



Union, MO

Municipal Separate Storm Sewer System
Stormwater Management Plan
Permit MO4040112
2021 to 2026

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Contact Information

Primary Program Contact:

J.D. Kelley, P.E.
City Engineer
636-584-3600
engineer@unionmissouri.org

Secondary Program Contacts:

James Schmeider
Assistant City Administrator
636-584-3600
jschmieder@unionmissouri.org

Chad Pohlman
Parks and Recreation Director 636-584-8471
parkdir@unionmissouri.org

Program Administration and Funding

It is a shared responsibility between the departments of Public Works, Engineering and Administration to develop, implement and enforce the City of Union's Stormwater Management Program (SMP), to the extent allowable under state and local law.

Currently, the City of Union has no direct funding or tax revenue to aid in the planning and preparation of the MS4 NPDES Phase II program, which includes the development of the SWMP and permit application. Resultant to this, existing city staff and department funding will be used to provide program management.

The Public Works, Engineering and Administration Departments staff includes the City Engineer, Assistant City Administrator and Parks and Recreation Director. These departments are involved with a majority of the BMPs, development and enforcement of ordinances, MS4 operational activities and construction related BMPs as well as program evaluation and annual report development. The City Engineer is the leader of the Stormwater Program. Department personnel will enforce existing policies and ordinances for development and redevelopment within the City as well as construction site runoff and post construction site runoff control enforcement. A flow chart with contact information is included in Appendix A.

City Information and Understanding a MS4:

A city's storm sewer system can be defined as a collection of publicly owned storm drains, gutters, roadside ditches, grassy swales, sediment ponds, and similar features—often interconnected with other privately owned systems—that function collectively to manage stormwater. Polluted stormwater runoff is often ultimately discharged into local rivers and streams without treatment. EPA's Stormwater Phase II Rule establishes an MS4 stormwater management program that is intended to improve the Nation's waterways by reducing the quantity of pollutants that stormwater picks up and carries into storm sewer systems during storm events.

MS4 permits authorize public entities, such as cities, to discharge pollutants from public stormwater systems to waters of the United States.

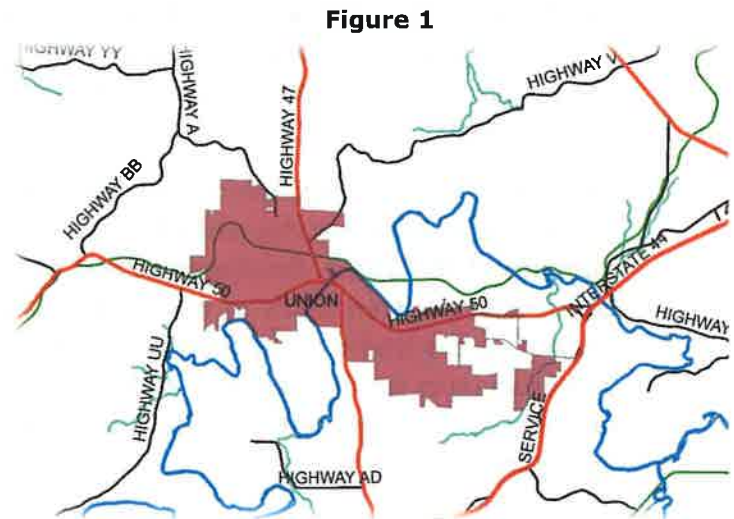
The MS4 (Municipal Separate Storm Sewer System) permit authorizes the discharges of stormwater from regulated MS4s, in addition to discharges of stormwater commingled with flows contributed by process wastewater, non-process wastewater, or stormwater associated with industrial activity - provided such discharges are authorized under separate NPDES permits, to waters of the state. Additionally, the permittee is authorized to discharge non-stormwater sources, provided these sources have been determined to not be substantial contributors of pollutants to the MS4.

The MS4 permit prohibits non-stormwater discharges and stormwater discharges that combine with sources of non-stormwater into the MS4 except where non-stormwater discharges comply with a separate NPDES permit and those authorized as described above.

The MS4 permit area covers all areas served by the MS4 for which the City is identified as the MS4 Operator. The permit area may change based upon areas incorporated into or removed from the jurisdictional area during the term of the permit.

Union is located approximately 45 miles southwest of St. Louis, just west of Interstate 44, in the center of Franklin County. Highways 47 and 50 provide north/south and east/west arterial traffic circulation, respectively. Several small creeks and tributaries flow through Union and enter into the Bourbeuse River, which meanders through the central portion of Union. The City includes approximately nine (9) square miles. The City Limits map is shown in **Figure 1**.

Under this comprehensive permit, and based on the 2010 Decennial U.S. Census, Union is categorized as a Group B Regulated Small MS4. A Group B MS4 is defined as a traditional small MS4 that serves a population of greater than 10,000 but less than 40,000. Union's current population, as recorded from



the 2010 Decennial U.S. Census, is 10,204; the 2019 population estimate, provided by the US Census Bureau, shows 11,990 (a 16.5% population increase).

Defining a Stormwater Management Program

The Stormwater Management Program (SMP) is developed by the MS4 Operator to detail the manner and methods the MS4 Operator utilizes to meet the specific terms and conditions of the MS4 regulatory requirements listed throughout the permit. The SMP is developed, implemented and enforced to the extent allowable under state and local law.

As part of the Stormwater Management Program, the MS4 Operator will develop and maintain a document, with appropriate appendices and supplemental attachments, explaining the Stormwater Management Program; this document will herein be referenced as the Stormwater Management Plan (SWMP). The SWMP will describe the schedules, procedures, contacts and other items listed in the Minimum Control Measures section of the permit. It is the responsibility of the MS4 Operator to maintain the SWMP to ensure consistency with implementation, continuity of the SMP and iterative reviews of programmatic Best Management Practices and procedures.

Defining Minimum Control Measures and Best Management Practices

Minimum control measures can be defined as the key elements a successful SMP is built upon to mitigate the discharge of pollutants into the receiving water bodies. The MS4 permit, in accordance with 10 CSR 20-6.200 and 40 CFR Part 122, requires the MS4 Operator to address, in its SMP, the following six (6) minimum control measures (MCMs):

1. MCM 1. Public Education and Outreach Program on Stormwater Impacts
2. MCM 2. Public Involvement and Participation
3. MCM 3. Illicit Discharge Detection and Elimination
4. MCM 4. Construction Site Stormwater Runoff Control
5. MCM 5. Post-Construction Stormwater Management in New Development and Redevelopment
6. MCM 6. Pollution Prevention/Good Housekeeping for Municipal Operations

The MCMs are not intended to serve as permit requirements, but rather areas of stormwater management that must be addressed in the permit through clear, specific, and measurable terms and conditions. Tied into each MCM, in its own respective way, are Best Management Practices (BMPs).

10 CSR 20-6.200(1)(D)1 defines BMPs as: "Schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of waters to the state. BMPs also include treatment requirements, operating procedures, and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage areas."

BMPs can be temporary or permanent and include structural items or non-structural practices or activities including schedules of activities, prohibitions of practices, maintenance procedures, structural

controls, local ordinances, and other management practices to prevent or reduce the discharge of pollutants. BMPs encompass both the enforceable terms and conditions of the permit as well as particular activities and practices selected by the City that will be undertaken to meet the permit requirements but that are not themselves enforceable.

Structural BMPs are physical structures or features that are intended to collect, treat, infiltrate and/or convey stormwater. Nonstructural BMPs include various practices or actions that are intended to directly reduce stormwater pollution or encourage the public to take steps to reduce stormwater pollution.

In order to adequately quantify the progress of program implementation and performance of BMPs, measurable goals will be established. The measurable goals will contain descriptions of actions taken to implement each BMP, what is anticipated to be achieved by each goal, and the frequency and dates for such actions to be taken. BMPs and measurable goals are the mechanisms used to establish a clear and specific baseline against which future progress at reducing pollutants to the maximum extent practicable can be measured.

TMDL Information

Section 303(d) of the federal Clean Water Act requires that each state identify waters that are not meeting water quality standards. This helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs.

One of the tools the department uses to protect our water quality is a Total Maximum Daily Load (TMDL) study. The study includes a calculation of the maximum amount of a given pollutant a waterbody can absorb before its quality is affected. The state is required to develop a Total Maximum Daily Load for all waters on the 303(d) list. Each TMDL document will include allocations of the acceptable load for all sources of the pollutant. It will also include an implementation plan to identify how the load will be reduced to a level that will protect water quality.

Currently, Union has no water bodies regulated by TMDL. However, the Bourbeuse River is listed as impaired water body on the 2020 Clean Water Act Section 303(d) and MDNR has scheduled a TMDL development for the following pollutants: *Mercury in Fish Tissue (T)* with the source listed as *Atmospheric Deposition - Toxics* with a low priority and schedule year as greater-than ten years (>10). Please refer to the following link for detailed information regarding this potential future TMDL:

<https://dnr.mo.gov/env/wpp/waterquality/303d/docs/2020-303d-list-cwc-approved-2020-04-02.pdf>

Co-Permittee Information (3.2.A):

Not Applicable.

Stormwater Program Review and BMP Iterative Process (3.3):

The City of Union conducts an annual review of its SMP and SWMP. Any changes requested to the program and plan, originating from MDNR, are made in writing and establish a schedule for development and permit opportunities for Union to propose alternate program changes to meet the objective of the Department-requested modification. Any changes originating internally will be presented to the residents of Union for review and feedback, in accordance with MCM #2.

Minimum Control Measures (MCMs)

MCM 1. Public Education and Outreach on Stormwater Impacts

The permittee shall implement a public education program to distribute educational materials to the community and/or conduct equivalent outreach activities about the impacts of stormwater discharges on water bodies and the steps that the public can take to reduce pollutants in stormwater runoff.

In order to maintain a storm sewer system that limits pollutants at outfall to the Maximum Extent Practicable (MEP), appointed city officials, city employees, residents, local businesses (industrial and commercial), schools and community groups all must incorporate seamlessly into the city's Stormwater Management Program. Since there are a legion of pollutant sources and BMPs corresponding to the many target audiences listed previously, the city will take an iterative approach to reach out and educate its community by effectively matching a target audience to a target pollutant. Once this relationship is established, educational resources and support activities will be coordinated to aid in providing focus to the goal of decreasing the amount of pollutants entering and discharging from the storm sewer system.

- 4.1.A Identify target audiences who are likely to have significant stormwater impacts.** The target audience(s) can change if, through review, a new target is determined to be better for the city;
- 4.1.B Target specific pollutant(s) in the cities education program.** Each target audience listed in 4.1.A will have a minimum of one target pollutant (the target pollutant may be used for more than one target audience and may change annually, as needed)
- 4.1.C Utilize appropriate educational resources to be used as BMPs (materials, events, activities, etc.) in conjunction with the selected pollutants for the selected target audiences.** BMPs may change during the permit cycle if, through review, a different BMP is determined to be more effective for the city in conjunction with a selected pollutant for a selected target audience.
- 4.1.D Create opportunities, or support activities that are coordinated by citizen groups, for residents and others to become involved with the Stormwater Management Program.** The BMPs must have an effort to impact stormwater runoff by improving water quality
- 4.1.E Create or support the involvement BMP(s) in Section 4.1.D.** City support for the involvement BMPs are further defined in the SWMP.
- 4.1.F Review Public Education and Outreach on Stormwater Impacts MCM annually and update implementation procedures and/or BMPs as necessary within the requirements of the permit.**

MCM 1 - Table 1 lists the target audiences, pollutants, outreach and educational BMPs and involvement BMPs the city will incorporate into the SMP. Measurable goal definition, tracking of measureable goals and city support related to these BMPs, are defined in Union's Stormwater Management Plan (SWMP).

MCM 1 - Table 1

Target Audience	Target Pollutants/Sources*	Outreach and Educational BMPs*	Involvement BMPs*
1. Residents 2. Service Organizations	1. Oil, grease, fluids from vehicles 2. Vehicle Washing	1. Information on the cities website 2. Social media posts, social media campaign 3. Maintain or mark storm inlets with “No Dumping – Drains to stream” 4. Promote, host or develop educational meetings, seminars, trainings	1. Stream, lake, watershed cleanup events 2. Planting, invasive species removal – stream restoration

*applies to each target audience

Measurable Goals

The City continues to work towards compliance with its Public Education and Outreach MCM with a public education program that will continue to distribute educational materials and conduct outreach activities. In an effort to stay current with new technologies used for the protection of the municipal storm sewer system, educational resources are continually reviewed and updated as new information is available. We will also continue to look at other methods and utilize new materials to educate the public on the importance of improved water quality throughout the city.

*See **Appendix ##** for full detail of our measurable goals for this Minimum Control Measure (MCM).*

MCM 2. Public Participation

The permittee shall develop and implement a comprehensive public participation program that provides opportunities for public participation in the development and oversight of the Stormwater Program.

MCM 2 calls on the entire community of Union to be part of the planning and implementation of the Stormwater Management Program. A successful SMP cannot continue to produce tangible results if it is not approached as a shared responsibility between the city and the public. Therefore, a goal is established which provides the public the opportunity to participate in the processes related to developing and modifying the SWMP. In order to create an effective process, it is the cities duty to create a system to record public input, direct this input to the Stormwater Management Team and allow the public to comment, and/or elaborate, on the input received. This is accomplished by complying with state and local public notice requirements.

- 4.2.A Hold a public notice period for a minimum of thirty (30) days to allow the public to review the draft permit, and description of the SWMP prior to the submission of the renewal application to the MDNR.**
- 4.2.B As part of the public notice, required items will be posted to Union’s website with a way to submit comments, along with the standard public notice methods according to city ordinance(s).** Comments received during the notice period will receive response. Copies of any public comments, records of information submitted by the public and associated responses made during the notice period will be retained and made available to the public or MDNR upon request.
- 4.2.C Hold a public information meeting to provide information on, or describe the contents of, the proposed SMP. This meeting will be advertised at least thirty (30) days prior to the public meeting.** As part of the public notice of public meeting, the date, time and location of the meeting will be posted to Union’s website, along with the standard public notice methods according to city ordinance(s).
- 4.2.D Have a publicly available method to accept public inquiries, or concerns, and take the information provided by the public about stormwater and stormwater-related topics.** This method shall encompass all MCMs contained in this permit. The city may provide a phone number, website comment form, voicemail, email address, social media, or a combination of these methods. Information received from the public will be tracked, recording the topic, location(s) and item of concern to help identify pollutants involved, pollutant sources, priority areas, educational needs and other information the city may use to evaluate the Stormwater Management Program.
- 4.2.E If the city utilizes a stormwater management panel or committee, it shall provide opportunities for citizen representatives on the panel or committee.** The city does not utilize a stormwater management panel or committee.
- 4.2.F A primary or secondary contact of the MS4 team will provide updates to local governing boards.** This will be conducted annually and preceding any changes made to the SMP and SWMP. The updates will focus on the status of the SMP and compliance with the SMP.

- 4.2.G Existing permittees: Evaluate current program to ensure it is in compliance with this permit and promoted to the community.** The program will be modified, as necessary, to continue reducing the discharge of pollutants from the MS4 to the maximum extent practicable through continued program development and implementation.
- 4.2.H Newly regulated permittees: Develop a stormwater Public Participation program.** The program will be fully implemented by the end of this permit term.
- 4.2.I Tracking mechanisms shall be used for tracking attendance, inquiries or concerns per the requirements of Section 4.2 of this permit.** The city will review the Public Participation Program annually and update implementation procedures as necessary. This will be used to review how to best reach the public, the effectiveness of the mechanisms, the effectiveness of reaching the public and the local governing board and if the community and city are working together for water quality. Any additional events and/or BMPs will be acknowledged in the SMP report.

It is the city's policy to host a public meeting to review the city's SWMP and any revisions or additions made to the SWMP. This public meeting is advertised, according to city ordinance, thirty (30) days prior to the meeting to allow the public time to review the SWMP, provide comment or question and schedule attendance. Comments collected during the review period receive response within 30 days of receipt. Public comments can be emailed or mailed-in.

The city held a public notice period for the draft SWMP July 23, 2021 to August 23, 2021. The city did/did not receive any comments from the public during the comment period. *(To be updated after August 23, 2021).*

MCM 3. Illicit Discharge Detection and Elimination (IDDE)

The MS4 Operator shall implement, and enforce a program to detect and eliminate illicit discharges (as defined in 10 CSR 20-6.200 at 40 CFR 122.26(b)(2)) into the regulated MS4.

4.3.A A current storm sewer system map will be updated as needed to include features which are added, removed or changed. This map will show the following:

1. Location of all MS4 outfalls
 - Outfall is defined as any point where the MS4 discharges to the waters of the state, which is owned and operated by the city
2. Names and locations of all receiving waters of the state receiving discharges from the MS4 outfalls
3. Boundary of the regulated MS4 area

The storm sewer system map will be readily available and used by the field staff as needed. The map, and any accompanying necessary information, will be made available to the Department upon request.

The City has completed locating all MS4 outfalls. This map is continuously updated as outfalls are installed resultant from residential development and infrastructure addition. This map is available upon request.

4.3.B The city will record the sources of information used for the storm sewer map and track:

1. A numbering or naming system of all outfalls
2. Dates that the outfall locations were verified or last field surveyed
3. For newly added outfalls, the date that it was added to the storm sewer system

4.3.C The city shall prohibit non-stormwater discharges into its storm sewer system and implement appropriate enforcement procedures and actions. The city will adopt a local ordinance defining non-stormwater discharges and develop enforcement procedures for violations to such ordinance.

The City has a completed Illicit Discharge Ordinance in place that includes enforcement actions. The ordinance is accessible at the following website: <https://ecode360.com/27866141>

4.3.D A dry weather field screening strategy. The city will conduct outfall field assessments to check for the presence of a discharge during dry weather conditions. Outfalls, as defined within this permit, within the city limits will be located and screened during the permit cycle; priority areas will also be established during this time. The field screening strategy will include a tracking method to ensure a complete inspection is performed at each outfall that produces consistent data. When a discharge has been discovered, the tracking method will note general and physical characteristics of the discharge and environmental conditions.

The City utilizes the City of O'Fallon's SOP for implementation of a dry weather field screening strategy for unauthorized non-stormwater flows included in the Illicit Discharge Detection and Elimination Manual. The SOP is reviewed biannually, and updates are made as needed. The city is currently developing its own IDDE SOP and will proceed to implementation once finalized and approved, per MCM 2.

The city also responds to any public reported concerns of potential illicit discharges. The procedures for both are the same. The City performs on-site inspections, utilizing multiple tools, to identify unauthorized non-stormwater flows. Outfalls are visually inspected, screened for temperature, odor, color, floatable materials and turbidity or discoloration. If a discharge is suspect, a grab sample may be required and sent to a chemical lab for further analysis; however, not all discharges require grab sampling. The discharge is then traced upstream within the storm system to locate the source. Once located, the property owner is notified of the violation and the remediation process begins. Any outfall that is deemed an area of concern will be added to the priority screening list.

- 4.3.E The city will maintain diagnostic monitoring procedures to detect and investigate unknown non-stormwater flows as part of the dry weather screening program.** Possible illicit discharges identified from these procedures may be collected and analyzed by an experienced contracted laboratory. The diagnostic monitoring will include sampling the unknown discharge from outfalls that are found to be flowing or ponding more than 72 hours after the last precipitation event and is considered to be an illicit discharge. The samples will be analyzed for relevant parameters to determine if a pollutant is involved. The relevant parameters will be determined on a case-by-case basis, depending on the nature of the discharge and what the potential sources may be. The city has the ability to sample for and analyze the samples through a contracted laboratory. Possible parameters sampled for and analyzed, when applicable, are listed in the SWMP.
- 4.3.F Maintain procedures for tracing the source of an illicit discharge.** If initial screening indicates that a dry weather discharge contains pollutants, or if an illicit discharge is suspected from another reporting method, the source will be traced. The procedures for tracing the source include mechanisms and investigative tools used to locate and follow stormwater infrastructure, as appropriate for each situation.
- 4.3.G Maintain procedures for removing the source of an illicit discharge.** Upon locating the illicit discharge source, the pollutant and source must be removed; the procedure used will depend on the source and surrounding circumstances. The city will maintain contact with appropriate entities that may be needed for these procedures. The city will work side-by-side with the illicit discharger to remedy the situation by implementing source control, or treatment BMPs, to prevent reoccurrence of the violation and to also help in restoring the affected property.
- 4.3.H In order to prevent further illicit discharges, the city will identify priority areas.** Annually, the city will evaluate the priority area list and update the list as necessary to reflect changing priorities.
- 4.3.I The city will maintain written procedures for implementing the IDDE Program, including the components described within this section, to ensure program continuity and consistency.** This will include a description of the dry weather field screening strategy and implementation schedule to detect and address non-stormwater discharges, including discharges from illegal dumping and spills, to the city's stormwater system. This will also include a description of how the discharge is evaluated and the possible testing parameters.

See 4.3.D.

4.3.J The city will conduct investigations in response to field screening discoveries, spills, or in response to complaints from the public, municipal staff, or adjacent MS4s. The investigation will work to determine the source of the connection, the nature and volume of discharge through the connection, and the party responsible for the connection.

Investigative responses will meet the following timelines:

1. Immediate response to an illicit discharge, including spills, which are determined to constitute a threat to human health, welfare or the environment
2. Investigate within five (5) business days, on average, any complaints, reports or monitoring information that indicates a potential illicit discharge which does not constitute a threat to human health, welfare or the environment.
3. If illicit connections or discharges are observed which are discharging to or from an adjacent MS4 Operator's storm sewer system, the city will notify the adjacent MS4 Operator within 24 hours of discovery, or as soon as practicable.

4.3.K The city will have procedures established, regarding appropriate enforcement, to ensure implementation of the illicit discharge ordinance. A written description of the enforcement procedure will be maintained that will include a link to the ordinance used to enforce the prohibition of illicit discharges into the cities storm sewer system.

4.3.L The city will maintain a database to track dry weather field screenings, spills, incidents and investigations. Tracking mechanisms will be employed to provide continuous evaluation of the effectiveness of the IDDE program. The data gathered from incidents, investigations, enforcement and follow-up will be reviewed to determine if there is a new priority area.

The city will record annually:

1. Number of outfalls screened
2. Number of complaints received and investigated
3. Number of illicit discharges removed.

The city will document all investigations to track:

1. Date the illicit discharge was observed and investigated
2. A summary of procedures used for investigation
3. The outcome of the investigation (including sample results and findings, if applicable)
4. Any follow-up of the investigation including cleanup, enforcement actions, visits to confirm illicit discharge removal
5. Date the investigation or issue was closed or resolved.

4.3.M The city will inform public employees, businesses and the general public of hazards associated with illegal discharges and improper disposal of waste. This will work in conjunction with MCM 1 and MCM 6.

The city's plan for informing public employees, businesses and the general public of hazards associated with illegal discharges and improper disposal of waste is through the measurable goals and education. Public meetings and early exposure of youth through school programs, regarding illicit discharges, will highlight the immediate and lasting effects resulting from the improper use of the storm sewer system. Through correspondence during construction and throughout the permitting and licensing processes, contractors and business owners will be informed of their responsibilities of limiting and preventing

pollutants from entering the storm sewer system. Additionally, city staff, through training, will provide oversight and inspection of the storm sewer system, while, at the same time, preventing illicit discharges during daily operations.

4.3.N The city will review the IDDE Program annually and update implementation procedures as necessary.

4.3.O The city will evaluate the current program to ensure that it is in compliance with this permit.

The program is reviewed during permit renewal to identify any changes required to be in compliance with the current permit version. Any revisions to the ordinance will be complete within the first year of the permit cycle.

4.3.P The city will develop an IDDE Program.

The city has developed the IDDE Program and will continue to monitor its successes and shortcomings.

4.3.Q The city will develop and implement a training program for all municipal field staff who may come into contact with or observe an illicit discharge or illicit connection to the storm sewer system. Each staff member will take the training within one year of hiring. The training dates, topics covered and attendance will be recorded. Training effectiveness reviews will be conducted after municipal site inspections or after an incident occurs. If staff, a department or facility did not handle an issue properly, or the way they were trained, the city will evaluate the effectiveness of the training. The city may also employ other tools to survey or test if the training is effective.

4.3.R The city will review the IDDE Program annually and update implementation procedures as necessary. This data will be used to continuously evaluate the effectiveness and implementation of each BMP. Additional BMPs will be acknowledged in the SMP report.

MCM 4. Construction Site Stormwater Runoff Control

The MS4 Operator shall develop, implement, and enforce a program to reduce pollutants in any storm water runoff to their MS4 from construction activities that result in a land disturbance of greater than or equal to one acre. Reduction of storm water discharges from construction activity disturbing less than one acre shall be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more.

- 4.4.A The city will have an ordinance to require construction site runoff control BMPs at construction and land disturbance sites greater than or equal to one (1) acre or less than one acre if the construction activity is part of a larger common plan or development or sale that would disturb one acre or more.** The ordinance will include sanctions that are designed to ensure compliance, to the extent allowable under state or local law.

The city has a completed Land Disturbance Ordinance in place. Additionally, erosion and sediment control plan review and site inspection procedures have been implemented. Construction site stormwater runoff control ordinances are located at <https://ecode360.com/27866141>.

4.4.B The city will review pre-construction plans.

The following plan items will be reviewed, utilizing procedures to ensure consistency and completeness:

1. Incorporation of the consideration of potential water quality impacts. Evaluation of threats to water quality is based on the following factors:
 - Soil erosion potential
 - Site slope
 - Project size and type
 - Sensitivity of receiving waterbodies
 - Discharge flow type (pipe or sheet)
 - Proximity of the site to receiving waterbodies
 - Other factors relevant to the storm sewer system service area
2. Adherence to requirements established for construction site operators to select, install, implement and maintain appropriate stormwater control measures
 - This includes temporary BMPs throughout the life of the land disturbance and permanent BMPs to remain on site as required by local code(s) or ordinance(s)
3. Construction phasing and/or temporary BMPs to minimize disturbed areas
4. Construction site operator plan to control construction-site waste that may cause adverse impacts to water quality. Construction-site waste is considered as follows:
 - Discarded building materials
 - Concrete truck or site-mixed cementitious material washout
 - Chemical (fertilizer, paint, oils, herbicides, pesticides)
 - Litter
 - Sanitary waste

4.4.C The city will establish authority for site inspection and enforcement of control measures. The city will implement procedures for inspecting construction and land disturbance projects to the extent allowable by state, federal and local law.

The construction site runoff control program will implement the following:

1. Identification of priority sites for inspection, based on:
 - Nature of construction activity

- Topography
 - Disturbed area
 - Characteristics of soils
 - Sensitivity of, or proximity to, receiving water
2. Construction site inspections will include assessment of compliance with the cities construction site storm water runoff control ordinance, and any other applicable ordinance(s)
 3. Evaluation of any structure that functions to prevent pollution of stormwater or to remove pollutants from stormwater and use enforcement policies to require BMPs are implemented and effective
 4. Final inspection, upon completion of the land disturbance and prior to final approval of construction project, to ensure all disturbed areas have been stabilized and that all temporary erosion and sediment control measures have been removed
 5. Inspections conducted by the city are documented with a checklist. The checklist includes structural BMPs and a check on the self-inspections performed by the construction site operator.

The city utilizes ordinances and provides oversight, to ensure construction sites are prepared to prevent pollutants from leaving the project site. The city requires site operators or owners to inspect the site weekly and after a runoff-producing rain event. The city also performs inspections of the installed control measures as necessary, but no less than one (1) inspection per 14 days.

Contractors are required to follow all regulations set forth by EPA, MDNR and the City. The MDNR provides the following field guide: *Protecting Water Quality: A Field Guide to Erosion, Sediment and Stormwater Best Management Practices for Development Sites*, <https://dnr.mo.gov/env/wpp/wpcp-guide.html>, to assist owners and contractors with installation, inspection and maintenance of BMPs during construction.

For sites over one acre, site operators or owners are required to follow the Land Disturbance Permit approved by MDNR. For land disturbance sites that disturb 20,000 square feet or more or disturb less than 20,000 square feet when part of a larger common plan of development or sale that will disturb a cumulative total of 20,000 square feet or more, site operators or owners must apply for a grading permit. All construction site plans are reviewed for thoroughness through our construction plan review and approval process. All sites are required to have solid waste containment, proper spill prevention and protection plans and encouraged to utilize concrete washout structures.

4.4.D The construction site runoff control program will include an established, escalating enforcement policy that clearly describes the action to be taken for violations. The program has written procedures to ensure compliance with the cities construction site runoff control ordinance; including sanctions, enforcement mechanisms and procedures for when certain penalties, injunctions or other measures will be used.

The city has the authority to initiate a range of enforcement actions to address the variability and severity of noncompliance. Enforcement responses to violations consider the degree and duration of the violation and effect the violation has on the receiving water. Enforcement actions will be timely in order to ensure the actions are effective. These procedures and actions are written and available for city staff for consistency and training purposes.

The city has at least two (2) enforcement actions to help prevent, or stop, new or continued construction site runoff control non-compliance(s).

4.4.E The city will require the construction site operator to conduct inspections of its construction site.

Site operator or owner inspections are required weekly when construction is active, within 24 hours of any storm event producing more than one-half (0.5) inch of rain at the project site, and within 48 hours after any storm

exceeding the design storm.

4.4.F The city will maintain an inventory of active public and private land disturbance sites, as defined in section 4.4 of this permit.

The inventory contains the following:

1. Relevant contact information for each project
2. Size of the project and area of disturbance
3. If the site is a priority site, and, if applicable, what priority level

A list of permitted land disturbance sites are available upon request from the MDNR and City.

4.4.G The city will track its oversight inspections. The inventory of inspections are available to MDNR upon request.

The tracking contains the following:

1. Inspection dates and time
2. Inspector name
3. Inspection findings
4. Follow-up actions and dates, including corrective and enforcement actions

4.4.H Existing Permittee. Review the SMP including ordinances, permitting procedures, review procedures, inspection procedures, and enforcement procedures to ensure compliance with these requirements.

4.4.I Newly regulated permittee. The city will develop the construction site program, utilizing the SWMP to describe the construction site stormwater plan and scheduled implementation.

4.4.J The Stormwater Management Program will include procedures for the city to receive and consider information by the public about land disturbance sites. This will be in combination with section 4.2.D of this permit.

The city provides a form on it's website for reporting a concern, complaint or suggestion from the public:
https://www.unionmissouri.org/document_center/Reportconcern.pdf

4.4.K The city will provide, or support access to, construction site runoff control training for MS4 inspectors and plan reviewers at a minimum once during the permit cycle. This education will be tracked by documentation.

4.4.L The city will provide written procedures outlining the local inspection and enforcement procedures, to MS4 inspectors, to ensure consistency among the inspections.

4.4.M The city will review its Construction Site Stormwater Runoff Control Program annually. The review will evaluate the following:

1. Ordinances
2. Review procedures
3. Inspection procedures
4. Enforcement procedures
5. Receipt of public information procedures
6. Effectiveness of training procedures to ensure compliance with these requirements and determine if changes are needed.

Any additional BMPs are acknowledged in the SWMP.

MCM 5. Post-Construction Stormwater Management in New Development and Redevelopment

The MS4 Operator shall continue or develop, implement, and enforce a program to address the quality of long-term stormwater runoff from new development and redevelopment projects that disturb greater equal to and greater than one acre, including projects less than one acre that are part of a larger common plan of development or sale that would disturb one acre or more and that discharge into the regulated MS4. The program shall ensure that controls are in place that have been designed and implemented to prevent or minimize water quality impacts.

4.5.A The city will maintain and utilize an ordinance(s) to address post-construction runoff from new development and redevelopment projects to the extent allowable under state or local law for sites equal to or greater than one acre including projects less than one acre that are part of a larger common plan of development or sale. The cities program will ensure that controls are in place that have been designed and implemented to prevent or minimize water quality impacts from stormwater, after construction.

The city has ordinances in place to protect sensitive areas and attempt to maintain pre-development runoff conditions: <https://ecode360.com/27866206>

4.5.B The city will develop a strategy to minimize water quality impacts. This will include a combination of structural and/or non-structural control, BMPs, appropriate for the cities' community.

Structural controls include:

1. Extended detention basin
2. Grass swales
3. Bio-retention
4. Permeable surfaces
5. Sand filter basins
6. Stormwater planters
7. Proprietary BMPs

The ordinance for structural post-construction controls, or water facilities, include:

1. Development of standards for post-construction stormwater discharges used for design, installation, implementation, and maintenance of stormwater control measures. These stormwater control measures include BMPs that infiltrate, evapo-transpire, harvest, detain, retain, and/or reuse stormwater.

The city will maintain local stormwater discharge design standards that consider parameters that include site discharge volume, rate, duration, and frequency for new development and redevelopment sites with purpose of minimizing the impact of stormwater runoff on water quality.

Non-structural controls include:

1. Stream buffers
2. No mow zones
3. Preservation of open spaces
4. Tree preservation

5. Impervious cover reduction
6. Land use planning
7. Low impact development

The ordinance(s) for non-structural post-construction controls will develop preventative actions that involve management and source controls.

4.5.C Pre-construction plan review will be conducted by the city to assess site characteristics at the beginning of the construction site design phase to ensure adequate planning for stormwater program compliance. The non-structural controls chosen shall protect sensitive areas, minimize the creation of stormwater pollution, and effectively reduce stormwater pollution.

The plan review process will consist of the following and utilize a checklist for documentation:

1. Evaluation of non-structural BMP selection first
 - a. Comprehensive zoning plans
 - b. Zoning ordinances
 - c. Buffer strips
 - d. Maximization and preservation of open space

The selection of non-structural BMPs primarily prevent stormwater runoff from the site, which could influence the options for structural BMPs which help mitigate the stormwater related impacts after they have occurred.

4.5.D The city will employ ordinances or similar enforcement mechanisms to ensure adequate long-term operation and maintenance (O&M) of the selected BMPs, including, as appropriate, agreements between the city and other parties such as post-development landowners or regional authorities. Long term O&M will be addressed during the plan review and approval process. Copies of the O&M manuals will be retained by the party responsible for the post-construction BMP and with the city.

4.5.E The city will inspect, or require inspection of, each water quality structural and non-structural water post-construction BMP according to the following:

1. **Minimum of one (1) inspection will be conducted during construction and one (1) inspection before the site is finalized**
 - a. Verify water quality facilities are built as designed
 - b. Verify applicable boundaries or practices for non-structural BMPs are being observed

The city inspector will have access to the approved plans to ensure proper installation

2. **Minimum of inspection in the first three years after the installation, by the city**
3. **Annual inspection by the owner or operator of the post-construction BMP or by the city. If completed by the owner or operator, the inspection report will be submitted to the city for evaluation and review**
4. **The city will inspection a minimum of sixty percent (60%) of all water quality post-construction BMPs within the five (5) year permit cycle. This includes installations with ongoing or open enforcement issues.**

The City's post-construction ordinance includes a specific section, 420.105, dedicated to long-term maintenance of detention facilities. The ordinance details the City's inspection plan and implementation schedule of post-construction BMPs to ensure they are constructed per design and implemented

effectively.

All detention facilities are to be inspected periodically by the property owner. As part of this ordinance, the property owner is required to apply for a permit every three (3) years. For underground detention facilities, the property owner is required to submit an annual maintenance report verifying condition and operation per the approved plans. The City also conducts periodic inspections. If a privately owned detention facility is found to be deficient and in need of compliance measures or maintenance, the property owner will be notified of such requested. The City utilizes the inspection procedure and report form as detailed by St. Charles County.

4.5.F The city will maintain a plan designed to ensure compliance with the cities post-construction water quality regulatory mechanism. The plan will include escalating enforcement mechanisms the city will use to ensure compliance. The city will have the authority to initiate a range of enforcement actions to address the variability and severity of noncompliance.

The enforcement responses will consider the following:

1. Degree and duration of the violation
2. Effect the violation has on the receiving water
3. Compliance history of the post-construction BMP owner or operator
4. Cooperation of the owner or operator with compliance efforts

4.5.G Enforcement actions will be timely in order to ensure the actions are effective. The city will begin enforcement actions within thirty (30) days of discovering a violation. The city maintains at least two possible sanctions.

These sanctions include the following:

1. Written warnings for notice of violation (this includes email notification)
2. Fines

4.5.H The city will maintain an inventory tracking the water quality post-construction BMPs. The inventory contains the following:

1. Relevant contact information for the responsible person(s) or entity
2. Type of post-construction BMP
3. Applicable operations and maintenance documents
4. Date the city approved the construction site plan
5. Include any ongoing maintenance procedures if the facility is owned or operated by the city

4.5.I The city will track the post-construction BMP inspections. This is accomplished by retaining copies of records such as inspection checklists and email correspondence. The city will make these inventories available to the Department upon request.

The city tracks the following:

1. Inspection dates and times
2. Inspector name and title
3. Inspection findings
4. Follow-up actions – including all enforcement actions

4.5.J Existing permittee: Evaluate the ordinances, permitting procedures, review procedures, inspection procedures and enforcement procedures to ensure compliance with these

requirements and determine if change is needed. Any changes necessary to be in compliance with this permit shall be completed within the first two (2) years of permit issuance. The inventory of water quality facilities must be updated as new facilities are added and projects are completed. This inventory shall be completed within two (2) years of this permit issuance.

4.5.K Newly regulated permittee:

4.5.L The city will provide appropriate training for MS4 inspectors once every permit cycle. Training will be focused on the function of both structural and non-structural post-construction water quality BMPs.

4.5.M The city will review annually, its Post-Construction Site Stormwater Management in New Development and Redevelopment Program and evaluate effectiveness of the overall program, and determine if changes are needed.

This evaluation will include the following:

1. Review of the number and types of developments
2. Number of BMPs that were installed and inspected
3. Type and frequency of violations
4. How education could improve the effectiveness of the program

Any additional programmatic BMPs will be acknowledged in the Stormwater Management Program Reports.

MCM 6. Pollution Prevention/Good Housekeeping for Municipal Operations

The permittee shall develop and implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from municipal operations.

- 4.6.A The city will maintain and utilize an employee training program for MS4 municipal staff.** The training will be given annually to all MS4 staff who work with material handling, at MS4 owned or operated vehicle/equipment maintenance areas, storage yards, and material storage facilities.

The City has training program for all municipal operations staff. The City utilizes various training materials and methods such as in person, on site, video, printed materials on proper management of municipal vehicle and equipment maintenance areas and storage yards; proper land disturbance site management; long-term BMP maintenance; and proper material handling at storage facilities. Trainings are conducted for new hires and annual to biannual refreshers performed for each applicable department. If an employee misses their annual training, a make-up training date is scheduled. Topics covered pertain to MCM's 3-6 and shall cover topics both on site and throughout the City. A log of the trainings, including sign in sheets are kept by the Stormwater Management Coordinator and available upon request.

- 4.6.B The training will be used to prevent and reduce stormwater pollution.** The training will cover the following topics and activities:

1. Vehicle and equipment washing
2. Fluid disposal and spills
3. Fleet, equipment, and building maintenance
4. Park and open space maintenance procedures (including fertilizer, herbicide, and pesticide application)
5. New construction, road maintenance, and land disturbances
6. Stormwater system maintenance
7. City operated salt and de-icing operations
8. Fueling
9. Solid waste disposal
10. Street sweeping operations
11. Illicit discharges

The city utilizes Standard Operating Procedures to ensure consistency throughout departments.

- 4.6.C The city will:**

1. Maintain material to use in the training program
2. Maintain written procedures for the training program
3. Maintain written schedule to offer topic-specific training, when it is appropriate

- 4.6.D The city will maintain a list of all municipal operations and facilities that are impacted by this operation and maintenance program.** This will include the following types of facilities:

1. Maintenance yards
2. Fleet or maintenance shops

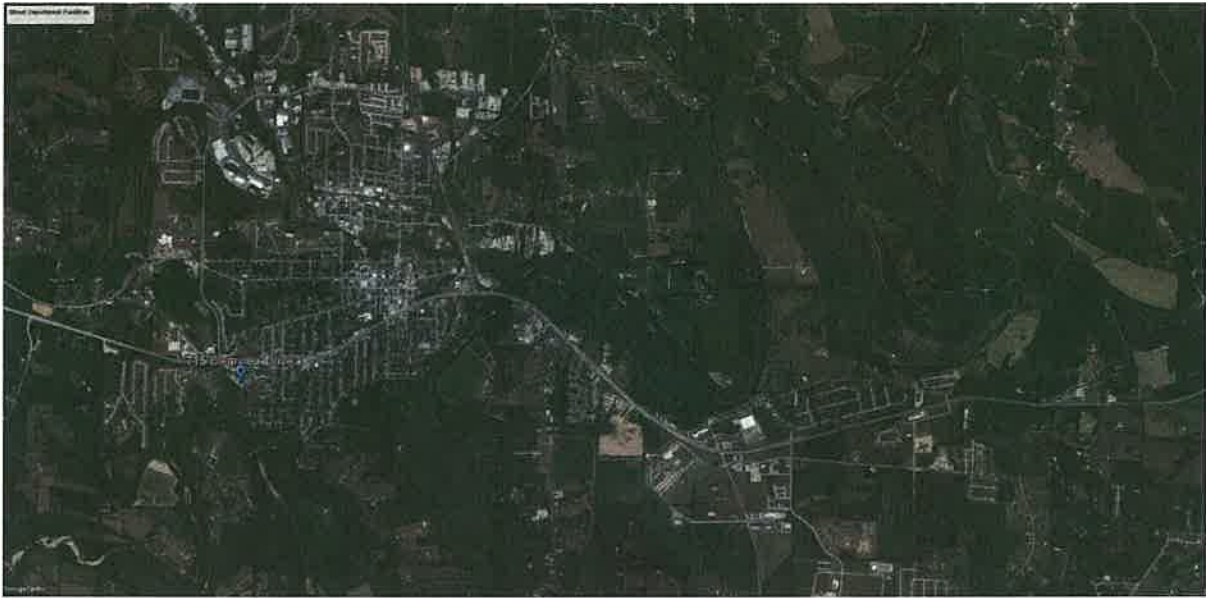
3. Storage yards
4. Parks, swimming pools, splash pads
5. Fairgrounds
6. Sport Field complexes
7. Municipal parking lots
8. Salt, sand, cinder storage locations
9. Other locations expected to contribute floatables and/or pollutants

The city has a catalog of all facilities in which potential pollutant-inducing materials are stored. The city annually inspects the control measures at these facilities to ensure continued effective operation. Any control measures deemed unsuitable, in need of maintenance or repair are corrected accordingly. The municipal facilities are:

Water/Wastewater	Main Office and Garage	715 Clearview Drive
Street	Main Office and Garage	808 Delmar St.
Street	Renovated Steel Building	202 W. Brown
Street	Storage Building (Turkey Shed)	702 N. Christina
Street	Riverview Drive	Riverview Drive
Street	Storage Building	1866 Denmark Rd.
Street	Storage Building	720 N. Christina
Parks	Fairgrounds	311 Jaycee Drive
Parks	Swimming Pool Complex	375 W Park Ave.
Parks	Main Office and Garage	628 N. Delmar
Parks	Clark Vitt Park	401 Clark Ave
Parks	Friendship Park	301 W Main St.
Parks	City Lake	502 Clark Ave
Parks	Softball Complex	620 E Park Ave.
Parks	Hoffert Park	101 Hoffert St.
Parks	K-9-N-Kiddos Park	226 N Christina Ave.
Parks	Storage Building	1866 Denmark Rd.
Parks	Veterans Memorial Park	600 Progress Parkway
Parks	College Hill Park	651 College Meadows Dr.
Parks	Clearview Park	1051 Clearview
Parks	Soccer Park	10 Union Village Shopping Center
Parks	City Park	500 W Park Ave.
Parks	Rotary Park	100 Memorial Parkway
Police	Shooting Range	671 Hwy 47

Figures 2, 3 and 4 show location of the maintenance facilities and parks in which potential pollutant-inducing materials are stored.

Figure 4 - Water and Wastewater Facility



4.6.E The city will maintain a list of industrial facilities it owns or operates which are subject to NPDES permits for discharges of stormwater associated with industrial activity. The list will include the permit number of the facility. This includes Municipal projects with a land disturbance permit, wastewater facilities, etc. The city will be familiar with NPDES permitted facilities not owned or operated by the city that are within the MS4 service area, as they may signify a priority area for the IDDE program.

The City operates two (2) POTWs subject to NPDES permit. These facilities are:

- Union East Sewage Treatment Plant
 - 1999 Denmark Road (MO0121312)
- Union West Wastewater Treatment Plant
 - 671 Highway 47 (MO0025283)

Figures 5, 6 and 7 show the locations of the regulated POTWs.

Figure 5 - POTWs

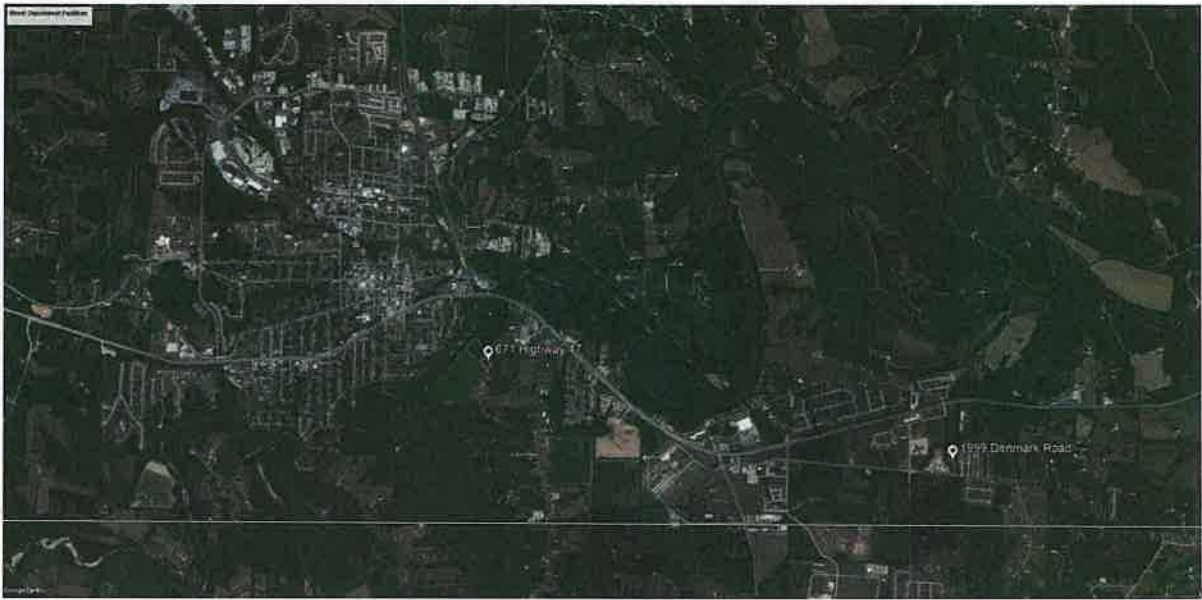


Figure 6



Union West - WWTP (POTW)

671 State Highway 47

Google Earth

These controls will include the following:

- 4.6.G The city will have procedures for proper disposal of waste removed from the MS4 structures and areas of jurisdiction.**

Union, MO – Stormwater Management Plan

1. Street sweeper spoils and washout
2. Accumulated sediment
3. Dredged materials
4. Floatables, trash and litter
5. Leaves, other organic matter

4.6.H The city will maintain and utilize the following procedures for the washing of all municipal vehicles and equipment:

1. Use of any soap or detergent will only be used where there connection to sanitary sewer or equivalent treatment
2. Any wash or rinse water that contains pollutants such as salt, oils, grease, sediment, grass clippings, lawn chemicals, or pesticides shall not be discharged to waters of the state or the MS4 system without appropriate treatment
3. Any washing or rinsing activities shall be conducted in an appropriate area. This area(s) will be marked on the map of the facility

4.6.I The city will maintain written explanations of the controls, procedures, inspection schedules, and explanation of tracking of these controls. Standard Operating Procedures for materials stored and used at all applicable MS4 facilities is permissible for use to comply with this requirement. Annually, the city will evaluate the results, controls, and inspection procedures to ensure compliance with these requirements and determine if changes are needed.

4.6.J The city will maintain procedures to determine if there are impacts to water quality for new flood management projects. Any flood management projects will require the protection of water quality in the standards that are used to plan, design, build, and maintain stormwater infrastructure.

4.6.K Existing permittees: Shall evaluate the current SMP including training, inspection procedures, and other municipal operation procedures to ensure compliance with these requirements. Any changes necessary to be in compliance with this permit will be completed within one (1) year of this permit issuance.

4.6.L Newly regulated permittees: Develop this program. The SWMP will describe the pollution prevention/good housekeeping plan and scheduled implementation. Development of this program will be completed within the first five (5) years of the permit issuance.

4.6.M The city will review its Municipal Operations Program annually and update implementation procedures as necessary within the permit requirement. Any additional BMPs shall be acknowledged in the Stormwater Management Program Report.

Stormwater Management Plan Report Progress and Compliance

Permit Section	BMP Description	BMP Purpose	BMP Goal	Milestone and Date					Milestone and Date		BMP Tracking	BMP Adaptive Management
				Permit Year 1	Permit Year 2	Permit Year 3	Permit Year 4	Permit Year 5				
4.1.A	Target Audience - Residents											
	Target Audience - Services Organizations											
	Target Pollutant - Oil, grease, fluids from vehicles	Educate residents and Service Organizations about the importance of maintaining vehicles according to manufacturer suggested frequencies and disposing of vehicular fluids properly.	Behavioral change, increased public awareness and involvement and decreased pollutants	Create an educational brochure focused on target pollutant and distribute to local residents and businesses (goal: 25 - resident, 10 - local business)	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Number of brochures distributed		
4.1.B		Educate residents and Service Organizations about the importance of limiting the amount of detergent used when washing vehicles and to utilize commercial vehicle washing facilities when a vehicle is heavily soiled.	Behavioral change, increased public awareness and involvement and decreased pollutants	Create an educational brochure focused on target pollutant and distribute to local residents and businesses (goal: 25 - resident, 10 - local business)	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Review list of common pollutants and update existing printed and electronic materials for distribution based on review	Number of brochures distributed		
	Outreach and Educational BMP: Information on the MS4 Operator's website	Inform public about the MS4 program and provide outreach information regarding funding and pollution prevention	Stormwater webpage on city website to be updated annually to provide residents or new outreach materials. MS4 Permit, SWMP and Annual Reports are provided on website.	Webpage hits (goal - 25)	Webpage hits (goal - 25)	Webpage hits (goal - 25)	Webpage hits (goal - 25)	Webpage hits (goal - 25)	Webpage hits (goal - 25)	Number of website hits corresponding to message	Certain messages may need more education	
	Outreach and Educational BMP: Social Media Post/Social Media Campaign	Address ways residents can minimize or avoid adverse stormwater impacts or practices	Provide seasonally appropriate messages to the public to improve the quality of stormwater runoff	Post a minimum of 6 times a year on a minimum of one social media platform.	Post a minimum of 6 times a year on a minimum of one social media platform.	Post a minimum of 6 times a year on a minimum of one social media platform.	Post a minimum of 6 times a year on a minimum of one social media platform.	Post a minimum of 6 times a year on a minimum of one social media platform.	Post a minimum of 6 times a year on a minimum of one social media platform.	Number of views, impressions, reactions and other interactions corresponding to message	Certain messages may need more education	
4.1.C	Outreach and Educational BMP: Maintain or mark storm sewer inlets with "No Dumping - Drains to Stream"	Ensure all storm drains public/private have educational marker to prevent illegal dumping	Provide a visual barrier to prevent illicit dumping into the stormwater system	Placard, stencil or paint 10% of all known stormwater inlets.	Placard, stencil or paint 10% of all known stormwater inlets	Placard, stencil or paint 10% of all known stormwater inlets	Placard, stencil or paint 10% of all known stormwater inlets	Placard, stencil or paint 10% of all known stormwater inlets	Placard, stencil or paint 10% of all known stormwater inlets	Number, location and marking type of inlets	Note if downstream outfalls reflect the message to determine if the markings are an effective deterrent or if additional areas could benefit from the markings	
	Outreach and Educational BMP: Promote, host, or develop education meetings, seminars and trainings	The events shall address ways attendees can minimize or avoid adverse stormwater impacts or practices to improve the quality of stormwater runoff.	Provide live events to encourage discussion and promotion of pollution prevention and limiting stormwater impacts	Promote, host or hold 2 events	Promote, host or hold 2 events	Promote, host or hold 2 events	Promote, host or hold 2 events	Promote, host or hold 2 events	Promote, host or hold 2 events	Attendance and distributed materials	Consider using a questionnaire or survey to track if attendees were interested in the topic, retained the information presented or found the event beneficial	
	Involvement BMP: Stream/Lake/Watershed cleanup events	Remove litter to prevent pollution of US Waters	Promote awareness to residents regarding garbage migration through the stormwater system	One event per year (an event is defined as 2 acres of land, 400 yards of stream or 2 miles of roadway)	One event per year (an event is defined as 2 acres of land, 400 yards of stream or 2 miles of roadway)	One event per year (an event is defined as 2 acres of land, 400 yards of stream or 2 miles of roadway)	One event per year (an event is defined as 2 acres of land, 400 yards of stream or 2 miles of roadway)	One event per year (an event is defined as 2 acres of land, 400 yards of stream or 2 miles of roadway)	One event per year (an event is defined as 2 acres of land, 400 yards of stream or 2 miles of roadway)	The area or distance cleaned (by acre, yard or lane mile), amount of waste removed (by weight, volume or bag count) and attendance.	Waste and attendance measurements will identify if there are priority areas for litter entering stormwater and illegal dumping hotspots.	
4.1.D		Remove invasive vegetation to local streams, parks, areas adjacent to public waterways and/or other green space	Promote awareness to residents regarding the issues created by allowing continued growth opportunities to invasive and foreign vegetation	One event per year (an event is defined as 0.5 acres or 25 yards)	One event per year (an event is defined as 0.5 acres or 25 yards)	One event per year (an event is defined as 0.5 acres or 25 yards)	One event per year (an event is defined as 0.5 acres or 25 yards)	One event per year (an event is defined as 0.5 acres or 25 yards)	One event per year (an event is defined as 0.5 acres or 25 yards)	Location along with the area or length of removal.	Analyze the areas improved to determine if there are opportunities to join the improved areas or work on a watershed basis	

Stormwater Management Plan Report Progress and Compliance

Permit Section	BMP Description	BMP Purpose	BMP Goal	Milestone and Date	Milestone and Date	Milestone and Date	Milestone and Date	Milestone and Date	BMP Tracking	BMP Adaptive Management
				Permit Year 1	Permit Year 2	Permit Year 3	Permit Year 4	Permit Year 5		
4.2.A 4.2.B	Public Notice for permit and SWMP Submission of public comments	Inform public of permit renewal and SMP and provide opportunity and method for public comment/questions	Promote involvement in the development of the SMP to residents and business owners	Public Notice and comment advertised on July 23, 2021	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	Number of comments received	Fewer comments will be equated to success of the MS4 program
4.2.C	Hold a Public Information Meeting	Provide information on, or describe the contents of the proposed SMP	Promote involvement in the development of the SMP to residents and business owners	Public Hearing held on August 23, 2021 at Planning and Zoning Commission meeting.	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	Public information meeting posted July 23, 2021. Maintain link to SMP on webpage.	Number of attendees at meeting
4.2.D	Public Inquiry or concern reporting	Provide methods (phone number, website comment form, email, social media) to allow the public to submit inquiries or concerns regarding stormwater-related topics	Encourage the public to comment on or report stormwater-related issues to help reduce pollutants from entering stormwater system	Recept and comment on two inquiries. Address comments from public and P&Z during SMP presentation	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	(Necessary for significant changes to the SMP or during permit renewal)	Number of comments and reports received	Relevancy of comments and reports received. Consider modifying topics covered in public information meeting

Stormwater Management Plan Report Progress and Compliance

Permit Section	BMP Description	BMP Purpose	BMP Goal	Milestone and Date				Milestone and Date		BMP Tracking	BMP Adaptive Management
				Permit Year 1	Permit Year 2	Permit Year 3	Permit Year 4	Permit Year 5			
4.3.A 4.3.B	Current storm sewer system map updated to show location of MS4 outfalls, names and locations of receiving waters of the state and boundary of the regulated MS4 area	Identification of storm sewer system throughout city for public and private infrastructure	Locate outfalls to provide monitoring of illicit discharges	Add boundary and identify receiving waters on GIS	Add outfalls located along Flat Creek to GIS	Add outfalls located along Possum Creek to GIS	Add outfalls of unnamed tributary along US 50 to GIS	Add remaining outfalls to GIS	Review amount of outfalls and system components added to GIS		
4.3.C	Illicit Discharge Detection and Elimination (IDDE) Ordinance	Prohibit non-stormwater discharges into the storm sewer system and implement enforcement procedures and actions	Decrease and correct the number of illicit discharges throughout the city.	Review ordinance	Review ordinance	Review ordinance	Review ordinance	Review ordinance	Review ordinance		Success determined by decrease in reported number of illicit discharges
4.3.D	Dry weather screening strategy	Tools used to determine if outfalls are producing an illicit discharge - measured during dry weather only	Locate, evaluate and educate illicit dischargers to prevent further pollutant discharge into the storm sewer system	Evaluate results of number of IDDEs reported and calculate as to whether there is a decreased number of reported discharges	Evaluate results of number of IDDEs reported and calculate as to whether there is a decreased number of reported discharges	Evaluate results of number of IDDEs reported and calculate as to whether there is a decreased number of reported discharges	Evaluate results of number of IDDEs reported and calculate as to whether there is a decreased number of reported discharges	Evaluate results of number of IDDEs reported and calculate as to whether there is a decreased number of reported discharges	Analyze results to determine if new priority area(s) need added		
4.3.H	Identify Priority Areas	Identify areas of higher potential concerns for illicit discharges through reports and outfall inspections.	Identify areas likely to have illicit discharges through site inspection and dry weather screening. Promote reporting of priority from citizens.	Follow-up on illicit discharge reports and maintain a database to highlight patterns	Follow-up on illicit discharge reports and maintain a database to highlight patterns	Follow-up on illicit discharge reports and maintain a database to highlight patterns	Follow-up on illicit discharge reports and maintain a database to highlight patterns	Follow-up on illicit discharge reports and maintain a database to highlight patterns	Analyze results to determine if new priority area(s) need added		Success determined by decrease in reported number of illicit discharges
4.3.X	IDDE Ordinance	Enforcement procedures to ensure implementation of ordinance	Decrease and correct the number of illicit discharges throughout the city	Review and evaluate ordinance as necessary for any revisions	Review and evaluate ordinance as necessary for any revisions	Review and evaluate ordinance as necessary for any revisions	Review and evaluate ordinance as necessary for any revisions	Review and evaluate ordinance as necessary for any revisions	Decreased number of potential IDDE concerns reaching enforcement action		Success determined by decrease in number of enforcement actions

Stormwater Management Plan Report Progress and Compliance

Permit Section	BMP Description	BMP Purpose	BMP Goal	Milestone and Date					BMP Tracking	BMP Adaptive Management
				Permit Year 1	Permit Year 2	Permit Year 3	Permit Year 4	Permit Year 5		
4.4.A	Construction Site Runoff Ordinance	Require construction site runoff control BMPs at construction and land disturbance sites	Prevent the discharge of pollutants from construction site runoff to the MS4	Ordinance and BMP review	Ordinance and BMP review	Ordinance and BMP review	Ordinance and BMP review	Ordinance and BMP review	Review number of deficiencies and public reports	Success determined by fewer deficiencies and public reports of issues
4.4.B	Pre-construction Plan review	Review pre-construction plans to ensure consistency and completeness	Ensure BMPs utilized on projects will be effective and utilize current technology	Review plan review process and modify as needed	Review plan review process and modify as needed	Review plan review process and modify as needed	Review plan review process and modify as needed	Review plan review process and modify as needed	Analyze comments on review	Fewer repetitive comments during review shows designers are aware of requirements.
4.4.C	Site Inspection and Enforcement of control measures	Implement procedures for inspecting construction land disturbance projects to ensure BMPs are being installed and maintained to prevent runoff	Identify priority sites, assess compliance with runoff ordinance, evaluate BMPs and ensure all areas have been stabilized	Review inspection procedures and frequency. Locate priority areas and educate installers	Review inspection procedures and frequency. Locate priority areas and educate installers	Review inspection procedures and frequency. Locate priority areas and educate installers	Review inspection procedures and frequency. Locate priority areas and educate installers	Review inspection procedures and frequency. Locate priority areas and educate installers	Analyze inspection database to determine if BMPs are installed and maintained and if owner inspections match city inspections	Fewer corrections found during site inspection shows installers are aware of requirements
4.4.D	Enforcement policy for ordinance violations	Written procedures to ensure compliance with the construction site runoff ordinance	Two enforcement actions to help prevent, or stop, new or continued construction site runoff control non-compliance(s)	Review and evaluate ordinance and monitor number of violations	Review and evaluate ordinance and monitor number of violations	Review and evaluate ordinance and monitor number of violations	Review and evaluate ordinance and monitor number of violations	Review and evaluate ordinance and monitor number of violations	Monitor number of repeat violations by installer or owner	Repeat offenders shows violation enforcement actions are potentially ineffective
4.4.J	Public reporting	Allows for public submission of concerns relating to runoff from land disturbance sites	Public involvement of site monitoring to help decrease potential release, or continued release, of runoff pollutants from land disturbance sites	Evaluate reporting mechanisms follow-up response timeliness	Evaluate reporting mechanisms follow-up response timeliness	Evaluate reporting mechanisms follow-up response timeliness	Evaluate reporting mechanisms follow-up response timeliness	Evaluate reporting mechanisms follow-up response timeliness	Review trends between reporting period to measure success of reporting mechanisms.	A normalized amount of reporting indicates successful reporting mechanisms.

Stormwater Management Plan Report Progress and Compliance

Permit Section	BMP Description	BMP Purpose	BMP Goal	Milestone and Date					BMP Tracking	BMP Adaptive Management
				Permit Year 1	Permit Year 2	Permit Year 3	Permit Year 4	Permit Year 5		
4.5.A	Post-Construction Runoff Ordinance	Create an enforceable mechanism to ensure post-construction runoff requirements are met	Environmental change, decreased erosion and pollutants and reduced impact to downstream watershed	Review and evaluate ordinance and post-construction BMPs	Review and evaluate ordinance and post-construction BMPs	Review and evaluate ordinance and post-construction BMPs	Review and evaluate ordinance and post-construction BMPs	Review and evaluate ordinance and post-construction BMPs	Annual review of program and ordinance to identify any limitations they may impose	
4.5.B	Develop a strategy to minimize water quality impacts	Ensure permanent and adequate protection of downstream watershed after completion of site development	Environmental change, decreased erosion and pollutants and reduced impact to downstream watershed	Review post-construction BMPs and number installed	Review post-construction BMPs and number installed	Review post-construction BMPs and number installed	Review post-construction BMPs and number installed	Review post-construction BMPs and number installed	Number of post-construction BMP permits issued annually with developments	See an increase in post-construction BMPs with new and redevelopment projects
4.5.C	Pre-construction plan review	Ensure the controls chosen will protect sensitive areas, minimize the creation of stormwater pollution and effectively reduce stormwater pollution	Reduce stormwater runoff from the site	Review plan review components and process	Review plan review components and process	Review plan review components and process	Review plan review components and process	Review plan review components and process	Analyze reviews to determine presence of consistent omissions	If consistent omissions are found, the plan review components and process may need to be altered
4.5.D	Ensure adequate long-term operation and maintenance of selected BMP's	Ensure owners of post-construction BMP provide continuing maintenance by enforcing an ordinance requiring such	Promote healthy and functioning long-term post-construction BMPs to limit the amount of pollutants entering WSA	Review and evaluate ordinance	Review and evaluate ordinance	Review and evaluate ordinance	Review and evaluate ordinance	Review and evaluate ordinance		
4.5.E	Inspection of post-construction BMPs	Inspection program to ensure BMPs are being maintained once they have been released by developer	Inspect, or require inspection of, all approved BMPs and track annually	Track inspections and reinspections. Evaluate effectiveness of program.	Track inspections and reinspections. Evaluate effectiveness of program.	Track inspections and reinspections. Evaluate effectiveness of program.	Track inspections and reinspections. Evaluate effectiveness of program.	Track inspections and reinspections. Evaluate effectiveness of program.	Analyze instances of failed inspections	A decrease in failed inspections shows signs of a successful inspection program
4.5.F	Enforcement policy for ordinance violations	Provide a procedure to include escalating enforcement mechanisms to ensure compliance with ordinance	Begin enforcement actions within thirty (30) days of discovering a violation and maintain two (2) sanctions	Track violations and effectiveness of sanctions	Track violations and effectiveness of sanctions	Track violations and effectiveness of sanctions	Track violations and effectiveness of sanctions	Track violations and effectiveness of sanctions	Analyze timeliness of compliance after a violation has been discovered	If violations are corrected outside of the allowable timeframe, the sanctions may require change

Stormwater Management Plan Report Progress and Compliance

Permit Section	BMP Description	BMP Purpose	BMP Goal	Milestones and Data				Milestone and Date		BMP Tracking	BMP Adaptive Management
				Permit Year 1	Permit Year 2	Permit Year 3	Permit Year 4	Permit Year 5			
4.6.A	Municipal employee training program	Provide employees with training on how to handle and prevent pollutants at municipal facilities from entering MS4.	Establish a training program regarding application, storage and disposal of materials and maintenance of BMPs to reduce target pollutants in runoff from municipal facilities	Perform training, record and track attendance.	Perform training, record and track attendance.	Perform training, record and track attendance.	Perform training, record and track attendance.	Perform training, record and track attendance.	Number of training sessions and employees	Success determined by feedback received from training	
4.6.D	List of all municipal facilities impacted by operation and maintenance program	Organization, coordination and management	Efficient, organized and coordinated SWMP	Review and update as necessary	Review and update as necessary	Review and update as necessary	Review and update as necessary	Review and update as necessary			
4.6.E	List of all municipal facilities that are subject to NPDES permits	Organization, coordination and management	Efficient, organized and coordinated SWMP	Review and update as necessary	Review and update as necessary	Review and update as necessary	Review and update as necessary	Review and update as necessary			
4.6.F	Maintain controls to reduce or eliminate the discharge of floatables and pollutants	Reduce pollutants from municipal-owned sites	Store and use materials in such a way as to prevent their migration offsite through the use of BMPs and SOPs	Review of SOPs and inspection of BMPs	Review of SOPs and inspection of BMPs	Review of SOPs and inspection of BMPs	Review of SOPs and inspection of BMPs	Review of SOPs and inspection of BMPs			
4.6.G	Procedures for proper disposal of waste removed from MS4 structures and areas of jurisdiction	Reduce pollutants generated from municipal right-of-way	Reduce the amount of waste entering the MS4	Record lane miles swept and volume of debris removed from street	Record lane miles swept and volume of debris removed from street	Record lane miles swept and volume of debris removed from street	Record lane miles swept and volume of debris removed from street	Record lane miles swept and volume of debris removed from street	Road miles swept and amount of debris removed from street	Success determined by increased number of lane miles with development and observable decrease in the amount of debris collected	
4.6.H	Vehicle Washing	Prevent pollutant discharge from leaving municipal owned sites for vehicles and equipment	SOP created to prevent excess pollutant discharge from municipal owned sites	Draft facility improvement plan for new wash bay. Review SOP.	Construct facility improvement. Review SOP.	Monitor effectiveness of pollutant collection system. Review SOP.	Monitor effectiveness of pollutant collection system. Review SOP.	Monitor effectiveness of pollutant collection system. Review SOP.			
4.6.I	Maintain explanation of controls, procedures, inspection schedules, and explanation of tracking table controls	Establish effective procedures to ensure facilities monitor suitability of BMPs and procedures	Maintain or install BMPs to continue reduction of pollutants entering the MS4	Evaluate results, controls and inspection procedures	Evaluate results, controls and inspection procedures	Evaluate results, controls and inspection procedures	Evaluate results, controls and inspection procedures	Evaluate results, controls and inspection procedures	Deficiencies noted on facility inspection forms	Reduction in deficiencies of facility inspections show successful maintenance of BMPs	
4.6.J	Procedures for determining impacts to water quality for new flood management projects	Ensure floodplain management projects involve water quality protection	Floodplain Management ordinance is in place	Ordinance review to address any significant changes need to the SWMP	Ordinance review to address any significant changes need to the SWMP	Ordinance review to address any significant changes need to the SWMP	Ordinance review to address any significant changes need to the SWMP	Ordinance review to address any significant changes need to the SWMP	Evaluated based on compliance approval from FEMA.	Success determined by approval of Floodplain Program via FEMA requirements	

100 N. Main St, O'Fallon MO 63366

City of O'Fallon, Missouri

Illicit Discharge Detection and Elimination Program



ADOPTED:
December 30, 2012

2010

Revised: 7/2017-new Inspection Form

Acknowledgements

One of the reasons the Stormwater Department was developed and designed to protect public health and our water quality resources from the impact of point source and non-point source pollution.

This policy was developed by Michele Gremminger with assistance from Jay Herigodt, and other City of O'Fallon staff

A number of reference documents were used in the development of this policy. These include:

- The Ohio IDDE Policy, A Guidance Manual for Municipalities in the State of Ohio by Harry Stark and other staff of CCBH.
- Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments by the Center of Watershed Protection and Robert Pitt, University of Alabama, 2004
- US EPA Phase II Storm Water Rules and Regulations
- US EPA Phase II Fact Sheets on Illicit Discharge Detection and Elimination Program

City of O'Fallon, Missouri

IDDE Program Policy

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City of O'Fallon

IDDE Program Policy

Purpose

The purpose of this policy is to establish procedures for the development of a program to address the broad range of administrative and technical considerations involved with setting up an effective Illicit Discharge Detection and Elimination (IDDE) program as required by the EPA's Phase II Stormwater Program. This policy profiles the IDDE minimum control measure, which is one of six minimum control measures operators of Phase II regulated small municipal separate storm sewer system (MS4) is required to include in its stormwater management program.

A regulated MS4 as defined as a means of conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels or storm drains.

An understanding of the nature of illicit discharges in urban watersheds is essential to find, fix and prevent them. This policy reviews water quality as well as the regulatory context for controlling illicit discharges.

Background of Phase II

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

In 1990, the EPA promulgated Phase I of its storm water program under the National Pollutant Discharge Elimination System (NPDES) permit provisions of the Clean Water Act. Phase I addressed storm water runoff from "medium" and "large" municipal separate storm sewer systems (MS4s) generally serving populations of 100,000 or greater, construction activity that would disturb five or more acres of land, and 10 categories of industrial activity. To further reduce the adverse effects of storm water runoff, the EPA instituted its Storm Water Phase II Final Rule on December 8, 1999.

The NPDES Phase II Stormwater Program was established in 2000 and is intended to further reduce adverse impacts to water quality and aquatic habitat by instituting the use of controls on the unregulated sources of stormwater discharges that have the likelihood of causing continued environmental degradation.

The Phase II Storm Water program is part of EPA's NPDES Program. The Missouri Department of Natural Resources (MDNR) is the regulating authority responsible for the Phase II Storm Water regulations in Missouri. The Phase II program regulates discharges from small MS4s located in "urbanized areas" (as delineated by the Census Bureau in the most recent census) and from operators of small construction activities that disturb equal to or greater than 1 (one) and less than 5 (five) acres of land.

The EPA's Storm Water Phase II Final Rule states that operators of regulated small MS4s are required to design their program to:

- Reduce the discharge of pollutants to the "maximum extent practicable"
- Protect water quality
- Satisfy the appropriate water quality requirements of the Clean Water Act

Further requirements within the program also state this storm water management program must include the following six minimum control measures (MCM):

- Public education and outreach on storm water impacts (MCM 1)
- Public involvement and participation (MCM 2)
- Illicit discharge detection and elimination (IDDE) (MCM 3)
- Construction site storm water runoff control (MCM 4)
- Post-construction storm water management in new development and redevelopment (MCM 5)
- Pollution prevention and good housekeeping for municipal operations (MCM 6)

Why are Efforts Necessary?

Many different sources and generating sites can produce illicit discharges. An understanding of the nature of illicit discharges in urban watersheds is essential to find, fix and prevent them.

The term "illicit discharge" has many meanings in regulation and practice. 40 CFR 122.26(b)(2) defines an illicit discharge as "any discharge to an MS4 not composed entirely of stormwater, except allowable discharges pursuant to an NPDES permit, including those resulting from fire activities".

Per City Ordinance Section 405.245 the term "illicit discharge" is defined as any direct or indirect non-stormwater discharge to the storm drain system except as exempted in subsection 405.245(G)(1).

What Are Some Guidelines for Developing and Implementing This Measure?

The objective of the illicit discharge detection and elimination minimum control measure is to have regulated, NPDES phase II operators gain a thorough awareness of their systems and position themselves to take necessary action on eliminating illicit discharges. This awareness will allow them to determine the types and sources of illicit discharges entering their system and establish the legal, technical, and educational means needed to eliminate these discharges.

Finding, Fixing, and Preventing Illicit Discharges

The purpose of an IDDE program is to find, fix and prevent illicit discharges, and develop a series of techniques to meet these objectives. This policy describes the major tools used to build a local IDDE program.

Highest priority in most programs is to find any continuous and intermittent discharges into the storm drain system. A range of monitoring techniques can be used to find such discharges. In general monitoring techniques are used to find problem areas and then trace the problem back up the stream or pipe to identify the ultimate generating site or connection. These techniques can sometimes pick up other types of illicit discharge that occurs. In the Phase II regulations, it is recommended that the plan to detect and address illicit discharges include procedures to:

- Map and Inventory System
- Inspect and Develop Priority areas by locating areas likely to have illicit discharges (which may include visually screening outfalls during dry weather and conducting field tests of selected pollutants)
- Tracing the source of an illicit discharge
- Removing the source of the discharge
- Program evaluation and assessment
- Educating Employees, Businesses and Residents

History

October 12, 2006 – Ordinance #5082 – Section 405.245 Stormwater Quality Management and Illicit Discharge control ordinance enacted to:

- Regulate contributions of pollution to the MS4 by stormwater discharges of any user
- Prohibit illicit connections and illicit discharges to the MS4
- Establish legal authority to carry out all inspection, surveillance and monitoring procedures necessary to ensure compliance

July 23, 1973 - Missouri State Statutes - Chapter 644 - Water Pollution, cited as the "Missouri Clean Water Law)

December 30, 2000 – Department of Natural Resources – Code of Regulations 10 CSR 20-7.031 Water Quality Standards

Chapter 1 What is an Illicit Discharge



Figure 1: Presence of Commercial Illicit Discharge

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

In most communities, the MS4 is directly connected to a water body and does not receive any type of treatment or "cleansing" prior to its discharge to receiving water bodies of the United States (per US Army Corps of Engineers delineation). Because of this non-treatment, it is vital that only storm water be discharged from these MS4s with as little pollutants as possible to the "maximum extent practicable".

The general permit received by Phase II regulated communities requires that those communities develop an illicit discharge detection and elimination (IDDE) program. This program will assist communities in meeting their requirement set forth in their general NPDES permit. This policy is designed to assist designated communities in establishing their IDDE program.

Types of Illicit Discharges

For the program to be effective it is important to be able to clearly distinguish between the various types of illicit discharges so that appropriate action towards compliance and necessary steps for elimination. These include:

- **Continuous** discharges occur most or all of the time, are usually easier to detect, and typically produce the greatest pollutant load. These are usually direct connections to

the MS4 and can be from sanitary sewers, cross connections, infrastructure problems with a sanitary sewer system or malfunctioning septic sewage system. These types of discharges are the easiest to find, investigate, trace and eliminate from the MS4. These types of discharges also have the greatest impact because of the constant pollutant loading into a water body or MS4

- **Intermittent** discharges occur over a shorter period of time or occasionally (e.g., a few hours per day or a few days per year). Because they are infrequent, they are harder to detect, but can still represent a serious water quality problem depending on their flow type. Methods of reducing this type of discharge is the use of a “hotline” telephone number for the public to call if discharge is observed
- **Transitory** discharges occur rarely or are a one-time event such as a spill, ruptured tank, sewer break, or illegal dumping episode. These discharges are hard to detect with routine monitoring, but under the right conditions, can exert severe water quality problems on downstream receiving waters. Methods of reducing this type of discharges are to educate the public on stormwater and illicit discharges, establishment of a “hotline” telephone number for public to call if a discharge is observed

Table 1-1 demonstrates examples of land uses, likely source locations and activities that can produce transitory or intermittent illicit discharges and Table 1-2 demonstrates examples that can produce continuous illicit discharges.

Table 1-1: LAND USES, LIKELY SOURCE LOCATIONS AND ACTIVITIES THAT CAN PRODUCE *TRANSITORY OR INTERMITTENT* ILLICIT DISCHARGES

Land Use	Likely Source Locations	Condition/Activity that Produces Discharge
Residential	<ul style="list-style-type: none"> · Apartments · Multi-family · Single Family Detached 	<ul style="list-style-type: none"> · Car Washing · Driveway Cleaning · Dumping/Spills · Equipment Wash-downs · Lawn/Landscape Watering · Septic System Maintenance · Swimming Pool Discharges · Laundry Wastewater · Improper Plumbing (garage floor drains)
Commercial	<ul style="list-style-type: none"> · Campgrounds/RV Parks · Car Dealers/Rental Car Co. · Car Washes · Commercial Laundry · Gas Stations/Auto Repair Shops · Marinas · Nurseries and Garden Centers · Oil Change Shops · Restaurants · Swimming Pools · Service Garages 	<ul style="list-style-type: none"> · Building Maintenance (power washing) · Dumping/Spills · Landscaping/Grounds Care (irrigation) · Outdoor Fluid Storage · Parking Lot Maintenance (power washing) · Vehicle Fueling · Vehicle Maintenance/Repair · Vehicle Washing · Wash-down of Greasy Equipment & Grease Traps
Industrial	<ul style="list-style-type: none"> · Auto Recyclers · Beverages and Brewing · Construction Vehicle Washouts · Distribution Centers · Food Processing · Garbage Truck Washouts · Marinas, Boat Building and repair · Metal Plating Operations · Paper and Wood Products · Petroleum Storage and Refining · Printing 	<ul style="list-style-type: none"> · All Commercial Activities · Industrial Process Water or Rinse Water · Loading and Un-loading Area Wash-downs · Outdoor Material Storage (fluids)
Municipal	<ul style="list-style-type: none"> · Airports · Landfills · Maintenance Depots · Municipal Fleet Storage Areas · Ports · Public Works Yards · Streets and Highways 	<ul style="list-style-type: none"> · Building Maintenance (power washing) · Dumping/Spills · Landscaping/Grounds Care (irrigation) · Outdoor Fluid Storage · Parking Lot Maintenance (power washing) · Road Maintenance · Emergency Response · Vehicle Fueling · Vehicle Maintenance/Repair · Vehicle Washing

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

Table 1-2: LAND USES, LIKELY SOURCE LOCATIONS AND ACTIVITIES THAT CAN PRODUCE *CONTINUOUS* ILLICIT DISCHARGES

Land Use	Condition or Activity that Produces Discharge
Residential	<ul style="list-style-type: none"> · Failed sanitary sewer infiltrating into storm drain · Sanitary sewer connection into storm drain · Failed septic systems discharging to storm drain system
Commercial/Industrial	<ul style="list-style-type: none"> · Failed sanitary sewer infiltrating into storm drain · Process water connections into storm drain · Sanitary sewer connection into storm drain
Municipal	<ul style="list-style-type: none"> · Failed sanitary sewer infiltrating into storm drain · Sanitary sewer connection into storm drain

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

These tables examine the likely source locations that contribute illicit discharges to an MS4 by understanding the possible discharges emanating from land use activities. It also allows for the IDDE program manager to thoroughly utilize this knowledge in identifying illicit discharges and their potential sources.

Industrial facilities are regulated by additional permits through the Missouri Department of Natural Resources (MDNR). For industrial problems, please contact your local MDNR St. Louis Regional Office at 314.416.2960 or Jefferson City at 573.634.2436 or <http://www.dnr.mo.gov/env/wpp/stormwater/sw-industrial-permits.htm>.

Discharge Flow Types

Dry weather discharges are composed of one or more possible flow types:

- Septic and sewage flows are produced from sewer pipes and septic systems
- Washwater flows are generated from activities such as gray water (laundry) from homes, commercial carwash wastewater, fleet washing, commercial laundry wastewater and floor washing to shop drains
- Liquid wastes refers to a wide variety such as oil, paint, and process water from radiator flushing that enter the storm drain
- Landscape irrigation flows occur when excess potable water used from residential or commercial irrigation ends up in the storm drain system
- Groundwater or spring water flows occur when the local water table rises above the bottom elevation of the storm drain and enters the storm drain either through cracks and joints, or where open channels or pipes associated with MS4 may intercept seeps

and springs. Each flow type has a distinct chemical fingerprint. The chemical fingerprint for each flow type can differ regionally, so it is a good idea to develop your own “fingerprint” library by sampling each local flow type

In practice, many storm drain discharges represent a blend of several flow types, particularly at larger outfalls that drain larger catchments. For example, groundwater flows often dilute sewage thereby making its presence.

Mode of Entry

Illicit discharges can be further classified based on how they enter a storm drain system or MS4. The mode of entry can either be direct or indirect.

Direct entry is generally by a direct connection to the system through a sewer pipe or drain of some kind. Direct entry usually occurs when two different types of plumbing or pipe are connected.

Indirect entry means that flows generated outside the system enter through storm drain inlets or by infiltrating through joints of the pipe. Generally, indirect modes of entry produce intermittent or transitory discharges with the exception of groundwater seepage. Other examples of these types of discharges are spills that enter the storm drain system at an inlet, dumping a liquid into a storm drain inlet, outdoor washing activities that create flow to a storm drain inlet, non-target irrigation from landscaping or lawns that reaches the storm drain system from over-watering or misdirected sprinklers that send runoff over impervious areas. In some instances, indirect entry can produce unacceptable loads of nutrients, organic matter or pesticides.

What are the Required EPA Elements of an Efficient IDDE Program?

The Phase II rule requires an operator of a regulated MS4 to develop, implement and enforce a program that includes the following:

- A storm sewer map system, showing the location of all outfalls and the names and location of waters of the US that receive discharges from outfalls
- Through an ordinance, or other regulatory mechanism, a prohibition (to the extent allowable under State, Tribal, or local law) on non-stormwater discharges into the MS4, and appropriate enforcement procedures and actions
- A plan to detect and address non-stormwater discharges, including illegal dumping, into the MS4
- The education of public employees, businesses, and the general public about the hazards associated with illegal discharges and improper disposal of waste
- The determination of appropriate best management practices (BMPs) and measurable goals for this minimum control measure. Some program implementation approaches, BMPs (i.e. the program actions/activities)

Does This Need to Address All Illicit Discharges?

The IDDE program does not need to address the categories of non-stormwater discharges or flows unless the operator of the MS4 identifies them as significant contributors of pollutants to it MS4. Per Ordinance Section 405.245(G) (1) the commencement, conduct or continuance of any illegal discharge to the storm drain system is prohibited except as described as follows:

- a. The following discharges are exempt from discharge prohibitions established by this Section: water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains, sump pumps (not including active groundwater dewatering systems), crawl space pumps, air conditioning, condensation, springs, non-commercial washing of vehicles, natural riparian habitat or wetland flows, swimming pools (if de-chlorinated – typically less than one PPM chlorine), fire fighting activities, and any other water source not containing pollutants
- b. Discharges specified in writing by the authorized enforcement agency as being necessary to protect public health and safety
- c. Dye testing is an allowable discharge, but requires a verbal notification to the authorized enforcement agency prior to the time of the test
- d. The prohibition shall not apply to any non-stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or Missouri Department of Natural Resources (MDNR) and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the storm drain system

Chapter 2 Mapping/Inventory

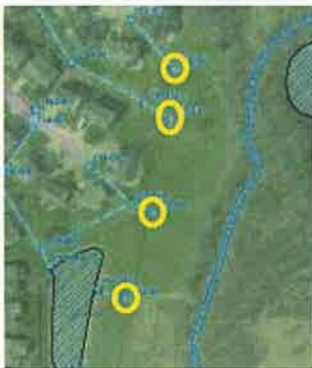


Figure 2: Stormwater GIS Mapping

What is a Municipal Separate Storm Sewer System (MS4)?

What constitutes an MS4 is often misinterpreted and misunderstood. The term does not solely refer to municipally-owned storm sewer systems, but rather is a term of art with a much

broader application that can include, in addition to local jurisdictions, State departments of transportation, universities, local sewer districts, hospitals, military bases and prisons.

An MS4 is not always a system of underground pipes – it can include roads with drainage systems, gutters and ditches. According to 40 CFR 122.26(b)(8), a “**municipal separate storm sewer**” means a convey and or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains):

- (i). Owned or operated by a state, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law)...including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the Clean Water Act that discharges into waters of the United States
- (ii) Designed or used for collecting or conveying stormwater
- (iii) Which is not a combined sewer
- (iv) Which is not part of a Publicly Owned Treatment Works (POTW) as defined at 40 CFR 122.2

When the field crew is performing the inventory of MS4 outfalls, a good understanding is needed as to the community and the outfalls possibly located within a water body. Most people know that a storm sewer outfall is an MS4 outfall. However, you must remember that ditches and catch basins are considered MS4s as well.



Figure 3: Storm sewer outfall



Figure 4: stormwater ditch

Mapping

One of the requirements of the NPDES IDDE component is that the MS4 develop, if not already completed, a storm sewer system map showing the location of all outfalls and names and locations of all surface waters of the state that receive discharges from those outfalls.

At the time that this policy was created, a city wide storm sewer system map is in place and a plan to label all outfalls by performing a system survey and inventory has been put into action.

Review Information Available

The City has developed a mapping system of the storm, water and sanitary sewer system. While not all of the details are enclosed on the current map, steps are being taken to get this map up-to-date to include all of the pertinent information. A list of the following resources has been and will be utilized to develop a comprehensive database for the storm sewer system. Identifying outfall locations may help prioritize areas that may have high priority outfalls.

- Review city records – city records can include a variety of maps as detailed below as well as information obtained regarding complaints filed with the community on possible illicit discharges emanating from a possible MS4 outfall.
- Zoning maps
- Drainage maps
- Subdivision maps
- Storm drain maps
- Age of infrastructure and development – this information is important when determining and prioritizing areas with possible illicit discharges
- Location of septic systems, both household and commercial – this information is important when prioritizing illicit discharge locations and should be given high priority
- Identify water bodies and watersheds within the community – this information will provide the community a sense of where they exist in a larger watershed as well as the water bodies that they contain
- Water quality information – this will assist the City in evaluating areas within their community that have impaired water bodies, as well as areas with high bacteria counts

Field Activities Performed in Conjunction with Mapping

Performance of field surveys will be necessary to update the existing map system. These activities will serve a number of purposes such as:

- Provide data to the community as to the location of their MS4 outfall location
- Provide data on possible areas of illicit discharge
- Provide data as to the condition of the outfall and water bodies within the community. This can include areas that can cause flooding problems due to excessive amounts of trees and debris obstructing flow during periods of high water flow
- It can help prioritize areas in regard to possible illicit discharges by the observance of pollution in a specific area

It is vital that when performing the field inventory that the public is made aware of the process. Several access areas and streams are located on private property. Notification can be done in a variety of ways: letters/postcards to homeowners, newsletters, local cable channel, and City webpage.

Personnel safety is also extremely important during this process. Walking or boating water bodies can be potentially very hazardous and safety precautions must be utilized during this phase of your IDDE program. Wearing safety vests, carry a first aid kit, being careful while walking a water body due to algae growth (makes the rocks extremely slippery) and dark water (can contain unexpected deep holes and other items which could cause injury). Safety in the field is vital and typical surveys should always be done with two field staff (if available).

All field staff (City Staff or hired contractor) should carry appropriate ID's for safety and notification to residents. Also, be aware of possible confined space locations when entering culvert pipes and follow confined space protocols for your location. Remember, like the mapping component, during the field investigations, there will be remote areas that the field staff will be inspecting. If injury occurs, the extra field staff is a necessity. Be aware of the locations where field inspections will occur because specific locations may present specific sources of safety concerns. Inform Stormwater Management Coordinator or appropriate personnel where field surveys will be conducted on any particular day for follow up if required.

Field Survey

The field survey includes a number of processes to accurately provide the desired information that the City needs in order to effectively develop an IDDE program. Attached to this document in Appendix A and Appendix B are field forms that can be used during the field surveys for inspection and inventory. The field survey begins by compiling all information that the City has obtained on their storm sewer systems as well as information as to the locations of their MS4 outfall locations. This information can be in the form of a map or in written comment. Once this information is obtained, it is vital to bring the information along during the field survey to verify the information or to locate the outfall locations. Equipment for field surveys includes:

- Existing maps-mark them in the field with locations of outfalls. It allows field crew the ability to know where they are in relation to specific areas as they walk the water bodies
- Field Inventory and Inspection sheets (located in Appendix A and B)
- Digital Camera
- GPS unit (if applicable)
- Clip boards and pens
- Tape measure
- Waders (either chest or hip)
- Water proof flash light
- First Aid kit (small pocket size recommended)
- Cell phone, Nextel or handheld radio
- Safety vests
- Walking Stick

Field surveys are best conducted during low flows of the surface water ways (aka dry weather screening) to ensure that all outfalls, etc. are observable. During the survey, the field crew

must be aware of how to properly perform the survey. The first step is to utilize the field maps and plan a course of action as to effectively walk or boat the water bodies within City limits. Field surveys of these water bodies can be performed in a variety of ways that include, but are not limited to:

- Perform in particular section of the City such as northwest, southeast, etc
- Survey one water body as it traverses through city limits. This can include just walking the main branch and then following up tributaries, or walking up tributaries as you come upon them in the field

Once the methodology is developed or decided upon, make sure all staff is familiar with the process that will be performed when conducting activity in the field. All must realize that this can change once the field survey has begun. All must be flexible to change once the field survey has begun.

The field survey begins by deciding where a creek will be entered by the survey crew and the utilization of an outfall site numbering system. The numbering of outfall locations is very important to the overall IDDE program. Having a rationale in place in the numbering of your outfall locations will enable future follow ups and easy determination as to the location of these outfall locations.

Once in the water body, the survey crew will walk or boat until they come upon a MS4 outfall location. When the outfall is located, the survey crew will photograph each outfall and characterize its dimensions, shape, and component material, and record observations on basic sensory and physical indicators. If dry weather flow occurs at the outfall, additional flow and water quality data are collected (refer to Appendix C). Field crews may also use field probes or test strips to measure indicators such as temperature, pH, chlorine and ammonia at flowing outfalls.

It is preferred to perform dry weather inspections and sampling at the same time as the field survey. However, due to the weather conditions, it may be necessary to perform the field surveys whenever possible and then to follow-up with dry weather inspections and sampling at a later date. Once the outfalls have been identified and mapped, it is easier to perform dry weather inspections and sampling because the locations will be easier to locate.

Chapter 3: Inspection and Developing Priority Areas

This chapter provides basic information about strategies needed to detect illicit discharges, beginning with a field screening technique designed to gather basic information and identify highly suspect outfalls or obvious discharges. EPA recommends that the plan to detect and address illicit discharges include the following four components:

1. Locate problem or priority areas
2. Trace the source
3. Remove/Correct source
4. Assess and evaluate the program

Developing Priority Areas/Hot Spots is vital to any IDDE program. The process can be broken down into three steps:

1. Use all available information to identify potential hot spots
2. Conduct dry weather screenings to locate non-stormwater discharges
3. Conduct water quality monitoring and analysis to determine if/what discharges are present

Hot Spots

These are areas where there is a potential for illicit discharges to occur. Such areas are where problems have occurred in the past. This includes locations with known water quality data and/or numerous concerns have been reported. Older areas of the community have a higher percentage of discharges due to illegal connections or deteriorating sewer lines leading to infiltration problems. Lastly commercial and/or industrial areas will tend to have a higher percentage of discharges because historically they have the most number of illegal connections and discharges with a higher potential to degrade water quality.



Figure 5: Hot spot Commercial Carwash – overflow directly to storm drain which leads directly to creek

Detection and Inspection

Once the hot spots have been identified and a list created, then inspections must be conducted on all of the known outfall locations within City limits. Dry weather inspections on all outfall locations within City limits are the preferred method of inspection. Dry weather inspections are visual inspections of the outfall location and include photos, measurements, water quality sampling, etc. Dry weather screening is defined as a minimum of 72 hours of no rainfall (0.1") within an area.

As necessary, notify the public during field inspections by letters/postcards, City website, City newsletters and/or cable channel as it is important that the public is very aware of what is occurring and keeping them informed that what is occurring will benefit the IDDE program.

The inspectors need to be reminded that safety is vital. It is preferred that surveys be conducted with two field staff (if available). Remember, there will be remote areas that field staff will be inspecting that have the potential for injury. If an injury occurs, the extra field staff is vital.

Inspectors will utilize the information obtained from the City Stormwater Map, print out any completed inventory forms and inspection forms. This will help ease locating the outfall locations. The field form should have a photo of the outfall if it has been inspected previously. This knowledge is imperative when in the field. The field form may also include a section for water quality sampling that is to be conducted in the field at the outfall (see to Appendix A, B, C).

During the visual inspection, fill out the field inspection form which will contain a list of observations needed such as: date, time, staff member conducting site visit, last rain date and pipe flow. Visual comments may also include such things as: odor, color, floatable materials, turbidity.

Any floatables observed should also be noted at this time. Floatables are a good physical indicator with regard to the presence of an illicit discharge. The most common floatables observed consist of sewage, sludge, suds, or oil sheens. Observation of sewage indicates a serious or severe problem. Suds can be indicative of several things. They can also form by the natural movement of water. If they are located at a water drop off and break up quickly, this may only be natural movement of water. If the suds have a fragrant odor, then this can be indicative of the presence of car wash, laundry or wash water. Oil sheens need to be looked at to try to determine whether they are naturally occurring by in-stream natural processes or synthetic (man-made). Naturally occurring sheens form when iron bacteria forms a sheet-like film. This can be determined by looking at the sheen and seeing if it cracks when disturbed. Synthetic oil sheens will swirl when disturbed. If this is observed, then it is from a petroleum or oil source.

Dry weather flows are observed at a point where an outfall pipe meets a stream can be considered non-storm related. It may also be flow being generated from another action which is not an illicit discharge. This is why it is important to observe the area at each outfall location for any type of observable pollution problem.

It is also very important for the IDDE program manager to recognize that during field inspections, the outfall is observed as a snapshot in time. An effective program utilizes long term dry weather inspections as well. This involves regular inspections of outfalls throughout the City. They can be done once a year, but should be conducted on a continuous basis over time. This helps to identify if any changes that occur at that location and if action is necessary.

Water Quality and Sampling and Testing

Utilizing water quality and testing can be utilized as a tool. When a dry weather flow is observed, it may be difficult to determine if there is a problem with that flow. Obvious problems such as odor or visual presence of raw sewage or toilet paper will indicate that there is a bacterial problem and that the problem is from sanitary sewer or a cross connection. Most water observed during dry weather conditions may not have such visual clues. That is why water quality testing and sampling is a very important part of an IDDE program.

Certain water quality parameters can serve as indicators of the likely presence or absence of a specific type of discharge. Bacteria are not a good indicator parameter to use in the field because lab results cannot be received for at least one day. It is important to note that other factors such as animal operations can elevate stream nutrient concentrations, so data should always be interpreted in the context of surrounding land use. Water quality monitoring benchmarks should be continuously be refined as the City develops a better understanding of what dry weather baseline concentrations to expect.

There are a large number of water quality parameters that can be measured. When deciding on what water quality parameters to use, the IDDE program manager must be aware of the community makeup and the possible sources of illicit discharges as well as how much money is available to complete water quality sampling. It is not necessary to do lab analysis on every sample. It is very possible to operate a successful IDDE program on a shoestring budget. That is why developing a priority list and hot spot locations are very important in determining the specific parameters to test for.

If stream water quality monitoring indicates that a potential problem level benchmark has been exceeded, field crews continue stream sampling to locate the discharge through a process of eliminations. Crews walk upstream taking regular samples above and below stream confluences until the benchmark concentration declines. The crew then takes samples at strategic points to narrow down the location of the discharge.

Water Quality Standards

Missouri Department of Natural Resources lists criteria for designated uses and parameters for sampling in 10 CSR 20-7.031 Table A, B, F, H and J. Please refer to Appendix E to view criteria.

There are several major elements that are included in the Water Quality Standards process. Classified waters (those that maintain water during low flow periods in dry weather) are given designated uses to protect the public's health, preserve the public's use and recreation, and to protect fish and wildlife. These uses may already exist or they may be goals that can be attained in the future with improved water quality.

Some designated uses include:

- Wildlife watering
- Public drinking water
- Whole body contact recreation
- Fish consumption by people
- Irrigation
- Protection of aquatic life and/or livestock

Waters classified for drinking water supplies have maximum allowable concentrations for additional chemicals in the standards with particular concern for human health. Waters protected for whole-body-contact recreation, such as swimming or water skiing, also have a maximum allowable bacteria standard. States define their Water Quality Standards in terms of these designated uses or goals and in terms of scientifically determined criteria that limit pollutants to the level needed to protect the designated use. Water Quality Standards form the basis of water quality pollution control permitting. Designated use of the waters, criteria to support that use, and general criteria including anti-degradation policies are the infrastructure for the standards. Water Quality Standards for designated uses of all classified water bodies in Missouri set maximum allowable concentrations for 110 chemicals, as well as other criteria such as dissolved oxygen. Section 303(c) of the Clean Water Act requires states to review these standards at least once each three-year period for the purpose of reviewing applicable Water Quality Standards and/or adopting new standards. At least one public hearing must be held on proposed changes.

Whenever water quality is not protective of the designated use for a water body, that water body is designated as water quality limited, or impaired. Missouri's impaired waters are listed in compliance with 303(d) requirements under the Clean Water Act. The 303(d) List helps state and federal agencies keep track of waters that are impaired but not addressed by normal water pollution control programs. It is crucial to note that often only a segment of a stream is listed on the 303(d) List. When a segment is listed, that does not mean that water quality is impaired for the entire stream, but only within the designated segment. Special emphasis is then given to restoring the water quality in the 303(d) listed portion of the stream. The most current

303(d) listing may be found on MDNR's website at:
<http://www.dnr.mo.gov/env/wpp/waterquality/303d.htm>.

"The Data in Table 3-2 are based on research by Robert Pitt, University of Alabama, 2004, and therefore, the percentages shown to distinguish "hits" for specific flow types should be viewed as representative and may shift. Also, in some instances, indicator parameters were "downgraded" to account for regional variation or dilution effects. For example, both color and turbidity are excellent indicators of sewage based on discharge fingerprint data, but both can vary regionally depending on the composition of clean groundwater." (Center for Watershed Protection and Pitt, 2004)

Table 3-2: Indicator Parameters Used to Detect Illicit Discharges					
Discharge Types It Can Detect					
Parameter	Sewage	Wash water	Tap Water	Industrial or Commercial Liquid Wastes	Laboratory/Analytical Challenges
Ammonia	#	*	x	*	Can change into other nitrogen forms as the flow travels to the outfall
Boron	*	*	x	N/A	
Chlorine	x	x	x	*	High Chlorine demand in natural waters limits utility to flows with very high chlorine concentrations
Color	*	*	x	*	
Conductivity	*	*	x	*	Ineffective in saline waters
Detergents-Surfactants	//	//	x	*	Reagent is a hazardous waste
E. coli Enterococci Total Coliform	*	x	x	x	24-hour wait for results. Need to modify standard monitoring protocols to measure high bacteria concentrations
Fluoride ¹	x	x	#	*	Reagent is a hazardous waste exception for communities that do not fluoridate their tap water
Hardness	*	*	*	*	
pH	x	*	x	*	
Potassium	*	x	x	#	May need to use two separate analytical techniques, depending on the concentration
Turbidity	*	*	x	*	
# Can almost always (>80% of samples) distinguish this discharge from clean flow types (e.g., tap water or natural water). For tap water can distinguish from natural water. * Can sometime (>50% of samples) distinguish this discharge from clean flow types depending on regional characteristics, or can be helpful in combination with another parameter x Poor indicator. Cannot reliably detect illicit discharges, or cannot detect tap water. N/A Data are not available to assess the utility of this parameter for this purpose. Data Source: Pitt (this study) ¹ Fluoride is a poor indicator when used as a single parameter, but when combined with additional parameter (such as detergent, ammonia and potassium), it can almost always distinguish between sewage and wash water.					
SOURCE: Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection					

Odd hours of monitoring

Since many types of intermittent discharges probably occur when households are home, then the inspections may need to be performed during these times as well. They may need to be performed either later in the evening or early morning hours or on the weekends. Make sure that if samples will be collected during odd times, the lab needs to be notified to ensure they can accept and analyze the sample since there are specific holding times for each type of parameter.

Sampling at the outfall plunge pool:

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

Chapter 4: Tracing for the Source of an Illicit Discharge



Figure 6: Presence of Commercial Illicit Discharge-grease from restaurant

Once an illicit discharge is found, a combination of methods is used to isolate its specific source and this chapter describes four investigation options. Once the pipe or stream segment has been identified, on-site investigations are used to find the specific discharge or improper connection. This method relies on an analysis of land use or other characteristics of the drainage area that is producing the illicit discharge. The investigation can be as simple as a “drive by” or “windshield” survey of the drainage or a more complex mapping analysis of the storm system network and potential generating sites. Drainage area investigations work best when prior indicator monitoring reveals strong clues as to the likely generating site producing the discharge.

On-site methods are used to trace the source of an illicit discharge in a pipe segment, and may involve dye, video or smoke testing within isolated segments of the storm system.

Where to sample?

The field crew should decide how to attack the pipe network that contributes to a problem outfall. Three options can be used:

1. Crews can work progressively up the trunk from the outfall and test manholes along the way
2. Crews can split the trunk into equal segments and test manholes at strategic junctions in the storm drain system
3. Crews can work progressively down from the upper parts of the storm drain network toward the problem outfall

The decision made to move up or down the trunk depends on the nature and land use of the contributing drainage area. Some guidance for making this decision is provided in Table 53. Each option requires different levels of advance preparation.

Table 53: Methods to Attack the Storm Drain Network

Method	Nature of Investigation	Drainage System	Advance Required	Prep
Follow the discharge up	Narrow source of an individual discharge	Small diameter outfall (<36") Simple drainage network	No	
Spilt into segments	Narrow source of a discharge identified at outfall	Large diameter outfall (>30"), Complex drainage Logistical or traffic issues may make sampling difficult	Yes	
Move down the storm drain	Multiple types of pollution, many suspected problems – possibly due to old plumbing practices or number of NPDES permits	Very large drainage area (> one square mile)	Yes	

Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments, Center for Watershed Protection

Option 1: Move up the trunk:

Moving up the trunk of the storm system network is effective for illicit discharge problems in relatively small drainage areas. Field crews can begin immediately when an illicit discharge is detected at the outfall, and only requires a map of the storm drain system. Field crews start with the manhole closest to the outfall, and progressively move up the network, inspecting manholes until indicators reveal that the discharge is no longer present. The goal is to isolate the discharge between two storm drain manholes.

Option 2: Split the storm drain network:

When splitting the storm system network, field crews select strategic manholes at junctions in the storm drain system to isolate discharges. This option is particularly suited in larger and more complex drainage areas since it can limit the total number of manholes to inspect, and it can avoid locations where access and traffic are problematic.

The method recommended for splitting the trunk is as follows:

1. Review a map of the storm drain network leading to the suspect outfall
2. Identify major contributing branches to the trunk. The trunk is defined as the largest diameter pipe in the storm drain network that leads directly to the outfall. The "branches" are networks of smaller pipes that contribute to the trunk
3. Identify manholes to inspect at the farthest downstream node of each contributing branch and one immediately upstream
4. Working up the network, investigate manholes on each contributing branch and trunk, until the source is narrowed to a specific section of the trunk or contributing branch

5. Once the discharge is narrowed to a specific section of trunk, select the appropriate on-site investigation method to trace the exact source
6. If narrowed to a contributing branch, move up or split the branch until a specific pipe segment is isolated, and commence the appropriate on-site investigation to determine the source

Option 3: Move down the storm drain network:

In this option, crews start by inspecting manholes at the “headwaters” of the storm system network, and progressively move down the pipe. This approach works best in very large drainage areas that have many potential continuous and/or intermittent discharges. Field crews certify that each upstream branch of the storm drain network has no contributing discharges before moving down pipe to a “junction manhole”. If discharges are found, the crew performs dye testing to pinpoint the discharge. The crew then confirms that the discharge is removed before moving farther down the pipe network.

Key visual observations that are made during inspection include:

- Presence of flow
- Color
- Odor
- Floatable materials
- Deposits or stains (intermittent flows)

The results of storm drain network investigations should be systematically documented to guide future discharge investigations, and describe any infrastructure maintenance problems encountered.

Televising/Video Inspection

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

Smoke Testing

This method should be used during special circumstances when a good storm sewer map is not available for a location and there are known problems of connection issues. Smoke is introduced into the storm drainage system and will emerge at locations that are connected to that system. It is recommended that qualified personnel be used for this method to ensure accurate test results. “Notifying the public about the date and purpose of smoke testing before starting is critical. The smoke used is non-toxic, but can cause respiratory irritation, which can be a problem for some residents. Residents should be notified one week prior to testing, if possible, and should be provided the following information” (Hurco Technologies, Inc., 2003):

- Date testing will occur and reason for smoke testing

- Precautions they can take to prevent smoke from entering their homes or businesses
- What they need to do if smoke enters their home or business, and any health concerns associated with the smoke
- A number residents can call to relay any particular health concerns (e.g., chronic respiratory problems)

Optical Brightener Monitoring (OBM) Traps

OBM traps can be used to assist in tracing intermittent flows that result from wash water with detergent. Detergents contain optical brighteners that can be detected at high concentrations. However, this method usually only picks up highly concentrated discharges. The OBM method may be used as a simple indicator for the presence or absence of intermittent flows or to detect the most concentrated flows.

These traps usually contain unbleached cotton pads or a fabric swatch placed inside of a wire mesh trap. These traps are anchored inside of an outfall using wire that is secured to the pipe itself. Rocks can also be used to hold the trap in place.

These traps will be retrieved after 24-48 hours of dry weather. They need to be removed prior to having contact with storm water. When placed under a fluorescent light, an OBM trap will indicate if it has been exposed to detergents.

Chapter 5 Elimination of Illicit Discharges

Developing and implementing an effective IDDE program requires the successful removal of an illicit discharge once it is located. Under the MDNR EPA Phase II rules, you must “to the extent allowable under law, effectively prohibit, through ordinance or other regulatory mechanism, non-stormwater discharges into your storm sewer system and implement appropriate enforcement procedures and actions.”

There is currently an ordinance in place (#5082, Section 405.245) that addresses the regulatory mechanisms to address these discharges and comply with MDNR EPA Phase II requirements.

Once an illicit discharge has been identified, then the City must determine who is responsible for the removal of the discharge. Ultimately, it is the responsibility of the property owner. If the property owner cannot be identified, then the responsibility falls back to the City to remove the discharge. A few examples of such discharges are as follows:

- Internal plumbing connection-building/property owner
- Water/Sewer lateral-building/property owner
- Infrastructure Failure, e.g. sanitary sewer main within dedicated easement or right of way-City
- Illegal Dumping-e.g., oil, grease, paint, grass clippings/yard waste-building/property owner

Per the ordinance, the timeframe to repair the illicit discharge is determined by the type of discharge that occurs. A notice of violation is normally given to the building/property owner along with a timeline to correct in writing unless the discharge needs immediate attention, then the building/owner is notified in person and formal notification in writing is sent at a later date.

Once removal of the illicit discharge has occurred, it must be confirmed to ensure that all corrections have been made. For example, a dye test or camera of failed infrastructure, visible inspection after removal of grass clippings.

If the illicit discharge is emanating from outside City jurisdiction, it is important to notify the community where the discharge is coming from. This should be done in a letter format where you can document that it was sent out. The letter should include where the illicit discharge was detected and where it was traced to. Keeping records of what you did, and ask the neighboring community/jurisdiction to inform you that the correction has been made is also very important. Include all documentation with the annual Phase II Stormwater Report.

Preventing Illegal Dumping

One source of illicit discharge is illegal dumping. This is often difficult to identify and locate. It is also difficult to determine who is responsible for the illegal dumping. Because of the potential problem that this type of discharge presents, it is important to develop an IDDE program.

The US EPA has developed an Illegal Dumping Prevention Guidebook that provides key information and procedures in addressing this type of illicit discharge. The guidebook can be located at <http://www.epa.gov/region5/illegal dumping/>. Strategies for preventing illegal dumping include:

- Site maintenance controls: clean up areas where illegal dumping has occurred and use other controls to prevent further dumping, signs, fencing, etc.
- Targeted Enforcement: Utilization of an ordinance that prohibits illegal dumping
- Education and Involvement: Community outreach is vital to any successful IDDE program. There are a variety of programs that can assist the community in meeting their requirements under this component of Phase II

Chapter 6: Evaluation of your IDDE Program

A successful IDDE program involves program evaluation and assessment. EPA recommends that the IDDE programs be evaluated periodically to assess if it has been effective and most of all efficient.

Prior to evaluating the program, it is important to note that goals and implementation strategies need to be included with the IDDE program. This is done once the City understands the extent of the illicit discharge problem and how it influences local water quality. Initial program goals should be realistic and provide specific completion milestones to measure program compliance. Measurable goals enable the City to track and evaluate permit compliance over time, and to reassess and modify the program over time.

The NPDES Phase II MS4 permit regulations grant considerable flexibility to develop program goals, as long as they are defined in a measurable way to gauge permit compliance and program effectiveness. EPA states (2000e) state that goals “should reflect the needs and characteristics of the operator and the area served by its small MS4. Furthermore, they should be chosen using an integrated approach that fully addresses the requirements and intent of the minimum control measure”.

Tracking and Reporting System

An accurate and user-friendly system to track, report and respond to illicit discharge problems is critical for program managers. The tracking system enables managers to measure program indicators, and gives field crews a home to store the data they collect. The fundamental units to track are individual outfalls, along with any supporting information about their contributing drainage area. Some of the key information to include when tracking outfalls includes:

- Geospatial coordinates of each outfall location
- Any supporting information about the contributing land use
- Diameter and physical characteristics of the outfall
- Outfall Reconnaissance Inventory (ORI) data
- Any accompanying digital photos
- Any follow-up monitoring at the outfall or further up the pipe
- Any hotline complaints logged for the outfall, along with local response
- Status and dispositions of any enforcement actions
- Any maintenance and inspection data

Evaluating the Program

Program managers need to be extremely adaptable in how they allocate their resources. Effective IDDE programs are dynamic and flexible to respond to an ever-changing set of discharge problems, program obstacles, and emerging technologies. At a minimum, program managers should maintain and evaluate their IDDE tracking system annually, and modify program components as needed. Tracking systems should be designed so that progress toward

measurable goals can be easily reported. The tracking system should be evaluated and contain the following features:

- Updated mapping to reflect outfalls located during the ORI
- Surveyed stream reaches with locations obvious, suspect, and potential discharges, and locations of dumping sites
- Indicator sampling results for specific streams, outfalls, and storm drains
- Frequency of hotline use or confirmed illicit discharges
- Costs for each component of the program
- Number of discharges corrected
- Status and disposition of enforcement actions

Regular analysis of the tracking system sheds light on program strengths and deficiencies, and improved targeting limited program resources.

To effectively evaluate your program, a number of questions need to be asked and analyzed:

1. Evaluate priority areas within City limits
 - a. Were areas identified initially?
 - b. Are there areas still appropriate to continue to be a priority area?
 - c. Have illicit discharges been located in these areas?
2. Detection Program
 - a. Is the program effective? Need to assess and reassess the program by determining what has been achieved. Look at the number of outfall inventories, the number visibly inspected, the number that had dry weather flows and look at the overall percentages of these flows as part of your overall storm sewer system for the City
 - b. Cost effectiveness: What aspects of the program had the highest quality of effectiveness in relationship to cost?
 - c. Number of illicit discharges detected utilizing the detection method (which method is more effective?)
3. Tracing Program
 - a. What techniques were used?
 - b. Were these methods successful?
 - c. What techniques that were not used would be beneficial for next year?
 - d. How many illicit discharge sources were identified and/or eliminated?
4. Other
 - a. If using water quality sampling, resample areas within community to determine effectiveness of removal of illicit discharges
 - b. Determine how much time was spent by employees and expenses to determine overall cost for achieving a given result

City Action Items

At this time, the City addresses illicit discharges on a reactive basis. The goal of this program is to begin the process of being becoming more proactive so that discharges can be stopped before they start. We currently have most of the system located and mapped using our GIS system. An ordinance is in place for when a discharge occurs and we have a tracking system by means of database that houses all of the stormwater concerns reported to the City. The following is a list of items that the City will be addressing with regards to the IDDE program:

1. Continue to update mapping system as new development occurs
 - a. One goal is to have all illicit discharges and monitoring information included in the mapping system
2. Perform Inventory and Survey of MS4 within City limits
 - a. Once complete identify hot spots and violators
3. Establish a schedule for dry weather screening and testing/monitoring

Chapter 7: Education to Employees, General Public and Businesses

This chapter provides some suggestions as to how to provide this information to target audiences.

Employees

The Phase II Storm Water rule requires that municipal employees be trained on pollution prevention techniques. This is located within minimum control measure #6: "Pollution Prevention/Good Housekeeping for Municipal Operations."

Part of this training can include prevention of non-stormwater discharges from entering the storm sewer system from municipal operations. Employees can play an important role as partners in the detection and/or prevention of illicit discharges

Employees can also look for signs of illegal dumping into storm drains/detention/retention areas. Staff whose jobs keep them outside and mobile can help spot illegal dumpers. Fire and police department personnel, who respond to hazardous material spills, can help keep these spills out of the storm sewer system and adjacent water bodies.

General Public

The general public is made aware and educated on environmental and water quality issues. During the outreach stage, it is important to get the public engaged and involved in the process. Some examples of what can be done to educate the general public:

- Print and distribute outreach materials. This should include brochures/leaflets, articles in the City news letter, information on City website
- Use of a dedicated "hotline" for the public to call when they observe illicit discharges or illegal dumping
- Develop citizen volunteer programs or events to conduct storm drain stenciling, creek and roadside clean up events. All volunteer should sign a liability form
- Develop a recycling program for hazardous wastes as well as regular recyclables. St. Charles County has two such locations that citizens are referred to for bulk and hazardous waste recycling. They take such items as paint or appliances

Businesses

It is also important to educate local businesses to show how they can have an impact on water pollution. Here are some steps you can take to reach out to businesses:

- Develop a brochure and/or presentations to inform businesses about water pollution, storm water and illicit discharges. It is important to have partners assist on this project including the local Chamber of Commerce
- Provide contractors and developers information on illegal connections, non-stormwater discharges and illegal dumping

References

Center for Watershed Protection and Robert Pitt. 2004. Illicit Discharge Detection and Elimination: A Guidance Manual for Program Development and Technical Assessments.

The Cuyhoga County Board of Health Water Protection, 1996 Illicit Discharge Detection and Elimination Manual: A Guidance Manual for Municipalities in the State of Ohio

New England Interstate Water Pollution Control Commission, 2003. Illicit Discharge Detection and Elimination Manual: A Handbook for Municipalities

US Environmental Protection Agency Federal Register, 1999. 40 CFR Parts 9, 122, and 124. National Pollutant Discharge Elimination System – Regulations for Revision of the Water Pollution Control Program Addressing Storm Water Discharges; Final Rule Report to Congress on the Phase II Storm Water Regulations; Notice

Missouri Department of Natural Resources Water Protection Program:
<http://www.mdnr.gov/env/wpp>

US Environmental Protection agency: <http://cfpub.epa.gov/npdes/stormwater/munic.cfm>

Appendix A

Inventory Form

Outfall Inventory Form

General Location Information		
Receiving Stream:		
Stream Segment:		
Watershed:		
City:		
Latitude:		
Longitude:		
Location Description:		Outfall Photograph
Storm Sewer Map Information		
Outfall on Map: <input type="checkbox"/> Yes <input type="checkbox"/> No		
Map ID/Number:		
Map Source:		
Outfall Located on (facing downstream):		Location Map
Pipe Characteristics		
<input type="checkbox"/> Circular <input type="checkbox"/> Elliptical <input type="checkbox"/> Egg <input type="checkbox"/> Rectangular <input type="checkbox"/> Other, Describe:		
Pipe Height (in):		
Pipe Width (in):		
Pipe Material:		
<input type="checkbox"/> RCP <input type="checkbox"/> PVC <input type="checkbox"/> VCP <input type="checkbox"/> Cast Iron <input type="checkbox"/> CMP <input type="checkbox"/> Other, Describe:		
Pipe Condition:		
<input type="checkbox"/> Good <input type="checkbox"/> Poor <input type="checkbox"/> Fair <input type="checkbox"/> N/A		
Height from Invert to Stream Flow Level (ft):		Additional Details
Outfall Type/Ownership		
Outfall Type:		Comments
Owner:		
Authority: City of O'Fallon		
Other ID:		
NPDES Permit: <input type="checkbox"/> Yes <input type="checkbox"/> No		
If Yes, #:		

Appendix B

Inspection Form

Stormwater Outfall Inspection Form

Section 1: Background Data

Date: _____ Time: _____ Temperature: _____ °F

Inspector Name: _____

Watershed/Subwatershed: _____

Outfall ID: _____

Last Rain: None: 24 hr ☐ 48 hr ☐ Greater than 48 hr ☐

If Rain: less than 1/2 in ☐ 1/2 inch-3/4 in ☐ Greater than 3/4 in ☐

Land Use in Drainage Area (Check all that apply)

Residential ☐ Commercial ☐ Industrial ☐ Open Space ☐

Section 2: Outfall Description

Storm Sewer Material Type: RCP ☐ CMP ☐ Other ☐

Outfall Shape: Circular ☐ Square ☐ Elliptical ☐ Other ☐

Diameter (in): _____

Submerged In Water: No ☐ Partially ☐ Fully ☐

Submerged with Sediment: No ☐ Partially ☐ Fully ☐

Open Drainage (Swale/Ditch): Earthen ☐ Concrete ☐ Rip Rap/Rock ☐ Other ☐

If Other: _____

Section 3: Physical Indicators (Check if present):

Outfall Damage ☐ Description: Spalling, cracking or chipping ☐ corrosion ☐ Other ☐

If other: _____

Deposits/Stains ☐ Kind: Oily ☐ Flow Line ☐ Paint ☐ Other ☐ If other: _____

Abnormal Vegetation ☐ If yes: Minor ☐ Excessive ☐ Inhibit Flow ☐

Water/Pool Quality: Odors ☐ Color ☐ Floatables (not trash) ☐ Oil sheen ☐ Suds ☐

Excessive Algae ☐ Other: _____

Do physical indicators suggest an illicit discharge is present? Yes ☐ No ☐

Section 4: Physical Indicators (Flowing Outfalls Only)

If Odor: sewage ☐ rancid/sour ☐ sulfur/sulfide ☐ petroleum/gas/diesel ☐ Detergent ☐
antifreeze ☐

Is Odor: 1.-Faint ☐ 2. Easily detected ☐ 3. Noticeable from a distance: ☐

What Color: Clear ☐ Gray ☐ Green ☐ Black ☐ Brown ☐ Yellow ☐
Orange/Red ☐ Multi-color ☐

Other

Is Color: 1. Very Light/Faint ☐ Clearly visible in outfall ☐ Clearly visible in sample bottle ☐

Type of Floatables: Sewage ☐ Petroleum (oil sheen) ☐ Grease ☐ Suds/Foam ☐

Floatables Source: 1. Slight-origin not obvious ☐ 2. Some indication of origin ☐ 3. Origin is obvious: ☐

If suspicion of Illicit Discharge sample taken for lab? Yes ☐ No ☐

****Note Outfall number on sample taken**

If collected from: Flow ☐ Pool ☐

Appendix C

Missouri Stream Team Data Sheets

The following data sheets are provided by the Missouri Stream Team can be found on their website at: <http://www.mostreamteam.org/>

- Water Chemistry Data Sheet
- Visual Survey Data Sheet
- Macroinvertebrate Data Sheet
- Stream Discharge Data Sheet

Appendix D

Illicit Discharge Ordinance

Please refer to the following website or contact the Stormwater Management Department for a copy of the City of O'Fallon Stormwater Quality Management and Illicit Discharge Control Ordinance, #5082, Section 405.245:

- City Website: http://www.ofallon.mo.us/dept_water-sewer_swm_regs.htm
- Stormwater Management Department: 636.240.2000

Appendix E

10 CSR 20-7.031

Table A, B, F, H and J

For the most updated regulations please refer to the MDNR website at:
http://www.dnr.mo.gov/env/wpp/wqstandards/wq_antideg_pol.htm

Or

Missouri Secretary of State's website at:

<http://www.sos.mo.gov/adrules/csr/current/10csr/10c20-7.pdf>

Appendix F

IDDE Field Guide

Illicit Discharge Detection and Elimination Field Guide



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

Illicit Discharge Testing Procedure

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

MS4 means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains)

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

Stormwater testing supplies

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

Key Observations:

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

Know the Difference??



Iron Bacteria



Diesel Fuel

Illicit Discharge Detection and Elimination Field Guide

Water Quality Test Parameters and Uses

Water Quality Test

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

Outfall Material:



High Density Polyethylene (HDPE)



Vitrified Clay Pipe (VCP)



Corrugated Metal Pipe (CMP)



Reinforced Concrete Pipe (RCP)



Polyvinyl Chloride (PVC)



Ductile Iron Pipe (DIP)



Illicit Discharge Detection & Elimination (IDDE)

Field Pocket Guide



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CDOT has a permit from the Colorado Department of Public Health and the Environment (CDPHE) to discharge stormwater from our storm drain system to surface waters of the state. The permit states that only stormwater can be discharged from CDOT's storm drain system. Pollutants, such as sediment; fertilizers; pesticides; oil and grease, antifreeze; and other automotive fluids are strictly prohibited from being disposed of in CDOT's storm drain system.

As part of the permit, CDOT has several different programs to prevent pollutants from entering the storm drain system. The programs are:

- Construction sites program
- New development and redevelopment program
- **Illicit discharges program**
- Industrial facilities program
- Public education and involvement program
- Pollution prevention and good housekeeping program
- Wet weather monitoring program

The purpose of the Illicit Discharge Program is to identify and eliminate any discharge that is not composed entirely of stormwater (unless authorized by a separate permit from CDPHE). CDOT employees can help prevent these discharges from polluting stormwater and our streams and rivers.

Corrective Action for an Illicit Discharge

The CDOT Illicit Discharge Response Team, in conjunction with the CDOT Water Quality Program Manager, will take action to respond to suspected illicit discharges with the following steps:

Suspected Hazardous Discharge

Spills on highways, into waterways, or that may otherwise present and immediate danger to the public shall be reported by:

- Call **911**
- Immediately notify the CDOT illicit discharge hotline
303-512-4H20 (4426).
- Immediately Notify the CDOT Water Quality Program Manager
303-757-9343.
- Immediately Notify the CDPHE-EMP hotline (and follow up in writing within 5-days)
1-877-518-5608.
- Contact State Patrol Dispatch
303-239-4546
- Complete incident tracking forms
- Conduct follow-up inspections to ensure the discharge has been stopped and/or illicit connection has been removed

Suspected Non-Hazardous Discharge

- Immediately notify the CDOT illicit discharge hotline **303-512-4H20 (4426).**
- Notify the CDOT Water Quality Program Manager **303-757-9343.**
- Notify the CDPHE-EMP hotline (and follow up in writing within allowed time period) **1-877-518-5608.**
- Notify the local MS4 municipality
- Dispatch the CDOT Illicit Discharge Response Team
- Perform sampling of any non-hazardous discharge to determine its nature
- Perform sampling and visual inspection upstream of the discharge to determine the location of its origin
- Once the source of an illicit discharge has been identified, steps should be taken to eliminate the discharge.
- Issue a letter of violation to the upstream offender
- Complete incident tracking forms
- Conduct follow-up inspections to ensure the discharge has been stopped and/or illicit connection has been removed
- If the offending party does not take corrective action, contact the CDPHE-Water Quality Control Division

Outfall Field Screening

When screening outfalls for illicit discharge it is important to ensure that any dry weather discharges are not influenced by stormwater. Therefore, all outfall sampling and inspections should be conducted **48 hours** or more after the end of a precipitation or snowmelt event.

To ensure safety, efficiency, proper documentation and testing, CDOT field inspection teams will consist of a minimum of two people, one team leader and at least one sampler/technician.

Precipitation Within Last 48 hours -

The exact time and date of previous precipitation is NOT required. Enter amount in inches based on knowledge of the area and physical evidence (i.e., rain, snow, etc.). <http://www.wunderground.com/wundermap/> as well as many other on-line sources provide both current and historical precipitation data and are useful tools to determine the physical attributes of a precipitation event at a specific location.

Visit Procedure

- Go to site
- Locate outfall using GPS coordinates (if known).
- Capture GPS coordinates location (if not known)
- Photograph outfall with “white board”, document on field data sheet.
- Complete the Outfall Visit Field Data Sheet recording visual observations about the outfall, its condition, and the discharge (if any) flowing out of the outfall including color, odor, turbidity, and floatables.

Collecting a water sample*

- Transport sampling equipment to the outfall.
- Put on nitrile gloves.
- A 1-liter grab sample will be collected for field testing of total chlorine, color, total copper, turbidity, pH, phenols, and other parameters. Two, 1-liter grab samples will be collected at the same time for possible laboratory analysis of the same parameters.
- Preserve field and laboratory samples by placing samples in a cooler with ice, or for onsite testing.
- Rinse meters/equipment in the water to be tested.
- Complete water quality tests on sample.

(Continued Next Page)

- **Measure the flow rate.**
- **Rinse probes with distilled water**
- **Complete all paper work.**
- **Gather all equipment.**
- **Label samples with indelible ink.**
- **Record sample number, analysis parameter, and collection time on COC and in field data sheet.**
- **Transport samples to lab.**

*Field testing is primarily for outfall reconnaissance investigations. Depending upon the potential regulatory implications, any additional samples obtained at a suspected ID site must be sent to an independent lab.



Outfall Visit Field Data Sheet

CDOT Outfall Field Visit Data Sheet					
(1) Outfall ID No. _____		(2) GPS Unit _____		(3) Date _____	
(4) Time _____ AM/PM					
(5) Investigation Team: _____					
SECTION 1: Background Information					
(6) Reason for Visit <input type="checkbox"/> Complaint <input type="checkbox"/> Outfall Screening <input type="checkbox"/> Repeat/Follow-up Visit <input type="checkbox"/> Illegal Connection/ Illicit Discharge <input type="checkbox"/> Other _____ Camera Name: _____ Photo Numbers: _____		(7) Location Highway: _____ In CDOT ROW? <input type="checkbox"/> Yes <input type="checkbox"/> No Address: _____ Milepost: _____ Latitude _____ Deg _____ Min _____ Sec N Longitude _____ Deg _____ Min _____ Sec W Distance from Outfall (if applicable): _____ Receiving Water: _____ Watershed: _____ Accessibility: _____		(8) Land Use <input type="checkbox"/> Agricultural <input type="checkbox"/> Commercial <input type="checkbox"/> Designated Open Space <input type="checkbox"/> Highway <input type="checkbox"/> Industrial <input type="checkbox"/> Institutional <input type="checkbox"/> Residential <input type="checkbox"/> Urban <input type="checkbox"/> Undeveloped <input type="checkbox"/> Other _____ (9) Drains To <input type="checkbox"/> Ditch <input type="checkbox"/> Gulch <input type="checkbox"/> Gore point <input type="checkbox"/> Stream <input type="checkbox"/> Other: _____ (10) Rainfall _____ in. <input type="checkbox"/> <48 hrs <input type="checkbox"/> 48-72 hours <input type="checkbox"/> >72 hours	
(11) Notes (e.g. Origin of outfall, Permit No., Outfall owner, other outfall ID info): _____					
SECTION 2: Outfall Description					
(12) Outfall Type <input type="checkbox"/> Closed Pipe <input type="checkbox"/> Manhole <input type="checkbox"/> Open Channel <input type="checkbox"/> Other _____	(14) Material <input type="checkbox"/> Clay <input type="checkbox"/> CMP <input type="checkbox"/> DIP (Iron) <input type="checkbox"/> Earthen <input type="checkbox"/> Grass Lined <input type="checkbox"/> HDPE <input type="checkbox"/> PVC <input type="checkbox"/> RCP (Concrete) <input type="checkbox"/> Rip-rap <input type="checkbox"/> Steel <input type="checkbox"/> VCP <input type="checkbox"/> Other: _____	(15) Shape Closed Pipe: <input type="checkbox"/> Box <input type="checkbox"/> Circular <input type="checkbox"/> Elliptical <input type="checkbox"/> Arch <input type="checkbox"/> Other: _____ Open Channel: <input type="checkbox"/> Chute <input type="checkbox"/> Trapezoidal <input type="checkbox"/> Parabolic <input type="checkbox"/> Other: _____	(16) Structure <input type="checkbox"/> Good Condition <input type="checkbox"/> Chipping <input type="checkbox"/> Collapsed <input type="checkbox"/> Corrosion <input type="checkbox"/> Cracking <input type="checkbox"/> Peeling Paint <input type="checkbox"/> Spalling <input type="checkbox"/> Other: _____	(17) Deposits <input type="checkbox"/> None <input type="checkbox"/> Oils <input type="checkbox"/> Sediments <input type="checkbox"/> Stains <input type="checkbox"/> Paint <input type="checkbox"/> Other: _____ Blocked? <input type="checkbox"/> Yes <input type="checkbox"/> No Percent Blocked: _____ %	(18) Vegetation <input type="checkbox"/> None <input type="checkbox"/> Light <input type="checkbox"/> Medium <input type="checkbox"/> Heavy <input type="checkbox"/> Excessive Blocked? <input type="checkbox"/> Yes <input type="checkbox"/> No Percent Blocked: _____ %
(13) Outfall Dia/Dimensions (Diameter/Height/Width) _____ _____ _____		(19) Submerged in Water? <input type="checkbox"/> No <input type="checkbox"/> Partially <input type="checkbox"/> Fully (20) Notes/Sketches: _____ _____ _____			
(21) Misc. Dumping <input type="checkbox"/> Appliances <input type="checkbox"/> Car Battery <input type="checkbox"/> Motor oil <input type="checkbox"/> Other car fluid <input type="checkbox"/> Mattresses <input type="checkbox"/> Trash <input type="checkbox"/> Food Waste Blocked? <input type="checkbox"/> Yes <input type="checkbox"/> No		(22) Benthic Growth <input type="checkbox"/> Yes <input type="checkbox"/> No Type: <input type="checkbox"/> Brown <input type="checkbox"/> Orange <input type="checkbox"/> Green <input type="checkbox"/> Other: _____		(23) Pool Quality* <input type="checkbox"/> Odor <input type="checkbox"/> Color <input type="checkbox"/> Floatables <input type="checkbox"/> Oil Sheen <input type="checkbox"/> Sewage <input type="checkbox"/> Sanitary Sewage <input type="checkbox"/> Illicit Dumping <input type="checkbox"/> Soda <input type="checkbox"/> Algae <input type="checkbox"/> Other: _____ *If any of the pool quality parameters are checked, collect sample and complete Sections 3 and 4.	
(24) Notes: _____					
SECTION 3: Flow Measurement and Water Quality					
(25) Flow Present? <input type="checkbox"/> Yes <input type="checkbox"/> No Flow Description: <input type="checkbox"/> Trickle <input type="checkbox"/> Moderate <input type="checkbox"/> Substantial (26) Evidence of Illicit Discharge in Pool? <input type="checkbox"/> Yes <input type="checkbox"/> No —If yes, skip to Section 4. If no, skip to Section 6—		(27) Field Meter Measurements Temperature _____ °F pH _____ Turbidity _____ NTU Conductivity _____ S/m (28) Stormwater Kit Measurements Ammonia _____ mg/L Chlorine, Total Residual _____ mg/L Color, Apparent _____ Color Units Copper, Total _____ mg/L Detergent Surfactants _____ mg/L Phenols, Total _____ mg/L Dissolved Oxygen _____ mg/L		(29) Flow Dimensions Flow Width: _____ in _____ ft Flow Depth: _____ in _____ ft Flow Velocity: _____ ft/sec Flow Rate _____ ft ³ /sec (Rate = Width*Depth*Velocity)	
(30) Notes: _____					
SECTION 4: Physical Characterization					
(31) ODOR <input type="checkbox"/> Yes <input type="checkbox"/> No Type: <input type="checkbox"/> Chlorine <input type="checkbox"/> Gasoline/Petroleum <input type="checkbox"/> Musty <input type="checkbox"/> Rancid <input type="checkbox"/> Rotten Eggs <input type="checkbox"/> Sewage <input type="checkbox"/> Sour Milk <input type="checkbox"/> Sulfide <input type="checkbox"/> Other: _____ Severity Index: <input type="checkbox"/> Faint <input type="checkbox"/> Easily Detected <input type="checkbox"/> Noticed from Distance	(32) COLOR <input type="checkbox"/> Yes <input type="checkbox"/> No Type: <input type="checkbox"/> Brown <input type="checkbox"/> Gray <input type="checkbox"/> Green <input type="checkbox"/> Orange <input type="checkbox"/> Red <input type="checkbox"/> Yellow <input type="checkbox"/> Other: _____ Severity Index: <input type="checkbox"/> Faint Colors in Sample Bottle <input type="checkbox"/> Clearly Visible in Sample Bottle <input type="checkbox"/> Clearly visible in Outfall Flow	(33) TURBIDITY/CLARITY <input type="checkbox"/> Yes <input type="checkbox"/> No Severity Index: <input type="checkbox"/> Slight Cloudiness <input type="checkbox"/> Cloudy <input type="checkbox"/> Opaque (34) BIOLOGICAL WASTE <input type="checkbox"/> Yes <input type="checkbox"/> No Type: <input type="checkbox"/> Insects <input type="checkbox"/> Algae <input type="checkbox"/> Other Biological Matter: _____	(35) FLOATABLES <input type="checkbox"/> Yes <input type="checkbox"/> No Type: <input type="checkbox"/> Biological Growth <input type="checkbox"/> Foam/Suds <input type="checkbox"/> Garbage <input type="checkbox"/> Oil Sheen <input type="checkbox"/> Sewage <input type="checkbox"/> Sanitary Sewage (toilet paper, coffee grounds, egg shells, com) <input type="checkbox"/> Other: _____ Severity Index: <input type="checkbox"/> Few/Slight, origin not obvious <input type="checkbox"/> Some indications of origin <input type="checkbox"/> Clear indications of origin		
(36) Notes: _____					
SECTION 5: Data Collection					
(37) Sample Collected for Lab? <input type="checkbox"/> Yes <input type="checkbox"/> No —If no, skip to Section 6—	(38) Collection Information Location: _____ Date: _____ Time: _____ Sample ID: _____		(39) Collected From: <input type="checkbox"/> Outfall <input type="checkbox"/> Pool <input type="checkbox"/> Upstream <input type="checkbox"/> Other: _____		(40) Side of Stream <input type="checkbox"/> River Right <input type="checkbox"/> River Left <input type="checkbox"/> Confluence River Right <input type="checkbox"/> Confluence River Left <input type="checkbox"/> Other: _____
SECTION 6: Overall Outfall Characterization					
(41) Probability of Illicit Discharge					
<input type="checkbox"/> Unlikely <input type="checkbox"/> Potential <input type="checkbox"/> Suspect <input type="checkbox"/> Obvious					
Notes: (Illicit Discharge Concerns? Non-illicit Discharge Concerns?) _____					

Field Equipment Checklist

Safety Equipment

	First Aid Kit
	Sunscreen
	Bug Spray
	Nitrile Gloves
	Safety Goggles
	Leather / work gloves
	Orange Traffic Safety Vests
	Emergency Telephone Numbers
	Snake Gaiters / Chaps
	Cell phone or Communication Device
	Traffic Cones for Parking
	Mace (optional, for self defense only)
	Maps / Aerial Photos / previous visits

Sample Collection Equipment

	Sample Pole and Accessories
	Manhole Cover Pick (optional)
	Sample Bottles – 500 mL (plastic and glass)
	Sample Bottles – 1000 mL (plastic)
	Sample Bottles – 125 mL (plastic)
	Beakers – 50 mL (plastic)
	Sharpie Markers/Label Tags for Sample Labeling
	Blue Ice Packs or Ice Cubes -Care must be taken to ensure that sufficient ice is maintained in the cooler to keep samples cool during transport to the laboratory
	Cooler Chest(s)
	Filter Funnel
	Filter Paper – for turbid samples
	MSDS for all Chemicals / Reagents
	Labels for samples & lab Chain of Custody forms.

Flow Estimation Equipment

	Flow tape measure and floating object to measure velocity (i.e. cork)
	Stop Watch
	Spray Paint / Chalk / Nylon Marking Ribbon
	Flow Containers / Buckets – Graduated in L or Gal
	Calculator
	Velocity Meter (Optional)









Analytical Equipment

	Conductivity Probe, Meter, and Calibration Standards
	Turbidity Meter
	pH Probe, Meter, and Calibration Standards Thermometer
	Ammonia Test Kit
	Total Chlorine Test Kit and Reagents
	Copper Test Kit and Reagents
	Phenols Test Kit and Reagent
	Detergents Test Kit
	De-ionized Water – to rinse analytical equipment
	Wash Bottles
	Pipets and Other Measuring Devices
	Replacement Batteries
	Pipettes and Bulb
	Clipboard
	Bound Field Notebook
	Kimwipes
	Paper Towels
	Scissors

Other Equipment

	Digital camera & white board/marker
	GPS handheld with data dictionary
	Outfall Visit Field Data Sheets
	Dry Weather Screening Manual

Typical Outfall Materials

<p>Clay & Brick</p> 	<p>Corrugated Metal Pipe (CMP)</p> 
<p>High Density Polyethylene (HDPE)</p> 	<p>HDPE Possible Illicit Laundry Connection</p> 
<p>Ductile Iron Pipe (DIP)</p> 	<p>Polyvinyl Chloride (PVC)</p> 
<p>Reinforced Concrete Pipe (RCP)</p> 	<p>Rip-rap</p> 

Typical Outfall Types

<p>Box Measure both H & V</p> 	<p>Chute Measure both width and depth indicating shape (Trapezoidal or Parabolic)</p> 
<p>Circular Measure diameter</p> 	<p>Culvert May not record, look for internal connections & look upstream for other outfalls.</p> 
<p>Elliptical Measure both horizontal and vertical diameters</p> 	<p>Weep Holes Don't record weep holes</p> 
<p>Bridge Drains Measure diameter</p> 	<p>Double Pipes Mark as separate outfalls unless known to connect immediately up-pipe.</p> 

Characterizing Flow

<p>Submerged: More than $\frac{1}{2}$ below water</p> 	<p>Partially Submerged: Less than $\frac{1}{2}$ below water</p> 
<p>Trickle Flow Very narrow stream of water</p> 	<p>Moderate Flow Steady stream, but very shallow depth</p> 
<p>Substantial Flow Steady stream, with several inches of depth</p> 	<p>Moderate Flow</p> 
<p>Blocked: More than $\frac{1}{2}$ with vegetation</p> 	<p>Blocked: More than $\frac{1}{2}$ with sediment</p> 

Outfall Structure Condition

<p>Chipping</p> 	<p>Collapsed Collapsed 50% or more</p> 
<p>Corrosion Metal pipes or covers</p> 	<p>Cracking</p> 
<p>Spalling Water entering concrete forcing the surface to peel, pop out or flake off.</p> 	<p>Light Vegetation</p> 
<p>Medium Vegetation:</p> 	<p>Heavy Vegetation:</p> 

Measuring Flow

1. Channel Flow

2. Free Falling Flow

1. Procedure for Channel Flow (including partial flow in pipe):

1. Locate the hydraulic control for flow measurement. Do not enter any pipes in order to measure flow as that may pose a possible health hazard.
2. If possible, mark off a 10-ft longitudinal segment in the channel or pipe.
3. Clock the time required for a light-weight floatable object to travel the marked-off distance.
4. Place the floating object in the water upstream of the starting point and begin timing as it passes the upstream mark.
5. Repeat Step 4 three times and calculate the average velocity (v) of the floating object in feet per second (fps).
6. If a current meter is available, direct stream measurements should be taken at 60% depth at the point that the cross-sectional flow area is measured in lieu of steps 1-5.
7. Estimate cross-sectional flow area.

For rectangular sections:

$$\text{Area}(A) = \text{Average Width } (W) \times \text{Average Depth } (D)$$

For a trapezoidal section:

$$\text{Area}(A) = \frac{(\text{Top of Water Width} + \text{Bottom Width})}{2} \times \text{Average Depth}(D)$$

Compute flow rate.

$$\text{Flowrate}(Q) = \text{Average Velocity}(v) \times \text{Area}(A)$$

Units:

Flow rate = cubic feet per second (cfs)

Velocity = feet per second (fps)

Area = square feet (ft^2)

Step 1: Measure flow depth



Step 2: Measure flow width



Step 3: Time the travel of a light object (e.g., cork) along a known distance to calculate velocity



2. Procedure for Free-Falling Flow:

1. Place a container of a specific volume directly beneath the free-falling discharge. NOTE: Carry several containers of different volumes and shapes so that you have one that is best suited to the site.
2. Use a stop watch to determine the time required to fill a known volume in the container.
3. Repeat Steps 1 and 2 two or three times. Calculate the average time required to fill the container.
4. Compute flow rate.

$$\text{Flowrate}(Q) = [\text{Volume}(V)] / [\text{Time}(t)]$$

Units:

Flow rate = gallons per minute (gpm)

Volume = gallons

Time = minutes

1. Convert gallons per minute to cubic feet per second. If the container is in other than gallon units, use an appropriate conversion factor (for example, 1-liter equals 0.2642 gallons): Flow in cubic feet per second = Flow in gallons per minute x 0.0022
2. Record the Calculated Flow on the Data sheet. Enter to the nearest two significant figures only. (Examples: 0.024 cfs, or 2.1 cfs, or 15 cfs).

Interpreting Color and Turbidity



Using a clear sample bottle to estimate color and turbidity

Color

Severity Index:
Clearly Visible at Outfall



Turbidity/Clarity

Severity Index: Opaque



Iron Floc

Color

Severity Index:
Clearly Visible



Turbidity/Clarity

Severity Index:
Cloudy



Color

Severity Index:
Faintly Visible











Turbidity/Clarity

Severity Index:
Slight Cloudiness



Interpreting Color and Turbidity Examples

<p>Color Clearly Visible Turbidity/Clarity Cloudy</p>  <p>Sewage Discharge</p>	<p>Color Clearly Visible Turbidity/Clarity Slight cloudiness</p>  <p>Confirm with sample bottle</p>
<p>Color Clearly Visible Turbidity/Clarity Cloudy</p>  <p>Sewage Discharge</p>	<p>Color Faintly Visible Turbidity/Clarity Cloudy</p>  <p>Confirm with sample bottle</p>
<p>Color Blue-green Severity Index: Clearly Visible at Outfall</p> 	<p>Color Red Turbidity/Clarity Opaque</p>  <p>Blood</p>
<p>Color clearly visible Turbidity/Clarity cloudy</p>  <p>Paint</p>	<p>Color clearly visible Turbidity/Clarity cloudy</p>  <p>Construction site discharge</p>

Suds and Oil Sheens

Suds

Natural Foam/Suds are only associated with high flows at the "drop off"



Oil Sheens

Low Severity, oil sheen



Suds

Low Severity appear to travel; very thin foam layer



Oil Sheens

Moderate severity oil sheen



Suds

High severity, sewage related



Oil Sheens

High severity oil film



Synthetic versus Natural Sheen






Sheen from bacteria such as iron floc forms a sheet-like film that cracks if disturbed




Synthetic oil forms a swirling pattern

Benthic & Biologic Indicators

<p>Bacterial growth as this outfall indicates nutrient enrichment, a likely sewage source</p> 	<p>This bright red bacterial growth often indicates high manganese & iron concentrations. Not typically associated with illicit discharges</p> 
<p>Sporolitis filamentous bacteria, also known as "sewage fungus" can be used to track down sanitary sewer leaks</p> 	<p>Algal mats on lakes indicate eutrophication. Several sources can cause this problem. Investigate potential illicit sources</p> 
<p>Illicit discharges or excessive nutrient application can lead to extreme algal growth on stream beds</p> 	<p>Potentially a high nutrient concentration. The cause may be an illicit discharge, but may be excessive use of lawn chemicals</p> 
<p>This brownish algae indicates an elevated nutrient level</p> 	<p>This flow is from rusting rebar from the RCP</p> 

Typical Findings at Outfalls

<p>Reddish staining on the rocks below this outfall indicate high iron concentrations</p> 	<p>Excessive vegetation may indicate enriched flows associated with sewage</p> 
<p>Toilet paper directly below the storm drain outlet</p> 	<p>Brownish stain of unclear origin. May be from degradation of the brick infrastructure</p> 
<p>Trash is not a sole indicator of illicit discharges, but should be noted</p> 	<p>Cracked rock below the outfall may indicate an intermittent discharge</p> 
<p>Staining at the base of the outfall may indicate a persistent, intermittent discharge</p> 	<p>Poor pool quality. Consider sampling from the pool to determine origin</p> 

Sample Collection

Holding Times

Parameter	Container ¹	Volume	Preservation	Maximum Holding Time
Ammonia	P		N/A (Field Analysis), H ₂ SO ₄ to pH<2, Cool at 4°C	Analyze within 28 days ²
Chlorine, Total Residual	P or G	500 mL	Analyze Immediately	Analyze within 15 min. ²
Color, Apparent	P or G	500 mL	Cool at 4°C (39°F)	Analyze within 48 hours
Conductivity	P or G	500 mL	Refrigerate	Analyze within 28 days
Copper, Total	P or G	1000 mL	N/A (Field Analysis), Filter and add HNO ₃ to pH<: 2 and Cool at 4°C (39°F) (Lab Analysis)	Analyze within 6 months ²
Surfactants	P or G	250 mL	N/A (Field Analysis), Cool at 4°C (39°F) (Lab Analysis)	Analyze within 48 hours ²
pH	P or G	50 mL	Analyze Immediately	Analyze within 15 min ²
Phenol, Total	P or G (PTFE-lined cap)	500 mL	N/A (Field Analysis), Cool at 4°C (39°F) ³ and adjust pH < 2 with H ₂ SO ₄ (Lab Analysis)	Analyze within 28 days ²
Turbidity	P or G	100 mL	N/A (Field Analysis), Store in dark up to 24 h, refrigerate	Analyze within 48 hours ²

Onsite Field Tests

Parameter	Method	Range	Detection Limit
Ammonia	Field Meter	0-6.0mg/L	
*Chlorine, Total Residual	DPD, Color Disc	0-3.5 mg/L	0.5 mg/L
Specific Conductance (Conductivity)	Field Meter	0-10,000 uS/cm	
Copper, Total	Bicinchoninate, Hydrosulfite, Color Disc	0-5 mg/L	0.5 mg/L
Detergents	Field Spectrophotometer	0-1 mg/L	0.05 mg/L
*pH	Platinum Electrode, Field Meter	0-14 pH	0.1 pH
Phenols, Total	Color Disc	0-0.200 mg/L	
Turbidity	Field Turbidimeter	0-1 000 NTU	0.01 NTU
*Temperature	Thermometer	NA	0.1°C

* Test MUST be performed immediately at outfall site, upon sample collection (no allowable holding time).

TOTAL AMMONIA

Range 0-6.0 mg/L Total Ammonia

- 1. Fill sample vial to top line with water.**
- 2. Dip the strip into water sample, Vigorously move the strip up and down in water sample for 30 seconds, making sure both pads are always submerged.**
- 3. Remove the test strip and shake off excess water.**
- 4. Hold the test strip level, with pad side up, for 30 seconds.**
- 5. To read result, turn test strip over so that both pads are facing away from you.**
- 6. Compare the color of the small pad to the color change on bottle. Read the result through the clear plastic of the test strip.**
- 7. Rinse sample vial with DI water after each use.**

TOTAL CHLORINE

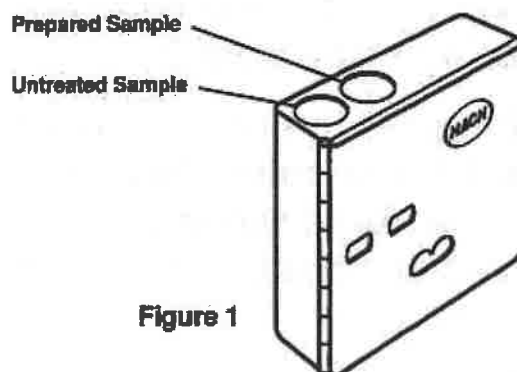
Range: 0-3.5 mg/L Total Chlorine (Cl_2)

To ensure accurate results please read carefully before proceeding.

Rinse viewing tubes thoroughly before conducting the test. The powder does not have to dissolve completely to obtain correct results.

PROCEDURE

1. Fill a color viewing tube to the lower edge of frosted area (5 mL) with clear water and place it in the left top opening of the comparator (untreated sample, Figure 1).
2. Fill the other viewing tube to the lower edge of frosted area (5 mL) with the water sample to be tested.
3. Open one DPD Total Chlorine Reagent Powder Pillow. Add the contents of the pillow to the test sample. Let stand for three minutes, but not more than six minutes, to let the color develop. Place the sample in the right top opening of the comparator (prepared sample, Figure 1).
4. Hold the comparator up to a light source such as a window the sky or a lamp and view through the openings in front. Rotate the disc until a color match is obtained. Read the mg/L total chlorine (Cl_2) through the scale window.



TOTAL COPPER

Range: 0-5 mg/L Total Copper (Cu)

To ensure accurate results please read carefully before proceeding.

This procedure tests for free or complexed copper. Free copper refers to any free or weakly chelated copper ion in solution. Complexed (chelated) copper is tightly bound, as in Cu (EDTA). Free copper plus complexed copper gives the total dissolved copper.

High concentrations of cyanide will inhibit color development. If the cyanide concentration is greater than 2 mg/L, add three drops of Formaldehyde Solution, Cat. 2059-36, to the prepared sample after completing Step 3. Wait three minutes before reading the mg/L free copper in Step 6. The Formaldehyde Solution is not part of this kit but may be ordered from Hach Company. See Replacements.

PROCEDURE

1. Rinse both color viewing tubes several times with the water to be tested. Fill both tubes to the 5-mL mark with the water sample.
2. Open one Free Copper Reagent Powder Pillow (red pillow). Add the contents of the pillow to one of the tubes.
3. Stopper the tube and invert several times to mix. If free copper is present, a purple color will develop. Allow at least two minutes before completing Steps 4 through 6.
4. Insert the prepared sample tube from Step 3 into the right top opening of the color comparator (prepared sample, Figure 1).
5. Insert the tube of untreated water sample into the left top opening of the color comparator (untreated sample, Figure 1).
6. Hold the comparator up to a light source such as the sky, a window or lamp and view through openings in front. Rotate disc to obtain a color match. Read the mg/L free copper through the scale window. Record the value obtained.
7. To determine the amount of total dissolved copper present in the sample add the contents of one Hydrosulfite Reagent Powder Pillow (clear pillow) to the sample tube prepared in Step 3. This is the sample tube in the right opening of the color comparator.
8. Stopper the tube and invert several times to mix. Allow at least two additional minutes before completing Step 9.
9. Replace the tube in the right top opening of the color comparator. Hold the comparator up to a light source and rotate the color disc to obtain a match. Read the mg/L total dissolved copper (free plus complexed copper) through the scale window.
10. The amount of complexed copper can be determined by subtracting the amount of free copper present in the sample (results from Step 6) from the amount of total copper present in the sample (results from Step 9).

DETERGENTS

Range: 0-1.3 mg/L Detergents

To ensure accurate results please read carefully before proceeding.

PROCEDURE

1. Fill one of the test tubes to the upper mark (20 mL) with the water to be tested.
2. Add 12 drops of Detergent Test Solution and shake to mix.
3. Add chloroform to the lowest mark (5 mL) on the test tube.
(Chloroform is heavier than water and will sink.) Stopper, shake vigorously for 30 seconds and let stand for one minute to allow the chloroform to separate.
4. Using the draw-off pipet, remove the water from the tube and discard.
5. Refill the test tube to the upper mark with the Wash Water Buffer and, using the draw-off pipet, remove the Wash Water Buffer and discard. This step washes away the remaining water sample.
6. Refill the test tube to the upper mark with the Wash Water Buffer, stopper and shake vigorously for 30 seconds. See Notes for turbid samples.
Let stand for one minute to allow the chloroform to separate.
7. Insert the test tube containing the prepared sample in the right opening of the color comparator.
8. Fill the other test tube with demineralized water and place it in the left opening of the comparator.
9. Hold the comparator up to a light, such as the sky, a window or a lamp, and view through the two openings in the front. Rotate the Detergents Color Disc until a color match is obtained. Read the ppm Detergents (LAS and/or ABS) from the scale window.
10. If the color is darker than the highest reading on the color disc, dilute the original sample 20-to-1 by adding 1 mL of sample to the test tube (using the plastic dropper filled to the top, or 1-mL mark) and filling the test tube to the upper mark (20 mL) with demineralized water. Repeat Steps 2 through 9 and multiply the results by 20.

pH

USING POCKET PAL™ pH TESTER

Range: 0-14 pH units

To ensure accurate results please read carefully before proceeding.

PROCEDURE

1. Slide the on/off switch to on. The switch is located on top of the Pocket Pal.
2. Remove protective cap from the bottom.
3. Immerse the bottom of the Pocket Pal 1.0 to 1.5 inches (2.5-3.8 cm) into the sample. See Note A on how to calibrate and verify the accuracy of the Pocket Pal.
4. Using the Pocket Pal, gently stir the sample for several seconds. After stirring and when the digital display stabilizes, read the pH value. See Note B.
5. Rinse the bottom of the Pocket Pal and replace the protective cap. Follow Note C for longer life.

NOTES

- A. Before using the Pocket Pal and for periodic calibration, prepare a pH 7.00 buffer solution. Use the Pocket Pal to read pH. If necessary adjust with a small screwdriver through the hole in the back to a 7.0 reading. The Pocket Pal is now calibrated (See Figure 1).
- B. Large differences in pH readings may be caused by a dry electrode or run-down batteries. To improve performance, dip to immersion level in tap water for a few minutes at least once a week.
- C. Place several drops of water in the protective cap to prevent the glass bulb from drying out. This will provide a faster response time and a longer Pocket Pal life.

PHENOLS

Range: 0-1 mg/L Phenols

To ensure accurate results please read carefully before proceeding.

PROCEDURE

1. Assemble the color comparator. If the anticipated concentration is between 0 and 1 mg/L, assemble with both the Long Path Viewing Adapter and the phenols color disc installed. See Figure 1. If the concentration is expected to require the 0-5 mg/L range, omit the adapter.

Note: If the sample is turbid, it may be necessary to filter the sample as described in Steps a and b to accurately determine a color match in the comparator. Figure 2 illustrates how to assemble the filter assembly components. If filtering is not needed, proceed to Step 2.

a. Install a 0.45 micron filter disc in the filter holder. Be sure the holder is well tightened after installation. Filter discs are packaged with blue papers separating them.

b. Fill the 30-cc syringe with the turbid sample and attach the filter holder to the syringe with a twisting motion. Use the filtered sample in Step 4.

2. Fill two plastic color viewing tubes to the line nearest the top with sample.

3. Add the contents of one EDTA Reagent Powder Pillow to each viewing tube. Cap each tube and mix until the powder is dissolved.

4. Add 15 drops of Hardness 1 Buffer Solution to each viewing tube. Cap the tubes and mix.

5. Place one of the tubes into the left opening in the top of the color comparator.

6. To the other tube, add the contents of one Phenol Reagent Powder Pillow (Nonextraction). Cap the tube and mix until powder is dissolved. Then add the contents of one Potassium Persulfate Powder Pillow for Phosphonate. Cap and mix until the powder is dissolved.

7. Place the sample tube treated in Step 6 into the right opening in the top of the comparator. Remove the caps from both tubes.
8. Hold the comparator so that light shines down through the tubes from the top if the adapter is installed or from the back if the adapter is not installed. See Figure 3. Rotate the disc to match the colors in the color matching windows. Read the mg/L phenols from the scale window. If measuring without the Long Path Viewing Adapter, multiply the reading by five.

Note: If the color of the sample is too red to make a color match with the Long Path Viewing Adapter installed, repeat the procedure without the adapter.

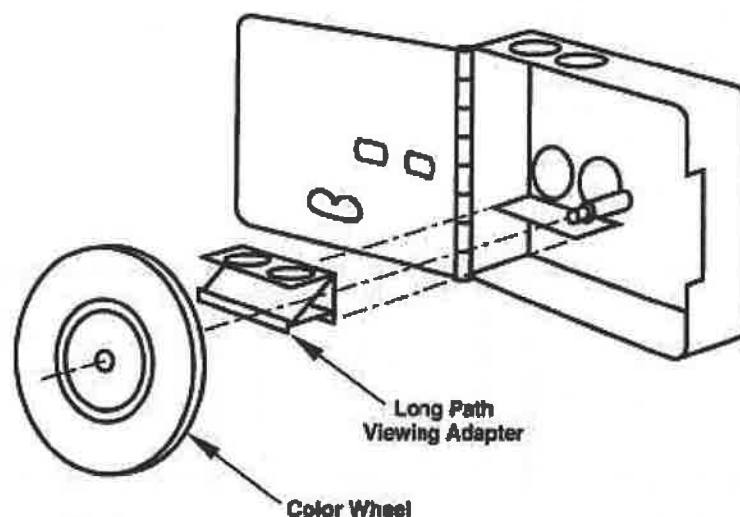


Figure 1

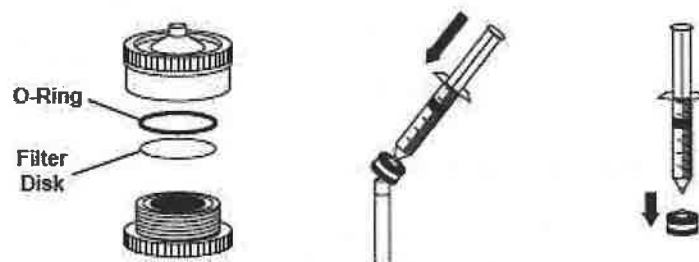
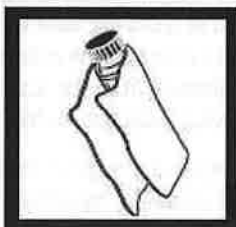


Figure 2 Optional Apparatus

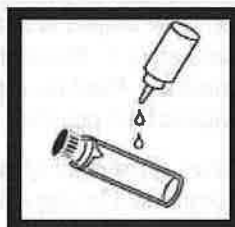
TURBIDITY



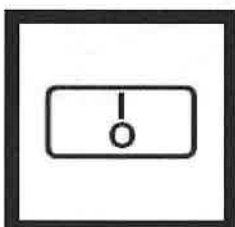
1. Collect a representative sample in a clean container. Fill a sample cell to the line (about 15 mL), taking care to handle the sample cell by the top. Cap the cell. (See *Section 2.3* on page 22 for more information about collecting a representative sample).



2. Wipe the cell with a soft, lint-free cloth to remove water spots and fingerprints.



3. Apply a thin film of silicone oil. Wipe with a soft cloth to obtain an even film over the entire surface.



4. Press: **I/O**.

The instrument will turn on. Place the instrument on a flat, sturdy surface. Do not hold the instrument while making measurements.



5. Insert the sample cell in the instrument cell compartment so the diamond or orientation mark aligns with the raised orientation mark in front of the cell compartment. Close the lid.



6. Select manual or automatic range selection by pressing the **RANGE** key. The display will show **AUTO RNG** when the instrument is in automatic range selection.



7. Select signal averaging mode by pressing the **SIGNAL AVERAGE** key. The display will show **SIG AVG** when the instrument is using signal averaging. Use signal average mode if the sample causes a noisy signal (display changes constantly).



8. Press: **READ**

The display will show **--- NTU**, then the turbidity in NTU. Record the turbidity after the lamp symbol turns off.

Fingerprints of Major Sources

****If testing kits aren't available in field, send samples to lab****

Sewage

- E. Coli
- Detergents (various)
- High Ammonia / Potassium Ratio

Wash Water

- Detergents (various)

Shallow Groundwater

- Hardness, pH

Tap Water

- Fluoride
- Sometimes Hardness

Septage

- E. Coli
- Fluorescence
- High Ammonia/Potassium



Trigger Levels

Valuable time may be lost in locating the source of an illicit discharge if a second analysis is done every time a screening parameter level is exceeded. If the team leader feels the analytical value obtained is valid, an immediate attempt to find the source should be undertaken.

Parameter	Trigger Levels	Action
Odor	Suspicious or Strong	Attempt to locate source.
Clarity	Other than clear	Attempt to locate source if CDOT has not permitted any large dewatering activities upstream.
Floatables	Foaming or oily sheen	Attempt to locate source.
pH	< 6.0 or > 9.0	Reanalyze. If confirmed, attempt to locate source.
Conductivity	>1,000 uS/cm	Attempt to locate source.
Total Chlorine	> 0.1 mg/L	Reanalyze. If confirmed, attempt to locate source.
Total Copper	> 0.1 mg/L	Reanalyze. If confirmed, attempt to locate source. Lab analysis will be required.

Parameter	Trigger Levels	Action
Turbidity	> 100 NTU	Reanalyze. If confirmed, attempt to locate source if CDOT has not permitted any large dewatering activities upstream.
Total Phenols	> 0.5 mg1L	Reanalyze. If confirmed, attempt to locate source. Lab analysis will be required.
Detergents	> 0.5 mg/L	Reanalyze. If confirmed, attempt to locate source. Perform lab analysis unless residential car washing is found to be the source.

Probability of an Illicit Discharge

Unlikely Discharge	Non-flowing outfalls with no physical indicators
Potential Discharge	Flowing or non-flowing with presence of two or more physical indicators.
Suspect Discharge	Flowing with one or more physical indicators above trigger levels.
Obvious Discharge	Outfalls where there is an illicit discharge that doesn't require sample collection for confirmation.

Laboratory Tests

Parameters	Method	Units	Sample Container	Sample Size
Phenol, Total	EPA 420.1	mg/L	Glass with Preservative	500 mL
*pH	EPA 150.1	SU	Plastic	50 mL
Color, Apparent	EPA 11 0.1 -3		Plastic	500 mL
Conductivity	EPA 120.1	uS/cm	Plastic	500 mL
*Chlorine. Total Residual	EPA 330.5	mg/L	Plastic	500 mL
Turbidity	EPA 180.1	NTU	Plastic	100 mL
Copper	EPA 220.1	mg/L	Plastic	500 mL
MBAS (Surfactants)	EPA 425.1	mg/L	Plastic	1000 mL

*Standard methods for these parameters require immediate analysis upon sample collection. This will be violated due to the time it takes to transport a sample from the outfall to the laboratory

Analysis QA/QC

The items listed below will help to ensure that the sample collection system is meeting project standards.

- **Duplicate samples
(1 in 10 samples)**
- ***Split samples
(1 in 10 samples - split sample sent to the laboratory)**
- **Distilled water blanks
(1 per analytical event)**
- ***Spiked samples
(1 in 10 samples - sample sent to laboratory for spiking and testing)**
- ***Sample preservative blanks
(1 per sampling event - sent to laboratory for analysis)**
- **Control charts (Completed by CDOT database manager and laboratory)**
- **Calibration of field equipment each day prior to sampling event**
- **Record field sample results in field log or on field investigation form.**
- **Label lab samples with indelible ink.**
- **Record sample number, analysis parameter, and collection time on COC and in field book**
- **Record photo id numbers in field log.**

* Required only if litigation is anticipated.
Sample analysis can be expensive.

Emergency Numbers:

Emergency Response

911

CDOT Illicit Discharge Hotline

303-512-4H20 (4426)

CDOT Water Quality Program

Manager

303-757-9343

CDPHE-EMP Hotline

1-877-518-5608

State Patrol Dispatch

303-239-4546

Field Crew Contact Numbers:

Revised 06-30-2008

Land Disturbance Inspection Report - Stormwater

Project Name: _____	
Project Address: _____	
Inspection Date: _____	Inspection Time: _____
Inspector Name: _____	
Type of Inspection:	Routine <input type="checkbox"/> Runoff Event <input type="checkbox"/> Reinspection <input type="checkbox"/> Original Inspection Date: _____
Weather during inspection: Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Precipitation <input type="checkbox"/> Strong Wind <input type="checkbox"/> Temperature: _____	
Weather during the previous 24 hours: Clear <input type="checkbox"/> Cloudy <input type="checkbox"/> Precipitation <input type="checkbox"/> Strong Wind <input type="checkbox"/>	
Is the MoDNR land disturbance permit displayed on-site? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
Is an electronic or paper copy of the SWPPP accessible on-site? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
Are copies of inspections reports, provided by the permittee, readily accessible? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
Are changes to the SWPPP documents noted and approved? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
Are corrective actions from the previous inspection completed? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
Are any discharges of pollutants occurring during the current inspection? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
Are there corrective actions or control measures requiring a follow-up inspection? Yes <input type="checkbox"/> No <input type="checkbox"/> N/A <input type="checkbox"/>	
Describe current phase of construction activities: _____ _____	
Permitted land disturbance area: _____ acres sqft	
Estimate of land disturbance area not permanently stabilized: _____ acres sqft	
Permanently seeded area with insufficient established density: _____ acres sqft	
<u>Certification Statement</u> <i>"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."</i>	
_____ Name	_____ Title
_____ Signature	_____ Date



Land Disturbance Inspection Report - Stormwater

Control Measure Report

Control Measure Number	Structural Control Measure	Condition of Control Measure	Corrective Action Type	Description of Corrective Action Type and Location
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	
		New	Maintenance	
		Good	Repair	
		Poor	Replacement	



Facility Inspection Report - Stormwater

Facility Name: _____

Facility Address: _____

Inspection Date: _____ Inspection Time: _____

Inspector Name: _____

Type of Inspection: Annual ☐ Random ☐ Reinspection ☐ Original Inspection Date: _____

Weather during inspection:

Clear ☐ Cloudy ☐ Precipitation ☐ Strong Wind ☐ Temperature: _____

Weather during the previous 24 hours:

Clear ☐ Cloudy ☐ Precipitation ☐ Strong Wind ☐

Are any discharges of pollutants occurring during the current inspection? Yes ☐ No ☐

If yes, provide a description of the discharge(s):

Are there corrective actions or control measures requiring a follow-up inspection? Yes* ☐ No ☐

*See below for additional control measures and page 2 for corrective actions

Additional Control Measures

Describe additional control measure(s) and location(s) needed for erosion and sediment control

Certification Statement

"I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information, the information submitted is, to the best of my knowledge and belief, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for knowing violations."

Name

Title

Signature

Date



Facility Inspection Report - Stormwater

Include a map of the facility showing location of control measures and activities/areas exposed to stormwater that have the potential to create discharge. Utilize this map during the inspection to ensure all control measures at the facility are inspected. For all ineffective control measures, describe what BMP is needed, and its location, on page 1 - Additional Control Measures. Customize this list as needed for the specific types of materials or activities/areas at the facility.

Control Measures				Activities/Areas Exposed to Stormwater	
Structural Control Measure	Condition of Control Measure	Corrective Action Type	Description of Corrective Action Type	Facility Activity/Area	Effectiveness of control measures
	New	Maintenance		Material loading and unloading and storage areas	Effective
	Good	Repair			Ineffective
	Poor	Replacement		Equipment operations and maintenance areas	Effective
	New	Maintenance			Ineffective
	Good	Repair		Fueling Areas	Effective
	Poor	Replacement			Ineffective
	New	Maintenance		Outdoor vehicle and equipment washing areas	Effective
	Good	Repair			Ineffective
	Poor	Replacement		Waste handling and disposal areas	Effective
	New	Maintenance			Ineffective
	Good	Repair		Erodible areas	Effective
	Poor	Replacement			Ineffective
	New	Maintenance		Salt storage piles and storage areas	Effective
	Good	Repair			Ineffective
	Poor	Replacement		Dust generation and vehicle track-out	Effective
	New	Maintenance			Ineffective
	Good	Repair		(Other)	Effective
	Poor	Replacement			Ineffective
	New	Maintenance		(Other)	Effective
	Good	Repair			Ineffective
	Poor	Replacement		(Other)	Effective
	New	Maintenance			Ineffective
	Good	Repair		(Other)	Effective
	Poor	Replacement			Ineffective
	New	Maintenance		(Other)	Effective
	Good	Repair			Ineffective
	Poor	Replacement		(Other)	Effective
	New	Maintenance			Ineffective
	Good	Repair		(Other)	Effective
	Poor	Replacement			Ineffective
	New	Maintenance		(Other)	Effective
	Good	Repair			Ineffective
	Poor	Replacement		(Other)	Effective
	New	Maintenance			Ineffective
	Good	Repair		(Other)	Effective
	Poor	Replacement			Ineffective
	New	Maintenance		(Other)	Effective
	Good	Repair			Ineffective
	Poor	Replacement		(Other)	Effective
	New	Maintenance			Ineffective
	Good	Repair		(Other)	Effective
	Poor	Replacement			Ineffective



Detention Basin Standards for Inspection

All grass within the basin shall be cut to the length provided in the building code.

Vegetation should not be overgrown as to impede the flow of water or alter the volume of the basin's design scope.

All inlets and outfalls should be clear of debris and vegetation as not to impede with the flow of stormwater.

All outfall structures and outlet pipes must be in good condition and be able to convey the flow of runoff from the basin to a stable point of discharge without causing erosion.

Outfall structures and outlet pipes should not have significant cracks, leaks or separations in pipe or pipe joints, deteriorating concrete, exposed rebar, and or structural failures. Corrugated metal pipe should not have rust in the pipe.

Outlet structures and or outlet pipes have not been modified or vandalized. The pipe opening dimensions and elevations should conform to the approved design.

Concrete swales (if applicable) should be in good repair. No significant cracks or vegetation growing in the water path to the outfall. Basin bottom shall be properly sloped to drain water to the outlet, and the swales shall not impound water after a rain event.

Total basin area should be free of all debris, man-made or natural.

Access to the basin must be available for cleaning and maintaining.

The volume of the basin should not be altered in any way. Any sedimentation must be removed from the basin and the basin must be restored to its originally approved volume.

Earth slopes into basin cannot be greater than a 3:1 slope.

Outlet ends of pipes must have scour protection that is adequately protecting against erosion.

Modular block walls (if applicable) and cast-in-place walls (if applicable) shall not show signs of wall failure or structural distress.

Underground detention facilities shall not show signs of failure. Areas where underground facilities are shall not have differential settlement or erosion at the outfall.

When an emergency spillway is required, the spillway shall conform to the approved design.

Condition of all berms and dams shall not have signs of seepage, erosion, or animal burrows.

DETENTION BASIN INSPECTION REPORT

St. Charles County Government
Community Development Department
Development Review Division

Date of Inspection: _____ Inspector: _____

Location of Basin: _____

GIS Locator of Basin: _____

Basin Owner: _____

Address: _____

City: _____ State: _____ Zip: _____ Phone: _____

Basin Inspection:

Volume of Basin: _____

Sedimentation in Basin: _____

Condition of Berms: _____

Vegetation in Basin: _____

Debris in Basin: _____

Drainage Swales and Bottom of Basin: _____

Outlet Structures in Basin: _____

Containment Structures in Basin (i.e. Retaining Walls Precast Walls): _____

Access to Basin: _____

Slopes: _____ Outlet Pipes: _____

Discharge Points: _____ Emergency Spillways: _____

Recommended Actions:

Office Use Only

Pass/Fail

Follow up date: _____

GIS Entry: yes/no

Inlet Structure Coordinates: _____

Outfall Structure Coordinates: _____

Basin Corners Coordinates: _____

Basin Bottom Coordinates: _____

Missouri Stream Teams... take to the streets!

To protect our water resources, people around the country are organizing storm drain stenciling and community education programs. The stenciled message, "Dump No Waste, Drains to Stream," provides a visible reminder of the consequences of improper waste disposal in storm drains. Now, a Storm Drain Stenciling Project is available in Missouri through the Stream Team program. The project involves stenciling storm drains, a litter clean-up and a community education campaign. How can you help? It's easy! Request your free Storm Drain Stenciling manual and kit today... and take to the streets!

How does it work?

1 Your group will identify a community, subdivision or cluster of streets to start your stenciling project. Locate the storm drains in the target area and the neighborhood streams, rivers or lakes that might be at risk from improper disposal.

2 Your group must obtain permission from the entity that has jurisdiction over the storm drains. This may include the city council, a neighborhood association or the public works department. Plan ahead and allow up to 6-8 weeks to obtain any necessary permits or licenses.

3 Stream Team provides stencils, but your group must supply latex paint, brushes, safety vests, traffic cones and maps. Local sponsors should be encouraged to provide these supplies and to assist with the promotion and safety of the stenciling project.

4 Alert the local media about your activities so the message will reach a greater number of people. Provide specific information about times, locations and contacts. You may want to use the sample news release included in the kit.

5 When ready to stencil, you can divide into small groups of three to five participants. Youth teams should have at least one supervising adult per group. Each group should receive a stencil, supplies and a map with the locations of the storm drains they have permission to stencil.

6 While at the storm drain site, take time to collect trash for proper disposal.

7 Within the group, participants can take turns painting, holding the stencil and watching for traffic. Each storm drain will take about 5-10 minutes to stencil.

8 When stenciling in an area is complete, your groups can distribute information to nearby homes. A door hanger will be included in the kit. The stenciled message is expected to last for approximately two years, so the reminder will continue beyond this stenciling event.

9 After the stenciling event, please complete a Stream Team Activity Report and mail it to the address provided on the report.

GOOD LUCK WITH YOUR STORM DRAIN STENCILING PROJECT!

**DUMP NO WASTE
DRAINS TO STREAM**

Where can I get more information?

If your Stream Team needs assistance or would like more information, please call:
1-800-781-1989 (voice mail)
or (573) 522-4115, ext. 3169

Or you can write to us at:

Stream Team
P.O. Box 180
Jefferson City, MO 65102-0180

Or e-mail us at:

streamteam@mdc.mo.gov

Or visit our Web site at:

www.mostreamteam.org



Stream Team is sponsored by:
Missouri Department of Conservation,
Missouri Department of Natural Resources,
and Conservation Federation of Missouri

Storm Drain Stenciling Kit Order Form

Stream Team Name and Number: _____

Contact Name: _____

Shipping Address: (no P.O. Box please) _____

City, State, ZIP: _____

Home Phone: (_____) _____ Work Phone: (_____) _____

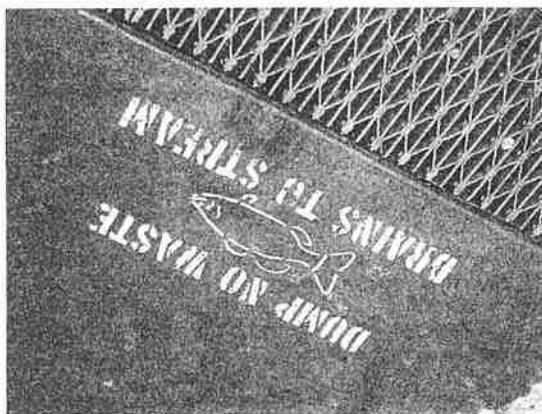
E-mail: _____

Community, city or city area to be stenciled: _____

Necessary supplies	Number needed
Stencils (Estimate five participants per stencil. The mylar stencil can be used repeatedly, and the stenciled message is expected to last for approximately two years.)	
Storm Drain Stenciling Kit booklets (Each kit booklet contains detailed instructions, safety information, and sample news release.)	
Community education door hangers (Estimate number of homes and/or businesses near storm drains for distribution before, during, or after stenciling.)	
Litter bags (Estimate one bag per 2 or 3 storm drains.)	
Pairs of latex gloves (Estimate one pair per participant.)	

Fill out form, detach and mail to: Stream Team
P.O. Box 180
Jefferson City, MO 65102-0180

Don't forget to send us an Activity Report when you are done with your project!
Report on-line at www.mostreamteam.org/DataSubmissions/actreport.aspx.



You can help!
To receive your Storm Drain Stenciling How-To Manual and kit, simply fill out the order form inside. Your free kit will contain mylar stencils and detailed instructions on how to stencil storm drains, provide safety instructions for participants, and information for the community. The kit also includes a sample news release and information to distribute to homes or businesses in the stenciled area. (Use your own paint and brushes. Follow our recommendations provided with the kit.) Storm drains can be stenciled only after receiving the necessary permission from the proper authorities, when the roads are dry, and the temperature is over 50 degrees F.

- Soap suds from washing the car, rinse water from paint cleanup, pet waste, cigarette butts, litter, pesticide and fertilizer runoff, and yard wastes can all cause environmental problems when discharged into waterways via storm drains.

If your Stream Team is looking for a city project,

STORM DRAIN STENCILING

is the one for you!



STORM DRAIN STENCILING

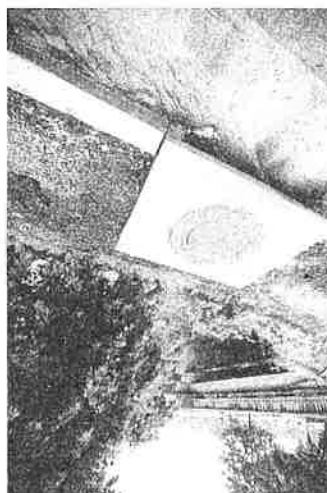
A Stream Team Activity



Help keep your local streams clean.



- Each year in the United States, do-it-yourself motor oil changes improperly dispose of 192 million gallons of used motor oil into our environment. One gallon of used motor oil can contaminate one million gallons of water.
- Antifreeze is primarily composed of ethylene glycol, a sweet and poisonous compound that can kill or injure pets, birds, fish and other wildlife when disposed of carelessly into the environment. It can also contain heavy metal contaminants picked up from engines during use.
- Paint, even latex, can contain a variety of hazardous ingredients including lead, mercury and organic solvents.



Storm drains and water quality

Storm drains are sometimes misused for the disposal of paint, motor oil, antifreeze, pesticides and other wastes. People are looking for a convenient place to dispose of these items and often are not aware that storm drains usually lead to nearby streams, rivers, lakes or even sinkholes, which are conduits to groundwater. In addition, each time it rains, water runoff carries street litter, yard debris, pet wastes and other pollutants into storm drains. This nonpoint source pollution is a significant source of contamination for Missouri's water resources.

Introduction

Spills, leaks, and overfilling can occur during handling of fuels and petroleum-based materials, representing a potential source of stormwater pollution, even in small volumes. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees on a variety of ways by which fuels and petroleum-based materials can be delivered, as well as steps to be taken when petroleum products (such as waste oil) are loaded onto vehicles for offsite disposal or recycling. Delivery, unloading, and loading of waste oils are hereafter referred to as “handling.”

General Guidelines

For all manners of fuel and oil handling described below, a knowledgeable member familiar with the facility should be present during handling procedures. This person should ensure that the following are observed:

- There is no smoking while fuel handling is in process or underway.
- Sources of flame are kept away while fuel handling is being completed.
- The delivery vehicle’s hand brake is set and wheels are chocked while the activity is being completed.
- Catch basins and drain manholes are adequately protected.
- No tools are to be used that could damage fuel or oil containers or the delivery vehicle.
- No flammable liquid should be unloaded from any motor vehicle while the engine is operating, unless the engine of the motor vehicle is required to be used for the operation of a pump.
- Ensure that local traffic does not interfere with fuel transfer operations. If it does, make appropriate accommodations.
- The attending persons should watch for any leaks or spills:
 - Halt transmission of the material if any leaks or spills are observed. Follow the procedures in *Spill Response and Cleanup SOP*.
 - In the event of a large spill or one that discharges to surface waters or an engineered storm drain system, the facility representative should follow the procedures in *Spill Response and Cleanup SOP*.

Delivery by Bulk (Tanker) Truck

Procedures for the delivery of bulk fuel should include the following:

- The truck driver should check in with the facility upon arrival.
- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to *Spill Response and Cleanup SOP* for examples of spill cleanup and response materials.
- The facility representative should check to ensure that the amount of delivery does not exceed the available capacity of the tank.
 - A level gauge can be used to verify the level in the tank.
 - If a level gauge is not functioning or is not present on the tank, the tank should be stick tested prior to filling.

- The truck driver and the facility representative should both remain with the vehicle during the delivery process.
- The truck driver and the facility representative should inspect all visible lines, connections, and valves for leaks.
- When delivery is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
- The delivery vehicle should be inspected prior to departure to ensure that the hose is disconnected from the tank.
- The facility representative should inspect the fuel tank to verify that no leaks have occurred, or that any leaked or spilled material has been cleaned and disposed of properly.
- The facility representative should gauge tank levels to ensure that the proper amount of fuel is delivered, and collect a receipt from the truck driver.

Delivery of Drummed Materials

Drummed materials may include motor oil, hydraulic fluid, transmission fluid, or waste oil from another facility (as approved). Procedures for the delivery of drummed materials should include the following:

- The truck driver should check in with the facility upon arrival.
- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to *Spill Response and Cleanup SOP* for examples of spill cleanup and response materials.
- The facility representative should closely examine the shipment for damaged drums.
 - If damaged drums are found, they should be closely inspected for leaks or punctures.
 - Breached drums should be removed to a dry, well-ventilated area and the contents transferred to other suitable containers.
 - Drums should be disposed of in accordance with all applicable regulations.
- Drummed materials should not be unloaded outdoors during wet weather events.
- The truck driver and the facility representative should both remain with the vehicle during the delivery process.
- Drums should be handled and unloaded carefully to prevent damage.
- Upon completion of unloading, the facility representative should inspect the unloading point and the drums to verify that no leaks have occurred, that any leaked or spilled material has been cleaned up and disposed of properly, and that the unloaded drums are not leaking.
- The facility representative should check to ensure that the proper amount of fuel or other material is delivered, and collect a receipt from the truck driver.

Removal of Waste Oil from the Facility

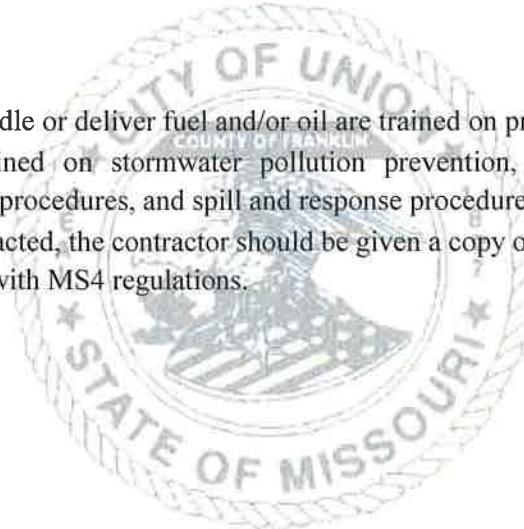
When waste oil or similar oil products need to be removed from the premises, only haulers certified to transport waste oil should be utilized. Procedures should include the following:

- The disposal truck driver should check in with the facility upon arrival.

- The facility representative should ensure that the appropriate spill cleanup and response equipment and personal protective equipment are readily available and easily accessible. Refer to *Spill Response and Cleanup SOP* for examples of spill cleanup and response materials.
- The truck driver and the facility representative should both remain with the vehicle during the tank draining process.
- When draining is complete and the hoses are removed, buckets should be placed underneath connection points to catch drippings.
- The facility representative should inspect the loading point and the tank to verify that no leaks have occurred and that any leaked or spilled material is cleaned up properly.
- The facility representative should collect a receipt from the truck driver.
- When draining bulk oil tanks:
 - The facility representative should verify that the volume of waste oil in the tank does not exceed the available capacity of the disposal hauler's vehicle.
 - The disposal hauler vehicle should be inspected prior to departure to ensure that the hose is disconnected from the tank.

Employee Training

- Employees who handle or deliver fuel and/or oil are trained on proper procedures.
- Employees are trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.



Introduction

A hazardous material is any biological, chemical, or physical material with properties that make it dangerous or potentially harmful to human health or the environment. Hazardous materials can be released to the environment in a variety of ways. When hazardous materials are exposed to rain or snow, they have potential to enter the storm sewer system and surface waterbodies and/or groundwater. Hazardous materials associated with municipal facilities and their operations include, but are not limited to, oil, gasoline, antifreeze, fertilizers, pesticides, and de-icing agents and additives.

Minimizing or eliminating contact of hazardous materials with stormwater can significantly reduce pollution of receiving waters. Proper hazardous material handling and storage also contributes to employee health, an organized workplace, and efficient operations. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to municipal employees to help prevent stormwater pollution resulting from the handling and storage of hazardous materials.

Handling, Loading, and Unloading

- Avoid loading and unloading materials in the rain, unless cover is provided.
- If a spill is identified, retrace material transfer route to locate other possible spill areas.
- When spills are located, follow the procedures in *Spill Response and Cleanup SOP*.
- Time delivery and handling of materials during favorable weather conditions, whenever possible
- Inspect containers for material compatibility and structural integrity prior to loading/unloading any raw or waste materials.
- Use dry cleanup methods (e.g., squeegee and dust pan, sweeping, and absorbents as last step) rather than hosing down surfaces.

Material Storage

- Confine material storage indoors whenever possible. Plug or disconnect floor drains, within the drainable area of material storage, that lead to the stormwater system.
- Confine outdoor material storage to designated areas that are covered, on impervious surfaces, away from high traffic areas, and outside of drainage pathways.
- Store containers on pallets or equivalent structures to facilitate leak inspection and to prevent contact with wet floors that can cause corrosion.
- Store materials and waste in materially compatible containment units.
- Keep hazardous materials in their original containers.
- If materials are not in their original containers, clearly label all storage containers with the name of the chemical, the expiration date, and handling instructions.
- Maintain an inventory of all raw and waste materials to identify leakage. Order new materials only when needed.
- Provide secondary containment for storage tanks and drums with sufficient volume to store 110 percent of the volume of the material.
- Provide sufficient aisle space to allow for routine inspections and access for spill cleanup.
- Inspect storage areas for spills or leaks and containment units for corrosion or other failures.

Waste Treatment, Disposal, and Cleanup

- Adopt a regular schedule for the pick-up and disposal of waste materials.
- Recycle leftover materials whenever possible.
- Substitute nonhazardous or less-hazardous materials for hazardous materials whenever possible.
- Protect empty containers from exposure to stormwater and dispose of them regularly to avoid contamination from container residues.

Employee Training

- Employees who handle and use hazardous materials are trained on these procedures.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor should be given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.



Introduction

Vehicle washing activities can result in the discharge of nutrients, sediment, petroleum products, and other contaminants to a surface water body or to an engineered drainage system.

Consistent with Section 4.6.H of the Phase II Small Municipal Separate Storm Sewer System (MS4) Permit, the city will maintain and utilize an approved procedure for the washing of all municipal vehicles and equipment.

Outdoor Vehicle Washing Procedures

Outdoor washing of municipal vehicles should be avoided unless wash water is contained in a tight tank or similar structure. Where no alternate wash system is available, and full containment of wash water cannot be achieved, the following procedures shall be followed:

1. Avoid discharge of any wash water directly to a surface water (e.g., stream, pond, drainage swale, etc.)
2. Minimize use of water to the extent practical.
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Do not use solvents except in dedicated solvent parts washer systems or in areas not connected to a sanitary sewer.
5. Do not power wash, steam clean or perform engine cleaning or undercarriage cleaning.
6. Grassy and pervious (porous) surfaces may be used to promote direct infiltration of wash water, providing treatment before recharging groundwater and minimizing runoff to an adjacent stormwater system. Pervious surfaces or other infiltration-based systems shall not be used within wellhead protection areas or within other protected resources.
7. Impervious surfaces discharging to engineered storm drain systems shall not discharge directly to a surface water unless treatment is provided. Treatment shall be designed specifically for removal of petroleum and nutrients. The treatment device shall be positioned such that all drainage must flow through the device, preventing bypassing or short-circuiting.
8. All adjacent engineered storm drain system catch basins shall have a sump. These structures shall be cleaned periodically.
9. Solids and particulate accumulation from the washing area shall be completed through periodic sweeping and/or cleaning.
10. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using approved procedures.

Heavily soiled vehicles or vehicles dirtied from salting or snow removal efforts shall not be washed outside, without exception.

Indoor Vehicle Washing Procedures

Indoor vehicle washing procedures shall include the following:

1. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
2. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
3. Designate separate areas for routine maintenance and vehicle cleaning. This helps prevent contamination of wash water by motor oils, hydraulic lubricants, greases, etc.
4. Dry clean-up methods, such as sweeping and vacuuming, are recommended within garage facilities. Do not wash down floors and work areas with water.
5. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using approved procedures.

Heavy Equipment Washing Procedures

Heavy equipment washing procedures shall include the following:

1. Mud and heavy debris removal shall occur on impervious pavement or within a retention area.
2. Maintain these areas with frequent mechanical removal and proper disposal of spoils.
3. All adjacent engineered storm drain system components shall have a sump. These structures shall be cleaned periodically (refer to SOP 3, "Catch Basin Inspection and Cleaning").
4. Impervious surfaces with engineered storm drain systems shall not discharge directly to a surface water.
5. Floor drains shall be connected to a sanitary sewer or tight tank. Floor drains discharging to adjacent surface water bodies or engineered storm drain systems shall be permanently plugged or otherwise abandoned before any vehicle wash activities are completed.
6. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
7. Maintain absorbent pads and drip pans to capture and collect spills or noticeable leaks observed during washing activities. Clean up any spills using approved procedures.

Engine Washing Procedures

Engine and steam washing procedures shall include the following:

1. Do not wash parts outdoors.
2. Maintain drip pans and smaller containers to contain motor oils, hydraulic lubricants, greases, etc. and to capture and collect spills or noticeable leaks observed during washing activities, to the extent practicable. Clean up any spills using approved procedures.
3. Where use of detergent cannot be avoided, use products that do not contain regulated contaminants. Use of a biodegradable, phosphate-free detergent is preferred.
4. Avoid cleaning with solvents except in dedicated solvent parts washer systems. Make use of pressure washing and steam cleaning.
5. Recycle clean solutions and rinse water to the extent practicable.



Introduction

The City of Union is responsible for any contaminant spill or release that occurs on property that it owns or operates. Particular areas of concern include facilities that use or store chemicals, fuel oil, or hazardous waste. Implementation of proper spill response and cleanup procedures can help to mitigate the effects of a contaminant release. The goal of this written Standard Operating Procedure (SOP) is to provide guidance to city employees to help reduce the discharge of pollutants from the MS4 as a result of spills or releases.

Responding to a Spill

Employees should be trained in proper spill response specific to the materials used at their site and utilizing the appropriate personal protective equipment (PPE). In the event of a spill, follow these spill response and cleanup procedures:

1. Do not walk into, touch, taste, or inhale the spilled material or disturb hazardous material containers. Stay upwind and updrift of any spilled material, fumes or dust.
2. Eliminate all ignition sources (flares, operating engines, smoking, electrical sparks).
3. Stay clear of the ends of any tanks or probable points of rupture.
4. Do not assume that gases or vapors are harmless because of a lack of odor.
5. Avoid confined spaces near the spill or release.
6. Secure the area.
7. Notify a primary or secondary contact of the Stormwater Management Program, the facility supervisor, and/or the facility safety officer.
8. Assess the contaminant release site for potential safety issues and for direction of flow.
9. Complete the following, **only if it can be done without jeopardizing human safety:**
 - o Identify the spilled material.
 - o Stop the contaminant release.
 - o Contain the contaminant release through the use of spill containment berms or absorbents
 - o Protect all drains and/or catch basins with the use of absorbents, booms, berms or drain covers.
 - o If the spill is petroleum and greater than 50 gallons, or entering a water body, it is mandatory that the spill be reported to MDNR and the National Response Center.
 - i. MDNR 24-hour Environmental Emergency Response Hotline, **(573)-634-2436**
 - ii. National Response Center, **(800)-424-8802**.
 - o Clean up the spill.
 - o Dispose of all contaminated products in accordance with applicable federal, state and local regulations.
10. If you need assistance containing and/or cleaning up the spill, or preventing it from discharging to a surface water (or an engineered storm drain system), contact your local fire department. **In the**

case of an emergency call 911.*Maintenance and Prevention Guidance*

Prevention of spills is preferable to even the best response and cleanup. To mitigate the effects of a contaminant release, provide proper maintenance and inspection at each facility. To protect against contaminant release adhere to the following guidance:

1. Ensure all employees are properly trained to respond in the case of a spill, understand the nature and properties of the contaminant, and understand the spill control materials and personnel safety equipment. Maintain training records of current personnel on-site and retain training records of former personnel for at least three years from the date last worked at the facility.
2. Provide yearly maintenance and inspection at all municipal facilities, paying particular attention to storage tanks. Maintain maintenance and inspection records on site.
3. Implement good management practices where chemicals and hazardous wastes are stored:
 - a. Ensure storage in closed containers inside a building and on an impervious surface wherever possible.
 - b. If storage cannot be provided inside, ensure secondary containment for 110 percent of the maximum volume of the storage container.
 - c. Locate storage areas near maintenance areas to decrease the distance required for transfer.
 - d. Provide accurate labels, Material Safety Data Sheets (MSDS) information, and warnings for all stored materials.
 - e. Regularly inspect storage areas for leaks.
 - f. Ensure secure storage locations, preventing access by untrained or unauthorized persons.
 - g. Maintain accurate records of stored materials.
4. Stay up-to-date regarding non-hazardous products that can replace traditional hazardous materials - such as pesticides and cleansers.
5. Maintain appropriately stocked spill response kits at each facilities and locations where oil, chemicals, or other hazardous materials are handled and stored.

Employee Training

- Provide employees with training regarding non-hazardous and hazardous chemicals in their work area at the time of their initial assignment, and whenever a new hazard is introduced into their work area. This training must include at least:
 - Methods and observations that may be used to detect the presence of a chemical in the work area.
 - The physical and health hazards of the chemicals in the work area.
 - The measures employees can take to protect themselves from those hazards.

- Explanation of the Safety Data Sheets (SDSs), the labeling system, and the methods for employees to obtain and use the appropriate hazards information.



Introduction

Regular sweeping of streets and municipally-owned parking lots is important for maintaining clean and safe roadways. It also plays a vital role in keeping pollutants like sand, garbage, and leaves out of the MS4. The goal of this Standard Operating Procedure (SOP) is to provide guidance to municipal employees on street and parking lot sweeping procedures and frequencies to reduce the discharge of pollutants to the storm drainage system and receiving waters. If sweeping services are contracted, this SOP is provided to the contractor.

The city will implement the following street and parking lot sweeping procedures to reduce the discharge of pollutants from the MS4.

Sweeping Frequency

- All streets should be swept and/or cleaned a minimum of once per year in the spring
- Sweep as soon as possible after snow melt and following winter activities to capture sand and debris before it is washed into the MS4.
- Create a targeted sweeping plan and schedule for the prioritized sweeping of streets and parking lots with high levels of accumulation.
 - Identify streets and parking lot areas where there are high amounts of debris accumulation (e.g., where large amounts of sand are used in winter, downward-sloping areas where debris and sand may accumulate, streets with considerable leaf fall, or high-traffic areas) that may require more frequent sweeping.

Sweeping Practices

- Dry cleaning methods should be used whenever possible, with the exception of very fine water spray for dust control. Avoid wet cleaning or flushing of the pavement.
- Sweeping should not be conducted during or immediately after rain storms.
- When necessary, enact parking bans to facilitate sweeping on busy streets.
- Sweep in a manner that avoids depositing debris into storm drains.
- Brush alignment, speed, rotation rate, and pattern used during sweeping should be set to optimal levels to manage debris.
- Routinely inspect and perform maintenance on sweeping equipment to reduce the potential for leaks.

Sweepings Reuse and Disposal

- Sweepings that are not screened to remove solid waste or contaminated, such as being impacted through a chemical spill, are classified as solid waste and should be disposed of at solid waste disposal sites.

Employee Training

- Employees who perform sweeping of streets and parking lots are trained annually on the preceding procedures and also on the proper operation of related equipment.

SWEEPING OF STREETS AND PARKING LOTS

Standard Operating Procedure

City of Union
10 E. Locust Street • Union, MO 63084

- Employees receive training on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.
- If services are contracted, the contractor is given a copy of this and any applicable SOPs to ensure compliance with MS4 regulations.

Documentation and Reporting

The following information is documented and included in each annual report:

- Number of miles cleaned or the volume or mass of material removed (refer to the sweeping log in the attachments).



Introduction

Winter road maintenance includes snow removal and the use of salt, sand, and other deicers to help provide safe winter driving conditions. Proper maintenance procedures and effective use of deicers and skid-resistant materials can help reduce the discharge of pollutants to the Small Municipal Storm Sewer System (MS4).

Consistent with Section 4.5.F of the Phase II MS4 Permit, the city will develop and maintain controls for reducing or eliminating the discharge of floatables and pollutants from municipal facilities.

Equipment and Maintenance

- Calibrate equipment to reduce and optimize salt use and ensure use of deicing agents is efficient. Provide employee training on proper calibration procedures.
- Do not overfill trucks with deicing materials as it may lead to spills.
- Wash equipment according to the using proper procedures to prevent pollutants from entering the stormwater system; dry cleanup procedures should be used when possible. Wash vehicles dirtied from deicers or sand application according to the city's *Municipal Vehicle Washing Procedure*.
- Regularly inspect and maintain equipment to reduce the potential for leaks.

Anti-icing and Deicing

- Optimize the application of deicers (while maintaining public safety) and consider opportunities for use of alternative materials.
- Remove as much snow as possible using mechanical means before deicing.
- When using deicers, use pre-wetting agents (e.g., salt brine) to help them work more efficiently and to reduce road salt scatter and bounce.
- As practical, use anti-icing practices to prevent ice formation.
 - Apply anti-icing agents 1-2 hours before winter weather events to ensure optimal performance (can be applied up to 24 prior).
- Salt brine solution used for anti-icing and pre-wetting can be stored for up to a year – concentration should be tested before use. If temperatures fall below 0° F, use a circulator pump to prevent the brine from freezing.
- Only apply road salt when the pavement temperature is above 15° F.
- Use alternative deicing materials instead of sodium chloride as appropriate (e.g., calcium magnesium acetate, magnesium chloride, or calcium chloride).
- Adjust the application rate of deicers based on the type of storm, type of agent used, and anti-icing and pre-wetting techniques employed.
- Perform loading and unloading of trucks on impervious surfaces, whenever possible. These areas provide for expedited and ease of cleanup to reduce the tracking and runoff of salt and to capture any spills.
- Track the amount of deicer used and maintain records of the application of sand, anti-icing and/or de-icing chemicals to document the reduction of chemicals to meet established goals.

Storage of Deicing Materials

- Prevent exposure of deicing material storage piles to precipitation by enclosing or covering the storage piles. Implement good housekeeping, diversions, containment or other measures to minimize exposure resulting from adding to or removing materials from the piles.
- Store materials under covered or enclosed areas and on impervious surfaces.
- Ensure that there are adequate drainage controls in storage areas to prevent runoff from entering the stormwater system.
- Follow appropriate loading and unloading procedures. If there are spills when loading or unloading materials, clean up any spills using approved procedures.
- Frequently sweep near the storage/loading areas to reduce the amount of materials that are tracked out.
- For liquid deicing chemicals, provide secondary storage containment.
- Do not store road salt near drinking water supplies, surface water resources, groundwater resources, recharge areas, and wells.

Snow Storage and Disposal

- Snow should not be pushed or stored near waterbodies or wetlands, into stormwater drainage swales or ditches, or on top of catch basins.
- Avoid storing snow in areas that are unstable, areas of potential erosion, or high points where snow may melt and collect debris as runoff before it enters the stormwater system.
- Consider sun exposure when storing snow. Snow in areas with higher sun exposure will melt faster but may require deicers if the snowmelt refreezes.
- Consider practices such as living snow fences to contain snow piles and reduce snow drifting.
- Dispose of snow only at locations that prevent direct melt water runoff into the stormwater system.

Reporting

The city will document and include the following information in its annual report:

- Road miles treated
- Type and amount of deicer used
- Equipment calibration records
- Employee training dates

Employee Training

- Employees who perform winter road maintenance are trained on these procedures and the proper operation of related equipment.
- Employees are also trained on stormwater pollution prevention, illicit discharge detection and elimination (IDDE) procedures, and spill and response procedures.