CORRESPONDENCE/MEMORANDUM

State of Wisconsin

DATE: March 15, 2012

TO: SW Program Staff

FROM: Pam Biersach – Bureau Director
Bureau of Watershed Management

SUBJECT: Program Guidance #3800-2012-01

Illicit Discharge Detection and Elimination

March 2012
3800-2012-01

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A. Statement of Problem Being Addressed

Limited information is available to assist municipalities with the development of an effective program to determine the presence of illicit discharges from storm sewer system outfalls.

B. Background

State and federal storm water discharge regulations require permitted municipal separate storm sewer systems (MS4s) to develop, implement and enforce a program to detect and remove illicit connections and discharges to the MS4. In Wisconsin, this requirement is established in s. NR 216.07(3), Wis. Adm. Code. The program must include routine dry weather field screening at storm sewer system outfalls and procedures for locating the source of known or suspected illicit discharges. If flow is observed, a combination of sensory observations and indicator parameter sampling must be used to determine the presence of illicit discharges and assist in the tracking, location and elimination of sources.

C. Discussion

Section NR 216.07(3)(i), Wis. Adm. Code, requires that field screening is conducted at all major outfalls and any additional outfalls designated by the municipality or Department. Field screening must include the following when flow is observed:

- Narrative descriptions of color, odor, turbidity, oil sheen, surface scum, flow rate and other relevant observations.

- Sampling for pH, total chlorine, total copper, total phenol and detergents unless Department

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approval has been obtained for alternative parameters such as ammonia, potassium or bacteria.

The combination of sensory and indicator parameters is intended to provide insight regarding the presence and potential sources of illicit discharges. However, ch. NR 216, Wis. Adm. Code does not identify specific discharge limits, action levels or other criteria that should be used to determine if an illicit discharge is either present or absent. In addition, ch. NR 216, Wis. Adm. Code does not address the following:

- Selection of outfalls for on-going field screening after the initial major outfall field screening has been completed.
- Frequency and timing of outfall field screening activities.
- Outfalls with baseflow consisting of groundwater and other non-illicit discharges.
- Submerged,enclosed, or otherwise inaccessible outfalls.
- Outfalls from pumped storm water systems.
- Outfalls from swale conveyance systems and storm water treatment practices.
- Proper documentation and evaluation of outfall field screening activities.

The purpose of this guidance document is to provide supplemental information that can be used by MS4 owners and operators to maximize the efficiency and effectiveness of illicit discharge detection and elimination programs.

D. Guidance

Outfall Selection

Currently, MS4 permits include a requirement that field screening is initially conducted at all major outfalls[1]. However, a more targeted approach to illicit discharge detection and elimination (IDDE) is recommended. Outfalls should be prioritized based on illicit discharge potential in the contributing drainage area rather than solely on pipe or drainage area size. Outfalls selected for on-going field screening based on illicit discharge potential are considered "priority outfalls". Contributing drainage area characteristics or land uses that should be considered when selecting priority outfalls include:

- History of known or suspected illicit discharges reported within the last five years
- Sections of storm sewer and/or sanitary sewer infrastructure that have exceeded or are approaching their design/useful life.
- Contributing drainage areas with 80 or more percent imperviousness.

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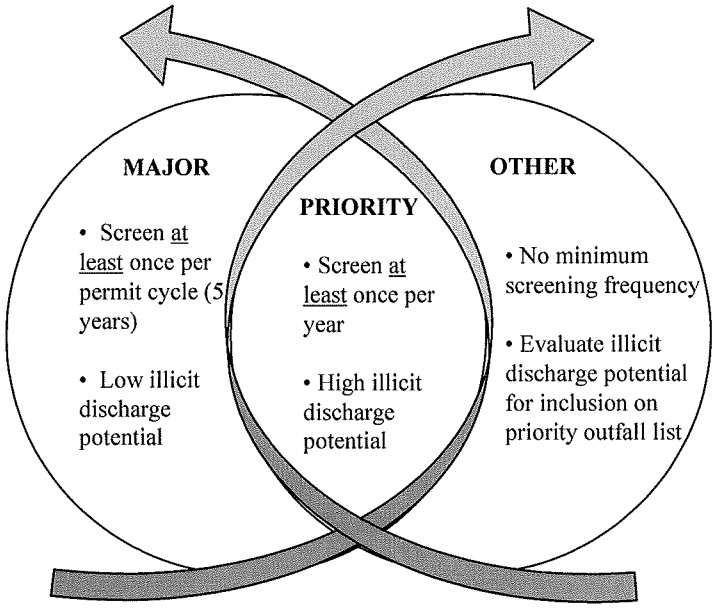
[1] "Major outfall" means a municipal separate storm sewer system outfall that meets one of the following criteria:
(a) A single pipe with an inside diameter of 36 inches or more, or from an equivalent conveyance which is associated with a drainage area of more than 50 acres.
(b) A single pipe with an inside diameter of 12 inches or more, or from an equivalent conveyance which receives storm water runoff from lands zoned for industrial activity with 2 or more acres of industrial activity.

- Business or industrial parks with frequent changes in property ownership or operations.
- Schools or other institutional facilities.
- Commercial or industrial operations that generate wastewater or wash water including food processing, metal plating or machining shops, auto and scrap recyclers, commercial car washes and chemical manufactures or users.

Frequency

The recommended approach to outfall field screening frequency is depicted in Figure 1. All priority outfalls should be screened at least once per year. In some cases, it may be appropriate to conduct more than one field screening per year at a particular priority outfall depending on initial screening results or illicit discharge potential. All other major outfalls not identified as priority outfalls should be screened at least once during each MS4 permit cycle (i.e., 5 years). The priority outfall list should be reviewed and modified if necessary during an annual program evaluation.

Figure 1 - Outfall Field Screening Frequency



Timing

Outfall field screening must be conducted during dry weather periods to minimize potential interference from non-illicit sources including runoff and groundwater. In general, field screening should not be conducted within 48 hours after a precipitation event that produces runoff. However, it may be necessary to wait longer than 48 hours after precipitation events depending on contributing drainage area characteristics, the presence of extended discharges from stormwater facilities or the size of the event. Field screening during periods of high groundwater, such as the early spring, should be avoided. However, spring or fall screening may be necessary if outfall access is significantly obstructed by vegetation.

Sensory Parameters

Obvious illicit discharges can potentially be identified by color, odor or other physical characteristics such as sheen or foam. However, proper interpretation of sensory observations can be complicated by the fact that some sources are naturally occurring (e.g., iron bacteria) or non-illicit (e.g., dye testing).

Chapter 11 of the Center for Watershed Protection's guidance manual for illicit discharge detection and elimination includes photos of common physical indicators for illicit and non-illicit sources. The entire manual can be downloaded from the USEPA website at http://www.epa.gov/npdes/pubs/idde_manualwithappendices.pdf

Indicator Parameters

Indicator parameter sampling is necessary to confirm sensory observations or distinguish illicit from non-illicit discharges. The following parameters are recommended for all observed discharges: **Ammonia, Detergents, pH and Total Chlorine**. Based on MS4 or outfall specific conditions, the following additional parameters should be considered:

- **Total Copper** in areas where industrial facilities that use or manufacture copper-based products are present.
- **Phenol** in areas where industrial facilities that utilize phenol in processes or products are present.
- **Potassium** when discharges of industrial wastewater or sanitary sewage are suspected.
- **Fluoride** when discharges with a drinking water supply component are suspected.
- **E. coli or Bacteriodes** when discharges of sanitary sewage are suspected.

The recommended parameters for all observed discharges are a deviation from the parameter lists identified in ch. NR 216, Wis. Adm Code and MS4 permits. Permitted MS4s should submit modified parameter list proposals to the Department for approval prior to implementation.

Test Methods

In order to provide relatively rapid results, indicator parameters should be analyzed using field test kits. However, field test kits should be used by staff with appropriate training and experience. Laboratory analysis is necessary for some parameters (e.g., E. coli, Bacteriodes) and recommended in cases where enforcement action may be necessary to eliminate illicit discharges or connections.

Action Levels

Recommended action levels for indicator parameters are found in Table 1. Sample results above these levels suggest the presence of an illicit discharge is likely. However, illicit discharges or connections should not be automatically ruled out in cases where parameters are detected below the recommended action levels. In some instances, illicit discharges can be masked by non-illicit sources depending on the time of the year, recent precipitation events, or other conditions, especially at outfalls with large

contributing drainage areas. With this in mind, the recommended action levels should be considered as starting points for decision making. Ultimately, identifying outliers to expected or past levels may be more important when determining if further investigation should be initiated. To determine when an outlier has been detected, each MS4 should maintain a database (or equivalent record) of indicator parameter test results for individual outfalls or groups of outfalls.

TABLE 1 – Indicator Parameters Action Levels

Parameter	Action Level	Illicit Sources	Non-Illicit Sources
Ammonia	0.1 mg/l	Sanitary sewage and industrial wastewater	Pets, wildlife and potentially WPDES permitted discharges
Detergents	0.5 mg/l	Industrial cleansers, commercial wash water and sanitary sewage	Residential car washing
pH	Less than 6 or greater than 9	Industrial wastewater and concrete truck wash-out	Groundwater and WPDES permitted discharges
Total Chlorine	Detection or positive test unless associated with a WPDES permitted discharge at background water supply levels	Industrial wastewater, swimming pools and sanitary sewage	WPDES permitted discharges
Total Copper	0.1 mg/l	Copper-based product use and manufacturing	WPDES permitted discharges
Phenol	Detection or positive test	Chemical, textile, paint, resin, tire, plastic, electronics and pharmaceutical manufacturing	None
Fluoride	Detection above background groundwater or water supply levels	Commercial and industrial wastewaters with a water supply component	Groundwater and WPDES permitted discharges
Potassium	10 mg/l	Sanitary sewage and industrial wastewater	Groundwater and WPDES permitted discharges
E. coli	10,000 MPN/100 mL	Sanitary sewage	Wildlife and pets
Human Bacteriodes	Detection or positive test	Sanitary sewage	None

Additional considerations for some of the indicator parameters are as follows:

- Field test methods for **detergents** are generally considered qualitative (i.e., positive or negative) tests. Some detergent test methods produce bubbles or a gel like substance that can be misinterpreted as a positive test for detergents. In addition, specific detergent test methods, such as the MBAS method, may not be capable of detecting all classes of detergents. Another potential

issue with detergent testing is distinguishing non-illicit discharges associated with residential car washing from illicit discharges.

- **Chlorine** residuals are typically short lived in the environment. Detection of chlorine at an outfall generally indicates a source that is relatively close to the outfall. However, chlorine detected at an outfall can be from an illicit or non-illicit source if chlorinated municipal drinking water supply is a component of the discharge (see "Non-Illicit Sources").

- Leaching of **copper** from plumbing systems can be a source of copper even in areas where copper-based product use or manufacturing does not occur.

- Municipal drinking water supply systems that add **fluoride** typically maintain levels between 1 and 1.5 mg/l.

- **E. coli** is a commonly used sanitary sewage indicator. However, dry weather flow outfall monitoring in Wisconsin and other states indicates that E. coli levels are highly variable and can be produced by naturally occurring, non-illicit sources in the environment such as raccoons in storm sewers. Elevated dry weather E. coli levels in conjunction with detection of other indicator parameters (e.g., detergents, total chlorine) may be more indicative of the presence of sanitary sewage.

- The ratio of human **Bacteriodes** to total Bacteriodes may be particularly useful in determining sanitary sewage sources. However, the availability of Bacteriodes testing may be limited.

Non-Illicit Sources

Indicator parameters can be detected from non-illicit sources such as groundwater inflows, non-contact cooling water discharges or other WPDES permitted discharges from commercial and industrial facilities:

- Groundwater: Flow rates associated with groundwater inflows can vary seasonally due to fluctuations in groundwater elevations. Groundwater inflows are typically highest in the early spring and lowest in the late summer. In some areas, groundwater inflows will also include natural levels of fluoride. Baseline conditions for outfalls with groundwater inflows can be established by documenting seasonal flow rates and/or fluoride levels over time. If baseline conditions have been established for an outfall, sampling for other indicator parameters can be avoided if flow rates and/or fluoride levels are consistent with the established baseline values.

- Permitted Facilities: In some areas, WPDES permitted industrial facilities are allowed to discharge wastewater to MS4s as long as discharge limits are met. These discharges can produce continuous or nearly continuous flows at outfalls. WPDES permitted discharges are considered non-illicit but can include one or more of the indicator parameters at detectable levels. In many cases, municipal drinking water supply is a component of WPDES permitted discharges and it may be difficult to distinguish non-illicit from illicit sources in these areas. However, establishing baseline flow rates and parameter levels for outfalls with WPDES permitted discharges is recommended. If necessary, the Department can assist in the identification and characterization of WPDES permitted discharge, including discharge limits.

The Department maintains a listing of current WPDES permit holders online:

- **WPDES Wastewater Permittees**
  http://dnr.wi.gov/org/water/wm/ww/permlists.htm
- **WPDES Industrial Storm Water Permittees**
  http://dnr.wi.gov/runoff/stormwater/industrial/

Submerged & Enclosed Outfalls

It may be difficult or impossible to conduct outfall field screening activities at outfalls that are fully or partially submerged by receiving waters or located within enclosed waterways. For these cases, field screening activities should be conducted at appropriate upstream manholes. On-site illicit connection inspections should be considered for any high risk facilities that can potentially discharge to the MS4 between the outfall and field screening manholes. Another option to consider is televising the storm sewer segments located between field screening manholes and the outfall.

Physically Interconnected Systems

One MS4 that discharges directly to a second MS4 is considered physically interconnected. The point of interconnection is considered an outfall from the upstream or discharging MS4. Although field screening activities should be conducted by the upstream MS4 at the point of interconnection, it may be appropriate for interconnected MS4s to coordinate and potentially consolidate field screening activities.

Pump Stations

For pumped storm water systems, field screening activities should be conducted at appropriate manholes located upstream from the pump station or intake. If the first upstream manhole from the pump station is submerged, the pump should be operated if possible to remove accumulated water from the storm sewer system prior to conducting field screening activities.

Swales Conveyance Systems

For swale conveyance systems, it may be appropriate to conduct a visual or "windshield" survey within the swale area in conjunction with or as an alternative to field screening at the outfall. Locations where piped systems discharge to swales should be targeted during windshield surveys.

Storm Water Practices

Wet detention basins and other storm water treatment practices can potentially mask the presence of illicit discharges from the storm sewer system. Field screening activities should be conducted at inlets to storm water treatment practices rather than from the outlet. However, the size and location of practices can be considered when determining if field screening at inlets is necessary.

Documentation and Program Evaluation

Written or electronic documentation of all outfall screening activities should be kept. At minimum, the documentation should identify the following items for each outfall:

- Outfall location & description
- Inspector name
- Date of inspection
- Date & amount of last rainfall
- Weather conditions
- Narrative description of all sensory observations and flow rate estimates
- Test results for all indictor parameter sampling
- Narrative description of potential or confirmed illicit discharge sources and actions taken to track and eliminate sources.
- Additional comments or observations

As suggested in the "Action Level" section, it is important to develop and maintain a field screening database (or equivalent) to track changes and establish trends over time. Each permitted MS4 should conduct an annual evaluation of the field screening data and priority outfall list. Program modifications should be made as needed based on the annual evaluation.

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DISCUSSED OR APPROVED:

PMT Approved on **3/15/2012**

Date