviewed or closed.

- Submit To: This field may include the inspector's name until the inspector is ready to have the Activity Report reviewed or closed, and then the inspector should complete the Submit To field with the person's name that needs to review or close the report (Supervisor).

- Activity Type: The Activity Type should indicate the type of activity that was occurring when the violation was observed. For example: a service request, BMP inspection, industrial inspection, IDEP activity, stream walk, etc.

- Activity Stage: The Activity Stage should be left blank as there is no such thing as an initial NOV or follow-up NOV.

- Customer: The Customer is the jurisdiction in which the problem was found.

- Actual Start and Actual Finish: These will be completed based on when the violation was first observed and finish when the problem is completely resolved.

- Problem Found & Resolved: On the NOV template, the number of problems found and problems resolved should always be 0. The problems found and resolved should be tracked in the general inspection activity reports. Theoretically, the number of problems found should always equal the number of problems resolved before closing the service request.

- Service Request: This field should have a number associated with the NOV, if applicable. If it is created from a Service Request then the service request # should already be filled in.

- Activity(s): This field lists all Activity Report #'s (General Inspections, etc.) associated with the NOV.

- NOV: This field should be left blank unless an additional NOV is generated.

- Violation Observation: Use the drop-down boxes to answer the four questions related to the NOV. Use the NOV Database and/or Cityworks to see if a violator is a repeat violator.

- NOV: Use the drop-down boxes to answer the four questions, if applicable. Use the comment fields under each question to explain or clarify your answer further.
    - The Continuing NOV is only used for Erosion Control purposes.

- CAR: Use the drop-down boxes to answer the three questions, if applicable. CARs are generally issued only for violations related to BMP inspections.

- Violation Type: Cite the appropriate Ordinance that was violated based on the Activity Type and jurisdiction.

- Compliance: Complete applicable fields.

- Penalty: Applicable fields will only be completed if a penalty was issued.

After the above information has been entered into the Cityworks Server, staff complete the following:

- Complete your NOV draft and submit it to your Supervisor for review.
- Make the suggested changes and have your Supervisor sign the final.
- Scan the signed copy and mail the NOV via Certified Mail to the responsible party as well as anyone cc: on the NOV. Email Activity Report #'s to City instead of a hard copy. Attach the signed NOV to your NOV Activity Report in Cityworks.
- Make sure all information related to the NOV is up-to-date in the NOV Activity Report and any other Activity Reports (General Inspections, etc.) so they can be referenced.
- Perform a follow-up investigation by the day indicated in the NOV, if possible, (normally 10 working days) and confirm that the violation has stopped/been remediated.
- Once the written response from the violator is received, scan it and attach it to your NOV Activity Report.
- If the response and remediation of the violation are acceptable, submit the NOV Activity Report to your Supervisor to close. Your Supervisor may want you to submit the NOV Activity Report when you submit all other Activity Reports, Service Request, etc.
- If no response is received or the violation has not been corrected, a second NOV with NRE, an NOV with Notice of Penalty, or other enforcement option are possibilities (coordinate with your supervisor and the City to decide the steps forward).

Notices of Violation Attachments - Attachments to the NOV template should be limited to the actual NOV document, the certified mail return receipt, the NOV response letter, and any associated penalty documentation as applicable. All additional related attachments will reside

on the initial Activity Report. Hard copies must be scanned and attached in PDF format. Only signed NOVs should be attached.

It is important to note that anytime edits are made to a document in Cityworks, the document must be reloaded, and the former version deleted. If the file name stays the same, the system will save over the document currently attached and it will not need to be deleted.

7.5 Photos and Maps

It is very important to include digital photo documentation of the incident. A photograph(s) must be taken of the following:

1. The scene of the incident;
2. The exact point of discharges such as a broken fuel line, ruptured saddle tank, floor drain in a facility, etc.;
3. The entry point of the discharge to surface waters and/or storm drains;
4. Impacts of the discharge on surface waters and/or storm drain, including discoloration, solids, foam, oil sheen, etc.;
5. Conditions upstream and downstream of the discharge point;
6. Impacts to aquatic flora and fauna, including fish kills, dead vegetation, etc.
7. Impacts of the discharge to the surface of the ground, including dead vegetation, solids, etc.;
8. Cleanup activities; and
9. Completed cleanup with affected areas fully restored.

Photos must be attached to the Inspection Report. When directly uploading photos as an attachment, a description of the photo must be entered into the filename of the image. Photos should be referenced in the text of the Inspection Report when describing the investigation. An alternative to directly uploading photos to Cityworks is to create a narrative documenting your work in a Word document and attaching the document to the Activity Report. This gives the staff member the ability to directly correlate photos to the documenting text. This is especially useful on large discharge events where you might find Cityworks text boxes limiting your ability to document the activities thoroughly and accurately.

If a discharge entered storm drains and/or surface waters, attach an aerial map illustrating where the discharge occurred, the path of flow, any storm drains impacted, the impacted receiving streams, as well as any other environmental impacts observed, and monitoring performed. Upload the map as an attachment to the Inspection Report. Make attachments to

the Inspection Report or Service Request as appropriate. If other attachments are necessary such as a SDS, digitize and attach them as well. All attachments should be referred to in the Comments field of the Inspection Report.

7.6 Monitoring Data

Monitoring data is collected for illicit discharges for one or more of the following reasons:

1. To determine the type and source of the discharge: Short term monitoring is typically performed. Figure 4-2 above describes this monitoring.
2. To identify an unknown substance that has been discharged: This is the most difficult and costly monitoring to perform and should be avoided if possible. If this monitoring is necessary, it should be performed by the responsible party. CMSWS will perform this monitoring only when the responsible party cannot be identified.
3. To determine the extent of contamination: This monitoring is usually performed on large spills requiring extensive cleanup and should typically be performed by the responsible party. Monitoring is usually performed where the spill enters the storm drain or surface waters as well as upstream above the discharge and downstream below the mixing zone. Multiple samples may need to be collected downstream depending on circumstances.
4. To document environmental impacts for enforcement action: This monitoring is done by CMSWS. If a discharge has occurred or is suspected to have occurred, monitoring must be performed to document violations and the extent of environmental impacts. In addition, a photograph must be taken at every location where a sample is collected. If the discharge can be effectively documented using pH, temperature, dissolved oxygen, conductivity or turbidity, then the YSI Multiprobe sonde should be used in accordance with the QAPP procedures described below. Monitoring must be performed at the origin of the discharge and where the discharge enters the storm drain and/or surface waters as well as upstream and downstream of this location. Surface water sampling must be performed for all discharges even if the discharge is observed to discontinue within a conveyance such as a pipe or ditch prior to reaching surface waters.

Monitoring data will either be collected in the field using a YSI Multiprobe sonde or through the collection of water samples for laboratory analysis. All data collection must follow the policies and procedures described in the QAPP. Inspectors can use their discretion for determining the collection of field measurements; however, approval must be obtained from the Supervisor or Program Manager prior to turning in a sample to the laboratory for analysis. If the Supervisor or Program Manager cannot be reached, collect the sample and hold off on delivery to the

laboratory until approval is obtained. Be sure to maintain the chain of custody and meet all sample holding times. The nature of the sampling performed, including the type, frequency, location and parameters measured, will need to be determined on a case-by-case basis consulting with your Supervisor.

All monitoring information must be documented in the Inspection Report, including the date, time, location, person collecting samples, parameters measured, sampling technique (grab, CMANN, YSI, etc.) and reasons for sampling. All sample ID numbers should also be included in the report as well as the name of the laboratory performing the analysis. The locations of all monitoring sites should be shown on a map in relationship to the discharge location. Once data is received, it must be recorded in the Inspection Report and laboratory sheets digitized and attached. The attachment(s) should be uploaded to the Inspection Report along with a description of the attachment.

7.7 Review and Approval of Reports

After the inspector completes a service request, the service request along with all associated inspections and NOVs are forwarded to the Supervisor for review and approval. The Supervisor will review all the information contained in the Inspection Report, including all attachments. The Supervisor is reviewing for content as well as punctuation and grammar. If problems are detected, the Supervisor will forward the report back to the inspector for correction. Following correction, the inspector sends the Inspection Report back to the Supervisor. This process continues until the Supervisor approves and closes the Inspection Report.

7.8 Accessing Reports in Cityworks

The reports associated with the IDDE Program are contained in Cityworks and are referred to as "Activity Reports." There are thousands of Activity Reports in Cityworks; therefore, in order to access a particular report, you must complete an Activity Report search. There are many methods for searching Activity Reports but the most commonly used include searching by ID numbers, the work history of a specific feature, an address or street, and an open search on select fields. The following sections describe these searches and additional information can be found in the Cityworks SOP (**Appendix ZZ**).

7.8.1 Searching for Inspection Reports by ID Number

On the Cityworks toolbar, click "Activity" and this will open the internal search function. In the Search window, enter the appropriate Activity Report number in the "Inspection

ID(s)" field. Alternatively, the Activity Report number can be typed in the window next to the login information. Cityworks will then open the specified Activity Report.

7.8.2 Searching for the Work History of a Specific Feature

If the ID number is not known, you can perform a GIS search to find all activities associated with a specific feature. First, you will need to select the specific feature:

1. On the Cityworks Server toolbar, click "GIS Search."
2. In the GIS Search window, select the appropriate Entity Group (Administration, Assets, Education, Inspections, and Monitoring) and Entity (the choices available will depend upon what you selected in the Entity Group option).
3. The resulting search window will allow you to select or enter certain attributes. These choices are based on the entity that is selected. Once you have entered your search criteria, click "Search".
4. Candidates that meet your search criteria will be displayed. Highlight the asset in which you're interested (do not click on the underlined OBJECTID; this will open the attributes of the asset). Then click on the barricade icon; this will open the asset's work history.
5. Cityworks will generate a tabbed list of Requests, Inspections, Work Orders, Assets, and Permits associated with the asset. You can click the different tabs to view the different types of search results. Click on the underlined ID number to open an activity report.

7.8.3 Searching History by Location

You may want to try a location search to find all historic activities that have occurred within a specific area. The easiest way to do this is using the Cityworks Map and the **Navigation tool**, found in the "Tools" menu.

1. Open the map service in Cityworks. Zoom to the area that you would like to search on your screen. Cityworks uses an internal extent calculator based upon your current zoom level.
2. Using the **Navigation** tool, be sure that the tool is expanded to show all options, click on the item you would like to search (Request, Inspections, or Asset History).
3. This will take you to the internal search function with the X&Y extent specified. You can then select additional options to help you narrow your search.

7.9 Documentation of Enforcement Actions

All enforcement actions are documented through digital files. No hard files are maintained. A description of the information contained in these files is provided in Table 7-1. These files are established on the LAN by the assigned inspector and reviewed/approved by their supervisor as attachments to the NOV Activity Report. Specific information regarding the Notice of Violation and enforcement action is entered in the "Custom Fields" section of the NOV Activity Report by the assigned inspector and reviewed/approved by their supervisor. Reports will be developed from these custom fields to summarize and track notices of violation issued and enforcement actions initiated.

Table 7-1: Information to be Contained in Digital Files for Enforcement Actions

Information Type
1. Inspection Reports
2. Pictures (showing violations and compliance) – All pictures must be dated
3. Notices of Violation (NOV)
4. Continuing Notices of Violation (CNOV)
5. Notice of Violation with Immediate Penalty (NOVP)
6. Penalty FAXes
7. Penalty Assessment Report (PAR)
8. Determination of Fine Amount
9. Notice of Penalty Assessment
10. Documentation of Penalty Assessment Conference
11. Request for Remission of the Civil Penalty
12. Copy of Check for Payment of Penalty
13. Documentation of Mitigation Measures Completed in Lieu of the Penalty
14. All correspondence with the violator, including response letters, emails, meeting minutes, etc.
15. Any other information relevant to the investigation and enforcement process.

Section 8: Assessment and Evaluation

8.1 Purpose

The purpose of assessing and evaluating the Illicit Discharge Detection and Elimination Program is to determine if it is effective at identifying and eliminating illicit discharges and restoring water quality conditions as well as to identify specific actions that can be taken to improve the Program. The Illicit Discharge Detection and Elimination Program operates under an adaptive management philosophy; therefore, once improvements have been identified, they are implemented as quickly and effectively as possible.

Program effectiveness is generally measured by observed improvements in measured water quality and the number of water quality issues identified and eliminated.

8.2 Adaptive Management

Several factors influence both the Program and Water Quality Measures described above, many of which are in no way associated with the Illicit Discharge Detection and Elimination Program. For example, the reporting of pollution problems can be affected by various factors and water quality can change significantly with weather conditions. Therefore, no one measure can stand alone but instead they must be evaluated as a whole and in consideration of outside influences before any conclusions can be drawn, and even these conclusions can be questionable. It is also important to look at long term trends for patterns. This is all taken into consideration by the Program Manager and Supervisors when they evaluate the Program and Water Quality Measures during meetings. Additional data and information are gathered, as necessary, regarding those measures that fail to meet their established goal. This information is used to develop Action Plans for addressing Program deficiencies that prevent goals from being achieved. Supervisors are responsible for implementing these Action Plans for their assigned areas.

8.3 Evaluation Metrics

Program implementation success and effectiveness are generally measured by observed improvements in measured water quality and the number of water quality problems identified and eliminated. Some of the metrics used to determine success and effectiveness include:

- Number of illicit discharges identified and reported
- Number of illicit discharges eliminated
- Improvements in surface water quality conditions
- Number of stream miles assessed

- Number of outfalls inspected and dry weather flows detected/monitored
- Number of employees educated/trained

Data to answer these questions is collected and evaluated annually by the City of Charlotte, Mecklenburg County and the Towns as part of the annual reports for NPDES and Total Maximum Daily Load (TMDL) regulations.

For Mecklenburg County and the Towns, there are two measures of success for the IDDE Program as described below. These measures are assessed and reported annually to NCDEQ through the Annual reporting process. Program improvements are identified and implemented as necessary.

1. Increasing Pollution Problems Identified – Mecklenburg County tracks the ratio of the number of notices of violation issued to the number of IDDE inspections conducted with an increase from the previous fiscal year serving as an indicator of the success of efforts to find and eliminate pollution sources.
2. Repeat Violators Minimized (added in FY2021) – Mecklenburg County tracks the percentage of written Notices of Violation issued to repeat violators compared to the average of the percentages for the past three (3) fiscal years with a percentage equal to or less than this average serving as an indicator of success.