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## **Dry Weather Screening of Stormwater Outfalls in Austin, Texas for Municipal Separate Storm Sewer System (MS4) Permit Year 2017-2022**

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### **Abstract**

*The City of Austin's (COA) Watershed Protection Department (WPD) conducted dry weather screening as part of the Texas Pollution Discharge Elimination System (TPDES) Municipal Separate Storm Sewer System (MS4) permit in September of 2017. Screening was conducted during dry periods where less than 0.1 inches of rain fell within the previous 72 hours. Outfall selection criteria were pipes with diameters greater than 36 inches, within 50 feet of a named creek and within the full purpose COA jurisdiction. Based on these specifications 503 outfalls were selected for the 2017 permit year (Appendix A). Of the 503 outfalls screened, 18 were found to have discharges greater than 1 gallon per minute (gpm), 71 had a discharge of less than 1 gpm, 58 were submerged and 27 were not found or were duplicates. The remaining 329 outfalls, approximately 65% of the MS4, were dry with no evidence of recent flow. Samples were collected at outfalls with measurable discharges greater than 1 gpm, and tested for chlorine, ammonia, temperature, pH and E.coli. When the threshold for chlorine (>01. mg/L), ammonia (>0.2 ppm) or pH (outside 6.5-9) were exceeded the COA Spills & Complaints Response Program (SCR) staff were notified and conducted follow-up investigations. When E.coli results were greater than 400 mpn/100 mL, follow up investigations by the Surface Water Team (SWT) were initiated.*

### **Introduction**

The general topography of Austin is characterized by a large number of natural creeks and tributaries that serve as primary conveyance of stormwater through the city. For this reason, the

typical storm sewer pipe system is short in length and serves to carry stormwater runoff from a limited drainage area and to the nearest waterway. The result is a municipal separate storm sewer system (MS4) that is comprised of numerous small pipe networks and many outfalls.

The City of Austin follows a comprehensive Stormwater Management Program (SWMP), outlined in the MS4 permit, that includes pollution prevention measures, treatment or pollutant removal techniques, stormwater monitoring, use of legal authority, and other appropriate means to control the quality of stormwater discharged from the MS4 that reach Waters of the United States as defined by Texas Commission on Environmental Quality (TCEQ). The SWMP effectively prohibits the discharge of non-stormwater into the MS4, and reduces the discharge of pollutants in stormwater from the MS4 to the maximum extent practicable.

To effectively prohibit illicit discharges to the MS4, the City of Austin uses a series of ordinances. The city code sections that address illicit discharges are as follows:

- Title 6, Chapter 6-5. Water Quality regulations of the Austin City Code contain regulatory language that prohibits non-stormwater discharges into storm sewers or water courses and provides requirements for pretreatment, monitoring and specifications related to specific activities. In addition, provisions for inspection by the City and penalties due to violations are included in this chapter.
- Title 25, Chapter 25-8. Environmental code contains language that prohibits illegal connections to the MS4 or any other illicit discharges at newly constructed facilities.

The Dry Weather Screening program seeks to protect the water quality of streams and related natural resources in Austin by targeting illicit discharges to the MS4. Discharges may occur through illicit plumbing connection, deliberate dumping or accidental spills of hazardous and non-hazardous materials. This program works to reduce the number of these discharges by identifying, tracking and eliminating illicit connections or sources and enforcing state and local statutes regarding illegal discharges.

The City of Austin has participated in dry weather screening efforts in one form or another for over 20 years. Throughout that time the program has evolved along with the city to address the growing demand on the MS4. As new outfalls are added and areas of concern have shifted, screening efforts have changed to ensure compliance with the MS4 permitting requirements. The information gathered through Dry Weather Screening is used to generate follow-up investigations. When an illicit discharge is found, City of Austin Spills & Complaints Response Team (SCRPT) works with responsible party(s) to obtain voluntary compliance with City Code requirements.

## **Methods**

During dry weather periods (no rainfall >0.1 inches in the previous 72 hours) and during summer months (generally June- September), Surface Water Evaluation (SWE) staff screen a representative number of stormwater outfalls within the City of Austin MS4 during the five-year permit term. 503 stormwater outfalls were selected for review in 2017 based on the following criteria:

- Outfalls with a diameter of 36" or greater
- Within 50' of a named creek

- Within the full purpose COA jurisdiction

Once an outfall was located, the physical descriptions, listed below, were recorded in an ArcCollector interface, using staff cell phones and/or COA iPads.

- Flow description: Dry Pipe, Trickle, Submerged, Flow >1 gallon per minute
- Estimated flow rate in gallons per minute (gpm)
- Structural condition: Normal, Cracking/Spalling, Excessive Erosion, Metal Corrosion, Other
- Diameter or dimensions of outfall in inches
- Vegetation: Normal, No Vegetation, Inhibited Growth, Excessive Growth, Other
- Odor: Musty, Sewage, Rotten Eggs, Sour Milk, Other
- Clarity: Clear, Cloudy, Opaque, Suspended Solids, Oily, Other
- Floatables: None, Oily Sheen, Garbage, Sewage, Surface Scum, Other

If the flow rate at an outfall exceeds approximately 1 gpm, two water quality samples were collected. The first sample was tested in the field for screening parameters using the following equipment:

- ExTech Instruments ExStik pH/Temperature probe model #PH100
- HACH Water Quality Test Strips for Ammonia Cat. 27553-25
- CHEMets Kit Chlorine K-2504

If screening parameter values listed below were exceeded, indicating leaking wastewater or drinking water, SCRIP staff were notified of the results and were responsible for follow-up investigations.

- Chlorine >0.1 mg/L
- Ammonia >0.2 ppm
- pH outside 6.5-9

A second sample was collected in a 100 mL plastic bottle containing sodium thiosulfate and preserved on ice for E.coli analysis. The bacteria samples were delivered to the Surface Water Team (SWT) lab for processing within 8 hour of collection. SWT staff were responsible for receiving the sample, analyzing, and storage of data. Outfalls with bacteria results greater than 400 mpn required follow-up investigations by SWT staff following the Bacteria Source Tracking Program ([Davis and Clamann 2015](#)).

## **Results**

Screening of the 503 outfalls found 18 with discharges greater than 1 gpm, 71 of less than 1 gpm, 58 submerged and 27 that were not found or were duplicates. The remaining 329 outfalls, approximately 65%, were dry with no evidence of recent flows. Of the 18 found with flows greater than 1 gpm, 6 had elevated levels of ammonia and/or chlorine, 3 had elevated levels of E.coli and 1 had both elevated levels of E.coli and ammonia. These 10 outfalls requiring follow-up investigations account for approximately 2% of all outfalls screened. The remaining 8 outfalls that did not require a follow-up investigation are believed to be the result of elevated ground water levels caused by heavy rains from hurricane Harvey approximately a week before screening began.

Below are the 10 outfalls that were found to have flow rates greater than 1 gpm with elevated levels of ammonia, chlorine, and/or E.coli, the results of follow-up investigations and plans moving forward.

- Waller Creek

- Outfall ID 87393: In-channel, upstream of 51<sup>st</sup> Street

- Flow Rate: 3 gpm
    - Structural Condition: Normal
    - Diameter/Dimensions: 42” Circular
    - Vegetation: None
    - Odor: None
    - Clarity: Clear
    - Floatables: None
    - Temperature: 27.5°C
    - pH: 7.91
    - Ammonia: Non-Detect
    - Chlorine: Non-Detect
    - E.coli: >2419.6 mpn

No resolution was found in the follow-up investigation. This outfall is currently being monitored by SWT staff under the Bacteria Source Tracking Program and will be further investigated in 2018.

- Outfall ID 70167: In-channel on the University of Texas campus at the corner of Deloss Dodds Way and San Jacinto Blvd.

- Flow Rate: 8 gpm
    - Structural Condition: Normal
    - Diameter/Dimensions: 42” Circular
    - Vegetation: None
    - Odor: None
    - Clarity: Clear
    - Floatables: None
    - Temperature: 23.6°C
    - pH: 8.43
    - Ammonia: 0.25 ppm
    - Chlorine: Non-Detect
    - E.coli: 201.4 mpn

SCRIP staff investigated the discharge and discovered the flow originating from a parking garage sump pump that was combined with municipal water from irrigation. No corrective action was initiated.

- Shoal Creek

- Outfall ID 86569: In-channel, upstream of Northland Dr.

- Flow Rate: 7 gpm
    - Structural Condition: Normal

- Diameter/Dimensions: 54" Circular
- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 22.3°C
- pH: 8.16
- Ammonia: 0.25 ppm
- Chlorine: Non-Detect
- E.coli: 298.7 mpn

SCRIP staff investigated the discharge and discovered the cause of the flow to be municipal water from irrigation activities in the area. No corrective action was initiated.

- Outfall ID 573305: Downstream of West 34<sup>th</sup> St. at the corner of Shoal Creek Blvd.

- Flow Rate: 10 gpm
- Structural Condition: Normal
- Diameter/Dimensions: 84" Box Culvert
- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 23.5°C
- pH: 8.46
- Ammonia: Non-Detect
- Chlorine: 0.01 ppm
- E.coli: >2419.6 mpn

No resolution was found in the follow-up investigation. This outfall is currently being monitored by SWT staff under the Bacteria Source Tracking Program and will be further investigated in 2018.

- Carson Creek

- Outfall ID 375368: Downstream of East Ben White Blvd.

- Flow Rate: 2 gpm
- Structural Condition: Normal
- Diameter/Dimensions: 84"X56" Box Culvert
- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 28.5°C
- pH: 8.52

- Ammonia: 0.25 ppm
- Chlorine: Non-Detect
- E.coli: 58.3 mpn

SCRIP staff investigated the discharge and found no dry weather flow at the time of investigation.

- Tannehill Creek

- Outfall ID 246492: In-Stream on Givens Park One Tributary of Tannehill Creek downstream of Tom Miller St.

- Flow Rate: 2 gpm
- Structural Condition: Normal
- Diameter/Dimensions: 108”X60” Box Culvert
- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 25.3°C
- pH: 8.26
- Ammonia: 0.25 ppm
- Chlorine: 0.01 ppm
- E.coli: 307.6 mpn

SCRIP staff investigated the discharge and found no dry weather flow at the time of investigation.

- Fort Branch

- Outfall ID 480032: In-Stream, upstream of Webberville Rd.

- Flow Rate: 5 gpm
- Structural Condition: Normal
- Diameter/Dimensions: 42” circular pipe
- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 22.5°C
- pH: 8.40
- Ammonia: Non-Detect
- Chlorine: Non-Detect
- E.coli: 488.4 mpn

The E.coli level, while elevated, were not enough to trigger an immediate follow-up. SWT staff will continue to monitor, and the outfall has been added to the Austin Youth River Watch volunteer monitoring list for 2018.

- Marble Creek

- Outfall ID 148573: In-stream, upstream corner of Colton Bluff Springs Rd. and Alum Rock Dr.

- Flow Rate: 1.5 gpm
- Structural Condition: Normal
- Diameter/Dimensions: 42” Circular Pipe
- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 25.0°C
- pH: 7.79
- Ammonia: 0.25 ppm
- Chlorine: Non-Detect
- E.coli: 222.4 mpn

SCRIP staff investigated the discharge and found no dry weather flow at time of the investigation.

- Town Lake (Ladybird Lake)

- Outfall ID 103154: North bank underneath Congress Ave. Bridge.

- Flow Rate: 10 gpm
- Structural Condition: Normal
- Diameter/Dimensions: 78” Circular Pipe
- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 27.2°C
- pH: 7.93
- Ammonia: 0.50 ppm
- Chlorine: Non-Detect
- E.coli: >2419.6 mpn

SCRIP and SWT staff investigated the outfall and found no evidence of leaking infrastructure. This outfall drains most of downtown Austin along Congress Ave. and is believed the indigent community is a major source of fecal contamination in this area. It is common practice for businesses to power wash alley ways afterhours and the runoff is directed to this outfall. No further action is planned at this time.

- Lake Creek

- Outfall ID 149207: Downstream of Lake Creek Pkwy

- Flow Rate: 30 gpm
- Structural Condition: Normal
- Diameter/Dimensions: 52” Circular Pipe

- Vegetation: None
- Odor: None
- Clarity: Clear
- Floatables: None
- Temperature: 28.8°C
- pH: 7.22
- Ammonia: 0.25 ppm
- Chlorine: Non-Detect
- E.coli: 157.6 mpn

SCRIP staff investigated the discharge and discovered the flow originating from AC condensate from commercial and multi-family residences in the area combined with municipal water from irrigation activities. No corrective action was initiated.

## **Discussion**

The dry weather screening field effort was greatly scaled back from 2016 (3521 outfalls) compared to 2017 (503 outfalls) due to the relatively few illicit discharges found with a large amount of staff time and logistical effort. Of those outfalls screened in 2016, 9 had flows greater than 1 gpm, of those, 2 (Outfall ID 86358 and 298725) resulted in corrective actions. The 2 outfalls that resulted in corrective action account for approximately 0.06% of all outfalls screened.

2017 screening efforts were reduced to outfalls that pose a greater risk of illicit discharge based on size, proximity to creeks and drainage area. Out of the 503 outfalls screened only 3, (Outfall ID 87393, 573305 and 480032), or approximately 0.6%, remained unresolved and required ongoing investigations. Over the next year the data generated by these investigations will hopefully result in corrective actions that will eliminate these illicit discharges.

Many of the outfalls screened in both 2016 and 2017 were in newer residential areas with little probability of illicit connections or discharges. Moving forward, WPD will utilize geospatial data to increase accuracy in predicting and locating illicit discharges. These mapping tools, called Heat Maps, use certain risk factors such as age of infrastructure, land use and past compliance complaints to isolate Illicit-Discharge Potential (IDP) (Bender et al., 2017). These risk factors have been shown to be statistically effective at predicting IDP and can result in a significant reduction in time and resources.

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**Appendix A:** TPDES 2017 Dry Weather Screening Map

