CITY OF FRANKFORT, INDIANA
FRANKFORT MUNICIPAL UTILITIES

STORMWATER STANDARDS
ORDINANCE NO. CO-04-26, EXHIBIT A

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1.0 INTRODUCTION

These Stormwater Standards (Standards) were developed under the former requirements of 327 IAC 15-13, Stormwater Run-Off Associated with Municipal Separate Storm Sewer System Conveyances (Rule13) and 327 IAC 15-5 for Stormwater Runoff Associated with Construction Activities (Rule 5). This document was updated to comply with the Construction Stormwater General Permit (CSGP) and the Municipal Separate Storm Sewer System (MS4) General Permit issued by the Indiana Department of Environmental Management (IDEM).

These Standards are intended to establish the minimum criteria for the design and construction of erosion and sedimentation controls and stormwater pollution prevention measures for construction sites where land disturbing activities are equal to or greater than one acre or operations that result in the land disturbance of less than one acre of total land area that are part of a larger common plan of development or sale. The applicability and exemptions are detailed in the Ordinance for the Stormwater Runoff Associated with Construction Activities (also called Construction Ordinance and Ordinance CO-04-26) and Ordinance for Post-Construction Stormwater Quality Runoff Controls (also called Post-Construction Ordinance and Ordinance CO-05-08) that have been incorporated into the City of Frankfort Code of Ordinances, Chapter 54.

These Standards should be considered as a companion document to the above-mentioned Ordinances. Whereas the Ordinances contain the regulatory authority and general requirements of comprehensive stormwater management, this document contains the necessary means and methods for achieving compliance with the ordinances. This document contains formulas and methodologies for reviewing and designing stormwater quality facilities. This is not a regulatory document, but a guide to assist plan reviewers, developers, and designers. If there are conflicts between the requirements in this document and the ordinance, the requirements of the ordinance should prevail.

2.0 MS4 APPROVAL REQUIREMENTS

MS4 Approval is required for all residential and non-residential construction projects that result in land disturbing activities equal to or greater than one (1) acre and are not exempt per the Construction Ordinance. New public or private fueling areas or those that replace existing tank systems, regardless of tank size or total land disturbance must also comply with these standards (refer to Section 5.0). Refer to Section 7 for specific requirements for Individual Lots.

2.1 SUBMITTAL PACKAGE

To receive MS4 Approval, items in this section must be submitted to the City of Frankfort (City) Building Services Department as part of the submittal package. The applicant shall provide an electronic copy (emailed, shared file, USB drive, CD, or other format acceptable to the department) and one hard copy (11x17 inches or 24x36 inches in size for plan sheets) of the construction plans. Copies will be forwarded to the Technical Review Committee and kept on file and used by the Building Services Department for erosion control inspections during project construction. All plans, reports, calculations, and narratives shall be signed and sealed by a professional engineer or a licensed surveyor registered in the state. The submittal package described in this section will include the *MS4 Approval Application for Review and Inspection* provided in **Appendix B** of these Standards.

2.1.1 Notice of Intent (NOI)

A draft NOI with the project and contact information shall be submitted. The draft NOI is completed through IDEM's online portal and a draft is printed for submittal. A completed NOI (signed with proof of publication) shall be provided before the start of the project (refer to Section 2.2.4).

2.1.2 Construction Plans

The following shall be included in the Construction Plans:

a) An index indicating the location, in the construction plan, of all information required by this chapter.

b) A vicinity map depicting the project site location in relationship to recognizable local landmarks, towns, and major roads.

c) A project narrative and supporting plan documents (documentation may be included on the plan sheets or in a separate document), which must include:

   1) A description of the nature and purpose of the project.

   2) A legal description of the project site. The description must include the legal section(s), or alternative land division(s), township and range, and civil township.

   3) The latitude and longitude to the nearest fifteen (15) seconds of the approximate center of the project site or the beginning and end of the project site for linear projects.

   4) The size of the project area in acres.

   5) The total expected land disturbance expressed in acres.

   6) Construction support activities that are expected to be part of the project.

   7) When known at the time of submittal, identification of other individuals or entities that will be associated with the project, including their name, affiliation, and contact information.

8) The soil properties, characteristics, limitations, and hazards associated with the project site and the measures that will be integrated into the project to overcome or minimize adverse soil conditions.

9) The general construction sequence of how the project site will be built, including the phases of construction.

10) A reduced plat or project site map (multiple sheets may be submitted to meet this requirement) that includes:

   i. A legend.

   ii. The boundaries of the project site as represented in the full construction plans and for which the NOI will be submitted.

   iii. The boundaries of each phase, section, or other divisions of the project site associated with the construction activity.

   iv. The general boundaries of land disturbance as depicted on the construction plans.

11) When applicable, the lot numbers, lot boundaries, road layout, and road names.

12) The identification and location of all wetlands, lakes, and watercourses on or adjacent to the project site.

13) The location of any in-stream activities that are planned for the project including, but not limited to stream crossings and pump arounds.

14) The identification and status of any other state or federal water quality permits or authorizations that are required for construction activities associated with the project site. If the permit or authorization has not been obtained, provide the expected timeline for obtaining the permit or authorization.

15) The identification of a USEPA-approved or established Total Maximum Daily Load (TMDL), including the name of the TMDL and the pollutant(s) for which there is a TMDL.

16) The identification of discharges to water on the current 303(d) list of impaired waters and the pollutant(s) for which it is impaired.

2.1.3 Existing and Final Project Site Layout

Provide existing and final project site layouts that include:

a) Existing conditions and proposed site improvements, including roads, utilities, lot delineation and identification, proposed structures, and common areas.

b) The existing and final boundaries of one hundred (100) year floodplains, floodway fringes, and floodways.

c) The existing and proposed topography at a contour interval appropriate to indicate drainage patterns.

d) The boundaries of natural features or unique resource areas that will be left undisturbed or preserved including, but not limited to, wetlands, steep slopes, riparian corridors, and natural buffers.

2.1.4 Drainage Plan

Provide a drainage plan that includes:

a) The location, size, and dimensions of all stormwater drainage systems, such as culverts, storm sewers, and conveyance channels.

b) The locations of specific points where stormwater and non-stormwater discharges will leave the project site.

c) The locations where stormwater may be directly discharged into groundwater, such as abandoned wells, sinkholes, or karst features.

d) The name(s) of the receiving water(s) and, when the discharge is to a system (storm sewer, stormwater management measure, etc.) owned/or operated by a municipality, city, town, or county, the name of the system operator and the ultimate receiving water.

e) The location, size, and dimensions of features, such as existing permanent retention or detention facilities, including manmade wetlands, designed for stormwater management.

2.1.5 Stormwater Pollution Prevention Plan (SWPPP) for Construction Activities

All land-disturbing projects shall implement controls to minimize the transport of sediment from the project sites. The Construction SWPPP must include:

a) A description of the pollutants and the potential sources that generate pollutants, including all potential non-stormwater discharges listed in the Construction Ordinance that are associated with the construction activities, which may reasonably be expected to contribute pollutants to stormwater discharges.

b) The location, dimensions, detailed specifications, and construction details of all temporary and permanent stormwater quality measures, including, but not limited to:

   1) Erosion control measures.

   2) Sediment control measures.

   3) Perimeter control measures.

   4) Run-off control measures.

   5) Dewatering applications and management methods.

   6) Construction traffic management control methods to reduce sediment tracking.

   7) Measures utilized to cross water resources for the accessibility needed to perform construction.

   8) Measures utilized to isolate or separate construction activities from work within waterbodies.

   9) Concrete washout areas and management measures.

c) Temporary stabilization and permanent stabilization plans, including the sequence of implementation planned to minimize the footprint of disturbed, unstable soil and the following information:

   1) Specifications and application rates for soil amendments and seed mixtures.

   2) The type and application rate for anchored mulch, erosion control blanket, and other appropriate stabilization options.

d) Temporary Stormwater Measure – For each temporary stormwater measure, a maintenance standard, including a threshold of when each requires corrective action, a contingency plan for corrective action and/or replacement with alternative measures, and an inspection schedule based on the type of measure.

e) Construction Sequence – The planned construction sequence describing the relationship between the implementation of stormwater quality measures, including temporary and permanent stabilization and stages of construction activities. The sequence must include the measures that

will be implemented before land disturbance in a specific drainage area and those that will be implemented as construction progresses throughout the life of the project.

f) Material Handling and Spill Prevention – Provide a material handling and spill prevention and spill response plan meeting the requirements in 327 IAC 2-6.1, including contact information for local emergency personnel and the IDEM Emergency Spill Line (888) 233-7745 or (317) 233-7745. Describe the management and disposal of construction products and waste.

g) Special Provisions

1) The use of anionic polymers (cationic polymers are not authorized for use) on the project site are allowed for sediment control provided their use conforms with current State of Indiana standards and specifications. Using polymers requires notification to IDEM and the Building Services Department.

2) Restoration and/or clean-up must be performed for those areas impacted by sediment or other pollutant discharges. These activities will be performed as directed by the inspecting authority and may require:

i. Development and submittal of a restoration plan to ensure the methodology chosen will not result in further degradation of the resource.

ii. Permission by a property owner when the restoration activity requires access to a property owned by another entity or individual.

3) Additional permits are to be obtained before the initiation of the work. These may include, but are not limited to, IDEM Water Quality Certifications, U.S. Army Corps of Engineers Section 404 Permit, or IDNR Construction in a Floodway Permit.

h) SWPPP Contact – The application will provide the name, address, and telephone number of the trained individual in charge of the mandatory stormwater pollution prevention self-monitoring program for the project site.

i) Certified Professional Signature – A certified professional shall develop the construction site SWPPP and approve that the design meets the requirements for stormwater quality. A signature is required.

2.1.6 SWPPP for Post-Construction Activities

A Post-Construction SWPPP shall be required that details how runoff and associated water quality impacts resulting from the development will be controlled or managed. The City has implemented a removal policy of eighty percent (80%) for total suspended solids (TSS). The plan must include:

a) A description of the pollutants and the potential sources that generate pollutants from the proposed land use that may reasonably be expected to contribute pollutants to stormwater discharges.

b) A description of stormwater quality and stormwater management measures that will be installed to address post-construction sources that are expected to generate pollutants in stormwater discharges after construction activities have been completed. Such practices include infiltration of runoff, flow reduction by use of open vegetated swales and natural depressions, buffer strip and riparian zone preservation, filter strip creation, minimization of land disturbance and surface imperviousness, maximization of open space, and stormwater retention and detention ponds. The measures selected should achieve, at a minimum, the following objectives:

1) Stormwater quality measures that target pollutants of concern and are designed to remove or minimize pollutants from stormwater run-off that are associated with the final land use.

2) Stormwater quality measures that will be implemented to prevent or minimize adverse impacts to aquatic resources including, but not limited to, wetlands, streams, karst features, and riparian habitats.

3) Stormwater management measures that will address the potential impacts of increased run-off from the project. Measures must be designed and approved according to these Standards and the Construction Ordinance. A certified professional must ensure that the design meets the applicable requirement(s).

4) Measures, including structural and those based on low-impact development principles, selected to address the pollutant(s) of concern, reduction of peak flows, and ability to infiltrate.

5) Protective measures that will be implemented during active construction when the type of post-construction measure(s) planned are susceptible to pollutants, specifically sediment, that may be generated during land-disturbing activities.

c) If a pre-approved BMP is selected from Section 5.4, Table 1, provide a discussion of how the BMP has been designed according to the BMP Design Criteria in **Appendix D**. If a pre-approved BMP is not selected, then provide a discussion of the treatment process and appropriate sampling information must be provided to verify that the BMP will meet the eighty percent (80%) TSS removal rate. Inlet inserts will not be approved as a stand-alone BMP.

d) The location, dimensions, detailed specifications, and construction details of all post-construction stormwater quality and stormwater management measures.

e) A sequence describing when each post-construction stormwater measure will be installed in relation to project construction.

f) A complete set of professionally certified construction plans showing the location, dimensions, and construction details of all post-construction stormwater quality measures, detailed specifications, and supporting water quality BMP sizing calculations.

g) The identification and location of a thirty-foot easement around the water quality treatment BMP along with an access easement to the BMP.

2.1.7 Operation and Maintenance (O&M) Manual

An O&M Manual shall be provided for each stormwater quality and quantity measure installed as part of the project to the City. Refer to Chapter 6 for details.

2.1.8 Plan Review Fees

At the time of application for review and inspection, the site owner shall pay an application fee to the City of Frankfort based on the *Construction and Post-Construction Fee Schedule* in **Appendix C**.

2.1.9 Accompanying City Forms

The following forms are included in **Appendix B** and shall be included in the submittal package as necessary:

a) MS4 Approval Application for Review and Inspection

b) MS4 Approval Application Submittal Checklist

c) Stormwater Pollution Prevention Plan Table of Contents

d) Improvement Location Permit

e) Grant of Perpetual Drainage Easement

f) Post-Construction Certification of Sufficiency of Plan

2.2 APPROVAL PROCESS

2.2.1 Plan Review

When a submittal package is received, the Building Services Department logs the time and date of the submittal. The submittal package is disseminated to the Technical Review Committee (technical reviewer, County Surveyor, and Frankfort Municipal Utilities) for approval. The technical reviewer evaluates the submittal per the ordinance and these Standards. Comments are provided on the *Construction/Stormwater Pollution Prevention Plan Technical Review* form within ten (10) days for projects one (1) to less than five (5) acres, and within fourteen (14) days for projects over five (5) acres. The *Construction/Stormwater Pollution Prevention Plan Technical Review* form may indicate one of the following:

a) "Plan is Deficient"

The plan is deficient if the applicant fails to provide all information outlined in the *MS4 Approval Application Submittal Checklist* or the information does not meet the ordinance and Standards. The applicant may not complete the NOI process or commence land-disturbing activities. Applicants are responsible for addressing and re-submitting any incomplete items. The initiation of construction activity following notification by the Building Services Department that the plan is deficient is a violation and subject to enforcement action. Once information is provided, the technical reviewer will evaluate per the ordinance and Standards and reissue the *Construction/Stormwater Pollution Prevention Plan Technical Review* form.

b) "Plan is Adequate with Conditions"

1) The technical reviewer may approve the plan but note the approval depends on reasonable conditions the applicant must meet including, but not limited to, receiving drainage approval from the County Surveyor or submittal of additional forms. The applicant may initiate the NOI process with IDEM.

2) If the plans are approved and then the city determines the applicant has failed to meet the identified conditions, the applicant must cease land-disturbing activities and provide the required information to the City. Applicants are responsible for addressing and re-submitting any incomplete items. Notification of approval will be provided to the applicant and land-disturbing activities may recommence. The continuation of construction activity following notification by the Building Services Department that the plan is deficient is a violation and subject to enforcement action.

c) "Plan is Adequate"

The technical reviewer approves the plans and provides a letter and the completed *Construction/Stormwater Pollution Prevention Plan Technical Review* form indicating the plans meet the ordinance and Standards. The applicant may initiate the NOI process with IDEM.

d) If the Building Services Department does not provide notification of the preliminary determination within the applicable time, the applicant may submit completed the NOI to IDEM and provide the completed NOI, proof of publication, and NOS to the Building Services Department and Clinton County SWCD. The applicant may commence construction forty-eight (48) hours after submitting the completed NOI.

Any changes or deviations in the plans and specifications after approval shall be filed with, and accepted by, the Building Services Department before the change. Copies of the changes, if accepted, shall be attached to the original plans and specifications. Technical review fees shall be the responsibility of the developer and/or owner and shall be paid in full before an MS4 Plan Approval is issued.

2.2.2 Determination of Sensitive Areas

The City intends to direct the community's physical growth away from sensitive areas and towards areas that can support it without compromising water quality. When construction plans are submitted for review, the reviewer will identify priority sites for inspection and enforcement. The criteria for priority sites will be based on the nature and extent of construction, proximity to sensitive areas, steep topography on or adjacent to the proposed construction site, proximity to wetlands, and potential for direct run-off to receiving waters. Construction site inspections will be based on priority determinations.

The Building Services Department may require more stringent stormwater quality measures than those detailed in these Standards or the latest edition of the *Indiana Stormwater Quality Manual* if a project site is determined to impact or discharge to a sensitive area,

a) Sensitive areas include highly erodible soils, wetlands, threatened or endangered species habitat, outstanding waters, impaired waters, recreational waters, and surface drinking water sources. Sensitive areas include the following:

b) Any discharge from a stormwater practice that is a Class V injection well shall meet the Indiana groundwater quality standards.

c) If wetlands are suspected on a site, wetland delineation shall be completed following the methodology established by the U.S. Army Corps of Engineers (ACOE) and addressed per ACOE requirements.

d) If a threatened or endangered species habitat is suspected on a site, the site must be evaluated and inspected by a professional experienced in such, and the results reported to the City and IDEM.

e) Special terms and conditions for development determined to impact or discharge to any sensitive area shall be included in the MS4 Approval.

2.2.3 Transfer of Ownership of Stormwater Systems

Owners/Developers that will dedicate the stormwater system to the City shall enter into an agreement - *Stormwater System Agreement – Developer-Installed and Contributed Stormwater System.* The Owner/Developer, at no cost to the City, shall furnish the design, labor, and materials to install the stormwater system. The Frankfort Municipal Utilities must approve the design, materials, and the Owner/Developer's selected contractor, based on reliability and responsiveness. *Waivers of Lien* for suppliers, subcontractors, and contractors will be required at the time of completion of the *Transfer of Ownership* form.

2.2.4 Submittal Package Approval

The applicant shall use the final *Construction/Stormwater Pollution Prevention Plan Technical Review* form as the approval to submit the Notice of Intent to IDEM. A review letter with the final review fees and any special conditions will be issued to the professional engineer responsible for completing the design. Fees shall be paid within thirty (30) days. Final MS4 Approval is not provided until all approvals from the County Surveyor and the Frankfort Municipal Utilities are received and approved by the Planning Commission and Board of Works.

2.3 MS4 APPROVAL TERMS AND CONDITIONS

2.3.1 Before Construction

After receiving the final *Construction/Stormwater Pollution Prevention Plan Technical Review* form, the site owner must follow the submittal requirements below before starting any construction:

a) The site owner is responsible for submitting the *Construction/Stormwater Pollution Prevention Plan Technical Review* form, final signed NOI, and proof of publication to IDEM through the online portal at least forty-eight (48) hours before any land disturbance or discharge occurs.

b) The site owner shall provide a copy of the signed NOI, proof of publication, and the Notice of Sufficiency from IDEM to the Building Services Department and the Clinton County SWCD.

c) Upon approval of the easement location for the post-construction BMP(s) shown on the construction plans, the easement shall be granted to the City by way of a *Grant of Perpetual Drainage Easement* (**Appendix B**).

d) The Owner/Developer shall provide a performance bond to the City of Frankfort before project construction. The performance bond shall be in the amount of one hundred twenty percent (120%) of the contract amount to construct drainage improvements and shall be provided on the *Performance and Repair Bond* form (**Appendix B**).

e) The professional design engineer for the project will complete the *Post-Construction Certification of Sufficiency of Plan* (**Appendix B**) and provide it to the Owner and the Frankfort Building Services Department.

2.3.2 Pre-Construction Meeting

A pre-construction meeting may be requested with the participation of the Building Services Department, other City departments, and other entities involved before any grading activity to review the project, ensure that appropriate perimeter control measures have been implemented on the site, and the location of any existing tiles has been properly marked.

2.3.3 Implementation Requirements

During the period of construction activities, all stormwater management measures necessary to meet the requirements of the MS4 Approval must be maintained, and as necessary, alternative measures must be selected and implemented. The following minimum standards apply to activities performed under the MS4 Approval:

a) Basin slopes must be stabilized upon achieving design grades to eliminate sediment inflow from the measure itself. The outfall of a basin must be stabilized and non-erosive within twenty-four (24) hours of installation of the basin outlet.

b) Pipe outlets discharging from the project site must be provided with temporary or permanent energy dissipation within twenty-four (24) hours of discharging run-off.

c) Roadway Clearing – Public or private roadways must be kept clear of accumulated sediment that is a result of run-off or tracking. The following minimum conditions are applicable:

   1) Clearing of sediment must not include the utilization of mechanical methods that will result in mobilization of sediment off the project site or flushing the area with water unless the flushed water is directed to an appropriate sediment control measure.

   2) Cleared sediment must be redistributed or disposed of in a manner that follows all applicable statutes and regulations.

   3) Sediment discharged or tracked onto public streets that are open to traffic must be removed as directed by a regulatory authority or at a minimum, removed by the end of the same day. Phasing of construction activities must be used, where applicable, to minimize the footprint of disturbed unstable areas.

d) Dust Suppression – Minimize the generation of dust through dust suppression techniques to prevent deposition into waters of the state.

e) Construction Entrance – A stable construction site access measure must be provided at all points of construction traffic ingress and egress to the project site. Where the selected measure is not effective, an alternative measure or additional controls must be utilized to minimize tracking. Alternative measures may include, but are not limited to, wheel wash systems and rumble strips.

f) Sediment-Laden Water – Discharge water from dewatering of groundwater from excavations, trenches, foundations, etc. must not be discharged when the discharge:

1) Contains sediment and is not first directed to an appropriate stormwater quality measure or a series of control measures that minimize the discharge of the sediment.

2) Has a visible sheen and/or contains pollutants at a level that requires additional treatment and/or an individual IDEM discharge permit.

g) Concrete Washout Areas – Concrete washout areas, where concrete washout is permissible, must be identified for the site and the locations clearly posted. Wash water must be directed into leak-proof containers or leak-proof containment areas which are designed to eliminate run-on and sized to prevent the discharge and/or overflow of the concrete wash water.

h) Fertilizer – Fertilizer applications associated with the stabilization plan for the project must meet the following requirements:

1) Apply fertilizer at a rate and amount as determined by a soil analysis or per the *Indiana Stormwater Quality Manual* or similar guidance documents.

2) Apply fertilizer at an appropriate time of year for the project location, taking into consideration proximity to a waterbody, and preferably timed to coincide with the period of maximum vegetative uptake and growth.

3) Avoid applying fertilizer before rainfall events that could result in the discharge of nutrients.

i) Storage and Handling of Materials and Wastes – Proper storage and handling of materials and wastes, such as fuels or hazardous wastes, and spill prevention and clean-up measures must be implemented to minimize the potential for pollutants to contaminate surface or groundwater or degrade soil quality. To meet this requirement:

1) Project management and the utilization of appropriate measures including, but not limited to, eliminating a source or the exposure of materials must be completed.

2) The following activities, where applicable must be managed:

i. Fueling and maintenance of equipment.

ii. Washing of equipment and vehicles.

iii. Storage, handling, and disposal of construction materials, products, and wastes.

iv. Application of pesticides, herbicides, insecticides, and fertilizers

v. Dispensing and utilization of diesel fuel, oil, hydraulic fluids, other petroleum products, and other chemicals.

vi. Handling and disposal of hazardous wastes, including, but not limited to paints, solvents, petroleum-based products, wood preservatives, additives, curing compounds, and acids.

vii. Washing applicators and containers used for paint, grout, or other materials.

3) Appropriate measures must be implemented to eliminate wastes or unused building materials including, but not limited to garbage, debris, cleaning wastes, wastewater, concrete washout, mortar/masonry products, soil stabilizers, lime stabilization materials, and other substances

from being carried from a project site by run-off or wind. Wastes and unused building materials must be managed and disposed of per all applicable statutes and regulations.

4) Construction and domestic waste must be managed to prevent the discharge of pollutants and windblown debris. When disposed of in waste containers (trash receptacles) the receptacle must be covered when not in use and at the end of the day. Waste that is not disposed of in trash receptacles must be removed at the end of the day from the site and disposed of properly.

j) Special terms and conditions identified during plan review for development within sensitive areas.

2.3.4 Construction Personnel Training

Personnel associated with the construction project must be informed of the terms and conditions of the MS4 Approval and the requirements within the SWPPP. The permittee is required to document this process. Information must be provided through training, preconstruction meetings, written notification, contracts, or other means that effectively communicate the provisions and requirements of the MS4 Approval and SWPPP. Personnel include, but are not limited to:

a) General contractors, construction management firms, grading or excavating contractors, trade industry representatives (i.e., concrete industry), and utility contractors associated with the overall project.

b) Contractors or individual lot operators that have primary oversight on individual building lots.

c) Those responsible for the implementation of the SWPPP, and the installation, repair, and maintenance of stormwater measures.

d) Those responsible for the application and storage of treatment chemicals.

e) Those responsible for administering the self-monitoring program.

2.3.5 Site Construction Notice

A notice must be posted near the main entrance of the project site or at a publicly accessible location. For linear project sites, such as a pipeline or highway, the notice must be placed in a publicly accessible location near the project field office. The notice must be maintained in a legible condition and include:

a) A copy of the completed NOI or a document that contains the same information.

b) The National Pollutant Discharge Elimination System (NPDES) permit number(s), upon receipt.

c) The name, company name, telephone number, email address, and address of the permittee or a local contact person.

d) The location of the SWPPP if the project site does not have an on-site location to store the plan.

2.3.6 Self-Monitoring Program

The permittee shall monitor and manage project construction and stormwater activities through the administration of a Self-Monitoring Program (SMP) that includes:

a) Written Evaluation – A complete written evaluation (or inspection) of the entire project site, except for those areas that are considered unsafe. The evaluation must be performed by a trained individual and include:

1) Name of the trained individual performing the evaluation, including printed name, title, and signature (electronic signatures are acceptable).

2) Date of the evaluation.

3) Amount of precipitation when the evaluation is conducted after a measurable storm event. Recorded rainfall may be documented utilizing an on-site rain gauge or storm event information from a weather station that is representative of the project location.

4) Observations of project performance concerning:

   i. Implementation of the stormwater pollution prevention plan.

   ii. Assessment of existing stormwater measures based on industry standards and as identified in Section 2.1.5 (d) to ensure each measure is operational and functioning properly.

   iii. Additional measures necessary in the event an existing measure fails or is not present in the landscape

   iv. Impacts include, but are not limited to, sediment discharges, erosion, discharges that result in bank erosion, and operational activities that have the potential to generate pollutants and unauthorized discharges.

5) Documentation of an actual discharge that is visible during the assessment, the location of the discharge, and a visual description of the discharge. The visual description includes, but is not limited to, color (turbidity reading is an option), odor, floatables, settled/suspended solids, foam, oil sheen, and any other visible sign that may be attributed to operations occurring on the project site.

b) Inspection Frequency – Inspections are to be performed and completed:

1) By the end of the next business day following each measurable storm event (excludes accumulated snow events); which is defined as a precipitation accumulation equal to, or greater than, one-half inch (0.50-inch) of rainfall. If no rain event occurs within the work week a minimum of one (1) inspection must occur.

2) When there is a failure to implement the SWPPP or initiate corrective action, the SMP must be administered per 1) above. However, the frequency to conduct an evaluation must be based on a one-quarter inch (0.25-inch) of rainfall.

3) At a minimum of once per month for areas within the project that are stabilized with permanent vegetative cover at seventy percent (70%) density. Before reducing the monitoring to monthly, records must identify the area and the date the area became eligible for monthly monitoring. Weekly monitoring as identified in 1) and 2) above must resume if one or more of the following occurs:

4) When the vegetative cover fails or there is evidence of erosion in the identified area.

5) When IDEM or the local inspecting authority requires monitoring to resume.

c) Corrective Actions – Provide details of corrective action(s) recommended and/or completed. Corrective actions include, but are not limited to:

1) Repairing, modifying, or replacing any stormwater management measure.

2) Clean-up and proper disposal of spills, releases, or other deposits.

3) Remedying a permit violation.

4) Taking reasonable steps to remediate, minimize, or prevent the discharge of pollutants associated with the construction activity until a permanent corrective solution is initiated.

5) Restoring an impacted area and/or removing accumulated sediment, provided appropriate permission and permits are obtained to conduct the activity.

6) A timeline for which corrective action will occur to remediate the discharge of pollutants. The established corrective action, at a minimum, must occur:

   i. On the day the deficiency was discovered or when it is not practical to initiate on the discovery date, no later than the following workday for the repair of a measure.

   ii. Within seven (7) days of discovery for the installation of a new measure or replacement of an existing measure unless a shorter time is required as part of a regulatory inspection. The inspecting authority may also allow additional time to take corrective action.

7) Documentation of corrective action taken from the previous self-monitoring report.

8) The Building Services Department or local, county, or state regulatory agency or a representative thereof may recommend to the project site owner or their representative to install appropriate measures beyond those specified in the stormwater pollution prevention plan to achieve compliance.

2.3.7 Availability of Documentation

Maintain the SMP reports at the site or an easily accessible location. Provide all reports for the project site to the local inspecting authority within forty-eight (48) hours of a request. Electronic copies are acceptable, provided they are in a format consistent with the paper record. Additionally, the site owner shall implement a Project Management Log as described in the CSGP.

2.3.8 Inspection by the City or Agency

Construction site owners shall allow right-of-entry for the City, or local, county, or state regulatory agency or a representative thereof to inspect any project site involved in construction activities, at reasonable times.

When construction plans are submitted for review, the reviewer identifies priority sites for inspection and enforcement. The criteria for priority sites are based on the nature and extent of construction, proximity to sensitive areas, steep topography on or adjacent to the proposed construction site, proximity to wetlands, and potential for direct run-off to receiving waters. The frequency of construction site inspections is based on priority determinations.

The Building Services Department, City, county, or state regulatory agency or a representative thereof may recommend to the project site owner or their representative to install appropriate measures beyond those specified in the stormwater pollution prevention plan to achieve compliance. A copy of any recommendations provided to the project site owner or their representative should also be forwarded to the Building Services Department.

2.3.9 Secondary Plat Approval

The following will be completed as part of the secondary plat approval process.

a) Final agreements and bonds

   1) Stormwater System Agreement – Developer-Installed and Contributed Stormwater System

   2) Maintenance Bond

   3) Performance and Repair Bond

   4) Waivers of Lien

   5) Transfer of Ownership

b) Record Drawings

Record drawings, certified by a Professional Engineer or Land Surveyor, of the completed drainage improvements that shall become public facilities shall be provided to the City during the secondary plat approval process. Record drawings shall include both a hard copy and an electronic copy (AutoCAD compatible CD) of as-built information including horizontal alignments, elevations, inverts, top-of-castings, pond cross sections, and flow lines of swales.

2.3.10 Project Termination Requirements

The project site owner shall plan an orderly and timely termination of the construction activities, including implementing stormwater quality measures that remain on the project site. The project site owner, or a representative, shall notify the Building Services Department when final stabilization per the ordinance and CSGP is completed so the department may complete a final site inspection before the Notice of Termination (NOT) submittal to IDEM.

The Building Services Department or a representative may inspect the project site to confirm the information provided in the NOT. Upon verification of the NOT letter, the Building Services Department shall issue written approval to the project site owner saying that the project site owner shall no longer be responsible for compliance with the requirements of this Chapter.

The project site owner shall submit the NOT within two (2) weeks of project termination through IDEM's online portal. A hard copy is provided to the City and county.

2.4 ENFORCEMENT

All persons engaging in construction activities on a project site shall be responsible for complying with these Standards, the Ordinance, and the CSGP. Any person causing or contributing to a violation of any provisions shall be subject to enforcement and penalty as described in the ordinance.

The City may recover all remediation costs, legal fees, consultant fees, monitoring costs, construction costs, collection fees, and any other costs borne by the City related to the project's non-compliance issue from the project site owner.

3.0 STORMWATER DESIGN STANDARDS AND SPECIFICATIONS

The City is in Clinton County, and as such, the City defers stormwater design standards and specifications to the Clinton County Surveyor. This includes standards and specifications for storm sewers, detention, and drainage. The City takes jurisdiction over construction and post-construction standards and specifications as detailed in these Standards.

However, at a minimum, the following is required as described in the ordinances.

3.1 EASEMENTS

The following applicable easements shall be granted to the City by way of a *Grant of Perpetual Drainage Easement* found in **Appendix D**.

a) Twenty (20) feet for pipes fifteen (15) inches in diameter and smaller.

b) Twenty-five (25) feet for pipes larger than fifteen (15) inches in diameter.

c) Twenty (20) feet measured horizontally outside the one hundred (100) year flood elevation for detention/retention ponds and access to the pond as determined by the City of Frankfort.

d) Fifteen (15) feet for yard swales.

e) Easements for open channels are to be determined by the City on a case-by-case basis.

f) Easements for drainage conveyances shall be centered on the centerline of the conveyance.

g) Thirty (30) feet around water quantity treatment BMP.

h) An access easement from a public right-of-way must be provided.

3.2 STORMWATER QUANTITY BMPS

The owner must provide the O&M Manual for stormwater quantity BMP(s) approved by the Clinton County Surveyor to the City. The contents of an O&M Manual are included in Section 6.0.

The project site owner shall provide a thirty (30) foot easement around the water quantity treatment BMP along with an access easement to the BMP. Upon approval of the easement location shown on the construction plans, the easement shall be granted to the City of Frankfort through a *Grant of Perpetual Drainage Easement* (**Appendix B**).

3.3 MS4 OWNED AND OPERATED CONSTRUCTION PROJECTS

For those construction activities operated by the MS4 operator or MS4 municipalities within the MS4 area, coverage under CSGP is required. The City will submit the necessary information to the local SWCD, or other entity designated by IDEM for review and approval. These projects must include a traffic phasing plan for those projects with the potential to alter vehicular traffic routes.

4.0 CONSTRUCTION PHASE

4.1 LAND DISTURBANCE

When calculating the total area of land disturbance, for the purpose of determining applicability of this chapter to the project, the following guidelines should be used. Additional information on what signifies as land disturbance is in the CSGP.

a) Off-site construction activities that provide services (for example, road extensions, sewer, water, and other utilities) to a land-disturbing project site, must be considered as a part of the total land disturbance calculation for the project site, when the activity is under the control of the project site owner.

b) Strip developments will be considered as one project site and must comply with this chapter unless the total combined disturbance on all individual lots is less than one (1) acre and is not part of a larger common plan of development or sale.

c) To determine if multi-lot project sites are regulated by this rule, the area of land disturbance shall be calculated by adding the total area of land disturbance for improvements, such as roads, utilities, or common areas, and the expected total disturbance on each individual lot, as determined by the following:

    1) For a single-family residential project site where the lots are one-half (0.5) acre or more, one-half (0.5) acre of land disturbance must be used as the expected lot disturbance.

    2) For a single-family residential project site where the lots are less than one-half (0.5) acre in size, the total lot must be calculated as being disturbed.

    3) To calculate lot disturbance on all other types of project sites, such as industrial and commercial projects project sites, a minimum of one (1) acre of land disturbance must be used as the expected lot disturbance, unless the lots are less than one (1) acre in size, in which case the total lot must be calculated as being disturbed.

d) The calculation methods as well as the type, sizing, and placement of all stormwater pollution prevention measures for construction sites shall meet the design criteria, standards, and specifications outlined in the *Indiana Stormwater Quality Manual* or the Standards. The methods and procedures included in these two references are in keeping with the above-stated policy and meet the requirements of CSGP.

e) Industrial and commercial project sites disturb a minimum of one (1) acre regardless of actual land disturbance.

4.2 POLLUTANTS OF CONCERN DURING CONSTRUCTION

The major pollutant of concern during construction is sediment. Natural erosion processes are accelerated at a project site by the construction process for several reasons, including the loss of surface vegetation and compaction damage to the soil structure itself, resulting in reduced infiltration and increased surface runoff. Clearing and grading operations also expose subsoils which are often poorly suited to re-establish vegetation, leading to longer-term erosion problems.

Problems associated with construction site erosion include the transport of pollutants attached to transported sediment; increased turbidity (reduced light) in receiving waters; and recreational use impairment. The deposited sediment may pose direct toxicity to wildlife or smother existing spawning areas and habitat. This siltation also reduces the capacity of waterways, resulting in increased flood hazards to the public.

Other pollutants of concern during the construction process are hazardous wastes or hydrocarbons associated with the construction equipment or processes. Examples include concrete washout, paints, solvents, and hydrocarbons from refueling operations. Poor control and handling of toxic construction materials pose an acute (short-term) or chronic (long-term) risk of death to both aquatic life, wildlife, and the public.

4.3 CONSTRUCTION SWPPP

4.3.1 General Requirements

A property owner submitting for MS4 Approval must meet the minimum requirements below.

a) Sediment-Laden Water – Treat sediment-laden water, which otherwise would flow from the project site, with sediment control measures appropriate to minimize sedimentation to receiving waters and adjacent properties.

b) Natural Features and Buffers

1) Protect natural features, including wetlands and sinkholes (karst features), from pollutant discharges associated with stormwater run-off.

2) Preserve existing natural buffers that are adjacent to the waters of the state to promote infiltration and provide protection of the water resource, unless infeasible. Activities performed by a county drainage board under IC 36-9-27 are excluded.

3) Preserve natural buffers, including the entire buffer bordering and/or surrounding the water resource.

i. Preserve buffers fifty (50) feet or more in width to a minimum of fifty (50) feet.
ii. Preserve buffers less than fifty (50) feet in width in their entirety.
iii. Buffers may be enhanced with vegetation that is native and promotes ecological improvement and sustainability.

4) Run-off directed to the natural buffer must be:

i. Treated with appropriate erosion and sediment control measures before discharging to the buffer.

ii. Managed with appropriate run-off control measures to prevent erosion from occurring within the buffer area.

c) Soil

1) Minimize soil compaction, especially in areas where permanent vegetation will be re-established and/or areas that are designated to infiltrate stormwater for the post-construction phase.

2) Topsoil will be preserved, unless infeasible.

4.3.2 Technical Design Criteria

Erosion and sediment controls shall be designed and installed per the CSGP, these Standards, and the *Indiana Stormwater Quality Manual*. Technical review of the erosion and sediment control program, stormwater pollution prevention plan, and other required submittals shall be completed by the Building Services Department or designated representative. The technical review shall assess the adequacy of proposed erosion and sediment control against the technical design criteria contained in the *Indiana Stormwater Quality Manual*.

a) Stormwater Management Measures – The selection, design, and implementation of all stormwater quality and management measures shall:

1) Apply sound engineering, agronomic, and scientific principles.
2) Follow applicable standards as specified in technical manuals, the *Indiana Stormwater Quality Manual,* or similar guidance documents, local ordinances, and the product guidance/specifications of the manufacturer.
3) Plan, design, and install appropriate measures as part of an erosion and sediment control system.
4) Discharge stormwater run-off leaving the project site in a manner that is consistent with applicable local, state, or federal law.
5) Direct stormwater run-off and project site discharges to an established vegetated area to increase pollutant removal and maximize stormwater infiltration, where applicable.
6) Discharge collected run-off leaving the project site directly to either a well-defined, stable receiving conveyance or diffuse and release to adjacent property without causing erosion at the point of discharge.
7) Design conveyance systems to consider both peak flow and total volume and adequately protect the conveyance system so the final gradient and resultant velocity will not cause erosion at the outlet or in the receiving channel.
8) Withdraw water from sediment basins from the surface of the water column, where feasible.

b) Stormwater Quality Management Measures – Post-construction stormwater management measures shall be implemented to manage the discharge of stormwater run-off to address quality. The selection, design, and implementation of all stormwater quality measures shall be in accordance with Section 5.0 in this document.

4.3.3 Common Control Practices

All erosion control and stormwater pollution prevention measures required to comply with this Construction Ordinance shall meet the design criteria, standards, and specifications similar to or the same as those outlined in the *Indiana Stormwater Quality Manual*. Erosion control and stormwater pollution prevention practices should be used to protect every potential pollution pathway to stormwater conveyances.

5.0 POST-CONSTRUCTION STORMWATER QUALITY

5.1 INTRODUCTION

The purpose of this chapter is to establish minimum performance standards for the management of post-construction stormwater runoff quality, which is necessary to reduce the impacts of sediment and pollutants on local habitat and water resources. In addition to the requirements in these Standards, projects meeting the applicability of this section must also comply with the Post-Construction Ordinance that has been incorporated into the City of Frankfort Code of Ordinances, Chapter 54. The ordinance establishes requirements for post-construction stormwater runoff controls.

Sediments can have adverse effects on aquatic life in streams and lakes and can transport other attached pollutants affecting the welfare of the public residing in local watersheds. Major sources of sediment include washing off particles that are deposited on impervious surfaces and the erosion of stream banks and construction sites. Improvements in the quality of post-construction stormwater runoff can be met by best management practices (BMPs) including maximizing the use of site design to reduce runoff, managing, and treating stormwater runoff using structural controls, and implementing pollution prevention practices to prevent erosion and reduce potential contaminants.

Hydrologic studies show that small-sized, frequently occurring storms account for most rainfall events. The runoff from these storms accounts for a major portion of the annual pollutant loadings. By treating the frequently occurring smaller rainfall events, and a portion of the stormwater runoff from larger events, it is possible to effectively mitigate the water quality impacts from developed areas.

5.2 APPLICABILITY

All construction activities where land disturbing activities are equal to or greater than one (1) acre or operations that result in the land disturbance of less than one (1) acre of total land area that are part of a larger common plan of development or sale. This also applies to new public or private fueling areas or those that replace existing tank systems, regardless of tank size or total land disturbance. The applicability and exemptions are detailed in the Post-Construction Ordinance and Chapter 54 of the Code of Ordinances.

Per ordinance, the following additional activities are exempt from these requirements:

a) Construction of, or modifications to, single-family structures that are not a part of a larger common plan of development,

b) Single-family residential development consisting of four (4) or fewer lots,

c) Individual lots within a larger common development plan that has been previously permitted for stormwater management, and

d) Any logging, agricultural, or other activity which is consistent with an approved soil conservation plan or a timber management plan prepared or approved by county, state, or federal regulating agencies.

5.3 POLICY

The City has adopted a policy that the control of stormwater runoff quality will be based on the management of total suspended solids (TSS). This requirement will serve as the basis of the stormwater quality management program for all areas within the jurisdiction of the City. The target TSS removal rate is eighty percent (80%).

In addition to TSS, design and install appropriate practices to reduce lead, copper, zinc, and polyaromatic hydrocarbons in stormwater runoff at all gasoline outlets and refueling areas (public and private) that install or replace tank systems.

One approach to reduce the post-development loadings is to require treatment of a water quality volume from a site. A second approach is to require treatment of a water quality flow rate from the site. Approved methods for calculating the water quality volume and flow rate are described in Section 5.6.

The appropriate stormwater quality volume (WQ_v) and/or stormwater quality flow rate (Q_{wq}) generated from a qualifying site shall be adequately treated before discharge.

5.4 PRE-APPROVED BMPS

Pre-approved structural BMPs are provided in Table 1 below and are presumed to comply with the eight percent (80%) TSS removal rate where indicated if:

a) Sized to capture the prescribed water quality volume or flow rate, as applicable,

b) Designed according to the specific performance criteria outlined in this manual,

c) Constructed properly, and

d) Maintained regularly.

If a pre-approved structural BMP is not utilized, the project designer must provide a justification and testing data to demonstrate that the selected BMP will meet the eight percent (80%) TSS removal rate as described in Section 2.1.6.

Post-construction stormwater quality measures must be properly maintained to ensure stormwater runoff is continuously treated from the developed and stabilized site. Refer to Section 7 for information on the required Operation and Maintenance Manual. Special circumstances that are not covered by these standards shall be regulated and reviewed on a case-by-case basis.

BMP	Description	80% TSS Removal
Stormwater Pond	Constructed basin with a permanent pool of water in which runoff is captured and treated.	Yes
Stormwater Wetland	Constructed wetland areas consisting of shallow marsh areas, open water, and semi-wet areas above a permanent pool.	Yes
Bioretention Area	Shallow basins or landscaped areas with engineered soils and vegetation and filter strip treatment prior to ponding area.	Yes
Water Quality Dry Swale with Pretreatment	Vegetated open channel that captures and treats stormwater runoff within dry cells.	Yes
Sand Filters with Pretreatment	Structure that treats runoff through filtration using a sand bed as the primary filter media. Requires pretreatment due to high clog factor.	Yes
Infiltration Trench with Forebay	Trench that captures and treats stormwater runoff by allowing it to infiltrate into the ground through aggregate into highly porous underlying soils.	Yes
Biofilters	Densely vegetated land engineered as pretreatment or as part of a treatment train	No

References:
Georgia Stormwater Management Manual, Volume 2, Maryland Stormwater Design Manual, Volume II, and Indianapolis Stormwater Specifications Manual

5.5 DESIGN REQUIREMENTS

Per ordinance, post-construction runoff control measures shall be designed and installed per the MS4GP and the Standards. Where appropriate, storage, infiltration, filtering, or vegetative practices shall be used to reduce the impact of pollutants in stormwater runoff on receiving waters. In addition to these practices, the following requirements shall be utilized:

a) Infiltration practices will not be allowed in wellhead protection areas.

b) Discharges will not be allowed directly into sinkholes or fractured bedrock without treatment that results in the discharge meeting Indiana groundwater quality standards as referenced in 327 IAC 2-11.

c) Any stormwater practice that is a Class V injection well must ensure that the discharge from such practices meets Indiana groundwater quality standards as referenced in 327 IAC 2-11.

d) As site conditions allow, the rate at which water flows through conveyances shall be regulated to reduce outfall scouring and stream bank erosion.

e) As site conditions allow, a vegetated filter strip of appropriate width shall be maintained along unvegetated swales and ditches.

f) New gasoline outlets and refueling areas, or outlets and refueling areas that replace their existing tank systems shall be designed and installed using appropriate practice to reduce lead, copper, zinc, and polyaromatic hydrocarbons in stormwater runoff.

The contents of the Post-Construction SWPPP are provided in Section 2.1.6.

5.6 METHODS FOR SIZING BMPS

There are two (2) methods for calculating the required size of a BMP. The first method calculates the water quality volume to be treated, which applies to detention-based BMPs. The second method calculates the water quality peak flow rate to be treated, which applies to filtration processes and mechanical-type BMPs such as hydrodynamic devices.

The water quality volume or flow rate shall be treated by an acceptable (pre-approved) BMP(s) from Section 5.4, Table 1, or an equivalent practice. Such practices or techniques and devices not pre-approved that may be more functional and desirable for stormwater management may be utilized upon approval by the City. Mechanical-type BMPs must meet ASTM standard methods for verifying performance and must be certified by a professional engineer. The BMP must meet the eight percent (80%) TSS removal rate at a fifty (50) to one hundred twenty-five (125) micron range (very fine/fine sand) without resuspension of particles at the design water quality flow rate resulting from a 1-inch rainfall depth. Testing of the TSS removal rate must be conducted by an independent testing facility rather than by the manufacturer.

A quick reference, minimum design criteria, and maintenance and inspection checklists for each pre-approved BMP are provided in **Appendix D**.

5.6.1 Water Quality Volume (WQ_v)

The WQ_v is the storage needed to capture and treat the runoff from the first 1-inch of rainfall. The WQ_v is equivalent to one (1) inch of rainfall multiplied by the volumetric runoff coefficient (R_v) and the site area. The volume of runoff is directly related to the amount of impervious cover at the site and is calculated using the following equation:

$$WQ_v = \frac{(P)\,(R_v)\,(A)}{12}$$

Where:
- WQ_v = water quality volume (acre-feet)
- P = 1 inch of rainfall
- R_v = volumetric runoff coefficient
  = 0.05 + 0.009(I), where I is the percent (%) impervious cover
  [Example: If the I value is 80%, then use 80 and not 0.80 for the calculation.]
- A = area in acres

5.6.2 Water Quality Flow Rate (Q_{wq})

The Q_{wq} is needed to size BMP devices designed to treat runoff at a peak design flow rate through the system.

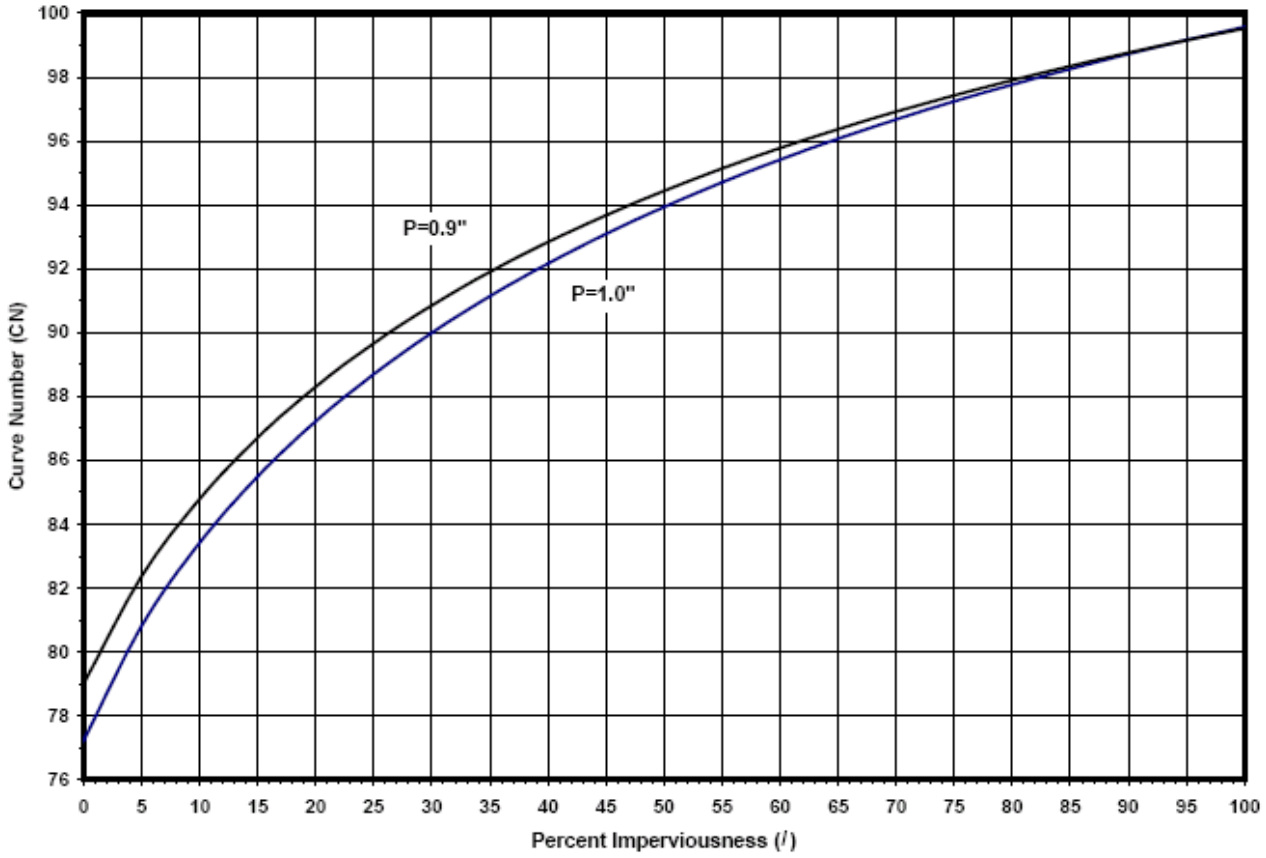
Conventional SCS methods have been found to underestimate the volume and rate of runoff for rainfall events less than two (2) inches. The following procedure can be used to calculate the Q_{wq}. The method relies on the water quality volume in conjunction with an adjusted curve number (CN_{wq}) and the NRCS TR-55 methodology.

Step 1 - Using the water quality volume, calculate the adjusted CN_{wq}:

$$CN_{wq} = \frac{1000}{10 + 5P + 10WQ_{vi} - 10(WQ_{vi}^2 + 1.25WQ_{vi}P)^{1/2}}$$

Where:
CN_{wq} = adjusted curve number for water quality flow rate calculation
P = all in inches (use 1 inch for water quality storm)
WQ_{vi} = water quality volume in inches = 1.0 inch(R_v)
R_v = volumetric runoff coefficient
= 0.05 + 0.009(I), where I is the percent (%) impervious cover

Graphically:



Step 2 – Calculate the site time of concentration (t_c) and area in acres (A).

Step 3 – Use the adjusted CN_{wq}, t_c and A as input for TR-55 calculations in conjunction with the SCS Type II rainfall distribution, 24-hour event, for 1 inch of rainfall depth to calculate the Q_{wq}.

5.7 BMP INSPECTIONS

The Building Services Department or designated representative may conduct inspections of the water quality treatment system construction. The site owner must notify the Building Services Department at least forty-eight (48) hours before the construction of the stormwater management system. Inspection fees shall apply and are payable as part of the *MS4 Approval Application*. Refer to the *Fee Schedule* in **Appendix C**. Fees shall be made payable to the City.

If required by the City, the applicant shall execute an *Inspection Services Agreement* with the City and pay all applicable inspection fees per the terms stated in the agreement.

The City reserves the right to perform periodic inspections of BMPs to ensure proper maintenance is completed for the life of the BMP. Fees associated with maintenance violations shall be assessed through enforcement actions if necessary.

6.0 OPERATION AND MAINTENANCE MANUAL

Each stormwater quantity and quality BMP must have an operation and maintenance (O&M) Manual signed by the BMP Owner and submitted with the *MS4 Approval Application* for approval. Routine inspection and maintenance are the responsibility of the BMP Owner. The example maintenance and inspection checklists provided in **Appendix D** may be used in performing maintenance activities. Records of routine inspection are the owner's responsibility and must be made available upon request of the City. The O&M Manual must include the following:

6.1 REQUIREMENTS

The O&M Manual shall include:

a) Additional operation and maintenance measures necessary to prolong the optimal function of the facility as determined by the designer.

b) A description of the maintenance guidelines for all post-construction stormwater measures to facilitate their proper long-term function.

c) The owner's signature and any future parties who will assume responsibility for the operation and long-term maintenance of the post-construction stormwater measures.

d) When known at the time of plan submittal, the entity that will be responsible for the operation and maintenance of the system.

6.2 CONTENTS

All O&M Manuals shall include the following information, at a minimum:

6.2.1 Owner Information

The first section of the manual must contain information about all the people involved with the O&M Manual. It must list the names and contact information of all responsible parties, including property owners, maintenance workers, and people who will be performing inspections. The responsibilities of each person listed should be clearly defined in this section.

6.2.2 Owner Acknowledgement Statement

The BMP owner shall provide a signed and notarized *Best Management Practice Owner Acknowledgement* (**Appendix B**) to the Building Services Department. The signed and approved O&M Manual shall be recorded with the property by the County Recorder's office. A copy of the O&M Manual shall be provided to each new owner before the transfer of ownership. The O&M Manual shall be signed by the new owner, notarized, and submitted to the Building Services Department to be kept on record.

6.2.3 Site Map and Location

The O&M Manual must include the site location (address or location map) and a site map showing the locations of all BMPs that will be present at the site. The site map should show the flow of stormwater through the site and provide an overview of the stormwater's path through the onsite BMPs. The site map and/or exhibits shall be provided digitally or drawn to a legible scale on 8.5-inches by 11-inches or 11-inches by 17-inches sized paper that clearly indicates the following:

a) The location of the stormwater management facilities and BMPs.

b) Plan and cross-section details, showing applicable features.

c) The flow of stormwater through the site, including an overview of the stormwater's path through the onsite stormwater facilities and BMPs.

d) Dimensions, easements, outlets/discharge points and outfall locations, drainage patterns, stormwater runoff flow directions, the extent and depth (elevation) of high-water levels, flood routing path, signage, connecting structures, weirs, detention control structure, anticlog methods, invert elevations, structural controls used to control stormwater flows, and other relevant features.

e) A narrative description and checklist of operation and maintenance guidelines for all post-construction stormwater quality measures to facilitate their proper long-term function. This narrative description and checklist shall be made available to future parties who will assume responsibility for the operation and maintenance of the post-construction stormwater quality measures.

6.2.4 BMP Description

A narrative description and checklist of operation and maintenance guidelines shall be provided for all post-construction stormwater quality measures to facilitate their proper long-term function. This narrative description and checklist shall be made available to future parties who will assume responsibility for the operation and maintenance of the post-construction stormwater quality measures

6.2.5 O&M Practices

Each stormwater management facility and BMP shall require specific inspection and maintenance procedures. Additionally, the minimum requirements below shall be incorporated into the inspection and maintenance regimen. Guidance shall be written in simple, layman's terms, including:

a) Guidance on owner-required periodic inspections and inspections to be performed by the City.

b) Guidance on routine maintenance including mowing, litter removal, woody growth removal, etc. to be performed by the owner.

c) Guidance on remedial maintenance such as inlet replacement, outlet work, etc. to be performed by the owner.

d) Guidance on sediment removal, both narrative and graphical, describing when sediment removal shall occur to ensure that the stormwater management facility or BMP remains effective as a stormwater management device. Guidance shall include instructions as to how the depth of sediment shall be measured and at what measurement removal will be required.

e) Instructions on inspection and clean-out of BMPs, sumps, trash screens, settling pits, and oil/grease collection chambers.

f) Instructions on proper disposal of removed sediments, trash, debris, and other substances.

g) Guidance and methods for preventing water stagnation and all recommended maintenance.

6.2.6 Inspection and Maintenance

The minimum requirements below shall also be incorporated into the inspection and maintenance regimen and clearly documented in the O&M Manual.

a) Operation and maintenance procedures and practices shall be reviewed and assessed annually.

b) Access routes, including roadways and sidewalks, shall be inspected annually and maintained as needed.

c) Drainage structures and flow restrictors shall be inspected and cleaned semi-annually or per the manufacturer's recommendations, whichever is more stringent.

d) Volume control facilities and BMPs shall be inspected semi-annually and after significant rainfall events exceeding one and one-half (1.5) inches, or per the manufacturer's recommendations, whichever is more stringent.

e) The owner shall keep an updated log or inspection worksheets documenting the performance of the required operation and maintenance activities for perpetuity. Note inspection dates, facility components inspected, facility condition, and any maintenance performed, or repairs made. Documentation must be produced upon the request of the City within forty-eight (48) hours of the request.

f) Vegetation shall be maintained regularly per design specifications.

g) Pest control measures shall be implemented to address insects, rodents, and other pests. Natural pest control is preferred over chemical treatments.

h) Mechanical measures shall be maintained regularly per the manufacturer's recommendations.

i) Native vegetation plantings shall have "No Mow" or other appropriate signage.

j) Underground vaults and structures shall include design measures to facilitate regular cleaning and maintenance. Confined space entry procedures shall be followed.

6.2.7 Implementation Schedule

An inspection and maintenance schedule shall be prepared in a tabular format and included in the O&M Manual. This schedule shall provide for routine examination of all stormwater management facilities and BMPs.

6.3 RIGHT-OF-ENTRY STATEMENT

The O&M Manual shall include a statement that the City has the right to enter the property to inspect the stormwater management facility or BMP. The statement shall be signed and notarized.

6.4 DRAINAGE EASEMENT(S) DOCUMENTATION

The O&M Manual shall include documentation of drainage easement(s) around the stormwater management facilities and BMPs. The documentation must be in graphic format.

7.0 INDIVIDUAL BUILDING LOT

7.1 GENERAL REQUIREMENTS

Individual building lots where land disturbance is expected to be one (1) acre or more and are part of larger development shall follow the erosion and sediment control practices of the approved larger common plan of development and the applicable requirements in this section of the Stormwater Standards.

Single-family residences and ponds where land disturbance is expected to be one (1) acre or more and are not part of a larger development shall obtain coverage under this ordinance and the CSGP except for the requirements in Sections 2.1.1 (public notice only), 2.1.6 (Post-Construction SWPPP), 2.1.7 (O&M Manual), 2.3.5 (Self-Monitoring Program), and 2.3.6 (documentation for a Self-Monitoring Program) unless otherwise notified.

7.2 MINIMUM SWPPP REQUIREMENTS

All stormwater quality measures, including erosion and sediment control, necessary to comply with the ordinances, the CSGP, and these Standards shall be implemented per the overall development plan. Provisions for erosion and sediment control on individual building lots regulated under the original permit of a project site owner must include the following minimum SWPPP requirements:

a) Install a temporary construction entrance/drive. Clean up sediment tracked or washed onto roads or into stormwater conveyances (sewers, ditches, waterways, storm inlets, etc.).

b) Sediment discharge and tracking from each lot must be minimized throughout the land-disturbing activities on the lot until permanent stabilization has been achieved.

c) Clean-up of sediment that is either tracked or washed onto roads or into stormwater conveyances (sewers, ditches, waterways, storm inlets, etc.). Bulk clearing of sediment shall not include flushing the area with water. Cleared sediment must be redistributed or disposed of in a manner that follows all applicable statutes and rules.

d) Install and maintain appropriate perimeter erosion and sediment control measures. Install before land disturbance and maintain until bare soils are stabilized to seventy percent (70%) density of permanent perennial vegetation.

e) Adjacent lots disturbed by an individual lot operator must be repaired and stabilized with temporary or permanent surface stabilization.

f) Establish a concrete washout area to contain residual concrete and washout waters. Water collected from washout that does not harden or evaporate must be handled as wastewater.

g) Install inlet protection at all stormwater inlets that receive runoff from disturbed areas.

h) Where construction disturbs surfaces greater than 3H:1V slope or in areas of concentrated flow, establish permanent vegetation with erosion control blanket and seeding.

i) For individual residential lots, final stabilization will be achieved when the individual lot operator:

   i. Completes final stabilization considering weather and season. Final stabilization is achieved when all land-disturbing activities have been completed, temporary BMPs have been removed, permanent BMPs have been cleaned, and a uniform perennial vegetative cover with a density of seventy percent (70%) has been established on all unpaved areas and areas not covered by a permanent structure or equivalent permanent stabilization measures have been employed. This does not include final landscaping.

ii. Initiates permanent seeding with appropriately crimped or tackified mulch cover, erosion control blanket, sod; or

iii. Installs and/or ensures functional erosion and sediment control measures are in place on the individual lot. Upon issuance of the *Certificate of Occupancy* and concurrence of the homeowner, the homeowner is responsible for maintaining the sediment control measures until final stabilization has occurred.

7.3 STRIP DEVELOPMENTS

Residential strip developments, when improvements are made to the property in preparation for development and the total projected land disturbance, including each building lot is one (1) acre or more must obtain permit coverage. Upon sale of the lots, the permittee must notify each individual lot owner or individual lot operator of the requirements of this permit and provide an erosion and sediment control plan and/or specifications to be implemented on the building lot.

7.4 PROJECT TERMINATION

The permittee may obtain early release from the CSGP and thus these Standards and ordinances, if the project site owner meets the conditions identified in the CSGP as described below.

a) The project is a multi-lot development that includes residential building lots or out lots associated with a commercial/industrial project that is part of a larger common project that has permit coverage.

b) All land-disturbing activities have been completed and the entire project site meets the performance criteria for final stabilization, except for individual residential building lots or commercial/industrial out lots that have active land disturbance at the time of the request to terminate.

c) The remaining, undeveloped acreage for residential projects does not exceed five (5) acres, with contiguous areas not to exceed one acre.

d) A map of the project site, clearly identifying all remaining undeveloped lots, is attached to the Notice of Termination (NOT). The map must be accompanied by a list of names and addresses of individual lot owners or individual lot operators of all undeveloped lots.

e) All public and common improvements, including infrastructure, have been completed and permanently stabilized and have been transferred to the appropriate local entity.

f) The remaining acreage does not pose a significant threat to the integrity of the infrastructure, adjacent properties, or water quality.

g) All permanent stormwater quality measures have been installed and are operational.

Upon verification of the NOT, the Building Services Department may issue written approval to the project site owner. Upon receipt of this approval, the project site owner shall notify all current individual lot owners and all subsequent individual lot owners of the remaining undeveloped acreage and acreage with construction activity that they are responsible for complying with Section 7.2. The remaining individual lot owners do not need to submit an NOI or NOT. The notice to individual lot owners must contain a verified statement that each of the conditions above has been met. The notice must also inform the individual lot owners of the requirements to:

a) Install and maintain appropriate measures to prevent sediment from leaving the individual building lot; and

b) Maintain all erosion and sediment control measures that are to remain on-site as part of the construction plan.

APPENDIX A – DEFINITIONS

(1) "Applicant" means a property owner or agent of a property owner who has applied for MS4 Approval or an improvement location permit from the City.

(2) "Certified Professional" means an individual who is trained and experienced in the principles of stormwater management, including erosion and sediment control as is demonstrated by completion of state registration, or professional certification that enables the individual to make judgments regarding stormwater management, treatment, and design.

(3) "Concrete Washout" means the rinsing of chutes, hoppers, wheelbarrows, and hand tools that are used to handle concrete, mortar, stucco, grout, or other mixtures of cement. Concrete washout water is a wastewater slurry containing metals and is caustic or corrosive, having a high pH.

(4) "Construction Activity" means land disturbing activities and land disturbing activities associated with the construction of infrastructure and structures. This term does not include routine ditch or road maintenance or minor landscaping projects.

(5) "Construction plan" means a representation of a project site and all activities associated with the project. The plan includes the location of the project site, buildings and other infrastructure, grading activities, schedules for implementation, and other pertinent information related to the project site. A stormwater pollution prevention plan is a part of the construction plan.

(6) "Construction site access" means a stabilized stone surface at all points of ingress or egress to a project site to capture and detain sediment carried by tires of vehicles or other equipment entering or exiting the project site.

(7) "Contractor" means an individual or company hired by the project site or individual lot owner, their agent, or the individual lot operator to perform services on the project site.

(8) "Conveyance" means a combination of drainage components that are used to convey stormwater discharge, either within or downstream of the land-disturbing activity including:

(9) "Manmade stormwater conveyance system" meaning a pipe, ditch, vegetated swale, or other stormwater conveyance system constructed by man except for restored stormwater conveyance systems;

(10) "Natural stormwater conveyance system" meaning the main channel of a natural stream and the flood-prone area adjacent to the main channel; or

(11) "Restored stormwater conveyance system" meaning a stormwater conveyance system that has been designed and constructed using natural channel design concepts. Restored stormwater conveyance systems include the main channel and the flood-prone area adjacent to the main channel.

(12) "Developer" means:

(A) any person financially responsible for construction activity; or
(B) an owner of property who sells or leases, or offers for sale or lease, any lots in a subdivision.

(13) "Dewatering" means the act of draining rainwater and/or groundwater from excavations, stormwater measures, building foundations, vaults, and trenches.

(14) "Erosion" means the detachment and movement of soil, sediment, or rock fragments by water, wind, ice, or gravity.

(15) "Erosion and sediment control measure" means a practice, or a combination of practices, to control erosion and resulting sedimentation.

(16) "Erosion and sediment control system" means the use of appropriate erosion and sediment control measures to minimize sedimentation by first reducing or eliminating erosion at the source and then, as necessary, trapping sediment to prevent it from being discharged from or within a project site.

(17) "Filter Strip" means an area of undisturbed or planted vegetation used to retard or collect sediment for the protection of watercourses, reservoirs, or adjacent properties.

(18) "Final stabilization" means the establishment of permanent vegetative cover or the application of a permanent nonerosive material to areas where all land disturbing activities have been completed and no additional land disturbing activities are planned under the current permit.

(19) "Floatable" means any solid or liquid that, due to its physical characteristics, will float on the surface of water. For this chapter, the term does not include naturally occurring floatables, such as leaves or tree limbs.

(20) "Grading" means the cutting and filling of the land surface to a desired slope or elevation.

(21) "IDEM" means the Indiana Department of Environmental Management.

(22) "Impaired Water" means any waterbody included on IDEM's current 303(d) list.

(23) "Impervious surface" means any land surface with a low or no capacity for soil infiltration, including, but not limited to pavement (sidewalks, streets, parking areas, and driveways), packed gravel or soil, and rooftops.

(24) "Individual building lot" means a single parcel of land within a multiparcel development.

(25) "Individual lot operator" means a person who has financial control of construction activities for an individual lot.

(26) "Individual Lot Owner" means a person who has a financial interest in the construction activities for an individual lot.

(27) "Infeasible" means not technologically possible, or not economically practicable and achievable considering best industry practices.

(28) "Infiltration" means the process by which surface water enters the soil and recharges streams, lakes, rivers, groundwater, and underground aquifers. Stormwater infiltration is a fundamental component of the water cycle and a centerpiece of stormwater management strategies.

(29) "Infiltration Practices" means any structural system designed to facilitate the percolation of runoff through the soil to groundwater. Examples include infiltration basins or trenches, dry wells, and porous pavement.

(30) "Land disturbing activity" means any man-made change of the land surface, including removing vegetative cover that exposes the underlying soil, excavating, filling, transporting, and grading.

(31) "Larger common plan of development or sale" means a plan, undertaken by a single project site owner or a group of project site owners acting in concert, to offer lots for sale or lease; where such land is contiguous, or is known, designated, purchased, or advertised as a common unit or by a common name, such land shall be presumed as being offered for sale or lease as part of a larger common plan. The term also includes phased or other construction activity by a single entity for its own use.

(32) "MS4" means Municipal Separate Storm Sewer System.

(33) "Natural Buffer" means an undisturbed area adjacent to or surrounding surface waters within which construction activity is restricted. A natural buffer may include natural vegetation, exposed rock, overflow channels, or barren earth that existed before land-disturbing activities.

(34) "Natural Vegetation" means vegetation that occurs spontaneously without regular management and/or maintenance. This definition also includes mitigation sites.

(35) "Non-Stormwater Discharges" means discharges that do not originate from storm events. These discharges include, but are not limited to process water, air conditioner condensate, non-contact cooling water, sanitary waste, concrete washout water, paint wash water, irrigation water, or pipe testing water.

(36) "Permanent stabilization" means the establishment, at a uniform design of seventy percent (70%) across the disturbed area, of vegetative cover or permanent non-erosive material that will ensure the resistance of the soil to erosion, sliding, or other movement.

(37) "Phasing" means sequential development of smaller portions of a large project site, stabilizing each portion before beginning land disturbance on subsequent portions, to minimize exposure of disturbed land to erosion.

(38) "Project site" means the entire area on which construction activity is to be performed.

(39) "Project Site Owner/Operator" means the person required to submit the NOI letter and required to comply with the terms of this permit, including either of the following:

(A) A developer.
(B) A person or entity that has financial and operational control of construction activities and project plans and specifications, including the authority to approve the expenditure of funds and the ability to make modifications to plans and specifications.

(40) "Regulatory Authority" means the department or other entity designated by the department to administer this chapter or develop a local stormwater program. The definition as used in this chapter may also include local law enforcement.

(41) "Run-off" means water that originates during a precipitation event and flows over the land as surface water rather than infiltrating into the ground or evaporating.

(42) "Run-on" means run-off that flows or is directed to a specific area on the project site that may result in run-off becoming comingled with pollutants.

(43) "Sediment" means solid material (both mineral and organic) that is in suspension, is being transported, or has been moved from its site of origin by air, water, gravity, or ice and has come to rest on the earth's surface.

(44) "Sedimentation" means the settling and accumulation of unconsolidated sediment carried by stormwater run-off.

(45) "Soil" means the unconsolidated mineral and organic material on the surface of the earth that serves as then natural medium for the growth of plants.

(46) "Soil and Water Conservation District" or "SWCD" means a political subdivision established under IC 14-32.

(47) "Stormwater Standards" means the stormwater standards for the City that contain policies and procedures, drainage, erosion and sediment control, and post-construction standards that new development and redevelopment must meet. The plan indicates the specific measures and sequencing to be used to control sediment, soil erosion and other construction site wastes during and after construction.

(48) "Stormwater Pollution Prevention Plan" or "SWPPP" means a plan developed to minimize the impact of stormwater pollutants resulting from construction activities.

(49) "Stormwater quality measure" means a practice, or a combination of practices, to control or minimize pollutants associated with stormwater run-off.

(50) "Strip development" means a multi-lot project where building lots front on an existing road and are not part of a larger common plan of development or sale.

(51) "Subdivision" means any land that is divided or proposed to be divided into lots, whether contiguous or subject to zoning requirements, for sale or lease as part of a larger common plan of development or sale.

(52) "Temporary stabilization" means the covering of soil to ensure its resistance to erosion, sliding, or other movement. The term includes vegetative cover, anchored mulch, or other non-erosive material applied at a uniform density of seventy percent (70%) across the disturbed area.

(53) "Tracking" means the deposition of soil that is transported from one (1) location to another by tires, tracks of vehicles, or other equipment.

(54) "Trained individual" means an individual who is trained and experienced in the principles of stormwater management, including erosion and sediment control as is demonstrated by completion of coursework, state registration, professional certification, or annual training that enables the individual to make judgments regarding stormwater management, treatment, and monitoring.

The CSGP also contains additional definitions for the language used in that permit.

APPENDIX B – FORMS

MS4 Approval Application Submittal Checklist

MS4 Approval Application for Review and Inspection

Construction/Stormwater Pollution Prevention Plan Technical Review

Statement of Financial Responsibility

Post-Construction Certification of Sufficiency of Plan

SWPPP and Post-Construction Stormwater Best Management Practice Owner Acknowledgement

Agreement for Post-Construction Stormwater Inspection Services

Grant of Perpetual Drainage Easement

Stormwater System Agreement – Developer-Installed and Contributed Stormwater System

Transfer of Ownership

Maintenance Bond

Performance and Repair Bond

Waivers of Lien

Disturbances Smaller than One (1) Acre Application for MS4 Review (SWPPP and Drainage)

MS4 APPROVAL APPLICATION SUBMITTAL CHECKLIST

Instructions: All items on this checklist must be submitted for a complete *MS4 Approval Application.* Provide to the Building Services Department at 301 East Clinton Street, Frankfort, IN 46041. The submittal package shall include an electronic file and one (1) hard copy of each.

☐ 1. Completed *MS4 Approval Application for Review and Inspection*.

☐ 2. Complete set of professionally certified Construction Plans showing the existing and final project site layouts and drainage plans.
- Name and location map of the proposed project
- Owner's name
- Seal and signature of professional engineer/land surveyor responsible for completing the design
- Date of plans
- North arrow and scale
- Existing and proposed site conditions, utilities, contours, elevations, finished floor elevation of buildings, entire stormwater system with applicable inverts and elevations, storm sewer profiles, stormwater treatment BMPs, drainage flow arrows, pond cross-section, utilities, building footprints and finished floor elevations, streets, drives, parking areas, easements, rights-of-way, property lines, benchmarks, floodway/floodplain boundaries, one hundred (100) year flood routing with flow arrows, hatched ponding areas, and peak elevations, all applicable construction/installation details, and erosion control measures and details.

☐ 3. Construction Stormwater Pollution Prevention Plan (SWPPP) including all information in the Stormwater Standards and erosion and sediment control locations, specifications, and details (refer to the *Construction/Stormwater Pollution Prevention Plan Technical Review* form for a listing of required components).

☐ 4. Post-Construction Stormwater Pollution Prevention Plan (SWPPP) including design calculations and technical specifications (refer to the *Construction/Stormwater Pollution Prevention Plan Technical Review* form for a listing of required components).

☐ 5. Operation & Maintenance Manual for proposed post-construction BMPs (stormwater quantity and quality) and technical specifications (refer to the Stormwater Standards for O&M Manual contents)

☐ 6. Technical Specifications

☐ 7. Copy of the Drainage Report submitted to the Clinton County Surveyor's Office. Must contain post-construction water quality treatment design calculations.

☐ 8. Construction inspection fees per *Fee Schedule*.

☐ 9. Completed *Grant of Perpetual Drainage Easement* for the post-construction BMP access easement

☐ 10. Completed *Stormwater System Agreement – Developer-Installed and Contributed Stormwater System*

☐ 11. Completed and certified *Statement of Financial Responsibility.*

☐ 12. Completed *Best Management Practice Owner Acknowledgement*

☐ 13. Completed *Post-Construction Certification of Sufficiency of Plan*

MS4 APPROVAL APPLICATION FOR REVIEW AND INSPECTION

The review and inspection fees are outlined in Appendix C of the Frankfort Stormwater Standards and must be submitted with this application to the City of Frankfort, Building Services Department, 301 E. Clinton Street, Frankfort, IN 46041. Make checks payable to the City of Frankfort. All items on the *MS4 Approval Application Submittal Checklist* must be submitted for the application to be deemed complete and start the review process.

Project Information:

Name of Project: _____

Legal Address: _____

Township: _____ Parcel No.: _____

Total Acres of Site: _____ Disturbed Acres of Site: _____

Impervious Area: (square feet): _____

Property Use (check one) ☐ Proposed Subdivision ☐ Commercial/Industrial/Apartment
☐ Other: _____

Estimated Construction Dates: Start: _____ End: _____

Estimated Total Length of Construction in Months: _____

Project Owner Information:

Name: _____

Address: _____

Contact: _____

Telephone: _____ Email: _____

Design Firm Information:

Name: _____

Address: _____

Professional Engineer: _____

Contact: _____

Telephone: _____ Email: _____

As the owner or an authorized representative of the Owner, I agree to pay all fees incurred for the requested review and inspection for the above project according to the attached Fee Schedule and Statement of Financial Responsibility.

Printed Name and Title: _____

Signature: _____ Date: _____

Address: _____

FOR CITY OF FRANKFORT – BUILDING SERVICES DEPARTMENT USE ONLY

Date Submitted: _____ *Approval Date:* _____ *Initial Fees:* _____

CONSTRUCTION/STORMWATER POLLUTION PREVENTION PLAN TECHNICAL REVIEW

THE CITY OF FRANKFORT

CONSTRUCTION/STORMWATER POLLUTION PREVENTION PLAN TECHNICAL REVIEW

City of Frankfort, IN Stormwater Runoff; Construction Activities Ordinance, Chapter 54
https://codelibrary.amlegal.com/codes/frankfortin/latest/frankfort_in/0-0-0-2143
City of Frankfort Stormwater Standards 1645719269_33876.pdf (frankfort-in.gov)
IDEM Construction Stormwater General Permit: (INRA00000 effective 12/18/2021)
https://www.in.gov/idem/stormwater/construction-land-disturbance-permitting/

Instructions:

Submit one hard copy and an electronic copy of the required documents for MS4 Approval. Refer to the Frankfort Stormwater Standards for requirements. Hard copies may be sent to City of Frankfort, Building Services Department, 301 E. Clinton Street, Frankfort, IN 46041.

Project Contacts:

Project Name: Click or tap here to enter text.
Project Address or Location Description: Click or tap here to enter text.
Scope of Project: Click or tap here to enter text.
Latitude: Click or tap here to enter text. **Longitude:** Click or tap here to enter text.

Plan Preparer: Click or tap here to enter text. **Affiliation:** Click or tap here to enter text.
Address (City, State & Zip): Click or tap here to enter text.
Phone: Click or tap here to enter text. **Cell Phone:** Click or tap here to enter text. **Email:** Click or tap here to enter text.

Project Site Owner: Click or tap here to enter text. **Company Name (if applicable):** Click or tap here to enter text.
Address (City, State & Zip): Click or tap here to enter text.
Phone: Click or tap here to enter text. **Cell Phone:** Click or tap here to enter text. **Email:** Click or tap here to enter text.

Contractor: Click or tap here to enter text. **Company Name (if applicable):** Click or tap here to enter text.
Address (City, State & Zip): Click or tap here to enter text.
Phone: Click or tap here to enter text. **Cell Phone:** Click or tap here to enter text. **Email:** Click or tap here to enter text.

Documents Required for City MS4 Approval:

- ☐ Technical Review Form (this form)
- ☐ MS4 Application for Review and Inspection
- ☐ Design plans with erosion and sediment control measures
- ☐ Draft IDEM Notice of Intent (NOI)
- ☐ Construction SWPPP
- ☐ Post-Construction SWPPP (with water quality calculations)
- ☐ Post-Construction Operation & Maintenance Manual
- ☐ Best Management Practice Owner Acknowledgement
- ☐ Statement of Financial Responsibility
- ☐ Application and inspection fees (Fee Schedule)

REMAINDER IS FOR FRANKFORT USE ONLY: **PLAN SUBMITTAL DATE:** Date. **PLAN REVIEW DATE:** Date

Plan Reviewer: Click or tap here to enter text. **Affiliation:** Click or tap here to enter text. **On behalf of:** City of Frankfort MS4
Address (City, State & Zip): Click or tap here to enter text.
Phone: Click or tap here to enter text. **Email:** Click or tap here to enter text.

Plan Review Status:

☐	**Plan is Adequate**	A comprehensive plan review has been completed and it was determined that the plan satisfies the minimum requirements of the Ordinance, Stormwater Standards, and the Construction Stormwater General Permit.
☐	**Conditional Acceptance**	Acceptance of the plan is conditional. The conditional acceptance is contingent upon addressing the issues identified in the comment sections.
☐	**Plan is Deficient**	Significant deficiencies were identified and must be addressed. Refer to the comment sections.
☐	**Preliminary Review**	A comprehensive review will not be completed at this time. The plan review authority reserves the right to perform a comprehensive review later, and revisions may be required at that time.

Action:

☐	**Submit a Notice of Intent:** Submit the Notice of Intent (NOI) and this review form (required) online through the IDEM Regulatory ePortal. (https://stormwater.idem.in.gov/ncore/external/home)
☐	**Do not file a Notice of Intent or commence land-disturbing activities:** Deficiencies must be adequately addressed and an acceptable plan review completed.
☐	**Comments:** Refer to the Plan Review Comments Sections of this document.
☐	**Revisions:** Update and submit the revised Construction Stormwater Pollution Prevention Plan as indicated below. ☐ Update and submit a complete plan set that addresses plan deficiencies. ☐ Update and submit a document (narrative and/or plan sheets) that addresses plan deficiencies. ☐ Update and submit a complete plan set that addresses plan deficiencies. A comprehensive plan review will not be completed.

CONSTRUCTION/STORMWATER POLLUTION PREVENTION PLAN TECHNICAL REVIEW (Continued)

Plan Review Information

- *The technical review and comments are intended to evaluate the completeness of the Construction/Stormwater Pollution Prevention Plan for the project. The Plan submitted was not reviewed for the adequacy of engineering design. All measures included in the plan, as well as those recommended in the comments should be evaluated as to their feasibility by a qualified individual with structural measures designed by a qualified engineer. The Plan has not been reviewed for other local, state, or federal permits that may be required to proceed with this project.*
- *Additional information, including design calculations may be requested to further evaluate the plan.*
- *All proposed stormwater pollution prevention measures and those referenced in this review must meet the design criteria and standards set forth in the Indiana Stormwater Quality Manual, Frankfort's Technical Standards,(as applicable), or similar Guidance Documents.*
- *Construction activities and unforeseen weather conditions may affect the performance of the erosion and sediment control system, individual measures, or the effectiveness of the plan. The plan must be a flexible document, with provisions to modify or substitute measures as necessary to ensure compliance.*

Section A: Construction Plan Elements

Adequate	Deficient	NA	A	*The construction plan elements include general information associated with the project site that are critical for the evaluation of the stormwater pollution prevention plan component. This information includes, but is not limited to an index, resource information, reference maps, grading information, project layout and design, and drainage plan*
☐	☐	☐	1	Index of the location of required plan elements in the construction plan
☐	☐	☐	2	A vicinity map depicting the project site location in relationship to recognizable local landmarks, towns, and major roads
☐	☐	☐	3	Narrative of the nature and purpose of the project
☐	☐	☐	4	Latitude and longitude to the nearest fifteen (15) seconds
☐	☐	☐	5	Legal description of the project site
☐	☐	☐	6	11 X 17-inch plat showing building lot numbers/boundaries and road layout/names
☐	☐	☐	7	Boundaries of the one hundred (100) year floodplains, floodway fringes, and floodways
☐	☐	☐	8	Land use of all adjacent properties
☐	☐	☐	9	Identification of a U.S. EPA approved or established TMDL
☐	☐	☐	10	Name(s) of the receiving water(s)
☐	☐	☐	11	Identification of discharges to a water on the current 303d list of impaired waters and the pollutant(s) for which it is impaired
☐	☐	☐	12	Soil map of the predominant soil types
☐	☐	☐	13	Identification and location of all known wetlands, lakes, and water courses on or adjacent to the project site (construction plan, existing site layout)
☐	☐	☐	14	Identification of any other state or federal water quality permits or authorizations that are required for construction activities (e.g., wetlands, floodways, or waterway crossings)
☐	☐	☐	15	Identification and delineation of existing cover, including natural buffers
☐	☐	☐	16	Existing topography at a contour interval appropriate to indicate drainage patterns
☐	☐	☐	17	Location(s) of where run-off enters the project site
☐	☐	☐	18	Location(s) of where run-off discharges from the project site prior to land disturbance
☐	☐	☐	19	Location of all existing structures on the project site
☐	☐	☐	20	Existing permanent retention or detention facilities, including manmade wetlands, designed for the purpose of stormwater management
☐	☐	☐	21	Locations where stormwater may be directly discharged into ground water, such as abandoned wells, sinkholes, or karst features
☐	☐	☐	22	Size of the project area expressed in acres
☐	☐	☐	23	Total expected land disturbance expressed in acres
☐	☐	☐	24	Proposed final topography

CONSTRUCTION/STORMWATER POLLUTION PREVENTION PLAN TECHNICAL REVIEW (Continued)

Section A: Construction Plan Elements (continued)				
Adequate	Deficient	NA	A	*The construction plan elements include general information associated with the project site that are critical for the evaluation of the stormwater pollution prevention plan component. This information includes, but is not limited to an index, resource information, reference maps, grading information, project layout and design, and drainage plan*
☐	☐	☐	25	Locations and approximate boundaries of all disturbed areas
☐	☐	☐	26	Location, size, and dimensions of all stormwater drainage systems, such as culverts, storm sewers, and conveyance channels
☐	☐	☐	27	Locations of specific points where stormwater and non-stormwater discharges will leave the project site
☐	☐	☐	28	Location of all proposed site improvements, including roads, utilities, lot delineation and identification, proposed structures, and common areas
☐	☐	☐	29	Location of all on-site soil stockpiles and borrow areas
☐	☐	☐	30	Construction support activities that are expected to be part of the project
☐	☐	☐	31	Location of any in-stream activities that are planned for the project including, but not limited to stream crossings and pump arounds

Priority Status: Identify if this is a priority site based on the nature and extent of the construction activity, topography, threat to the degradation of water quality, characteristics of soils, complaints, and other factors as determined by MS4 priorities.

☐ **Not a Priority Site**

☐ **Priority Site based on:** ☐ Nature and Extent of Construction ☐ Close Proximity to Sensitive Area(s) ☐ Close Proximity to Wetlands ☐ Characteristics of the Soil ☐ Threat to Water Quality Degradation ☐ Steep Topography on Proposed Construction Site ☐ Potential for Direct Runoff to Receiving Waters

Section A – Comments:

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CONSTRUCTION/STORMWATER POLLUTION PREVENTION PLAN TECHNICAL REVIEW (Continued)

Section B: Stormwater Pollution Prevention Plan – Erosion and Sediment Control/Project Site Management				
Adequate	Deficient	NA	B	*The construction component of the Stormwater Pollution Prevention Plan includes stormwater quality measures to address erosion, sedimentation, and other pollutants associated with land disturbance and construction activities. Proper implementation of the plan, maintenance of measures, and administering a self-monitoring program is required to manage the project site to minimize the discharge of sediment and other pollutants. Construction activities and unforeseen weather conditions may affect the performance of the erosion and sediment control system, individual measures, or the effectiveness of the plan. The plan must be a flexible document, with provisions to modify or substitute measures as necessary to ensure compliance.*
☐	☐	☐	1	Description of the potential pollutant generating sources and pollutants, including all potential non-stormwater discharges
☐	☐	☐	2	Stable construction entrance locations and specifications. Plan to clear tracking of sediments on road. Dust suppression plan.
☐	☐	☐	3	Specifications for temporary and permanent stabilization. Include seeding and mulching plan and 70% coverage requirement for final stabilization. Include 7-day stabilization requirement.
☐	☐	☐	4	Sediment control measures for concentrated flow areas (sediment basins if used have specific requirements).
☐	☐	☐	5	Sediment control measures for sheet flow areas
☐	☐	☐	6	Run-off control measures
☐	☐	☐	7	Stormwater outlet protection locations and specifications
☐	☐	☐	8	Grade stabilization structure locations and specifications
☐	☐	☐	9	Dewatering applications and management methods
☐	☐	☐	10	Measures utilized for work within waterbodies
☐	☐	☐	11	Maintenance guidelines for each proposed temporary stormwater quality measure
☐	☐	☐	12	Planned construction sequence describing the relationship between implementation of stormwater quality measures in relation to land disturbance
☐	☐	☐	13	Provisions for erosion and sediment control on individual building lots regulated under the proposed project
☐	☐	☐	14	Material handling and spill prevention and spill response plan meeting the requirements in 327 IAC 2-6.1
☐	☐	☐	15	Material handling and storage procedures associated with construction activity
☐	☐	☐	16	Monitoring and project management plan to include self-monitoring program (SMP), self-inspections and project management log
Section B – Comments: •				

CONSTRUCTION/STORMWATER POLLUTION PREVENTION PLAN TECHNICAL REVIEW (Continued)

Section C: Stormwater Pollution Prevention Plan – Post-Construction				
Adequate	Deficient	NA	C	*The post-construction component of the Stormwater Pollution Prevention Plan includes the implementation of stormwater quality measures to address pollutants that will be associated with the final project land use. Post-construction stormwater measures should be functional upon completion of the project. The long-term functionality of the measures is critical to their performance and should be monitored and maintained.*
☐	☐	☐	1	Description of pollutants and their sources associated with the proposed land use
☐	☐	☐	2	Description of proposed post-construction stormwater measures including location, dimensions, specifications, and stormwater detention and water quality treatment according to the local ordinance.
☐	☐	☐	3	Plan details and design calculations for each post-construction stormwater measure. If a pre-approved BMP is selected from the Stormwater Standards, discuss how the BMP has been designed according to the design criteria in the Stormwater Standards. If a pre-approved BMP is not selected, then provide a discussion of the treatment process and appropriate sampling information must be provided to verify that the BMP will meet the 80% TSS removal rate.
☐	☐	☐	4	Sequence describing stormwater measure implementation.
☐	☐	☐	5	A complete set of professionally certified construction plans showing the location, dimensions, and construction details of all post-construction stormwater quality measures, detailed specifications and supporting water quality and quantity BMP sizing calculations.
☐	☐	☐	6	Maintenance guidelines for proposed post-construction stormwater measures. Provide an Operation and Maintenance (O&M) Manual for each post-construction stormwater measure. The O&M Manual shall include the following: (a) Name, address, business phone number, home phone number, email address, cellular phone number; (b) Site map showing the general location of the property. Include a location description or street address. (c) Site drawings (8½" by 11" or 11" by 17"), showing both plan and cross-section views, showing the infrastructure and applicable features, including dimensions, easements, outlet works, forebays, signage, etc., as well as an overall site map of the development showing all structures; (d) Guidance on owner-required periodic inspections; (e) Guidance on routine maintenance (e.g., mowing, litter removal, woody growth removal, signage, etc.); (f) Guidance on remedial maintenance; such as inlet replacement, outlet works maintenance, etc.; (g) Guidance on sediment and trash removal, both narrative and graphical, describing when sediment removal or dredging should occur to ensure that BMPs and other infrastructure remain effective as water quality and/or quantity control devices; (h) A tabular schedule showing inspection and maintenance requirements; (i) Identification of the property owner as the party responsible for all maintenance, including cost; and (j) Identification of the Homeowners Association, if applicable, for eventual transfer of BMP ownership and maintenance responsibilities.
☐	☐	☐	7	Completed *Grant of Perpetual Drainage Easement* for the Post-Construction BMP. An easement around the water quality treatment BMP along with an access easement to the BMP is required.
☐	☐	☐	8	Completed *Post-Construction Certification of Sufficiency of Plan*
☐	☐	☐	9	Completed *Best Management Practice Owner Acknowledgement*
Section C – Comments: •				

STATEMENT OF FINANCIAL RESPONSIBILITY

The undersigned of the proposed project to be known as

_____

(project name and location or address)

do hereby agree to take full responsibility for the financial payment of review and inspection fees incurred on the above project.

I am aware that the review fees apply for projects that disturb one acre or more of land as described in the Frankfort Stormwater Standards and will begin upon the submittal of an *MS4 Approval Application for Review and Inspection* and continue until the project is approved and/or withdrawn. Fees are charged as outlined in the *Construction and Post-Construction Fee Schedule*. I understand that if the project is withdrawn the review fees are still due and payable from the application date to the date on the letter of withdrawal. Review fees are due within thirty (30) days of notification of the fees.

I am aware that initial inspection fees will be due with the submittal of the *MS4 Approval Application for Review and Inspection*. Initial MS4 inspection fees are based on the estimated number of months of land-disturbing activities at a rate outlined in the *Construction and Post-Construction Fee Schedule.* The City of Frankfort will continue monthly MS4 Approval inspections until a Notice of Termination is submitted to the City for Construction Stormwater General Permit (CSGP) projects. The City or a designated representative will complete a final inspection to verify that all land-disturbing activities are complete and all bare areas have been adequately stabilized. If more frequent inspections are required or if the land-disturbing activities continue beyond the estimated number of months, subsequent inspections will be billed at the rate outlined in the *Construction and Post-Construction Fee Schedule*. Inspection fees must be paid within ten (10) days of the date of notification. A stop work order may be issued if fees are not paid within the allowable time. Following a stop work order, a permit reinstatement fee will be assessed as outlined in the *Construction and Post-Construction Fee Schedule*. All review and inspection fees are payable to the City of Frankfort.

The undersigned, having duly sworn upon oath, that the above information has been read and fully understood to be true and correct and is (undersigned) a voluntary act and deed. The undersigned assumes responsibility for the fees.

Signature	Mailing Address
Printed Name	City, State, Zip Code

STATE OF INDIANA
COUNTY OF _____
This record was signed and sworn to be on this day _____ of _____, 20_____ by
_____.
(Notary Stamp or Seal)

_____
Notary Public Signature
Commissioned in _____ County
My Commission Expires _____

POST-CONSTRUCTION CERTIFICATION OF SUFFICIENCY OF PLAN

Project Name: _____

Project Address: _____

Date of Plans: _____

I hereby certify that to the best of my knowledge and belief as the professional engineer that:

1. The Post-Construction Stormwater Quality measure for this project is compliant with the requirements outlined in the City of Frankfort Stormwater Standards, and
2. The calculations, designs, reproducible drawings, masters, and original ideas reproduced in this Post-Construction Stormwater Pollution Prevention Plan are under my dominion and control and they were prepared by me and/or under my supervision.

Name: _____ Professional Registration No. _____

Firm: _____

Address: _____

Phone: _____

Signature: _____ Date: _____

Seal:

SWPPP AND POST-CONSTRUCTION STORMWATER BEST MANAGEMENT PRACTICE OWNER ACKNOWLEDGEMENT

Project Name: _____

Project Address: _____

Best Management Practice(s): _____

_____

_____

For good and valuable consideration, the receipt and sufficiency of which are hereby acknowledged, the undersigned owner ("Owner") hereby submits this Operation and Maintenance Manual ("Manual") to the City of Frankfort, Indiana ("City") as a written acknowledgment of Owner's warranty and agreement to institute, maintain, and follow the water quality Best Management Practices ("BMPs") listed above, and to follow and abide by the inspection schedule and maintenance activities listed in this Manual. The Owner also hereby agrees to provide, at Owner's cost, all additional maintenance, repair, and/or replacement services reasonably necessary to maintain the function and longevity of the BMPs from and including the date this Agreement is executed by Owner to and including the date on which a new Agreement is filed with the City by another party who assumes all the obligations and responsibilities of Owner as set forth herein.

The City and/or its representatives have the right to enter the property to inspect the BMPs. The Owner shall be financially responsible for any maintenance or repairs required by the City or its representatives during the inspections.

Owner Name: _____

Company: _____

Address: _____

Phone: _____

Signature: _____ Date: _____

STATE OF INDIANA
COUNTY OF _____
This record was signed and sworn to be on this day _____ of _____, 20_____ by
_____.
(Notary Stamp or Seal)

_____
Notary Public Signature
Commissioned in _____ County
My Commission Expires _____

GRANT OF PERPETUAL DRAINAGE EASEMENT

THIS INDENTURE, made this _____ day of _____, 20____, by and between _____ of the County of Clinton, State of Indiana, hereinafter called "GRANTOR" and the City of Frankfort, Indiana, by City Council, hereinafter called "GRANTEE":

WITNESSETH:

WHEREAS, GRANTOR must obtain from GRANTEE Post-Construction Stormwater Pollution Prevention Plan approval, according to the City of Frankfort Stormwater Standards, for the construction of the development or property known as

_____; and

WHEREAS, GRANTEE has determined that GRANTOR must grant it a perpetual easement and right-of-way to assure that GRANTOR'S Post-Construction Stormwater Pollution Prevention Plan, as approved by GRANTEE, and described in GRANTEE'S Stormwater Pollution Prevention Plan incorporated herein by reference (hereinafter called the "SWPPP") will be established and maintained, or to otherwise assure satisfactory stormwater quality.

NOW, THEREFORE, in consideration of the mutual covenants herein set forth and other valuable considerations, the receipt of which is hereby acknowledged, the GRANTOR for himself, his administrators, successors, and assigns, does hereby grant, convey and warrant unto the GRANTEE, its grantees, successors, and assigns, forever, a perpetual right-of-way and easement, with the right, privileges and authority in GRANTEE, its grantees, successors, and assigns, to enter upon, maintain, repair, continue and improve the Post Construction Stormwater Quality Best Management Practice (BMP) described in the SWPPP (hereinafter called the "BMP") located under, upon, over and across the real estate owned by GRANTOR and situated in the County of Clinton, State of Indiana, to wit:

A diagram map showing the route, courses, and distances through the above real estate and the width of the easement and right-of-way is attached hereto and incorporated herein by reference as Exhibit "A."

The GRANTEE, its successors, and assigns shall have the right to enter along, over, and upon said easement and right-of-way to install, repair, maintain, and continue such BMP and to make such alterations and improvements to the BMP as GRANTEE deems may be necessary or useful. GRANTEE shall also have the right of ingress and egress only, for temporary periods only, over GRANTOR'S property adjoining said easement when necessary to install, repair, maintain, continue, or improve the BMP. GRANTEE shall not otherwise enter upon GRANTOR'S real estate adjoining said easement and right-of-way. GRANTEE may remove any structure, pavement, or landscaping on the easement to inspect and/or maintain the BMP without liability for the replacement or repair of such structure, pavement, or landscaping.

GRANTEE may relinquish this easement and right-of-way, but only if GRANTOR can assure, to the satisfaction of GRANTEE, continuing and adequate stormwater quality absent this easement and right-of-way.

GRANTOR and GRANTEE agree that this easement and right-of-way shall not create in GRANTEE a duty to maintain, repair, continue, and improve the BMP but only shall create a right to do so. The duty to maintain, repair, and continue the easement and right-of-way and BMP shall remain with GRANTOR and shall include, but not be limited to, mowing grass and weeds, and removing silt, debris, and any other obstructions, to the free and unobstructed use of the easement and right-of-way or the BMP.

GRANT OF PERPETUAL DRAINAGE EASEMENT (continued)

GRANTOR covenants that it will not erect, maintain, or allow to continue the portion of the GRANTOR'S real estate in which the easement and right-of-way are granted herein any building or other structure **(**except for paving and/or landscaping**)** or obstruction to the free and unobstructed use of the easement and right-of-way or BMP without express written permission from GRANTEE. Such permission, when duly recorded, shall run with the real estate.

GRANTOR warrants that it is the owner in fee simple of said real estate, is lawfully seized thereof, and has a good right to grant and convey the foregoing easement and right-of-way therein; warrants the quiet use and enjoyment thereof; and warrants that it will defend GRANTEE'S title in said easement and right-or-way against all claims.

The easement and right-or-way granted herein, and its associated benefits and obligation**s**, shall run with the real estate.

This indenture shall bind and inure to the benefit of the respective successors and assigns of the parties hereto.

IN WITNESS WHEREOF, GRANTOR has sent his hand and seal the day and year first written above.

Signature	Printed
Signature	Printed
Title, if GRANTOR is a Corporation	

STATE OF INDIANA
COUNTY OF _____
This record was signed and sworn to be on this day _____ of _____, 20_____ by _____.

(Notary Stamp or Seal)

_____
Notary Public Signature
Commissioned in _____ County
My Commission Expires _____

GRANT OF PERPETUAL DRAINAGE EASEMENT - EXHIBIT "A"

AGREEMENT BETWEEN THE OWNER/CONTRACTOR AND THE CITY FOR POST-CONSTRUCTION STORMWATER INSPECTION SERVICES

Project Name: _____

Project Address: _____

Owner/Contractor: _____

The City of Frankfort ("City") agrees to provide the Inspection Services required in conjunction with the above Stormwater System Project. Such Inspection will be completed to determine if the work is proceeding per the Plans and Specifications and MS4 Approvals. Inspection Services shall include witnessing all tests required of the Owner or Contractor for the City to accept the Stormwater System.

The Owner/Contractor shall defend, indemnify, hold harmless, and protect the City, its employees, agents, officers, and directors, from and against all claims, demands, causes of action, liabilities, losses, damage, penalties, costs (including reasonable attorneys' fees) and suits, including without limiting the generality of the foregoing, those claims, demands, causes of action, liabilities, losses, damage, penalties, costs (including reasonable attorneys' fees) and suits for which the City may be, or may be claimed to be, liable through negligence or otherwise, for death, personal injury, illness or loss of property damage, or economic loss alleged to arise out of, result from, relate to, or be in any manner connected with activities of the Owner/Contractor or the services provided by the City under this Agreement. The Owner/Contractor shall provide such defense and indemnity whether the claim, demand, cause of action or suit alleges that the occurrence, omission, action, liability, loss or damage was caused or contributed to by the concurrent, joint, comparative, active or passive negligent act or omission of the City, except that the Owner/Contractor assumes no liability for the negligent acts or omissions of the City, its employees, agents, officers and directors, which, without contributory fault on the part of the Owner/Contractor, its contractor(s), subcontractor(s) or their employees, agents, officers or directors, is the sole cause of loss, damage to person or property, or injury to or death of any person.

This Agreement does not include construction engineering or construction stakeout.

The Utility agrees to perform such Inspection Services for a fee of $ 50.00 per hour of actual time spent on the project by the Utility and/or an authorized representative of the City in performing said Inspection Services.

The estimated time for completing the project is _____ week(s).

The estimated time of Inspection Services is _____ hours.

The total estimated cost for Inspection Services is $_____.

The Owner/Contractor agrees to include One Hundred percent (100%) of the total estimated cost of $_____ with this "Agreement" with the check made payable to the City of Frankfort.

The actual Inspection fee will be based on the actual number of hours required to inspect the complete installation of the Stormwater System portion of the project.

Adjustments to the total Inspection fee, if needed, are to be made upon the conditional acceptance of the completed work by the City of Frankfort and the posting of a three-year Maintenance Bond before the final acceptance of the Stormwater System by the City.

AGREEMENT BETWEEN OWNER/CONTRACTOR AND THE CITY FOR POST-CONSTRUCTION STORMWATER INSPECTION SERVICES (continued)

IN TESTIMONY WHEREOF, the Owner and Contractor have hereunto set their hands and seals this ____ day of _____, 20____.

Owner (Print)	Contractor (Print)
Organization (Print)	Organization (Print)
By: _____ Signature	By: _____ Signature
_____ Title	_____ Title
STATE OF INDIANA COUNTY OF _____ This record was signed and sworn to be on this day _____ of _____, 20_____ by _____.	STATE OF INDIANA COUNTY OF _____ This record was signed and sworn to be on this day _____ of _____, 20_____ by _____.
Notary Public Signature Commissioned in _____ County My Commission Expires on _____ (Notary Stamp or Seal)	Notary Public Signature Commissioned in _____ County My Commission Expires on _____ (Notary Stamp or Seal)

IN TESTIMONY WHEREOF, the City of Frankfort, Indiana, hereby accepts the foregoing Agreement and has set its hand this _____ day of _____, 20_____.

CITY OF FRANKFORT, INDIANA

Printed	Signature	Title

ATTEST BY:

Signature	Title	Date

STORMWATER SYSTEM AGREEMENT FOR DEVELOPER-INSTALLED AND CONTRIBUTED STORMWATER SYSTEM

Project Name: _____

THIS AGREEMENT, entered into this day _____ of _____, 20_____, by and between

_____

(collectively, the "Developer" or "Developers") and the City of Frankfort, Indiana ("City"), WITNESSETH THAT:

WHEREAS, the City, through the Frankfort Municipal Utilities, owns, operates, and maintains a Stormwater System ("System") serving the City of Frankfort in Clinton County, Indiana, and Frankfort Municipal Utilities, as used in this Agreement, includes "City;" and

WHEREAS, the Developer owns real estate in the vicinity of

_____,

in Clinton County, Indiana (the "development"), and the Developer will install a Local Stormwater System in said development as shown in Exhibit "A," and the Developer will contribute said Local Stormwater System to the City for operation by the City; and

WHEREAS, the City is willing to take ownership of the Local Stormwater System upon the following terms and conditions; and

WHEREAS, City and Developer agree the Developer at its cost and expense shall furnish the necessary design and engineering services, labor, and materials to install the Local Stormwater System and obtain all necessary easements, permits, right-of-way grants, or other authority which is required, before the start of construction, to provide stormwater service to the development as shown on Exhibit "A";

NOW THEREFORE, in consideration of the premises, covenants, agreements, and undertakings hereinafter provided, and each act to be performed pursuant hereto, the parties agree that:

1. Drainage Plans. The Developer shall provide the City with two (2) sets of drainage plans and technical specifications, which adhere to the criteria in the Frankfort Stormwater Standards. Submittals shall be made on twenty-four (24) inch by thirty-six (36) inch sheets at a minimum one (1) inch= fifty (50) feet scale. If applicable, the City will determine the size of the off-site storm sewer reasonably necessary to serve the Developer without degrading the integrity of the City's Stormwater System.

2. Review of Drainage Plan. The City shall review the Developer's drainage plan, drainage calculations, offsite drainage conditions, and easement drawings (if required), for compliance with the Frankfort Stormwater Standards. The City may require storm sewers large enough to provide future service. The additional cost of installing such sewers shall be at the Developer's expense. If the drainage plans comply with the Frankfort Stormwater Standards, the City will issue the Developer a Drainage Approval letter. The Developer will submit three (3) copies of the final construction plans on twenty-four (24) inch by thirty-six (36) inch sheets. Upon completion of construction, the Developer shall submit as-built drawings to the City on both twenty-four (24) inch by thirty-six (36) inch sheets and in electronic format (AutoCAD compatible).

3. Contractor and Materials. Upon issuance of a Drainage Approval letter to the Developer from the City, the Developer shall notify the City in writing of the installation contractor the Developer seeks to engage. The City must approve the Developer's selected contractor, based on reliability and responsiveness, and the City may withhold approval at its sole discretion. The City shall inform the Developer of any withheld approval within fourteen (14) days after the Developer notifies the City of the intended contractor or contractor approval. The Developer shall purchase pipe, manholes, inlets, catch basins, and other appurtenances ("Materials"). All materials must meet or exceed the Frankfort published standards and specifications and are subject to City approval.

STORMWATER SYSTEM AGREEMENT FOR DEVELOPER INSTALLED AND CONTRIBUTED STORMWATER SYSTEM (continued)

4. Developer Installation. Upon approval of the contractor and the materials by the City, the Developer agrees to commence construction within one hundred twenty (120) days after required permits have been obtained and to prosecute construction to full completion with all reasonable diligence consistent with good business practices and the availability of the necessary equipment, materials, and labor. The Developer shall provide the City at least one (1) week's notice before commencing construction of stormwater infrastructure. The Developer agrees to enter into an *Agreement Between the Owner/Contractor and the City for Stormwater System Inspection Services*. The City has the authority to inspect the installation of the Local Stormwater System during the installation at the City's convenience and discretion. The City shall have the authority to halt construction if the installation is not consistent with City standards. However, the City assumes no responsibility for construction safety, and its inspection is not for and does not include construction safety.

The Developer further agrees that the City, during the installation, at its discretion may request, and the Developer will honor such request, changes in the Local Stormwater System related to location, workmanship, and materials.

5. Other Requirements of Developer. Coincident with the delivery of the *Transfer of Ownership* and other documents required hereinabove by the Developer to the City, there shall also be delivered to the City by the Developer:

a) All required permits, and any other information about the Local Stormwater System;
b) Copy of the final platted map that is to be recorded for the development and/or address listing;
c) *Waivers of Lien* for material suppliers, subcontractors, and contractors;
d) *Performance and Repair Bond* on Local Stormwater System for materials and workmanship. Repair work performed during the one (1) year warranty period must be coordinated with and inspected by the City. Emergency repairs may be performed by the City, and the Developer/bonding company will be billed the cost of the repair;
e) *Maintenance Bond* that warrants the materials and workmanship on the Local Stormwater System for three (3) years;
f) Cost of Local Stormwater System itemized by pipe and structure size; certified as being accurate;
g) "As-built" drawings including materials listing, manufacturer, elevations, and locations;
h) All company fees, tax impact, and subsequent connector fees, if applicable; and
i) Recorded final plated map of the development when available from the County Recorder.

6. Testing. Developer's Contractor, in compliance with the Frankfort Stormwater Standards, shall test the installed storm sewers and structures. The Developer and/or Contractor shall notify the City and the assigned Inspector at least forty-eight (48) hours before testing of the Local Stormwater System.

7. Ownership of Local Stormwater System. Upon conveyance of the Local Stormwater System by the Developer to the City (including all pipes, structures, appurtenances, easements, and any equipment), it shall become the sole property of the City. The Developer shall be responsible for the maintenance of the Local Stormwater System for three (3) years from the date of the *Transfer of Ownership*, at the Developer's sole expense. Thereafter, the City shall be responsible for the maintenance and repair of the same. The Developer shall have no right of property in the Local Stormwater System or any part thereof because of or on account of the Developer having furnished a part or all the funds used in the purchase of materials and equipment for, or the employment of labor in connection with, the construction of the Local Stormwater System.

8. Determination of the Cost of Local Stormwater System. The City and Developer agree that the cost of the Local Stormwater System shall be the amount of ($_____) _____

STORMWATER SYSTEM AGREEMENT FOR DEVELOPER INSTALLED AND CONTRIBUTED STORMWATER SYSTEM (continued)

9. Other Local Stormwater System Connections. Notwithstanding any other provisions of this Agreement, the City shall have the absolute right at any time to construct and install other stormwater facilities connecting to the Local Stormwater System. Neither the connection of any such other facilities nor any service furnished by or from such other facilities shall be subject to or in any manner affect this Agreement.

10. Developer Safety Measures. The Developer and its contractor(s) shall take all steps necessary to ensure the safety of any City Inspector or other employee at the worksite. The City shall have no responsibility for identifying, eliminating, or otherwise abating any safety, health, or environmental hazard created or otherwise resulting at the worksite from the activities of the Developer or any other person. Nothing in this Agreement shall be construed or interpreted, directly or indirectly, as requiring that the City undertake any legal duty of the Developer or contractor(s) to the Developer's or contractor's employees, invitees, or licensees or any federal, state, or local government agency.

11. Liability and Indemnity. The Developer and its contractor(s) shall be solely responsible for all labor, materials, equipment, and work at the worksite. The Developer shall defend, indemnify, hold harmless, and protect the City, its employees, agents, officers, and directors, from and against all claims, demands, causes of action, liabilities, losses, damage, penalties, costs (including reasonable attorneys' fees) and suits, including without limiting the generality of the foregoing, those claims, demands, causes of action, liabilities, losses, damage, penalties, costs (including reasonable attorneys' fees) and suits for which the City may be, or may be claimed to be, liable through negligence or otherwise, for death, personal injury, illness or loss of property damage, or economic loss alleged to arise out of, result from, relate to, or be in any manner connected with activities of the Developer or the services provided by the City under this Agreement. The Developer shall provide such defense and indemnity whether the claim, demand, cause of action, or suit alleges that the occurrence, omission, action, liability, loss, or damage was caused or contributed to by the concurrent, joint, comparative, active or passive negligent act or omission of the City, except that the Developer assumes no liability for the negligent acts or omissions of the City, its employees, agents, officers, and directors, which, without contributory fault on the part of the Developer, its contractor(s), subcontractor(s) or their employees, agents, officers or directors, is the sole cause of loss, damage to person or property, or injury to or death of any person.

The City shall give the Developer prompt written notice of any claim for which indemnification is sought hereunder. The Developer shall at its own expense assume the defense of such claim with counsel selected in consultation with the City; provided, however, that the Developer shall not be entitled to settle any claim against the City without the prior written consent of the City, which consent shall not be unreasonably withheld. The City shall have the right, but not the duty, to employ, at its expense, its counsel in any such case.

12. Insurance. The Developer shall add the City as an additional insured under all the Developer's liability insurance policies covering work at the worksite. As an additional insured, the City shall be provided with the same extent and quality of coverage as the Developer and any other primary insured party. The Developer shall provide the City a Certificate of Insurance evidencing such coverage before the City performs any services under this Agreement.

13. City Employees. Under no circumstances shall City employees be deemed employees, agents, or representatives of the Developer. Under no circumstances shall this Agreement be deemed to constitute either party hereto as the agent or representative of the other party.

14. Successors and Assigns. This Agreement shall inure to the benefit of and be binding upon the parties hereto, including any subsequent connectors, and their respective successors and assigns.

STORMWATER SYSTEM AGREEMENT FOR DEVELOPER INSTALLED AND CONTRIBUTED STORMWATER SYSTEM (continued)

15. Agent of Developer. The Developers constitute _____, jointly and severally, as their agent and attorney in fact ("Agent") to deal with the City on all matters relating to this Agreement. The authority of the Agent includes but is not limited to the power to sign all documents on behalf of all the Developers.

IN WITNESS WHEREOF, the City and Developer have properly executed this Agreement or caused the same to be properly executed as of the date set forth.

DEVELOPER

Signature (of Officer)	Printed
Name of Corporation (if applicable)	Title

STATE OF INDIANA
COUNTY OF _____
This record was signed and sworn to be on this day _____ of _____, 20_____ by _____.

(Notary Stamp or Seal)

Notary Public Signature
Commissioned in _____ County
My Commission Expires _____

SEWER DEPARTMENT, CITY OF FRANKFORT, INDIANA

Printed	Signature	Title

ATTEST BY:

Signature	Title	Date

STORMWATER SYSTEM AGREEMENT FOR DEVELOPER INSTALLED AND CONTRIBUTED STORMWATER SYSTEM
EXHIBIT "A"

MAINTENANCE BOND

Instructions:

1. The Contractor must use this form or another form containing the same material conditions and provisions with advances approved by the City of Frankfort.
2. The date of the Bond must not be before the date of the Contract. If the Contractor is a Partnership, all partners should execute the bond.
3. The surety company executing this bond shall appear on the most current list of "Surety Companies Acceptable on Federal Bonds," as specified in the U.S. Treasury Department Circular 570, as amended, and be authorized to transact business in the State of Indiana.

KNOW ALL MEN BY THESE PRESENTS: that

"Contractor" _____

and

"Surety" _____

Address of Surety: _____

a corporation chartered and existing under the laws of the State of _____, and authorized to do business in the State of Indiana, are held and firmly bound unto the City of Frankfort, Indiana, hereinafter collectively called Owner, in the penal sum of _____ Dollars
(25% Value of Stormwater System)

($_____) in lawful money of the United States, for the payment of which sum well and truly to be made, together with interest at the maximum legal rate from the date of demand and any attorney fees and court costs incurred by the Owner (the Obligee) to enforce this instrument, we bind ourselves, successors, and assigns, jointly and severally, firmly by these presents.

WHEREAS, the Contractor has entered into a certain Agreement with the Owner, dated as of this _____ day of _____, 20_____, by which the Contractor has agreed to perform and furnish certain work (the Work) for or in furtherance of construction of public improvements described generally as the

_____
(Project Name and description of Work)

which Agreement, and the "Contract Documents" as referred to therein, are hereby incorporated herein by reference;

WHEREAS, the Contractor has installed and completed and met all improvements, installations, and requirements applicable to the above-described Work, but said improvements and installations have not yet been accepted for public maintenance; and

WHEREAS, the Owner requires a guarantee from the Contractor against defective materials and workmanship in connection with such maintenance.

NOW, THEREFORE, the Contractor warrants the workmanship and all materials used in the construction, installation, and completion of said Work, to be of good quality and completed in a workmanlike manner per the Agreement and Contract Documents and all laws, ordinances, rules, standards, and regulations applicable to said Work;

MAINTENANCE BOND (continued)

FURTHERMORE, the conditions of the Surety's obligation hereunder are such that if the Contractor at his own expense, for three years after said Work, improvements, and installations are accepted for public maintenance by the Owner, shall make all repairs or replacements thereto which may become necessary because of improper or defective workmanship or materials, or any failure thereof to conform to the provisions of the Agreement or Contract Documents, then Surety's obligation is to be null and void; otherwise such obligation shall remain in full force and effect. Any repairs or replacements made under this Bond shall in a like manner be subject to the terms and conditions hereof.

Contractor and Surety covenant that all action required by law to be taken by them to authorize the execution and delivery of this bond have been previously taken, that the officers whose signatures appear below have been fully empowered to execute and deliver this instrument, and that once executed and delivered, it shall represent the lawful and binding obligation of the parties.

IN WITNESS WHEREOF, this instrument is executed in duplicate counterparts, each one of which shall be deemed an original, this the _____ day of _____, 20_____.

Contractor: _____

By: _____ _____
Signature Printed Name

Attest: _____ _____
Signature Title

Surety: _____

By: _____ , Attorney-in-Fact
Signature

Printed Name: _____

Address: _____

PERFORMANCE AND REPAIR BOND

KNOW ALL MEN BY THESE PRESENTS: That _____,
(Name of Developer)

_____,
(Address of Developer)

as Principal, and _____,
(Name of Surety)

_____,
(Address of Surety)

as Surety, are held and firmly bound unto the City of Frankfort, in the sum of ($_____),

_____
(120% of Value of Stormwater System)

the payment of which sum, well and truly to be made, we hereby bind ourselves, our heirs, executors, administrators, successors, and assigns, firmly by these presents.

WHEREAS _____ (Developer),

entered into a Contract with the City of Frankfort dated _____, 20____, to install a stormwater system as described in Exhibit "A"; and has employed the Installation Contractor, _____

_____, to perform said improvement.

NOW THEREFORE, if the said _____(Developer), as Principal shall construct or cause to be constructed and completed the entire stormwater system provided for in said Contract and shall construct same in accordance with the standards and specifications used by the City of Frankfort for like constructions, all to be done subject to the approval and acceptance of the City of Frankfort; and shall construct said improvement with such materials and in such manner that the same shall endure without the need of any completion of said improvement and acceptance thereof ('in-service date"), then this obligation shall be void, otherwise, it shall remain in full force and effect.

The performance requirements of this bond shall remain in full force and effect until the Principal has paid to the proper parties all amounts due for labor performed, for equipment, materials, and services furnished and consumed, for sales taxes, and for all insurance and royalties in connection with, or incidental to, the completion of the Contract. While this Bond is in full force and effect, it may be sued on at the instance of any interested party (as mentioned above), in the name of the City of Frankfort, to the use of such interested party, for the breach of any of the conditions of the Contract.

If the said improvement shall endure without the need of repairs for the period of one (1) year from and after the in-service date thereof as previously mentioned and if all the conditions of the Contract, as above stated, have been fully discharged, the obligations of this Bond shall become void.

WAIVER, the said Surety, for value received, hereby expressly agrees that no change, extension of time, alteration or addition to the terms of the Contract or to the work to be performed thereunder shall in any way affect the obligations of the Bond, and it does hereby waive notice of any such change, extension of time, or alteration or addition to the terms of the Contract, or to the work to be performed thereunder.

PERFORMANCE AND REPAIR BOND (continued)

IN WITNESS WHEREOF, on this _____ day of _____, 20_____, the said Principal has caused this Bond to be signed by its _____ by order of its board of directors. And the said Surety _____ has caused this Bond Number_____, to be signed by its _____ by order of its board of directors.

ATTEST:	WITNESS:
_____	_____
Principal Signature	Witness Signature
_____	_____
Printed Name	Printed Name
_____	_____
Title	Title
_____	_____
Date	Date
Seal:	Seal:

Name of Surety: _____

Address of Surety: _____

The foregoing Bond is hereby approved this ____ day of _____, 20____.

_____
Name

_____
Title
City of Frankfort, Indiana

PERFORMANCE AND REPAIR BOND
EXHIBIT "A" (DESCRIPTION OF STORM SEWER SYSTEM)

TRANSFER OF OWNERSHIP OF DEVELOPER-INSTALLED STORMWATER SYSTEM

By this document, the undersigned does sell and covenant and assign all rights, interest, and ownership of the stormwater system installed at

_____
(Project Name)

_____
(Location)

as noted by the as-built drawings and per the materials listed on the Cost of Stormwater System which reflects a total cost for materials and installation of $_____, to the City of Frankfort.

DEVELOPER'S CERTIFICATION

I certify that no advance or contribution for the construction of this facility has been made by the owners of any lots being served by this facility, and there are no agreements that might result in claims that all or some part of the cost of the installed storm sewers and appurtenances at

_____

has been contributed by any such person. The Title to all facilities having been vested in the City of Frankfort provided that any construction warranty received by this Developer in connection with the installation thereof shall automatically be assigned to the City of Frankfort for its benefit. This Developer further agrees that it shall not charge directly or indirectly, customers or potential customers of the City of Frankfort for any facilities installed by the Developers.

It is mutually understood and agreed that the Stormwater Utility of the City of Frankfort is a municipal utility and that its rights and obligations hereunder shall be subject to all applicable orders, rules, and regulations of such regulatory commissions or regulatory authorities as may have jurisdiction over the operation, maintenance, and ownership of these and all facilities described above.

_____ _____
Signature Date

STATE OF INDIANA
COUNTY OF _____
This record was signed and sworn to be on this day _____ of _____, 20_____ by
_____.
(Notary Stamp or Seal)

_____
Notary Public Signature
Commissioned in _____ County
My Commission Expires _____

WAIVERS OF LIEN

I, _____ being _____ of
(Individual) (Title)

_____
(Name and Address of Contractor)

on _____, certify that I received payment in full for _____
(Date) (Type of Work)

per my contract with the landowner and/or land developer, performed under a certain Contract with

_____

dated_____for the construction of _____

_____

for the full amount (consideration) of $_____.

The Undersigned further certifies that all labor performed under the Contract for the above-stated work has been paid in full, in compliance with the General Conditions of the Contract; that all materials, equipment, fees, licenses, insurance, and taxes of every description have been paid in full; that there are no liens against the Undersigned or the Work; the Undersigned further certifies and states that he will indemnify and save harmless the Contractor, Owners, and the City of Frankfort and its Sewer Department from all manner of claims, liens, or suits, loss, or damage arising under said Contract or subcontractors with the Undersigned; and the Undersigned hereby releases forever and transfers to the City of Frankfort and its Sewer Department all claim, title, and interest in the above property as described.

Name of Contractor	Date
Authorized Representative of Contractor	Title
Address of Contractor	Contractor Affix Corporate Seal Here

STATE OF INDIANA
COUNTY OF _____
This record was signed and sworn to be on this day _____ of _____, 20_____ by _____.

(Notary Stamp or Seal)

_____
Notary Public Signature
Commissioned in _____ County
My Commission Expires _____

APPLICATION FOR MS4 REVIEW (SWPPP AND DRAINAGE) FOR DISTURBANCES SMALLER THAN ONE (1) ACRE

Submit with this application the following to the Building Services Department at 301 East Clinton Street, Frankfort, IN 46041:

1. An application fee of $50. Make checks payable to the City of Frankfort.
2. A plan showing proposed drainage patterns. An example plan is included in this application.
3. A Stormwater Pollution Prevention Plan (SWPPP) that contains the minimum SWPPP requirements identified in the Stormwater Standards. An example plan is included in this application.

Project Information:

Name of Project: _____

Street Address: _____

Description of Project: _____

Total Acres of Site: _____ Disturbed Acres of Site: _____

Impervious Area: (sq.ft.): _____

Property Use (check one) ☐ Residential Lot ☐ Commercial/Industrial/Apartment

☐ Other: _____

Builder/Contractor: _____

Site Contact Name: _____

Estimated Construction Dates: Start: _____ End: _____

Project Owner Information:

Owner Name: _____

Address: _____

Telephone: _____ Email: _____

As the Owner or an authorized representative of the Owner, I certify that the above information is true and correct to the best of my knowledge.

Printed Name and Title: _____

Signature: _____ Date: _____

Address: _____

FOR CITY OF FRANKFORT – BUILDING SERVICES DEPARTMENT USE ONLY

Date Submitted: _____ *Approval Date:* _____ *Initial Fees:* _____

**APPLICATION FOR MS4 REVIEW (SWPPP AND DRAINAGE)
FOR DISTURBANCES SMALLER THAN ONE (1) ACRE** (Continued)

Example Drainage Patterns Exhibit:

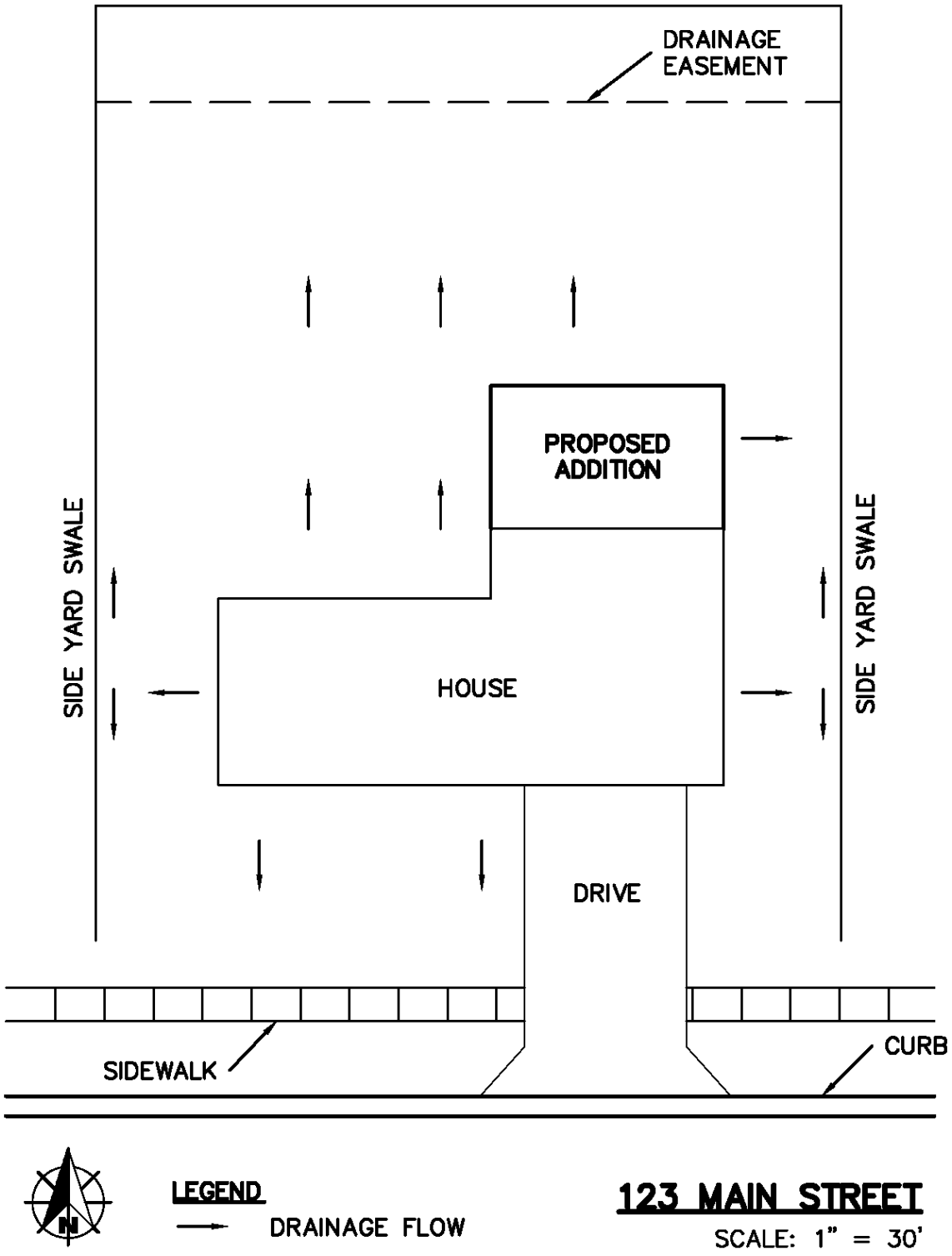

Exhibit provided by Local Technical Assistance Program (LTAP), Purdue University, Model Stormwater Technical Standards Manual

**APPLICATION FOR MS4 REVIEW (SWPPP AND DRAINAGE)
FOR DISTURBANCES SMALLER THAN ONE (1) ACRE** (Continued)

Example Individual Lot SWPPP Exhibit:

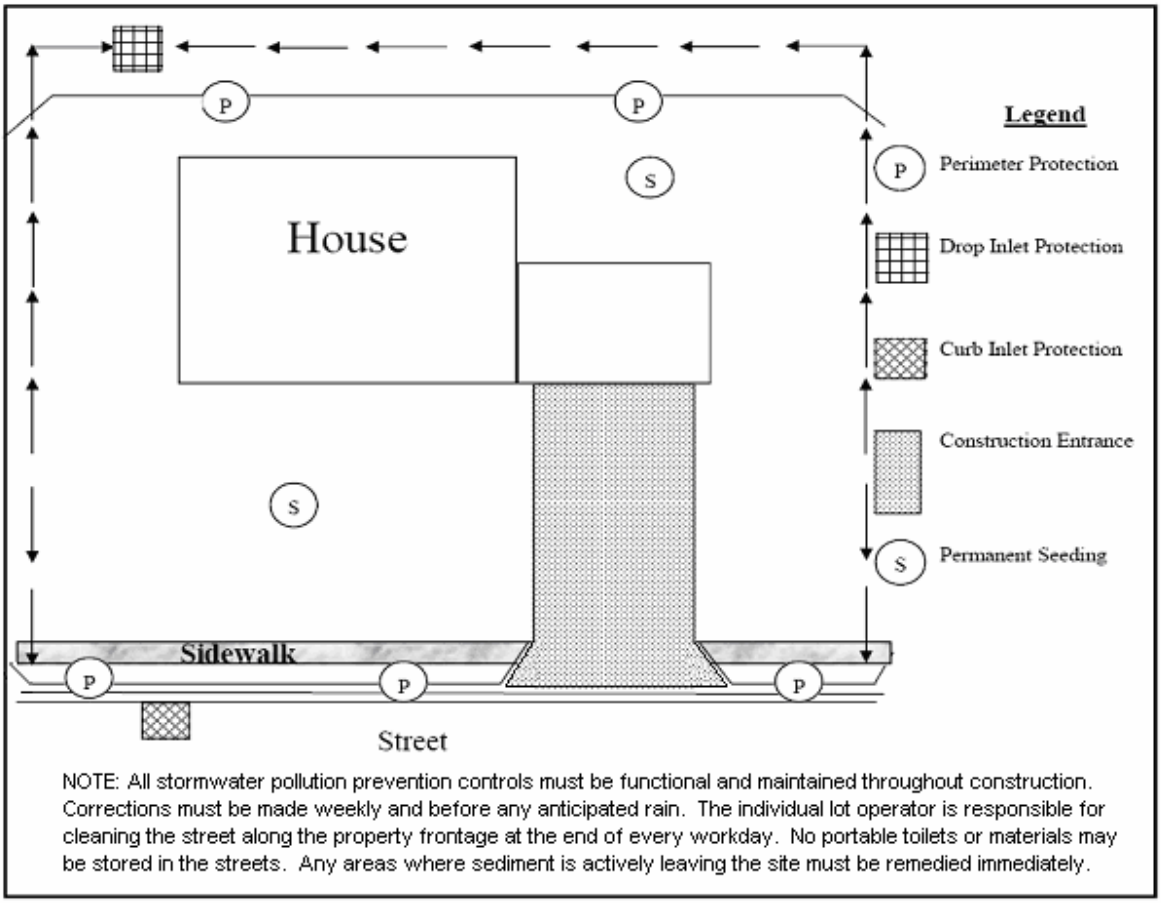

Exhibit provided by Local Technical Assistance Program (LTAP), Purdue University, Model Stormwater Technical Standards Manual

APPENDIX C – CONSTRUCTION AND POST-CONSTRUCTION FEE SCHEDULE

CONSTRUCTION AND POST-CONSTRUCTION FEE SCHEDULE

1. INTRODUCTION

A. All fees are to be made payable to the City of Frankfort. **All fees are non-refundable** (unless authorized by the City of Frankfort).

B. The City of Frankfort Code of Ordinance and the Construction Stormwater General Permit require construction sites to develop an erosion and sediment control plan, control pollution during land disturbing activities, and obtain approval before construction.

C. All proposed projects must pay an MS4 Approval Application Fee, Construction Site Inspection Fee, Post-Construction Initial Review, and Post-Construction Inspection Fee, and certify a *Statement of Financial Responsibility*.

D. All fees are due at the time the application packet is submitted to the Building Services Department.

E. The City of Frankfort or the designated representative will complete the MS4 plan review and conduct the CSGP inspections during the construction process.

F. One copy of the post-construction submittal will be forwarded to an engineer for review. One inspection will be completed during construction to ensure the post-construction BMP is installed as designed.

2. APPLICATION FEES:

A.	MS4 Approval Application Fee	$300.00
B.	Submitting Amended Plans (previously approved)	$150.00
C.	Demolition Only	$150.00
D.	Soil Disturbance without improvements	$100.00
E.	MS4 Review (SWPPP And Drainage) for Disturbances Smaller Than 1 Acre	$50.00

3. CONSTRUCTION INSPECTION FEES:

A. Construction Site Inspection — $100.00 per inspection

B. The estimated number of months of land-disturbing activities is estimated and recorded on the permit application. An initial fee of $100.00 per month for inspection must be paid at the time the permit application is submitted to the Building Services Department (i.e., for a project that will last 3 months, the initial inspection fee will be 3 x $100 = $300.00).

C. For those projects that extend beyond the estimated number of months, an additional fee of $100.00 per inspection with a minimum of one inspection per month will be charged.

D. For those projects that require inspections more frequently than once a month (due to non-compliance or enforcement actions), an additional fee of $100.00 per inspection will be charged. These additional fees will be charged to the person who has signed the *Statement of Financial Responsibly* (submitted with the permit application). These fees must be paid within 10 days from the date of notification. If not paid within the allowable time, a stop work order may be issued (See Section for additional fees associated with stop work orders).

4. POST-CONSTRUCTION REVIEW AND INSPECTION FEES:

A.	Post-Construction Initial Review (first 2 hours of review time)	$240.00
B.	Post-Construction Inspection	$400.00

C. For post-construction technical plan reviews that require more than 2 hours for review (deficient or incomplete submittals), additional fees will be charged according to the current hourly rate of the reviewing engineer and according to the signed *Statement of Financial Responsibility*. Review fees shall be paid to the City of Frankfort and shall be paid in full within 30 days of notification of the fees.

5. STOP WORK ORDERS:

A. Following a stop work order, a permit reinstatement fee will be assessed at $500.00 plus a $50.00 inspection fee.

B. A fine of $1,000.00 for the first day and up to $500.00 for each additional day will be assessed if construction activities continue during a stop work order.

6. NON-COMPLIANCE FEES:

The City may recover all remediation costs, legal fees, consultant fees, monitoring costs, construction costs, collection fees, and any other costs borne by the City related to the project's non-compliance issue from the project site owner.

APPENDIX D – BMP DESIGN CRITERIA

Stormwater Ponds

Stormwater Wetlands

Bioretention Areas

Water Quality Swales

Sand Filters

Infiltration Trenches

Biofilters

STORMWATER PONDS

QUICK REFERENCE

Description:	Constructed stormwater detention or retention basin that has a permanent pool of water in which runoff from each rain event is captured and treated in the pool.
Site Feasibility:	Residential Subdivision Use: Yes High Density/Ultra-Urban: consider space requirements
Design Criteria:	Sediment forebay or upstream BMP required to collect TSS Length to width ratio is 3:1 Maximum depth of permanent pool should not exceed 8 feet Side slopes of pond should not exceed 3:1 High permeable soils (hydrologic group A or B) may require a liner
Advantages:	Moderate to high removal rate of urban pollutants Can use for water quality and flood control High community acceptance when designed with attention to aesthetics and maintained properly Opportunity for wildlife habitat
Disadvantages:	Potential for thermal impacts/downstream warming Pond drainage can be problematic for low relief terrain Dam height restrictions for high relief areas Improperly designed or maintained ponds may become stagnant causing unpleasant conditions
Maintenance:	Monitor sediment accumulation and remove periodically Remove debris from inlet and outlet structures Maintain side slopes and remove invasive vegetation

GENERAL

a) Description

Stormwater ponds are constructed stormwater retention basins that contain a permanent pool of water in which runoff from each rain event is captured and treated in the pool. The purpose of the

pond is to retain runoff and allow contaminated sediments to settle by removing particulates and, through biological uptake, some nutrients attached to the particulates. A forebay or BMP placed in front of the pond is required to intercept most sediments providing ease of cleanout.

Underlying soils of hydrologic group C or D should be adequate to maintain a permanent pool. Most group A soil and some group B soils will require a pond liner. Subsurface analysis and permeability tests may be required to evaluate soils. Wet ponds require an adequate water source to maintain a permanent pool of water.

If stormwater ponds are used on a site with an underlying water supply aquifer, a separation distance of 2 feet is required between the bottom of the pond and the elevation of the seasonally high-water table.

b) Variations

1) Wet pond – provides all the water quality volume storage volume in a permanent pool.

2) Wet extended detention (ED) pond – provides the water quality storage volume through a combination of the permanent pool and ED storage above the permanent pool. The ED storage volume should be detained and released over a 24-hour period.

3) Micro-pool ED pond – only a small micro-pool of water within an ED pond is maintained at the outlet to the pond, which is sized to detain the water quality volume for 24 hours. The micro-pool prevents resuspension of previously settled sediments.

4) Multiple ponds – provide the water quality storage volume in two or more cells that create longer pollutant removal pathways.

DESIGN CRITERIA

The following criteria are minimum standards for the design of a wet stormwater pond. A stormwater pond may be designed to meet water quantity and quality requirements. If considered for water quality treatment only, the pond shall be designed to capture the water quality volume (WQ_v) using the equation in Chapter 2 of this manual.

c) Pond geometry:

1) The pond should have a minimum length to width ratio of 3:1. The flow path between the inlet and outlet should be maximized and shaped so that flow enters the pond and gradually spreads out, improving sediment removal. Baffles, pond shaping and islands can be utilized to increase the flow path.

2) The depth of the permanent pool should be greater than 4 feet to avoid resuspension of particles and less than 8 feet to avoid stratification and anoxic conditions.

3) Vegetated side slopes to the pond should not exceed 3:1 and shall terminate on a minimum 10-foot safety ledge with a maximum 10:1 slope. Side slopes steeper than 3:1 require riprap to stabilize the banks. Below the safety ledge, ponds with slopes steeper than 3:1 shall also be secured with riprap and no bank shall exceed a slope of 1½:1.

4) Sediment forebay or water quality BMP:

i. All ponds shall include a sediment BMP that consists of a separate cell, formed by an acceptable barrier or water quality BMP. A forebay is to be provided at each inlet to the pond unless the inlet provides less than 10% of the total design storm inflow to the pond. For flow-through BMPs, the water quality flow rate must be calculated and percent TSS removal must be included in the design of a treatment train.

ii. The forebay shall be sized to contain 10% of the water quality volume. The forebay storage volume is part of the total WQ_v requirement.

iii. Entrance and exit velocities from the forebay must be non-erosive.

iv. A fixed vertical depth marker shall be installed in the forebay to continually measure sediment deposition. Sediment in the forebay shall be removed after 50% of the forebay capacity has been depleted.

v. Direct maintenance access for appropriate equipment shall be provided to the forebay or water quality BMP. Consider access of a vac-truck for cleaning.

5) Outlet Structures:

i. The outlet structure should be designed to detain the water quality volume above the permanent pool for 24 to 48 hours.

ii. Flow control from a pond is typically accomplished with the use of a riser and barrel. The riser is a vertical pipe or inlet structure that is attached to the base of the pond with a watertight connection. The outlet barrel is a horizontal pipe attached to the riser that conveys flow under the embankment. The riser should be located within the embankment for maintenance access, safety, and aesthetics. Suitable erosion control measures must be provided for the outlet and all inlet structures to the pond. Energy dissipaters should be placed at the outlet of the barrel to prevent scouring and erosion.

iii. Anti-seep collars or filter diaphragms must be provided for the barrel of the outlet structure. If reinforced concrete pipe is used, O-ring gaskets shall be used to create watertight joints.

iv. Orifice-type outlets below the permanent pool elevation of the pond shall have an appropriate anti-clogging device.

v. Provide trash racks, filters, hoods, or other debris control. A negatively sloped pipe from the riser to one foot below the permanent pool, away from floating debris, can reduce the risk of clogging. An orifice covered by wire mesh and a hood may accomplish protection of the extended detention orifice.

vi. Design and install an emergency drain (i.e., sluice gate or drawdown pipe) capable of draining within 24 hours.

6) An emergency spillway shall be designed to pass 1.25 times the peak discharge and peak flow velocity from the 100-year storm event for the entire contributing drainage area (unless bypassed), assuming post-development conditions. Provide a one-foot minimum freeboard above the maximum anticipated flow depth through the emergency spillway.

7) To prevent drawdown of the permanent pool, a clay or poly liner may be needed. Hydrologic group A soils generally require a pond liner and group B soils may require infiltration testing.

8) Stormwater ponds must be constructed within an easement either platted or legally described and recorded as a perpetual stormwater drainage easement. The easement shall extend a minimum of 30 feet horizontally outside of the design 100-year floodwater elevation of the basin and provide a minimum 10-feet wide access easement. A copy of the easement should be included in the BMP operations and maintenance manual.

9) A pond buffer should extend 25 feet outward from the maximum water surface elevation.

10) If the pond is used as a sediment control measure during active construction, the sediment must be cleaned out of the pond and elevations and grades reestablished as noted in the approved stormwater management plan for post-construction runoff control.

MAINTENANCE AND INSPECTION CHECKLIST
STORMWATER PONDS

Regular inspection and maintenance are critical to the effective operation of stormwater ponds. The following inspection checklist, to be completed at periods indicated, is provided for the BMP owner and should be retained as a record by the owner for five (5) years from the approval date of the Stormwater Pollution Prevention Plan. Evidence of inspection and maintenance shall be provided to the City of Frankfort upon request.

Project Name/Site Location: _____

Owner Name: _____ Phone: _____

Owner Address: _____

Date: _____ Inspector: _____

MAINTENANCE ITEM	YES/NO	COMMENTS
Embankment and Emergency Spillway		**Inspect Annually**
1. Vegetation established and thriving?		
2. Any erosion?		
3. Animal burrows present?		
4. Cracking, bulging, or sliding of dam?		
5. All drains clear and functioning?		
6. Any leaks or seeps in the embankment?		
7. Any slope failure?		
8. Obstructions in emergency spillway?		
9. Other problems evident?		
Outlet Structure		**Inspect Annually**
1. Low flow orifice blocked?		
2. Trash rack clear of debris?		
3. Any corrosion evident on the trash rack?		
4. Excessive sediment in riser?		
5. Cracks or spalling in concrete?		
6. Any corrosion evident on metal pipes?		
7. Are all control valves operational?		
8. Outfall channels functioning?		
9. Other problems evident?		
Permanent Pool		**Inspect Monthly**
1. Undesirable vegetative growth?		
2. Floatable debris removal needed?		
3. Any visible pollution?		
4. Any shoreline problems?		
5. Other problems evident?		
Sediment Forebay		**Inspect Monthly**
1. Sedimentation marker visible?		
2. Sediment cleanout needed (50% full)?		
3. Other problems evident?		

MAINTENANCE ITEM	YES/NO	COMMENTS
Other		**Inspect Monthly**
1. Erosion at inflow or outfall points?		
2. Condition of headwalls satisfactory?		
3. Encroachments in pond easement area?		
4. Complaints from area residents?		
5. Any public hazards present?		
6. Other problems evident?		

Additional Comments:

Recommended Corrective Actions:

Recommended Time for Corrective Actions:

STORMWATER WETLANDS

QUICK REFERENCE

Description:	Constructed shallow marsh systems designed to treat stormwater runoff through settling and vegetative uptake and to control runoff volumes. .
Site Feasibility:	Residential Subdivision Use: Yes High Density/Ultra-Urban: No
Design Criteria:	Sediment forebay and micro-pool required Minimum dry weather flow path length to width ratio is 2:1 Minimum 35% of total surface area should have a depth of 6 inches or less; 10% to 20% of surface area should be deep pool (1.5 to 6-foot depth) High permeable soils (hydrologic group A or B) may require a liner
Advantages:	Effective nutrient removal Natural aesthetic qualities and wildlife habitat
Disadvantages:	Requires large land area Require a continuous base flow Sediment regulation is critical to sustain wetlands
Maintenance:	Replace wetland vegetation to maintain at least 50% surface area coverage Remove invasive vegetation Monitor sediment accumulation and remove periodically

GENERAL

a) Description

Stormwater wetlands are constructed shallow marsh systems designed to control the quantity and quality of stormwater runoff. Microbial breakdown, settling, adsorption, retention, and vegetative uptake remove pollutants as stormwater moves through the wetland under low flow conditions. Runoff volumes are reduced by evapotranspiration and infiltration. Peak flow is reduced by storage and slow release. Wetlands further offer erosion control, aesthetic value, and wildlife habitat.

A sediment forebay at the inflow point to a wetland is required to allow heavier sediments to drop out before the runoff enters the wetland marsh. Underlying soils of hydrologic group C or D should be adequate to maintain a permanent pool. Most group A soils and some group B soils may require

a liner. Subsurface analysis and permeability tests may be required to evaluate soils. A continuous base flow or a high-water table is required to support aquatic vegetation in a wetland facility. A water balance must be performed to demonstrate the wetland can withstand a thirty-day drought at summer evaporation rates without completely drawing down.

If stormwater wetlands are used on a site with an underlying water supply aquifer, a separation distance of 2 feet is required between the bottom of the pond and the elevation of the seasonally high-water table. A pocket wetland is typically below the water table.

b) Variations

1) Shallow Wetland – most of the water quality treatment volume is in the shallow high marsh or low marsh depths. The only deep portions of the shallow wetland are the forebay and the micro-pool. A relatively large amount of land is typically needed to store the water quality volume.

2) Extended Detention (ED) Shallow Wetland – the same as the shallow wetland, except part of the water quality treatment volume is provided as extended detention above the surface of the marsh and released over a period of 24 hours. This design allows for treatment in a smaller space than the shallow wetland. Plants that can tolerate both wet and dry periods need to be specified in the ED zone.

3) Pond/Wetland System – this system has two (2) separate cells, a wet pond, and a shallow marsh. The wet pond traps sediments and reduces runoff velocities prior to entry into the wetland where stormwater flows receive additional treatment. Less land is required than for the shallow wetland or the ED shallow wetland systems.

4) Pocket Wetland – intended for smaller drainage areas of 5 to 10 acres and typically requires excavation down to the water table for a reliable water source to support the wetland system.

DESIGN CRITERIA

The following criteria are minimum standards for the design of a wetland. A stormwater wetland may be designed to meet water quantity and quality requirements. If considered for water quality treatment only, the pond shall be designed to capture the water quality volume (WQ_v) using the equation in Chapter 2 of this manual.

a) The minimum drainage area tributary to the wetland is 25 acres (5 acres for a pocket wetland).

b) Base flow: A water balance must be calculated to ensure enough inflow to sustain the wetland:

$$S = Q_i + R + Inf - Q_o - ET$$

Where:
S = net change in storage
Q_i = stormwater runoff inflow
R = contribution from rainfall
Inf = net infiltration (infiltration – exfiltration)
Q_o = surface outflow
ET = evapotranspiration

c) Wetland geometry:

1) The surface area of the wetland should be approximately 3% of the tributary drainage area.

2) The wetland should have a minimum length to width ratio of 2:1, with 3:1 preferred. The flow path may be achieved using internal dikes or berms, marsh plantings, or multiple cells.

3) Side slopes to the wetland should not exceed 4:1, with 6:1 preferred. Minimal longitudinal slopes are required. Safety and aquatic benches should surround the perimeter of all deep pool areas.

4) Contours of the wetland should be irregular to provide a natural landscaping effect.

5) The volume of the ED must not comprise more than 50% of the total WQ_v and its maximum water surface elevation must not extend more than 2 feet above the normal pool. Peak flow storage can be provided above the maximum WQ_v elevation within the wetland.

d) Depth zones:

Wetlands should be designed with the recommended proportion of depth zones as follows:

1) Deepwater zone – 1.5 to 6 feet below normal pool elevation. Includes the outlet micro-pool and deep-water channels through the wetland facility. This zone supports little emergent wetland vegetation, but may support submerged or floating vegetation.

2) Low marsh zone – 6 to 8 inches below normal pool elevation. This zone is suitable for the growth of several emergent wetland plant species.

3) High marsh zone – 6 inches or less below normal pool elevation. This zone will support a greater density and diversity of wetland species than the low marsh zone. The high marsh zone should have a higher surface area to volume ratio than the low marsh zone.

4) Semi-wet zone – areas above normal pool elevation that are inundated during larger storm events. This zone supports several species that can survive flooding.

Recommended Design Criteria for Stormwater Wetlands
Modified from Massachusetts DEP, 1997; Schueler, 1992

Design Criteria	Shallow Wetland	ED Shallow Wetland	Pond/ Wetland	Pocket Wetland
Minimum Length to Width Ratio	2:1	2:1	2:1	2:1
Extended Detention (ED)	No	Yes	Optional	Optional
Allocation of WQ_v (pool/marsh/ED) in %	25/75/0	25/25/50	70/30/0 (includes pond volume)	25/75/0
Allocation of surface area (deep-water/low marsh/high marsh/semi-wet) in %	20/35/40/5	10/35/45/10	45/25/25/5 (includes pond surface area)	10/45/40/5
Forebay	Required	Required	Required	Optional
Micro-pool	Required	Required	Required	Required
Outlet Configuration	Reverse-slope pipe or hooded broad-crested weir	Reverse-slope pipe or hooded broad-crested weir	Reverse-slope pipe or hooded broad-crested weir	Hooded broad-crested weir

e) Sediment forebay:

1) All wetlands shall include a sediment forebay that consists of a separate cell, formed by an acceptable barrier. A forebay is to be provided at each inlet to the wetland unless the inlet provides less than 10% of the total design storm inflow to the wetland.

2) The forebay shall be sized to contain 10% of the water quality volume and should be 3 to 6 feet deep. The forebay storage volume is part of the total WQ_v requirement.

3) Entrance and exit velocities from the forebay must be non-erosive. Inflow channels should be stabilized with flared riprap aprons, or the equivalent.

4) A fixed vertical depth marker shall be installed in the forebay to measure sediment deposition. Sediment in the forebay shall be removed after 50% of the forebay capacity has been depleted.

5) Direct maintenance access for appropriate equipment shall be provided to the forebay.

f) Outlet Structures:

1) The outlet structure should be designed to detain the water quality volume above the permanent pool for 24 to 48 hours.

2) Flow control from a stormwater wetland is typically accomplished with the use of a riser and barrel. The riser is a vertical pipe or inlet structure that is attached to the base of the micro-pool with a watertight connection. The outlet barrel is a horizontal pipe attached to the riser that conveys flow under the embankment. The riser should be located within the embankment for maintenance access, safety, and aesthetics.

3) Suitable erosion control measures must be provided for the outlet and all inlet structures to the pond. Energy dissipaters should be placed at the outlet of the barrel to prevent scouring and erosion.

4) Anti-seep collars or filter diaphragms must be provided for the barrel of the outlet structure. If reinforced concrete pipe is used, O-ring gaskets shall be used to create watertight joints.

5) Orifice-type outlets below the permanent pool elevation of the pond shall have an appropriate anti-clogging device.

6) Provide trash racks, filters, hoods, or other debris control. A negatively sloped pipe from the riser to one foot below the permanent pool, away from floating debris, can reduce the risk of clogging. An orifice covered by wire mesh and a hood may accomplish protection of the ED orifice.

7) Design and install an emergency drain (i.e., sluice gate or drawdown pipe) capable of draining within 24 hours.

8) A micro-pool, 3 to 6 feet deep, shall be provided before the outlet structure of the wetland to aid in the prevention of clogging of the low flow pipe and sediment resuspension. Protection against blockage must be installed as part of the outlet design.

g) An emergency spillway shall be designed to pass 1.25 times the peak discharge and peak flow velocity from the 100-year storm event for the entire contributing drainage area (unless bypassed), assuming post-development conditions. Provide a one-foot minimum freeboard above the maximum anticipated flow depth through the emergency spillway.

h) To prevent the drawdown of the permanent pool, a clay or poly liner may be needed below the planting soil. Permeable soils are not well suited for a wetland without a high-water table. Hydrologic group A soils generally require a pond liner and group B soils may require infiltration testing through subsurface analyses.

i) A landscaping plan must be provided that indicates the methods used to establish and maintain wetland coverage. Minimum elements of a plan include delineation of pond-scaping zones, selection of corresponding plant species, planting configuration, and sequence for preparing wetland bed, including any needed soil amendments. If a minimum coverage of 50% is not

achieved in the planted wetland zones after the second growing season, reinforcement planting will be required.

j) Stormwater wetlands must be constructed within an easement either platted or legally described and recorded as a perpetual stormwater drainage easement. The easement shall include the frequently flooded zone surrounding the wetland and provide a minimum of 10-feet wide access to the wetland facility including the forebay and outlet structure. A copy of the easement should be included in the BMP operations and maintenance manual.

k) A wetland buffer should extend 25 feet outward from the maximum water surface elevation with an additional 15-foot setback to structures.

l) If the wetland is used as a sediment control measure during active construction, the sediment must be cleaned out of the wetland and forebay and elevations and grades reestablished as noted in the approved stormwater management plan for post-construction runoff control.

MAINTENANCE AND INSPECTION CHECKLIST
STORMWATER WETLANDS

Regular inspection and maintenance are critical to the effective operation of stormwater wetlands. The following inspection checklist, to be completed at periods indicated, is provided for the BMP owner and should be retained as a record by the owner for five (5) years from the approval date of the Stormwater Pollution Prevention Plan. Evidence of inspection and maintenance shall be provided to the City of Frankfort upon request.

Project Name/Site Location: _____

Owner Name: _____ Phone: _____

Owner Address: _____

Date: _____ Inspector: _____

MAINTENANCE ITEM	YES/NO	COMMENTS
Embankment and Emergency Spillway		**Inspect Annually**
1. Vegetation established and thriving?		
2. Any erosion?		
3. Animal burrows present?		
4. Cracking, bulging, or sliding of dam?		
5. All drains clear and functioning?		
6. Any leaks or seeps in the embankment?		
7. Any slope failure?		
8. Obstructions in emergency spillway?		
9. Other problems evident?		
Outlet Structure		**Inspect Annually**
1. Low flow orifice blocked?		
2. Trash rack clear of debris?		
3. Any corrosion evident on the trash rack?		
4. Excessive sediment in the riser?		
5. Cracks or spalling in concrete?		
6. Any corrosion evident on metal pipes?		
7. Are all control valves operational?		
8. Outfall channels functioning?		
9. Other problems evident?		
Wetland Area		**Inspect Annually**
1. Is vegetation healthy and growing?		
2. Any evidence of invasive species?		
3. Sediment cleanout needed (50% full)?		
4. Other problems evident?		
Permanent Pool		**Inspect Monthly**
1. Undesirable vegetative growth?		
2. Floatable debris removal needed?		
3. Any visible pollution?		
4. Any shoreline problems?		
5. Other problems evident?		

MAINTENANCE ITEM	YES/NO	COMMENTS
Sediment Forebay		**Inspect Monthly**
1. Sedimentation marker visible?		
2. Sediment cleanout needed (50% full)?		
3. Other problems evident?		
Other		**Inspect Monthly**
1. Erosion at inflow or outfall points?		
2. Condition of headwalls satisfactory?		
3. Encroachments in pond easement area?		
4. Complaints from area residents?		
5. Any public hazards present?		
6. Other problems evident?		

Additional Comments:

Recommended Corrective Actions:

Recommended Time for Corrective Actions:

BIORETENTION AREAS

QUICK REFERENCE

Newly Constructed Bioretention Area

Description:	Shallow stormwater basins or landscaped areas that utilize engineered soils and vegetation to capture and treat runoff.
Site Feasibility:	Residential Subdivision Use: Yes High Density/Ultra-Urban: Yes
Design Criteria:	Consists of a grass filter strip, ponding area, organic/mulch layer, planting soil, vegetation, and possibly a sand bed. Typically requires 5 feet of head.
Advantages:	High pollutant removal. Often located in landscaping islands of parking lots. Good retrofit capability for redevelopment. Aesthetic qualities.
Disadvantages:	Requires extensive landscaping. Not acceptable for site slopes greater than 6%. Generally, requires an underdrain system. Clogging may be a problem in areas with high sediment loads.
Maintenance:	Inspect and repair/replace treatment area components.

GENERAL

a) Description

Bioretention areas are structural stormwater controls that capture and temporarily store the WQ_v using engineered soils and vegetation in shallow basins or landscaped areas to remove pollutants from stormwater runoff. Runoff is conveyed as sheet flow to the bioretention area, which consists of a grass filter strip, ponding area, organic or mulch layer, planting soil, and vegetation. A sand bed can also be included in the design to provide aeration and drainage of the planting soil. The filtered runoff is typically collected and returned to the conveyance system, though it can also be exfiltrated into the surrounding soil in areas with porous soils.

Bioretention systems are designed for intermittent flow and need to drain and reaerate between rainfall events. The systems should not be used on sites with a continuous flow from groundwater, sump pumps, or other sources.

A separation distance of 2 feet is required between the bottom of the bioretention facility and the elevation of the seasonally high-water table.

b) Bioretention Components

1) Stone diaphragm at the beginning of the grass filter strip - to reduce runoff velocities and spread flow into the grass filter strip.

2) Grass filter strip – further reduces incoming runoff velocity and filters particulates from runoff.

3) Ponding area – provides temporary storage of stormwater runoff before its evaporation, infiltration, or uptake and provides settling capacity.

4) Organic or mulch layer – provides filtration as well as an environment conducive to the growth of microorganisms that degrade hydrocarbons and organic material.

5) Planting soil – acts as a filtration system, and clay in the soil provides adsorption sites for hydrocarbons, heavy metals, nutrients, and other pollutants.

6) Woody and herbaceous plants – provide vegetative uptake of runoff and pollutants and serve to stabilize the surrounding soils.

7) Sand bed – provides positive drainage and aerobic conditions in the planting soil and serves as a final treatment medium.

8) Gravel and perforated pipe underdrain system – collects runoff that has filtered through the soil layers. Bioretention areas can be designed to infiltrate into surrounding soils having infiltration rates greater than 0.5 inch per hour.

DESIGN CRITERIA

The following criteria are minimum standards for the design of a bioretention area, which is designed for stormwater quality treatment only. Flow from runoff more than the WQ_v must be diverted or the bioretention area designed to safely pass higher flows to protect the ponding area, mulch layer, and vegetation. The WQ_v in the bioretention area can be subtracted from detention storage requirements for the contributing area.

a) The maximum drainage area tributary to a bioretention area is 5 acres (½ to 2 acres is preferred).

b) Bioretention area geometry:

1) The surface area of the bioretention area should be approximately 5% of the tributary impervious area and a minimum of 200 ft^2 for small sites. The bioretention area should have a minimum length to width ratio of 2:1

2) The elevation difference (head) needed from inflow to outflow is 5 feet.

3) The site slope should be a maximum of 6%. Velocities entering the mulch layer should be less than 2 fps.

4) The maximum ponding depth in the bioretention area is 6 inches.

5) The area of the planting soil filter bed is sized using Darcy's Law equation with a filter bed drain time of 48 hours and a coefficient of permeability (k) of 0.5 ft/day. The planting soil bed must be at least 4 feet in depth.

$$A_f = (WQ_v)(d_f) / [(k)(h_f+d_f)(t_f)]$$

Where:

A_f = surface area of ponding area (ft^2)
WQ_v = water quality volume (ft^3)
d_f = filter bed depth (4 feet minimum)
k = coefficient of permeability of filter media (ft/day) (use 0.5 ft/day for silt-loam)
h_f = average height of water above filter bed (ft) (typically 3 inches, which is half of the 6-inch ponding depth)
t_f = design filter bed drain time (days) (2 days maximum)

c) Pretreatment:

1) A grass filter strip with a pea gravel diaphragm is typically utilized for pretreatment. See the attached schematic for the design criteria for the grass filter strip.

2) For offline applications, a grass channel with a pea gravel diaphragm flow spreader is typically used for pretreatment. The minimum grassed channel length is 20 feet. See the attached schematic for the design criteria for the grass channel.

d) Components:

1) Pea gravel for the diaphragm and curtain should be ASTM D 448 size No. 6 (1/8" to ¼"). A drop of at least six inches should be provided at the inlet of the stone diaphragm.

2) The mulch layer shall consist of 2 to 4 inches of commercially available fine shredded hardwood mulch or shredded hardwood chips.

3) Planting soils shall be sandy loam, loamy sand, or loam texture and shall have an infiltration rate of at least 0.5 inches per hour. The planting soil shall be tested and shall meet the following criteria:

clay content	10% to 25% by volume
silt content	30% to 55% by volume
sand content	35% to 60% by volume
pH	5.2 to 7.0
organic matter	1.5% and 4% by weight
magnesium	35 lb./ac
phosphorus (phosphate–P_2O_5)	75 lb./ac
potassium (potash-K_2O)	85 lb./ac
soluble salts	500 ppm maximum

4) The sand bed should be 12 to 18 inches thick. Sand should be clean and have less than 15% silt or clay content.

5) The underdrain collection system shall consist of a 4- to 6-inch perforated PVC pipe (Schedule 40 or greater in strength) in an 8-inch gravel layer (clean washed aggregate 0.5 to 2-inches in diameter). The pipe is spaced at a maximum of 10 feet on center at a minimum grade of 0.5%. A permeable filter fabric is required between the gravel layer and the planting soil bed. An observation well/clean out must be provided; a minimum of one well for every 1000 ft^2 of surface area. A visible floating marker shall be provided to indicate the water level. The ends of the underdrain pipes must be capped. The underdrain pipe must be discharged to an appropriate facility.

6) Compaction during construction must be minimized at both the base of the bioretention area and for the backfill materials. The use of equipment causing excessive compaction will result

in reduced infiltration rates contributing to system failure and is not acceptable. Do not use heavy equipment within the bioretention basin.

e) Overflow structure:

1) An overflow structure and non-erosive overflow channel must be provided to safely pass flows from the bioretention area that exceeds the system storage capacity to a stabilized downstream area or watercourse.

2) An overflow structure within the bioretention system may consist of a catch basin with the inlet placed 6 inches above the mulch layer at the elevation of the shallow ponding area.

3) An overflow structure may consist of a weir sized using the Weir equation.

$$Q = CLH$$

Where:
Q = peak flow
C = 2.65 for a smooth crested grass weir
L = length
H = 6 inches of head

f) A landscaping plan must be provided. The bioretention area should be vegetated to resemble a terrestrial forest ecosystem, with a mature tree canopy, sub-canopy of understory trees, scrub layer, and herbaceous ground cover. Three species of trees and shrubs should be planted. The tree-to-shrub ratio should be 2:1 to 3:1. Trees should be spaced 8 feet apart.

g) Bioretention areas must be constructed within an easement either platted or legally described and recorded as a perpetual stormwater drainage easement. The easement shall extend a minimum of 30 feet horizontally outside of the bioretention system limits and provide a minimum 10-feet wide access easement. A copy of the easement should be included in the BMP operations and maintenance manual.

h) The bioretention facility shall not be constructed until all contributing drainage areas have been stabilized. The bioretention facility shall not be used as a sediment control measure during active construction.

MAINTENANCE AND INSPECTION CHECKLIST
BIORETENTION AREAS

Regular inspection and maintenance are critical to the effective operation of bioretention facilities. The following inspection checklist, to be completed at periods indicated, is provided for the BMP owner, and should be retained as a record by the owner for five (5) years from the approval date of the Stormwater Pollution Prevention Plan. Evidence of inspection and maintenance shall be provided to the City of Frankfort upon request.

Project Name/Site Location: _____

Owner Name: _____ Phone: _____

Owner Address: _____

Date: _____ Inspector: _____

MAINTENANCE ITEM	YES/NO	COMMENTS
Vegetation		**Inspect Monthly**
1. Is vegetation established and thriving?		
2. Does mulch require replacement due to erosion, silting, or deterioration? (Mulch should be replaced every 3 years).		
3. Any weeding or pruning needed?		
4. Grass less than 6 inches in height?		
5. Any trash or plant debris to be cleared?		
6. Any dead or diseased vegetation or trees to be cleared and replaced?		
7. Is the soil pH test satisfactory? (5.2 to 7.0)		**Inspect Annually**
8. Is the surface of the ponding area becoming clogged with sediment?		
9. Other problems evident?		
Inflow/outlet areas		**Inspect Annually**
1. Does the filter strip need reseeding?		
2. Does sediment need to be removed?		
3. Does the pea gravel diaphragm need to be replaced due to clogging?		
4. Any clogging of underdrain?		**Inspect Monthly**
5. Is the overflow structure operating properly?		
6. Other problems evident?		

Additional Comments:

Recommended Corrective Actions:

Recommended Time for Corrective Actions:

WATER QUALITY SWALES

QUICK REFERENCE

Description:	Vegetated open channels that are explicitly designed and constructed to capture and treat stormwater runoff within dry cells formed by check dams or other means.
Site Feasibility:	Residential Subdivision Use: Yes High Density/Ultra-Urban: No
Design Criteria:	Pretreatment forebay required. Longitudinal slopes must be less than 4%. Maximum side slopes 2:1 with 4:1 preferred.
Advantages:	Combines stormwater treatment with runoff conveyance system. Relatively inexpensive to install. Reduces runoff velocities. Aesthetic qualities.
Disadvantages:	Cannot be used on steep slopes. Large area requirement - not feasible for high-density areas
Maintenance:	Maintain grass height of 4 to 6 inches Remove sediment from the forebay and channel

GENERAL

a) Description

Water quality swales are conveyance channels engineered to capture and treat the WQ_v for a drainage area. They differ from normal drainage channels or swales through the incorporation of specific features that remove stormwater pollutants by filtration through an engineered media. Water quality swales are different from filter strips, which are limited application structural controls and not considered acceptable for meeting the TSS removal requirements independently. Water quality swales are designed to include a forebay in addition to a filter bed of prepared soil that overlays an underdrain system. The swales are sized to allow the entire WQ_v to be filtered and discharged or infiltrated through the bottom of the swale. Limited longitudinal slopes, in conjunction with berms and/or check dams installed perpendicular to the flow path, force the flow

to be slow and shallow allowing for particulates to settle and limiting erosion. Runoff is collected by a perforated pipe and discharged to an appropriate outlet.

A separation distance of 2 feet is required between the bottom of the water quality swale and the elevation of the seasonally high-water table.

DESIGN CRITERIA

The following criteria are minimum standards for the design of a water quality swale, which is acceptable for stormwater quality treatment only and does not provide detention storage. Flow from runoff more than the WQ_v must be diverted or the water quality swale adequately designed to safely pass higher flows to prevent erosion of the swale.

a) The maximum drainage area tributary to a water quality swale is 5 acres.

b) Peak flows are limited to 10 cfs and runoff velocities are limited to 2.5 fps.

c) The maximum ponding time in the water quality swale is 48 hours.

d) The swale shall have a maximum ponding time of 48 hours. Soil media shall have an infiltration rate of at least 1 foot per day ($f_c > 0.5$ inches per hour), with 1.5 feet per day maximum. Infiltration of the WQ_v will only be allowed when proven by geotechnical evaluation that underlying soils have an infiltration rate of 0.5 inches per hour (typically hydrologic group A soils). Infiltration will not be allowed in wellhead protection areas.

e) Water quality swale geometry:

1) The surface area of the water quality swale should be approximately 10% to 20% of the tributary impervious.

2) The elevation difference (head) generally needed from inflow to outflow is 3 to 5 feet.

3) The longitudinal slope of the swale shall be a maximum of 4%, with 1% to 2% preferred.

4) Side slopes of the swale shall be no greater than 3:1. Swales shall be parabolic or trapezoidal to maximize vegetative areas and to provide ease of maintenance.

5) The maximum design flow depth shall be 12 inches. The depth of the WQ_v at the downstream end of the swale should not exceed 18 inches.

6) A minimum bottom channel width of 2 feet is required to ensure adequate filtration.

7) The bed of the swale shall have a minimum permeable soil layer 30 inches in depth.

8) The swale must have a minimum length of 100 feet.

f) Pretreatment:

1) All water-quality swales shall include a sediment forebay that consists of a separate cell, formed by an acceptable barrier. See A.1. - Stormwater Ponds for design criteria for a forebay.

2) Runoff can also enter along the sides of the channel as sheet flow through a grass filter strip containing a pea gravel flow spreader trench (diaphragm) along the entrance to the filter strip. Slopes to the diaphragm shall not exceed 6% for the last 20 feet before entering the spreader.

g) The underdrain collection system shall consist of a 4- to 6-inch perforated PVC pipe (Schedule 40 or greater in strength) in an 8-inch gravel layer (clean washed aggregate 0.5 to 2-inches in diameter). A permeable filter fabric is required between the gravel layer and the planting soil bed. A clean-out must be provided and the underdrain pipe must be discharged to an appropriate facility.

h) Compaction during construction must be minimized at both the base of the water quality swale and for the backfill materials. The use of equipment causing excessive compaction will result in reduced infiltration rates contributing to system failure and is not acceptable. Do not use heavy equipment within the bioretention basin.

i) An overflow structure and non-erosive overflow channel must be provided to safely pass flows from the water quality swale that exceeds the system storage capacity to a stabilized downstream area or watercourse.

j) Proper grass species and plants should be specified for the water quality swale.

k) Water quality swales must be constructed within an easement either platted or legally described and recorded as a perpetual stormwater drainage easement. The easement shall extend a minimum of 30 feet horizontally outside of the water quality swale limits and provide a minimum 10-feet wide access easement. A copy of the easement should be included in the BMP operations and maintenance manual.

l) The water quality swale shall not be constructed until all contributing drainage areas have been stabilized. The swale shall not be used as a sediment control measure during active construction.

MAINTENANCE AND INSPECTION CHECKLIST
WATER QUALITY SWALES

Regular inspection and maintenance are critical to the effective operation of water-quality swales. The following inspection checklist, to be completed at periods indicated, is provided for the BMP owner and should be retained as a record by the owner for five (5) years from the approval date of the Stormwater Pollution Prevention Plan. Evidence of inspection and maintenance shall be provided to the City of Frankfort upon request.

Project Name/Site Location: _____

Owner Name: _____ Phone: _____

Owner Address: _____

Date: _____ Inspector: _____

MAINTENANCE ITEM	YES/NO	COMMENTS
Vegetation		**Inspect Monthly**
1. Is vegetation and/or grass cover dense and vigorous?		
2. Any weeds or debris to be cleared?		
3. Any erosion of swale?		
4. Any sediment build-up in the bottom of the swale?		
5. Is grass height maintained at 4 to 6 inches?		
6. Other problems evident?		
Pretreatment		**Inspect Monthly**
1. Sedimentation marker visible?		
2. Sediment cleanout needed (50% full)?		
3. Does the pea gravel diaphragm need to be replaced due to clogging?		
4. Other problems evident?		
Outlet areas		**Inspect Monthly**
1. Any evidence of erosion or failure at berms or check dams?		
2. Any clogging of underdrain?		
3. Is the overflow structure operating properly?		
4. Other problems evident?		

Additional Comments:

Recommended Corrective Actions:

Recommended Time for Corrective Actions:

SAND FILTERS

QUICK REFERENCE

Description:	Multi-chamber structure consisting of a pretreatment chamber, a sand bed as its primary filter media, and an underdrain collection system - designed to treat stormwater runoff through filtration.
Site Feasibility:	Residential Subdivision Use: No High Density/Ultra-Urban: Yes
Design Criteria:	Pretreatment forebay/chamber required. Requires 2 to 6 feet of head. Sand filter media with an underdrain system.
Advantages:	Good for highly impervious areas. Good retrofit capability.
Disadvantages:	High maintenance burden. Not recommended for areas with high sediment content in runoff. Relatively costly. Possible odor problems.
Maintenance:	Inspect for clogging. Remove sediment from the forebay/chamber. Replace sand filter media as needed

GENERAL

a) Description

Sand filters are structural stormwater controls that capture and temporarily store stormwater runoff and pass it through a filter bed of sand. Most sand filter systems consist of two-chamber structures. The first chamber is a sediment forebay or chamber, which removes floatables and heavy sediments. The second is the filtration chamber, which removes additional pollutants by filtering the runoff through a sand bed. The filtered runoff is collected and returned to the conveyance system by way of an underdrain system.

Sand filters are typically designed as off-line systems. Stormwater pollutants are removed through a combination of gravitational settling, filtration, and adsorption. Surface sand filters with a grass cover have additional opportunities for bacterial decomposition as well as vegetation uptake of

pollutants, particularly nutrients. Sand filter systems are designed for intermittent flow and must be allowed to drain and reaerate between rainfall events. They should not be used on sites with a continuous flow from groundwater, sump pumps, or other sources.

Because they have few site constraints besides head requirements, sand filters can be used on development sites where the use of other structural controls may be precluded. However, sand filter systems can be relatively expensive to construct and install.

b) Variations

1) Surface sand filter – a ground-level open-air structure that consists of a pretreatment sediment forebay and a filter bed chamber. This system can treat drainage areas up to 10 acres in size and is typically located offline. Surface sand filters can be designed as an excavation with earthen embankments or as a concrete or block structure.

2) Perimeter sand filter – an enclosed filter system typically constructed just below grade in a vault along the edge of an impervious area such as a parking lot. The system consists of a sedimentation chamber and a sand bed filter. Runoff flows into the structure through a series of inlet grates located along the top of the control.

3) Underground sand filter – located in an underground vault designed for high-density land use or ultra-urban applications. Typically, a three-chamber system consists of a sedimentation chamber, a filter chamber, and an overflow chamber. Underground sand filters have a high maintenance burden and should only be used where adequate inspection and maintenance can be ensured. Underground sand filters are typically constructed on-line but can be constructed off-line. For off-line construction, the overflow between the second and third chambers is not included.

DESIGN CRITERIA

The following criteria are minimum standards for the design of a sand filter system, which is acceptable for stormwater quality treatment only and does not provide detention storage. The WQ_v is generally routed to the sand filter using a diversion structure. Runoff more than the WQ_v must be diverted or the sand filter adequately designed to safely pass higher flows to prevent erosion of pretreatment sediment and filter media.

a) Surface Sand Filter Criteria

1) Description - A surface sand filter facility consists of a two-chamber open-air structure, which is located at ground level. The first chamber is the sediment forebay and the second chamber contains the sand filter bed. Flow enters the forebay for settling of larger sediment particles. Runoff is then discharged from the forebay through a perforated standpipe into the filtration chamber. After passing through the filter bed, runoff is collected by a perforated pipe and gravel underdrain system. See the attached schematics of a surface sand filter.

2) The maximum drainage area tributary to a surface sand filter is 10 acres.

3) Surface sand filter geometry:

i. The elevation difference (head) needed from inflow to outflow is 5 feet.

ii. The slope across the filter location shall be a maximum of 6%.

iii. The area of the filter bed is sized using Darcy's Law equation with a filter bed drain time of 36 hours and a coefficient of permeability (k) of 3.5 ft/day.

$$A_f = (WQ_v)(d_f) / [(k)(h_f+d_f)(t_f)]$$

Where:

A_f = surface area of filter bed (ft^2)
WQ_v = water quality volume (ft^3)
d_f = filter bed depth (1.5 feet minimum)
k = coefficient of permeability of filter media (ft/day) (use 3.5 ft/day for sand)
h_f = average height of water above filter bed (ft)
t_f = design filter bed drain time (days) (1.5 days maximum)

4) Pretreatment:

   i. The surface sand filter system shall include a sediment forebay that consists of a separate cell, formed by an acceptable barrier. The forebay shall be sized to contain 25% of the WQ_v.

   ii. The forebay shall have a minimum length-to-width ratio of 2:1.

   iii. Inlet and outlet structures shall be located at opposite ends of the forebay.

   iv. Entrance and exit velocities to the forebay shall be non-erosive. A flow distribution chamber shall be provided at the entrance to the filter media to spread the flow evenly across the surface of the filter media. Erosion protection shall be provided over the filter media using riprap, grass, or other dissipation devices.

5) Filter media shall be a minimum 18-inch layer of clean-washed medium sand (ASTM C-33 concrete sand) on top of an underdrain system. Three inches of topsoil (or other erosion protection) are placed over the sand bed. Permeable filter fabric is required above and below the sand bed to prevent clogging of the sand filter and underdrain system.

6) The underdrain collection system shall consist of a 4- to 6-inch perforated PVC pipe (Schedule 40 or greater in strength) in an 8-inch gravel layer (clean washed aggregate 0.5 to 2-inches in diameter). The underdrain shall have a minimum slope of 1%. A clean-out must be provided and the underdrain pipe must be discharged to an appropriate facility.

7) The surface sand filter structure may be constructed of concrete or earthen embankments. When constructed with earthen walls/embankments, filter fabric shall be used to line the bottom and side slopes of the structures before installation of the underdrain system and filter media.

8) An emergency spillway must be included to safely pass flows that exceed the design storm flows.

b) Perimeter Sand Filter Criteria

1) Description - A perimeter sand filter facility is a vault structure located just below grade level. Runoff enters a sedimentation chamber through inlet grates along the top of the structure. Runoff is discharged from the sedimentation chamber through a weir into the filtration chamber. After passing through the filter, runoff is collected by a perforated pipe and gravel underdrain system. See the attached schematics of a perimeter sand filter.

2) The maximum drainage area tributary to a perimeter sand filter is 2 acres.

3) Perimeter sand filter geometry:

   i. The elevation difference (head) needed from inflow to outflow is 2 to 3 feet.

   ii. The area of the filter bed is sized using Darcy's Law equation with a filter bed drain time of 36 hours and a coefficient of permeability (k) of 3.5 ft/day. (See 3.c. above - surface sand filter criteria.)

4) Pretreatment: The perimeter sand filter system shall include a sediment chamber that consists of a separate cell. The sediment chamber shall be sized to contain 50% of the WQ_v.

5) Filter media shall be a minimum 18-inch layer of clean-washed medium sand (ASTM C-33 concrete sand) on top of an underdrain system. Permeable filter fabric is required between the sand bed and the underdrain gravel layer to prevent clogging.

6) The underdrain collection system shall consist of a 4- to 6-inch perforated PVC pipe (Schedule 40 or greater in strength) in an 8-inch gravel layer (clean washed aggregate 0.5 to 2-inches in diameter). The underdrain shall have a minimum slope of 1%. A clean-out must be provided and the underdrain pipe must be discharged to an appropriate facility.

c) Underground Sand Filter Criteria

1) Description – An underground sand filter is in an underground vault. The filter is a three-chamber system. The first chamber is a sedimentation chamber that temporarily stores runoff and utilizes a wet pool to capture sediment. The sedimentation chamber is connected to the sand filter chamber by a submerged wall that protects the filter bed from oil and trash. The filter bed is 18 to 24 inches deep and may have a protective screen of gravel or permeable geotextile to limit clogging. The sand filter chamber also includes an underdrain system with inspection and clean-out wells. Perforated pipes under the sand filter bed extend into a third chamber that collects filtered runoff. Flows beyond the filter capacity are diverted through an overflow weir.

2) The maximum drainage area tributary to a perimeter sand filter is 2 acres.

3) Underground sand filters are typically constructed online, but can be constructed off-line. For off-line construction, the overflow between the second and third chambers is not included.

4) The underground vault shall be tested for water tightness before the placement of filter layers.

5) Adequate maintenance access must be provided to the sedimentation and filter bed chambers.

d) General

1) Sand filter facilities must be constructed within an easement either platted or legally described and recorded as a perpetual stormwater drainage easement. The easement shall extend a minimum of 30 feet horizontally outside of the facility limits and provide a minimum 10-feet wide access easement. A copy of the easement should be included in the BMP operations and maintenance manual.

2) The sand filter facility shall not be constructed until all contributing drainage areas have been stabilized. The sand filter facility shall not be used as a sediment control measure during active construction.

MAINTENANCE ANDINSPECITON CHECKLIST
SAND FILTERS

Regular inspection and maintenance are critical to the effective operation of sand filter facilities. The following inspection checklist, to be completed at periods indicated, is provided for the BMP owner and should be retained as a record by the owner for five (5) years from the approval date of the Stormwater Pollution Prevention Plan. Evidence of inspection and maintenance shall be provided to the City of Frankfort upon request.

Project Name/Site Location: _____

Owner Name: _____ Phone: _____

Owner Address: _____

Date: _____ Inspector: _____

MAINTENANCE ITEM	YES/NO	COMMENTS
Pretreatment		**Inspect Monthly**
1. Any evidence of erosion?		
2. Are grass clippings removed from contributing areas that are mowed?		
3. Are inlets, outlets, and filter areas clear of debris?		
4. Is the normal pool level being retained (perimeter and underground facilities)? Are any leaks evident?		
5. Other problems evident?		
Filter Bed		**Inspect Monthly**
1. Is the filter bed free of sediments? Is sediment cleanout needed (50% full or 6 inches, whichever is less)?		
2. Is the filter bed free of oil and grease?		
3. If clogging of the filter bed is present, remove the top few inches of sand and replace it.		
4. Any clogging of the underdrain?		
5. Any clogging of the filter fabric?		
6. Other problems evident?		
Structural		**Inspect Annually**
1. Any evidence of deterioration, spalling, or cracking of concrete vault, spillway, etc.?		
2. Are inlet grates in good condition?		
3. Is the overflow structure operating properly?		
4. Other problems evident?		
Other		**Inspect Monthly**
1. Any odors?		
2. Any evidence of flow bypassing the facility?		

Additional Comments:

Recommended Corrective Actions:

Recommended Time for Corrective Actions:

INFILTRATION TRENCHES

QUICK REFERENCE

Description:	Excavated trench filled with stone aggregate used to capture and allow infiltration of stormwater runoff into the surrounding soils from the bottom and sides of the trench.
Site Feasibility:	Residential Subdivision Use: Yes High Density/Ultra-Urban: Yes
Design Criteria:	Pretreatment forebay required. Minimum surrounding soil infiltration rate of 0.5 inches per hour. Excavated trench filled with stone media, pea gravel and sand filter layers Observation well required to monitor percolation.
Advantages:	Good for small sites with porous soil. Good retrofit capability for redevelopment.
Disadvantages:	Geotechnical testing required. High clogging potential; not to be used on sites with fine-particle soils in drainage area.
Maintenance:	Remove sediment from forebay. Inspect for clogging. Replace pea gravel layer as needed.

GENERAL

a) Description

Infiltration trenches are excavations filled with stone to create an underground reservoir of stormwater runoff. The runoff volume gradually exfiltrates through the bottom and sides of the trench into the subsoil over a 2-day period and eventually reaches the water table. By diverting runoff into the soil, an infiltration trench treats the water quality volume and helps to preserve the natural water balance on a site and can recharge groundwater and preserve base flow. Due to this fact, infiltration systems are limited to areas with highly porous soils where the water table and/or bedrock are located well below the bottom of the trench. Infiltration trenches must be carefully sited to avoid the potential of groundwater contamination.

Infiltration trenches are not intended to trap sediment and must always be designed with a sediment forebay and grass channel or filter strip, or other appropriate pretreatment measures to prevent clogging and failure. The facility is only for impervious areas where there are not high levels of fine particulates (clay/silt soils) in the runoff and will only be considered for sites where the sediment load is relatively low.

A separation distance of 4 feet is required between the bottom of the infiltration trench and the elevation of the seasonally high-water table.

Infiltration trenches are designed for intermittent flow and need to drain and reaerate between rainfall events. The systems should not be used on sites with a continuous flow from groundwater, sump pumps, or other sources.

Infiltration trenches shall not be used for manufacturing and industrial sites, where there is a potential for high concentrations of soluble pollutants and heavy metals. In addition, infiltration shall not be considered for areas with a high pesticide concentration.

DESIGN CRITERIA

The following criteria are minimum standards for the design of an infiltration trench, which is designed for stormwater quality treatment only. Flow from runoff more than the WQ_v must be diverted. The WQ_v in the infiltration trench can be subtracted from detention storage requirements for the contributing area.

a) The maximum drainage area tributary to an infiltration trench is 5 acres.

b) Underlying soils shall have a minimum infiltration rate (f_c) of 0.5 inches per hour as determined from geotechnical tests. The minimum geotechnical testing is one test hole per 5,000 ft^2, with a minimum of two borings per facility taken within the limits of the facility. Infiltration trenches cannot be used in fill soils.

c) Soils on the drainage area tributary to an infiltration trench shall have a clay content of less than 20% and a silt/clay content of less than 40% to prevent clogging and failure.

d) Clay lenses, bedrock, and other restrictive layers below the bottom of the trench will reduce infiltration rates unless excavated.

e) To reduce the potential for costly maintenance and/or system reconstruction, the trench should be in an open or lawn area. Infiltration trenches shall not be located beneath paved surfaces.

f) Minimum setback requirements for infiltration trench facilities (unless otherwise specified by local ordinance or criteria):

   1) From a property line – 10 feet

   2) From a building foundation – 25 feet

   3) From a private well – 100 feet

   4) From a public water supply well – 1,200 feet

   5) From a septic system tank/leach field – 100 feet

   6) From surface waters – 100 feet

   7) From surface drinking water sources – 400 feet (100 feet for a tributary)

g) Infiltration trench geometry:

   1) The required trench storage volume is equal to the WQ_v.

2) The trench must be designed to fully dewater the WQ_v within 24 to 48 hours. The slowest infiltration rate obtained from geotechnical tests performed at the site should be used in the design calculations.

3) Trench depths should be 3 to 8 feet. The width of the trench must be less than 25 feet.

4) Broader, shallow trenches reduce the risk of clogging by spreading the flow over a larger area for infiltration.

5) The surface area is calculated based on the trench depth, soil infiltration rate, aggregate void space, and fill time (assume a fill time of 2 hours for most designs).

6) The bottom of a trench shall be flat across its length and width to evenly distribute flow, encourage uniform infiltration through the bottom, and reduce the risk of clogging.

7) Stone aggregate should be washed, bank-run gravel, 1.5 to 2.5 inches in diameter with a void space of about 40%. Aggregate contaminated with soil shall not be used. A porosity value (void space/total volume) of 0.32 should be used in calculations unless aggregate specific data exists.

8) A 6-inch layer of clean, washed sand is placed on the bottom of the trench to encourage drainage and prevent compaction of the native soil while the stone aggregate is added.

9) The trench shall be lined on the sides and top by an appropriate geotextile filter fabric that prevents soil piping but has greater permeability than the parent soil. The top layer of filter fabric is placed 2 to 6 inches from the top of the trench to prevent sediment from passing into the stone aggregate. This top layer will need to be replaced more frequently and must be readily separated from the side section.

10) The top surface of the trench above the filter fabric is covered with pea gravel to improve sediment filtering. It shall be removed and replaced should the device clog. Alternatively, the trench can be covered with permeable topsoil and planted with grass in a landscaped area.

11) An observation well consisting of 4- to 6-inch perforated PVC pipe must be installed and extended to the bottom of the trench. The well should be installed along the centerline of the structure, flush with the ground elevation of the trench. A visible floating marker shall be provided to indicate the water level.

12) The trench excavation shall be limited to the width and depth specified in the design. The bottom of the excavated trench shall not be loaded in a way that causes soil compaction and shall be scarified prior to placement of sand. The sides of the trench shall be trimmed of all large roots.

h) Pretreatment:

1) For an infiltration trench receiving sheet flow from an adjacent drainage area, the pretreatment system may consist of a vegetated filter strip with a minimum 25-foot length. A vegetated buffer strip around the entire trench is required if the facility is receiving runoff from other directions. See the attached schematic for design criteria for the vegetated filter strip.

2) For off-line applications, pretreatment shall consist of a sediment forebay or similar sedimentation chamber (with energy dissipaters) sized to 25% of the WQ_v. Exit velocities from the pretreatment chamber must be nonerosive.

i) Overflow structure - a nonerosive overflow channel must be provided to safely pass flows from the infiltration trench that exceeds the system storage capacity to a stabilized downstream area or watercourse.

j) Infiltration trenches must be constructed within an easement either platted or legally described and recorded as a perpetual stormwater drainage easement. The easement shall extend a minimum of 30 feet horizontally outside of the system limits and provide a minimum 10-feet wide access easement. A copy of the easement should be included in the BMP operations and maintenance manual.

k) The infiltration trench shall not be constructed until all contributing drainage area has been stabilized. The infiltration trench shall not be used as a sediment control measure during active construction.

MAINTENANCE AND INSPECTION CHECKLIST
INFILTRATION TRENCHES

Regular inspection and maintenance are critical to the effective operation of infiltration trenches. The following inspection checklist, to be completed at periods indicated, is provided for the BMP owner and should be retained as a record by the owner for five (5) years from the approval date of the Stormwater Pollution Prevention Plan. Evidence of inspection and maintenance shall be provided to the City of Frankfort upon request.

Project Name/Site Location: _____

Owner Name: _____ Phone: _____

Owner Address: _____

Date: _____ Inspector: _____

MAINTENANCE ITEM	YES/NO	COMMENTS
Vegetation/Pretreatment		**Inspect Monthly**
1. Any evidence of erosion? Does the filter strip need to be reseeded?		
2. Are grass clippings removed from contributing areas that are mowed?		
3. Are inlets and filter areas clear of debris?		
4. Sedimentation marker visible?		
5. Sediment cleanout needed (50% full)?		
6. Other problems evident?		
Trench		**Inspect Monthly**
1. Any vegetative growth in the trench area?		
2. Are observation wells clear of water after 3 days of dry weather?		
3. Does pea gravel/topsoil need to be replaced due to clogging?		
4. Does the top surface filter fabric need to be replaced due to clogging?		
5. Other problems evident?		
6. Upon failure of the trench, perform total rehabilitation to maintain design storage capacity. Excavate trench walls to expose clean soil.		

Additional Comments:

Recommended Corrective Actions:

Recommended Time for Corrective Actions:

BIOFILTERS

QUICK REFERENCE

Description:	Uniformly graded and densely vegetated sections of land engineered and designed to treat runoff and remove pollutants through vegetative filtering and infiltration.
Site Feasibility:	Residential Subdivision Use: Yes High Density/Ultra-Urban: No
Design Criteria:	Requires slopes between 2% and 6%. Level spreader required where concentrated runoff flows into biofilter.
Advantages:	Relatively inexpensive to install. Reduces runoff velocities. Aesthetic qualities and preservation of riparian zones.
Disadvantages:	TSS removal is less than 80%. Cannot be used on steep slopes. Large land requirement.
Maintenance:	Maintain grass height of 2 to 6 inches. Requires periodic sediment removal.

GENERAL

a) Description

Biofilters are densely vegetated sections of land designed to treat runoff and remove pollutants through vegetative filtering and infiltration. Biofilters must receive runoff from adjacent areas as sheet flow to provide treatment and prevent erosion. The vegetation slows the runoff and filters out sediment and other pollutants. Biofilters provide less than 80% TSS removal but can be used as pretreatment measures in conjunction with other water quality treatment practices.

Biofilters are best suited to treat runoff from roads and highways, rooftops, small parking lots, and pervious surfaces. Biofilters can be incorporated into residential developments as land-use buffers and setbacks.

b) Variations

1) Filter strip – a uniformly graded and densely vegetated strip of land. The vegetation can be grass or a combination of grass and woody plants.

2) Riparian buffer – a strip of land with natural, woody vegetation along a stream or other watercourse. The riparian zone includes deep-rooted trees with undergrowth of grasses and herbaceous vegetation.

DESIGN CRITERIA

The following criteria are minimum standards for the design of biofilters, which can be used as pretreatment in conjunction with other water quality measures. Biofilters alone do not fulfill the 80% TSS removal requirement.

a) Uniform sheet flow must be maintained across the entire biofilter using consistent grades and low slopes. The biofilter area shall be free of gullies or rills that can concentrate overland flow.

b) Filter strips can be used as pretreatment measures. The minimum length (parallel to the flow path) sizing criteria shall be:

1) Impervious area approach length of 35 feet or less – 15 feet minimum filter strip length.

2) Impervious area approach length of 35 to 75 feet – 25 feet minimum filter strip length.

3) Pervious area approach length of 75 feet or less – 12 feet minimum filter strip length.

4) Pervious area approach length of 75 to 100 feet – 18 feet minimum filter strip length.

c) A level spreader is required at the end of sheet flow paths longer than 75 feet for impervious surfaces and 100 feet for pervious surfaces. In addition, areas of concentrated runoff tributary to a biofilter shall require a level spreader.

1) The maximum drainage area tributary to a biofilter is 10 acres with 5 acres preferred.

2) The level spreader shall have a 0% slope and encompass the entire width of the biofilter (perpendicular to the flow path).

3) The slope of the surface before the level spreader should provide a smooth transition into the spreader.

i. If a channel is directing runoff to the level spreader, the last 20 feet of the channel shall have a slope of 1% or less and shall provide a smooth transition of flow to the level spreader. The depth of the level spreader must be a minimum of six inches. The level spreader lip must be constructed on undisturbed soil to a uniform height and 0% slope over the length of the spreader to ensure even runoff distribution.

ii. If the runoff is being directed to the level spreader overland as sheet flow, the last 20 feet of the ground shall be 6% or less.

4) A pea gravel diaphragm at the top of the slope of a biofilter receiving sheet flow provides settling of sediment particles and acts as a level spreader, maintaining sheet flow over the biofilter.

d) Filter strip geometry: The filter strip should be designed based on Manning's equation for channel design using the following criteria:

1) Rectangular shape for the filter strip.

2) Maximum design flow depth of 0.5 inches.

3) Velocity no greater than 0.9 ft/s to prevent flattening of grasses.

4) Manning's n of 0.02 for grassed strips, 0.024 for infrequently mowed strips, or appropriate n for wooded strips.

5) The width of the strip shall be dependent upon where uniform flow is obtained from the site.

6) Because the strip is wide, the hydraulic radius approaches the flow depth and is taken to be equal to the design flow depth.

7) The slope is between 2% and 6%.

8) Dense grasses must be specified.

e) Riparian zone geometry: At a minimum, a riparian zone should consist of a 20-foot strip of trees and herbaceous vegetation closest to the stream or watercourse and a 30-foot strip of dense grasses before the tree zone.

f) Biofilters must be constructed within an easement either platted or legally described and recorded as a perpetual stormwater drainage easement. The easement shall encompass the biofilter and level spreader and provide a minimum 10-foot-wide access easement. A copy of the easement should be included in the BMP operations and maintenance manual.

MAINTENANCE AND INSPECTION CHECKLIST
BIOFILTERS

Regular inspection and maintenance are critical to the effective operation of biofilters. The following inspection checklist, to be completed at periods indicated, is provided for the BMP owner and should be retained as a record by the owner for five (5) years from the approval date of the Stormwater Pollution Prevention Plan. Evidence of inspection and maintenance shall be provided to the City of Frankfort upon request.

Project Name/Site Location: _____

Owner Name: _____ Phone: _____

Owner Address: _____

Date: _____ Inspector: _____

MAINTENANCE ITEM	YES/NO	COMMENTS
Vegetation		**Inspect Monthly**
1. Is vegetation and/or grass cover dense and vigorous?		
2. Any gullies or rills present?		
3. Any erosion evident?		
4. Any sediment build-up present?		
5. Is grass height maintained at 2 to 6 inches?		
6. Other problems evident?		
Level Spreader		**Inspect Monthly**
1. Is vegetation and/or grass cover dense and vigorous?		
2. Any signs of erosion on lip of spreader?		
3. Any sediment build-up present?		
2. Does pea gravel diaphragm need to be cleaned out due to sediment build-up?		
3. Does pea gravel diaphragm need to be replaced due to clogging?		
4. Other problems evident?		

Additional Comments:

Recommended Corrective Actions:

Recommended Time for Corrective Actions: