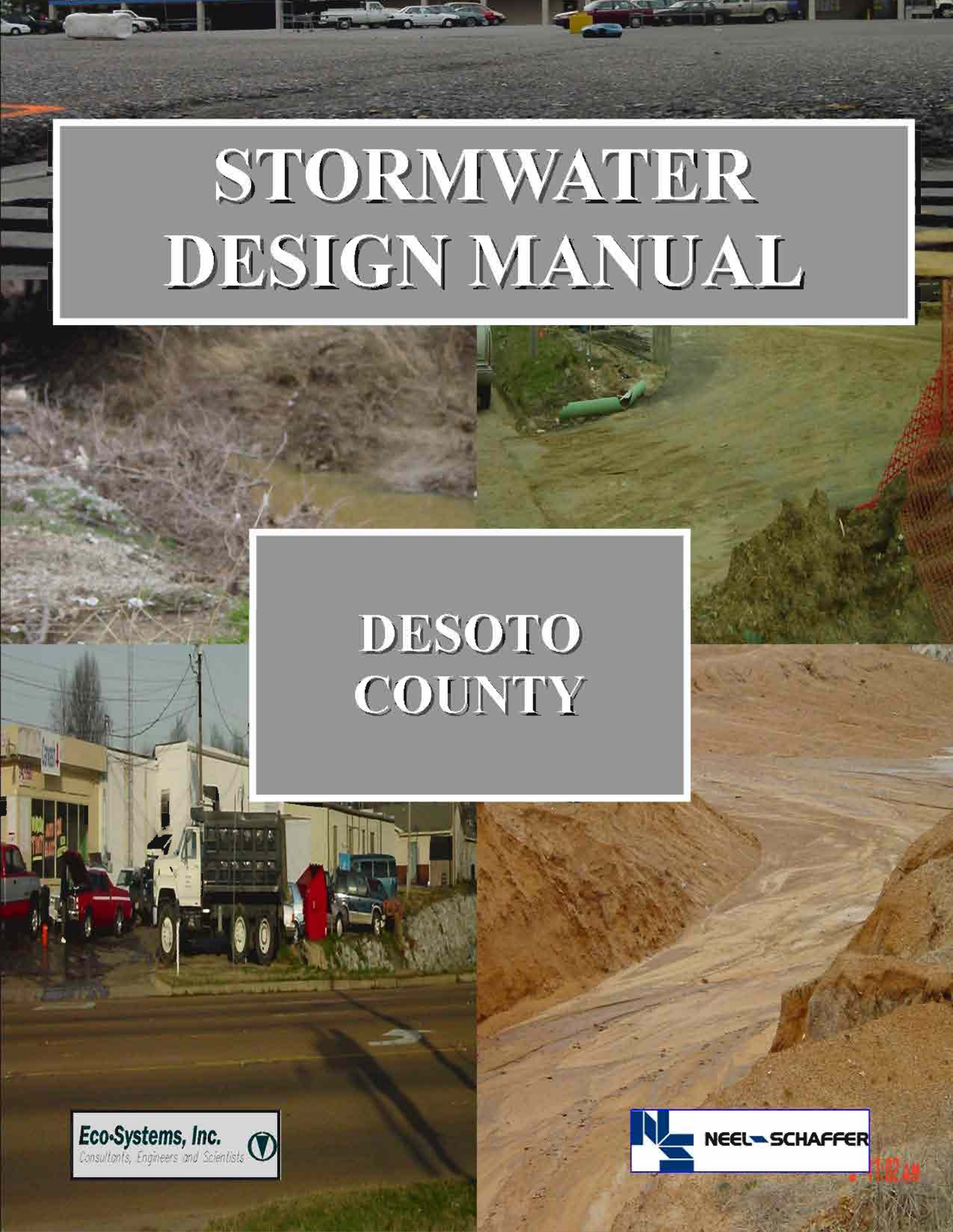

STORMWATER DESIGN MANUAL

DESOTO COUNTY

Eco-Systems, Inc.
Consultants, Engineers and Scientists

NEEL-SCHAFFER

STORMWATER DESIGN MANUAL

TABLE OF CONTENTS

Some of the material in this manual may have been adapted, manipulated, used or copied from:

1. "Planning & Design Manual for the Control of Erosion, Sediment & Stormwater". First Edition, April 1994. MDEQ, MSWCC, and USDASCS.

2. "Mississippi Gulf Coat Stormwater Management Toolbox – Comprehensive Resource Management Plan, Volumes I & II". October 2003, The Mississippi Department of Marine Resources, MDEQ, Eco-Systems, Inc., Neel-Schaffer, Inc.

3. "An NPDES Inspection Program That Works." Stormwater. November/December 2002.

4. Missouri's Department of Natural Resources Website Address. www.dnr.state.mu.us.

SECTION 1

PROGRAM OVERVIEW

SECTION 1.1

SUMMARY AND OVERVIEW

1.0 STORMWATER PHASE II PROGRAM OVERVIEW

BACKGROUND

Amendments to the Clean Water Act established a two-phased approach to manage stormwater runoff and address non-point source pollution. The United States Environmental Protection Agency (EPA) was the designated agency to develop and implement the Stormwater Phase I and Phase II Programs. The Stormwater Phase I Program was promulgated under the Clean Water Act in 1990. Phase I addressed stormwater runoff associated with larger municipalities and counties (100,000 residents or greater), construction activities disturbing 5 acres or more, and industrial facilities within eleven specific categories. EPA's next step in achieving the goals of reducing pollutants to the maximum extent practicable and protecting water quality was to develop the Phase II Program in 1999. The Stormwater Phase II Program expanded the existing Phase I Program to include smaller municipalities and counties (50,000 residents or more and a population density of 1,000 residents per square mile) and construction activities that disturb one acre or greater.

AFFECTED ENTITIES

Municipalities and counties designated under Phase II included (1) small municipal separate storm sewer systems (MS4s) within urbanized areas, (2) any MS4 contributing substantially to stormwater pollutant loading of a regulated physically interconnected MS4, and (3) any small MS4 meeting the criteria for designation as established by the Mississippi Department of Environmental Quality (MDEQ). There were thirty-two municipalities and counties within Mississippi required to develop and implement a Stormwater Phase II Program. The designated cities and counties were as follows:

Bay St. Louis	Gautier	Lamar County	Pass Christian
Biloxi	Gulfport	Long Beach	Pearl
Brandon	Hancock County	Madison	Petal
Clinton	Harrison County	Madison County	Rankin County
D'Iberville	Hattiesburg	Moss Point	Richland
DeSoto County	Hinds County	Ocean Springs	Ridgeland
Flowood	Horn Lake	Olive Branch	Southaven
Forrest County	Jackson County	Pascagoula	Waveland

For a detailed list of contacts for the local designated entities, please see the Directory of Designated Phase II Entities provided as **APPENDIX A.**

2.0 GENERAL PROGRAM REQUIREMENTS

As federally-mandated, the designated cities and counties are to develop and implement a stormwater management program, evaluate and assess the program, and submit periodic reports. Six minimum control measures are to be implemented under Phase II Stormwater Permits. The minimum measures are (1) public education and outreach; (2) public involvement and participation; (3) illicit discharge detection and elimination; (4) construction site stormwater runoff control; (5) post-construction stormwater management in areas of new development and redevelopment; and (6) pollution prevention and good housekeeping. Best Management Practices (BMPs) and measurable goals associated with the BMPs are to be implemented in an effort to ensure success of the six minimum control measures in achieving water quality improvements. The deadline for municipalities and counties to submit the program and Notice of Intent to obtain permit coverage was March 10, 2003

3.0 PURPOSE OF THIS MANUAL

The purpose of this manual is to furnish additional policy, criteria and information, including specifications and standards, for the proper implementation of the requirements of Stormwater Ordinance No. _____. Of the six required Phase II Stormwater control measures, the primary focus of this manual shall be on illicit discharge detection and elimination, construction site stormwater runoff control, and post-construction stormwater management. This manual includes a list of acceptable Stormwater treatment practices, including the specific design criteria for each Stormwater practice. It shall also include operation, permitting, and inspection checklists which shall be used by the AEA and/or Contractor in evaluating Stormwater practices. The manual may be updated and expanded from time to time based on improvements in engineering, science, monitoring and local maintenance experience. Stormwater treatment practices that are designed and constructed in accordance with these design and sizing criteria will be presumed to meet the minimum water quality performance standards.

SECTION 1.2

MDEQ GENERAL PERMIT

STATE OF MISSISSIPPI
DAVID RONALD MUSGROVE, GOVERNOR
MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY
CHARLES H. CHISOLM, EXECUTIVE DIRECTOR

June 26, 2003

CERTIFIED MAIL NO: 7002 0510 0001 8860 2903
Mr. David Armstrong, County Administrator
DeSoto County,
365 Losher Street, Suite 300
Hernando, Mississippi

Dear Mr. Armstrong:

Re: DeSoto County, MS4 Stormwater Management Program, Desoto County
Small MS4 General Permit
Coverage. No. MSRMS4006

Enclosed is a Certificate of Coverage granting DeSoto County coverage under Mississippi's Small Municipal Separate Storm Sewer System (MS4) General NPDES permit (copy enclosed). The submitted Storm Water Management Program (SWMP) appears to meet permit requirements and will be reviewed further during compliance inspections and audits. The SWMP must be implemented according to the schedule outlined in the program and be fully implemented within five years from the date of permit issuance. Annual reports summarizing the progress made in implementing the conditions of the permit and elements of the SWMP must be submitted to MDEQ no later than the 28th day of January, each year for the term of the permit. The annual reports must address minimum elements identified in Part V. C. of the permit and any modifications to the program must be in accordance with Part IV.D.

This permit coverage is issued in accordance with the provisions of the Mississippi Air and Water Pollution Control Law (Sections 49-17-1, et seq., Mississippi code of 1972), and the regulations and standards adopted and promulgated thereunder and under the authority granted to the Mississippi Environmental Quality Permit Board pursuant to Section 402(b) of the Federal Water Pollution Control Act. Any appeal of this action must be made within the 30-day period provided for in Section 49-17-29(4)(b) Mississippi code of 1972.

Sincerely,

Jim Morris, Chief
General Permits Branch

Enclosures
17801 GNP20030001

State of Mississippi
Department of Environmental Quality
Office of Pollution Control

Certificate of Permit Coverage

under Mississippi's Small Municipal Separate Storm Sewer System (MS4) Storm Water General NPDES Permit

Be it known

DeSoto County, Mississippi

having submitted an acceptable Small Municipal Separate Storm Sewer System Notice of Intent (MS4 NOI), is hereby granted this Certificate of Permit Coverage in order to discharge storm water from small storm sewer systems owned and operated by

DeSoto County

Receiving Streams: State Waters including Horn Lake, Coldwater River, Hurricane Creek, Mussacuna Creek, Cane-Mussacuna Creek, Lower and Upper Camp Creek, Pigeon Roost Creek Creek, Rock Creek, Short Fork Creek, Johnson Creek, Jackson Creek, White Creek

Chief, General Permits Branch

Coverage No: MSRMS4006
Date of Coverage: June 26, 2003
Date First Annual Report is due January 28, 2004
Date Coverage Expires: November 30, 2007

17801 GNP20030001

State of Mississippi
Mississippi Department of
Environmental Quality (MDEQ)
Office of Pollution Control (OPC)
Water Pollution Control

MISSISSIPPI SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEM (MS4) GENERAL PERMIT

FOR CITIES, COUNTIES AND OTHER DESIGNATED ENTITIES

TO DISCHARGE STORM WATER IN ACCORDANCE WITH THE NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

THIS CERTIFIES THAT

MS4s ISSUED A CERTIFICATE OF PERMIT COVERAGE UNDER THIS PERMIT ARE GRANTED PERMISSION TO DISCHARGE

STORM WATER FROM SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEMS

INTO

STATE WATERS

in accordance with effluent limitations, inspection requirements and other conditions set forth in Parts I through VII hereof. This permit is issued in accordance with the provisions of the Mississippi Water Pollution Control Law (Section 49-17-1 et seq., Mississippi Code of 1972), and the regulations and standards adopted and promulgated thereunder, and under authority granted pursuant to Section 402(b) of the Federal Water Pollution Control Act.

MISSISSIPPI ENVIRONMENTAL QUALITY PERMIT BOARD

_____

AUTHORIZED SIGNATURE

MISSISSIPPI DEPARTMENT OF ENVIRONMENTAL QUALITY

Permit Issued: December 10, 2002 **Permit No. MSRMS4**

Permit Expires: November 30, 2007

SMALL MS4 STORM WATER
GENERAL NPDES PERMIT

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PART I. PERMIT APPLICABILITY AND COVERAGE

A. PERMIT AREA

The permit covers the State of Mississippi.

B. ELIGIBILITY

1. The permitting of selected storm sewer systems is required as a result of the U.S. Environmental Protection Agency's Phase II Storm Water Rule. This permit authorizes discharges of storm water from small Municipal Separate Storm Sewer Systems (MS4s), as defined in 40 CFR 122.26(b)(16). MS4s are authorized to discharge under the terms and conditions of this general permit that:

   - operate a small MS4 within the State of Mississippi, and
   - are located fully or partially within an urbanized area as determined by the latest census by the Bureau of Census and pursuant to 40 CFR 122.32, or
   - as designated by the Mississippi Commission on Environmental Quality (Commission) pursuant to 40 CFR 122.32(a)(2), 122.32(b), or 123.35(b)(3) or (4).

2. For the Mississippi Department of Transportation (MDOT), at a minimum, permit coverage must be obtained for the entire counties (including cities within) of: DeSoto, Forrest, Hancock, Harrison, Hinds, Jackson, Lamar, Madison and Rankin.

3. The discharges of storm water commingled with discharges authorized by and in compliance with separate NPDES permits are authorized under this permit.

4. This permit authorizes the following non-storm water discharges provided: (1) they do not cause or contribute to a violation of water quality standards, (2) the Executive Director of the Mississippi Department of Environmental Quality (MDEQ) has determined these sources entering the MS4 are not a substantial cause or contributor of pollutants entering the MS4 that may violate applicable state or federal laws, regulations, or criteria, (3) the regulated entity has determined these sources entering the MS4 are not a substantial contributor of pollutants entering the MS4 that may violate applicable state or federal laws, regulations, or criteria, and (4) the regulated entity is implementing the Storm Water Management Program as set forth in Part IV. of this permit:

   - water line flushing
   - landscape irrigation
   - diverted stream flows
   - rising ground waters
   - uncontaminated ground water infiltration (infiltration is defined as water other than wastewater that enters a storm sewer system, including sewer service connections and foundation drains, from the ground through such means as defective pipes, pipe joints, connections, or manholes. Infiltration does not include, and is distinguished from, inflow.)
   - uncontaminated pumped ground water
   - discharges from potable water sources
   - foundation drains
   - air conditioning condensate
   - irrigation water
   - springs
   - water from crawl space pumps
   - footing drains
   - lawn watering runoff
   - water from individual residential car washing
   - flows from riparian habitats and wetlands
   - dechlorinated swimming pool discharges
   - street wash water
   - discharges or flows from fire fighting activities
   - fire hydrant flushings
   - external building wash downs which do not use detergents

C. LIMITATIONS ON COVERAGE

1. This permit does **not** authorize:

   a. Storm water discharges that are mixed with non-storm water unless such non-storm water discharges are in compliance with a separate NPDES permit.

   b. Storm water discharges that are mixed with non-storm water discharges and that are determined to be a substantial contributor of pollutants to waters of the United States.

   c. Storm water discharges associated with industrial activity as defined in 40 CFR 122.26(b)(14) (i) – (ix) and (xi).

   d. Storm water discharges associated with construction activity as defined in 40 CFR 122.26(b)(14)(x) or 40 CFR 122.26(b)(15).

   e. Discharges or discharge-related activities that are likely to jeopardize the continued existence of any species that is listed as endangered or threatened under the Endangered Species Act (ESA) or result in the adverse modification or destruction of habitat that is designated as critical under the ESA. Coverage under this permit is available only if the regulated entity's storm water discharges, allowable non-storm water discharges, and discharge-related activities are not likely to jeopardize the continued existence of any species that is listed as endangered or threatened ("listed") under the ESA or result in the adverse modification or destruction of habitat that is designated as critical under the ESA ("critical habitat").

   f. Implementation of a Storm Water Management Program (SWMP) which directly and adversely affect properties listed or eligible for listing in the National Register of Historic Places, unless the regulated entity is in compliance with requirements of the National Historic Preservation Act and has coordinated any necessary activities to avoid or minimize such direct and adverse impacts with the appropriate State Historic Preservation Officer.

   g. Storm water discharges, which result in violation of State Water Quality Standards.

2. Submission of a signed NOI will be deemed to constitute the regulated entity's certification of eligibility regarding Part I. C. 1. e. and 1. f. of this permit.

D. OBTAINING AUTHORIZATION

1. The regulated entity must submit a MS4 Notice of Intent (MS4 NOI) and a Storm Water Management Program (SWMP) in accordance with the requirements of Part II. of this permit.

2. Upon review of the MS4 NOI, the staff may require additional information, deny coverage, or require an alternate permit. Staff decisions may be brought before the Mississippi Environmental Quality Permit Board (Permit Board) for review and reconsideration at a regularly scheduled meeting.

3. A regulated entity is authorized to discharge storm water from its MS4 under the terms and conditions of this permit, only upon receipt of written notification of approval of coverage by the Permit Board. Discharge of storm water by a regulated entity without written notification of coverage or issuance of an individual NPDES Storm Water Permit by the Permit Board is a violation of State law.

4. In the event that a regulated entity: (1) submits an MS4 NOI in a timely manner, and (2) substantially complies with the requirements of the general permit, including development of the Storm Water Management Program, the discharges occurring between the submission of the MS4 NOI and the issuance of notification of coverage shall be considered in compliance with this permit.

E. REQUIRING AN INDIVIDUAL PERMIT OR ALTERNATIVE GENERAL PERMIT

1. The Permit Board may require the regulated entity to apply for and obtain an individual NPDES permit instead of coverage under this permit. Any interested person may petition the Permit Board to take action under this paragraph in accordance with Section 49-17-29 of the Mississippi Code. The Permit Board may require the regulated entity to apply for an individual NPDES permit only after they have been notified in writing. This notice shall include reasons for this decision, an application form and a filing deadline. The Permit Board may grant additional time upon request. If the regulated entity fails to submit a requested application in a timely manner, coverage under this permit is automatically terminated at the end of the day specified for application submittal.

2. The regulated entity may request to be excluded from permit coverage by applying for an individual permit. The regulated entity shall submit an individual application in accordance with 40 CFR 122.33 (2) (i – iii).

3. Coverage under this permit is automatically terminated on the issuance or coverage date of the respective alternate individual NPDES permit. When an alternate individual NPDES permit is denied, coverage under this permit continues unless terminated on the date of such denial by the Permit Board.

PART II. SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEM NOTICE OF INTENT (MS4 NOI)

A. DEADLINES FOR NOTIFICATION

1. A regulated entity desiring coverage for storm water discharges under this general permit shall submit a MS4 NOI form. If the regulated entity is automatically designated under 40 CFR 122.32(a)(1), then the regulated entity is required to submit a MS4 NOI and storm water management plan by March 10, 2003. For regulated entities that have been designated by the Commission pursuant to 40 CFR 122.32(a)(2), the regulated entity is required to submit an MS4 NOI and storm water management plan within 180 days of designation by the Commission. If a late MS4 NOI is submitted, the regulated entity's authorization is only for discharges that occur after permit coverage is granted. The Commission reserves the right to take appropriate enforcement actions for any unpermitted discharges during the period of March 10, 2003 to the time that the regulated entity obtains coverage.

   MS4 NOI forms may be obtained from MDEQ by calling 601/961-5171. MS4 NOI forms, as well as the general permit and guidance manual, and may also be found on the MDEQ web site at www.deq.state.ms.us.

2. For regulated entities covered by a previous Small Municipal Separate Storm Sewer System (MS4) General Permit, re-coverage must be made in accordance with the requirements of the reissued permit.

B. CONTENTS OF THE MUNICIPAL SEPARATE STORM SEWER SYSTEM NOTICE OF INTENT

The Notice of Intent shall be signed in accordance with Part VI. E. of this permit and shall include the following information:

1. The name of the regulated entity, mailing address, and telephone number specifying the contact person.

2. An indication of whether the regulated entity is a Federal, State, County, Municipal, or other public entity.

3. The urbanized area where your MS4 is located; the name of your organization, and county(ies) where your MS4 is located.

4. The name of the major (named on a USGS Quad Map) receiving water(s).

5. A list of receiving waters that are on the latest State of Mississippi 303(d) list of impaired waters.

6. If relying on another governmental entity regulated under the storm water regulations (40 CFR 122.26 & 122.32) to satisfy one or more of the regulated entity's permit obligations, the identity of that entity or entities and the element(s) they will be implementing must be submitted. If the entity that the permitted MS4 operator is relying on to carry out the requirements of the minimum control measure fails to meet the permit requirements, it is the regulated entity's responsibility to assure compliance.

7. As an attachment to the MS4 NOI, **a Storm Water Management Program (SWMP)** must be submitted that includes the minimum requirements of Part IV. A. and B. of this permit.

C. JOINT MUNICIPAL SEPARATE STORM SEWER SYSTEM NOTICE OF INTENT (MS4 NOI)

A regulated entity may, pursuant to the Mississippi Storm Water Management District Act, Miss. Code Ann § 51-39-1 et. Seq., or under other applicable authority, partner with another regulated entity to develop and/or implement a SWMP. However, each regulated entity remains responsible for the implementation of the SWMP in their MS4. Each regulated entity must complete the joint MS4 NOI form. The SWMP must clearly describe which regulated entity will be implementing each control measure.

D. WHERE TO SUBMIT THE MUNICIPAL SEPARATE STORM SEWER SYSTEM NOTICE OF INTENT (MS4 NOI)

Complete and appropriately signed MS4 NOI forms must be submitted to:

Chief, Environmental Permits Division
MS Dept of Environmental Quality, Office of Pollution Control
P.O. Box 10385
Jackson, Mississippi 39289-0385

E. FAILURE TO NOTIFY

Failure to submit a MS4 NOI in accordance with State and Federal Law and Regulations, or as required by this general permit and discharges of storm water from regulated MS4s to waters of the State without coverage under this permit or an individual NPDES permit are violations of State law.

PART III. SPECIAL CONDITIONS

A. DISCHARGES TO WATER QUALITY IMPAIRED WATERS AND TOTAL MAXIMUM DAILY LOAD (TMDL) ALLOCATIONS

If there are storm water discharges to a 303(d) listed impaired water, the SWMP must include a section describing how the program will control the discharge of the pollutants of concern and not cause or contribute to violations of water quality standards. The required description must identify specific measures and Best Management Practices (BMPs) that will be implemented to collectively control the discharge of the pollutants of concern so as not to cause or contribute to violations of water quality standards. During the term of the permit (5 years), additional measures may be required when a Total Maximum Daily Load (TMDL) has been specified for a receiving waterbody or when a Watershed Management Plan has been adopted for a watershed.

B. DISCHARGE COMPLIANCE WITH WATER QUALITY STANDARDS

Discharges must not be causing or have the reasonable potential to cause or contribute to a violation of a water quality standard. If a discharge authorized under this permit is later determined to cause or have the reasonable potential to cause or contribute to the violation of an applicable water quality standard, MDEQ will notify the regulated entity of such water quality violation(s) in writing and will provide the public information used by MDEQ to make this determination. The regulated entity must take all necessary actions required by their SWMP to ensure future discharges do not cause or contribute to the violation of a water quality standard and document these actions in the SWMP. If such violations remain or re-occur, then additional measures such as the addition of BMPs or the requirement to obtain an individual permit may be required by the Permit Board. Compliance with this requirement does not preclude any enforcement activity as provided by the Clean Water Act for the underlying violation.

PART IV. STORM WATER MANAGEMENT PROGRAM (SWMP)

A. REQUIREMENTS

The regulated entity must develop, implement, and enforce a Storm Water Management Program (SWMP) designed to reduce the discharge of pollutants from its Municipal Separate Storm Sewer System (MS4) to the maximum extent practicable (MEP) to protect water quality and to satisfy applicable water quality requirements of the Clean Water Act. The SWMP is not required to address discharges into the regulated MS4 that occur outside the jurisdiction (not owned or operated by the regulated entity) of the regulated entity. The SWMP should include management practices; control techniques and system design, and engineering methods; and such other provisions necessary for the control of pollutants to satisfy the applicable water quality requirements of the Clean Water Act. The SWMP and MS4 NOI must be submitted by March 10, 2003. A regulated entity's SWMP must include the minimum control measures described in Section B. of this Part. The SWMP, at a minimum, must be implemented for the entire urbanized area, or if designated separately by the MDEQ Executive Director, the entire designated area. To the extent available to it, MDEQ will provide to the regulated entity EPA maps of the relevant urbanized area. The plan must identify:

1. Best Management Practices (BMPs) that the regulated entity or partner regulated entity will implement for each of the storm water minimum control measures.

2. Measurable goals for each of the BMPs including, as appropriate, the years in which the regulated entity will undertake required actions, including interim milestones and the frequency of the action.

3. Responsible persons for implementing or coordinating the BMPs for the SWMP.

4. In addition to the requirements listed above, the regulated entity must:

    a. Provide a rationale for how and why the regulated entity selected each of the BMPs and measurable goals for the SWMP.

    b. Develop and fully implement the regulated entity's program by five years from permit issuance.

    c. Implement BMPs and set measurable goals that are targeted to addressing existing water quality problems and preventing new water quality problems.

B. SIX MINIMUM CONTROL MEASURES

The six minimum control measures to be included in the SWMP are:

1. Public education and outreach on storm water impacts

The regulated entity must:

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

b. Define appropriate BMPs for this minimum control measure and measurable goals for each BMP.

c. Document the decision process for the development of a storm water public education and outreach program. The regulated entity's rationale statement must address both the overall public education program and the individual BMPs, measurable goals, and responsible persons for this program. The rationale statement must include the following information, at a minimum:

    (1) How the regulated entity plans to inform individuals and households about the steps they can take to reduce storm water pollution such as proper septic system maintenance, proper

use and disposal of landscape and garden chemicals including fertilizers and pesticides, protecting and restoring riparian vegetation and properly disposing of used motor oil or household hazardous waste.

(2) How the regulated entity plans to inform individuals and groups on how to become involved in the storm water program (with activities such as storm drain stenciling/marking, adopt-a-stream, and liter clean-up projects).

(3) Who are the target audiences for the education program who are likely to have significant storm water impacts (including commercial, industrial and institutional entities) and why those target audiences were selected.

(4) What are the target pollutant sources the public education program is designed to address.

(5) What is the regulated entity's outreach strategy, including the mechanisms (e.g., printed brochures, newspapers, media, workshops, etc.) the regulated entity will use to reach target audiences, and how many people the regulated entity expects to reach by the outreach strategy over the permit term.

(6) How the regulated entity will evaluate the success of this minimum measure, including how the measurable goals for each of the BMPs were selected.

(7) Responsibility for overall management and implementation of the storm water public education and outreach program and, if different, who is responsible for each of the BMPs identified for this program.

2. Public Involvement/Participation

The regulated entity must:

a. At a minimum, notify the public of opportunities to provide input to the process of implementing a SWMP by:

(1) Posting a notification of opportunities to participate at the courthouse of the county in which the regulated entity exists, at the main post office serving the area of the regulated entity, and in at least one library serving the area of the regulated entity.

(2) Publishing once a week for three weeks a notification of opportunities to participate in at least one newspaper of general circulation in the county that includes the regulated entity or, if the regulated entity is a municipality, in at least one newspaper of general circulation in that municipality.

b. Define appropriate BMPs for this minimum control measure and measurable goals for each BMP.

c. Document the decision process for the development of a storm water public involvement/participation program. The regulated entity's rationale statement must address both the overall public involvement/participation program and the individual BMPs, measurable goals, and responsible persons for this program. The rationale statement must include the following information, at a minimum:

(1) How the regulated entity has and will continue to involve the public in the development and submittal of the MS4 NOI and SWMP.

(2) What is the plan to involve the public in the development and implementation of this program.

(3) Who are the target audiences for the public involvement program, including a description of the types of ethnic and economic groups engaged? The regulated entity is encouraged to actively involve all potentially affected stakeholder groups, including commercial and

industrial businesses, trade associations, environmental groups, homeowners associations, and educational organizations, among others.

(4) What are the types of public involvement activities included in the program. Where appropriate, consider the following types of pubic involvement activities:

(a) Citizen representatives on a storm water management panel

(b) Public hearings

(c) Working with citizen volunteers willing to educate others about the program

(d) Volunteer monitoring or stream/beach clean-up activities

(5) How the regulated entity will evaluate the success of this minimum measure, including how the measurable goals for each of the BMPs were selected.

(6) Responsibility for the overall management and implementation of the storm water public involvement/participation program and, if different, who is responsible for each of the BMPs identified for this program

3. Illicit discharge detection and elimination

The regulated entity must:

a. Develop, implement and enforce a program to detect and eliminate illicit discharges (as defined in 40CFR 122.26(b)(2)) into the regulated entity's small MS4.

b. Develop, if not already completed, a storm sewer system map, showing the location of all outfalls and the names and location of all waters of the United States that receive discharges from those outfalls.

c. To the extent allowable under State or local law, effectively prohibit, through ordinance, or other regulatory mechanism, non-storm water discharges into the regulated entity's storm sewer system and implement appropriate enforcement procedures and actions. If the regulated entity's ordinance or regulatory mechanism is already developed, include a copy of the relevant sections with the program.

d. Develop and implement a plan to detect and address illicit discharges, including illegal dumping, to the regulated entity's system.

e. Inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste.

f. Address the non-storm water discharges or flows identified in Part I. B. 4. of this permit only if the regulated entity or MDEQ identify them as significant contributors of pollutants to the regulated entity's small MS4. The regulated entity may also develop a list of other similar occasional incidental non-storm water discharges (e.g. non-commercial or charity car washes, etc.) that will not be addressed as illicit discharges. These non-storm water discharges must not be reasonably expected (based on available information) to be significant sources of pollutants to the MS4. If a list of incidental non-storm water discharges is developed the regulated entity must:

(1) Document in your plan any local controls or conditions placed on the discharges.

(2) Include a provision prohibiting any individual non-storm water discharge that is determined to be contributing significant amounts of pollutants to the MS4.

g. Define appropriate BMPs for this minimum control measure and measurable goals for each BMP.

h. Document the decision process for the development of a storm water illicit discharge detection and elimination program. The regulated entity's rationale statement must address both the overall illicit discharge detection and elimination program and the individual BMPs, measurable goals, and responsible persons for this program. The rationale statement must include the following information, at a minimum:

(1) The plan to detect and address illicit discharges to the regulated entity's system, including discharges from illegal dumping and spills. This plan must include dry weather field screening for non-storm water flows. This plan must also address on-site sewage disposal systems that flow into the regulated entity's storm drainage system. This description must address the following, at a minimum:

(a) Procedures for locating priority areas which include areas with higher likelihood of illicit connections (e.g., areas with older sanitary sewer lines)

(b) Procedures for tracing/locating the source of an illicit discharge

(c) Procedures for removing the source of the illicit discharge

(d) Procedures for program evaluation and assessment

(2) How the regulated entity plans to inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste. Include in the regulated entity's description how this plan will coordinate with the regulated entity's public education minimum measure and the regulated entity's pollution prevention/good housekeeping minimum measure programs. Illicit discharge education actions may include storm drain marking, a program to promote, publicize, and facilitate public reporting of illicit connections or discharges, and distribution of outreach materials.

(3) How the regulated entity will evaluate the success of this minimum measure, including how the measurable goals for each of the BMPs were selected.

(4) Responsibility for overall management and implementation of the storm water illicit discharge detection and elimination program and, if different, who is responsible for each of the BMPs identified for this program.

4. Construction site storm water runoff control

The regulated entity must:

a. Develop, implement, and enforce a program to reduce pollutants in any storm water runoff to the small MS4 from construction activities that result in a land disturbance of greater than or equal to one (1) acre. Reduction of storm water discharges from construction activity disturbing less than one (1) acre must be included in your program if that construction activity is part of a larger common plan of development or sale that would disturb one (1) acre or more. The program must include the development and implementation of, at a minimum:

(1) An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under State or local law. If an ordinance or regulatory mechanism is already developed, include a copy of the relevant sections with the storm water management program description.

(2) Requirements for construction site operators to implement appropriate erosion and sediment control best management practices.

(3) Requirements for construction site operators to control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality.

(4) Procedures for site plan review which incorporate consideration of potential water quality impacts.

(5) Procedures for receipt and consideration of information submitted by the public.

(6) Procedures for site inspection and enforcement of control measures.

b. Define appropriate BMPs for this minimum control measure and measurable goals for each BMP.

c. Document the decision process for the development of a construction site storm water control program. The regulated entity's rationale statement must address the overall construction site storm water control program, the individual BMPs, measurable goals, and responsible persons for this program. The rationale statement must include the following information, at a minimum:

(1) The procedures for site plan review, including the review of pre-construction site plans, which incorporate consideration of potential water quality impacts and consistency with local sediment and erosion control requirements.

(2) The procedures for receipt and consideration of information submitted by the public. Consider coordinating this requirement with the regulated entity's public education program.

(3) The procedures for site inspection and enforcement of control measures, including how the regulated entity will prioritize sites for inspection based on the nature of the construction activity, topography, soil characteristics, and receiving water quality. Some examples of sanctions to ensure compliance include non-monetary penalties, fines, bonding requirements and/or permit denials for non-compliance.

(4) The procedures to provide appropriate educational training measures for construction site operators.

(5) How the regulated entity will evaluate the success of this minimum measure, including how the measurable goals for each of the BMPs were selected.

(6) Responsibility for overall management and implementation of the construction site storm water control program and, if different, who is responsible for each of the BMPs identified for this program.

5. Post-construction storm water management in new development and redevelopment

The regulated entity must:

a. Develop, implement, and enforce a program to address storm water runoff from new development and redevelopment projects that disturb greater than or equal to one (1) acre, including projects less than one (1) acre that are part of a larger common plan of development or sale, that discharge into the regulated entity's small MS4. The program must ensure that controls are in place that would prevent or minimize water quality impacts.

b. Develop and implement strategies, which include a combination of structural and/or non-structural best management practices (BMPs), appropriate for the regulated entity.

c. Use an ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under State or local law. If this ordinance or regulatory mechanism is already developed, include a copy of the relevant sections with the program.

d. Ensure adequate long-term operation and maintenance of BMPs.

e. Define appropriate BMPs for this minimum control measure and measurable goals for each BMP.

f. Document the decision process for the development of a post-construction storm water management program. The regulated entity's rationale statement must address the overall post-construction storm water management program, the individual BMPs, measurable goals, and responsible persons for this program. The rationale statement must include the following information, at a minimum:

(1) The regulated entity's program to address storm water runoff from new development and redevelopment projects. Include in this description any specific priority areas for this program.

(2) How the regulated entity's program will be specifically tailored for the regulated entity, minimize water quality impacts, and attempt to maintain pre-development runoff conditions.

(3) Any non-structural BMPs in the program, including, as appropriate:

(a) Policies and ordinances that provide requirements and standards to direct growth to identified areas, protect sensitive areas such as wetlands and riparian areas, maintain and/or increase open space (including a dedicated funding source for open space acquisition), provide buffers along sensitive water bodies, minimize impervious surfaces, and minimize disturbance of soils and vegetation and encourage infill development in higher density urban areas, and areas with existing storm sewer infrastructure.

(b) Education programs for developers and the public about project designs that minimize water quality impacts.

(c) Measures such as minimization of the percentage of impervious area after development, and minimization of directly connected impervious areas.

(4) Any structural BMPs in the program, including, as appropriate:

(a) Storage practices such as wet ponds and extended-detention outlet structures.

(b) Filtration practices such as grassed swales, bioretention cells, sand filters and filter strips.

(c) Infiltration practices such as infiltration basins, infiltration trenches and pervious concrete.

(5) Ensure the appropriate implementation of the structural BMPs by considering some or all of the following:

(a) Pre-construction review of BMP design

(b) Inspections during construction to verify BMPs are built and properly designed

(c) Post-construction inspection and maintenance of BMPs

(d) Penalty provisions for non-compliance

(6) How the regulated entity will evaluate the success of this minimum measure, including how the measurable goals for each of the BMPs were selected.

(7) Responsibility for overall management and implementation of the regulated entity's post-construction storm water management program and, if different, who is responsible for each of the BMPs identified for this program.

6. Pollution prevention/good housekeeping for municipal operations

The regulated entity must:

a. Develop and implement an operation and maintenance program that includes a training component and has the ultimate goal of preventing or reducing pollutant runoff from the regulated entity's operations.

b. Using training materials that are available from EPA, the State, or other organizations, the regulated entity's program must include employee training to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance.

c. Define appropriate BMPs for this minimum control measure and measurable goals for each BMP.

d. Document the decision process for the development of a pollution prevention/good housekeeping program for municipal operations. The regulated entity's rationale statement must address the overall pollution prevention/good housekeeping program, the individual BMPs, measurable goals, and responsible persons for this program. The rationale statement must include the following information, at a minimum:

(1) The regulated entity's program must specifically list the municipal operations that are impacted by this operation and maintenance program. The regulated entity must also include a list of industrial facilities that the regulated entity owns or operates which are covered by General Storm Water Permits or have individual NPDES Storm Water Permits. Include the facility's coverage number and/or permit number.

(2) Any employee training program the regulated entity will use to prevent and reduce storm water pollution from activities such as park and open space maintenance, fleet and building maintenance, new construction and land disturbances, and storm water system maintenance. Describe any existing, available materials the regulated entity plans to use. Describe how this training program will be coordinated with the outreach programs developed for the public information minimum measure and the illicit discharge minimum measure.

(3) The regulated entity's program description must specifically address the following areas:

(a) Maintenance activities, maintenance schedules, and long-term inspection procedures for controls to reduce floatables (including froth, oil and floating solids) and other pollutants to the MS4.

(b) Controls for reducing or eliminating the discharge of pollutants from streets, roads, highways, municipal parking lots, maintenance and storage yards, waste transfer stations, fleet or maintenance shops with outdoor storage areas, salt/sand storage locations and waste transfer stations.

(c) Procedures for the proper disposal of waste removed from the MS4 and regulated entity's operations, including dredge spoil, accumulated sediments, floatables, and other debris.

(d) Procedures to ensure that new flood management projects are assessed for impacts on water quality and existing projects are assessed for incorporation of additional water quality protection devices or practices.

(4) How the regulated entity will evaluate the success of this minimum measure, including how the measurable goals for each of the BMPs were selected.

(5) Responsibility for overall management and implementation of the pollution prevention/good housekeeping program and, if different, who is responsible for each of the BMPs identified for this program.

C. SHARING RESPONSIBILITY

1. Implementation of one or more of the minimum measures may be shared with another entity, or the other entity may fully take over the measure. A regulated entity may rely on another entity only if:

   a. The other entity, in fact, implements the control measure.

   b. The particular control measure, or component of that measure, is at least as stringent as the corresponding permit requirement.

   c. The other entity agrees to implement the control measure on the regulated entity's behalf and accepts this obligation in writing. This obligation must be maintained as part of the description of the regulated entity's storm water management program. If the other entity fails to implement the control measure on the regulated entity's behalf, then the regulated entity remains liable for any discharges due to that failure to implement.

2. In the case of the construction minimum measure, MDEQ may agree to assume responsibility, if petitioned by the regulated entity, for the portion of the minimum measure that addresses large construction activities five (5) acres and greater. If MDEQ agrees to assume responsibility the regulated entity is not required to include that portion of the minimum control measure in the SWMP nor required to address large construction in the annual report.

D. REVIEWING AND UPDATING STORM WATER MANAGEMENT PROGRAMS

1. **Storm Water Management Program Review**: The regulated entity must do an annual review of their Storm Water Management Program in conjunction with preparation of the annual report required under Part V. C. of this permit.

2. **Storm Water Management Program Update**: The regulated entity may change their Storm Water Management Program during the life of the permit in accordance with the following procedures:

   a. Changes adding (but not subtracting or replacing) components, control measures, or requirements to the Storm Water Management Program may be made at any time upon written notification to MDEQ. These changes must be documented in the annual report.

   b. Changes subtracting or replacing ineffective or impracticable components, control measures, or requirements, specifically identified in the Storm Water Management Program, with alternate components, controls, or requirements may be requested at any time. Unless denied by the Permit Board, changes proposed in accordance with the criteria below shall be deemed approved and may be implemented 60 days from submittal of the request. If request is denied, the Permit Board, or MDEQ acting on behalf of the Permit Board, will respond in writing. The regulated entity's modification requests must include the following:

      (1) An analysis of why the components, control measures, goals, or requirements are ineffective or impracticable (including cost analyses).

(2) Expectations on the effectiveness of replacement components, control measures, goals, or requirements.

(3) An analysis of why the replacement components, control measures, goals, or requirements are expected to achieve the goals of the components, controls, or requirements to be replaced.

c. Change requests or notifications must be made in writing and signed in accordance with Part VI. E. of this permit.

3. **Storm Water Management Program Updates Required by MDEQ:**

a. The Permit Board may require changes to the Storm Water Management Program as needed to:

(1) Address impacts on receiving water quality caused, or contributed to, by discharges from the MS4.

(2) Include additional control measures when a Total Maximum Daily Load (TMDL) has been specified for a receiving waterbody, when a Watershed Management Plan has been adopted for a watershed or if a coverage recipient's SWMP proves to be inadequate in reducing pollutants in storm water runoff.

(3) Include more stringent requirements necessary to comply with new Federal statutory or regulatory requirements.

(4) Include such other conditions necessary to comply with the requirements of the Clean Water Act.

b. Changes requested by the Permit Board must be made in writing, set forth the time schedule for the regulated entity to develop the changes, and offer the regulated entity the opportunity to propose alternative program changes to meet the objective of the requested modification. All changes required by the Permit Board will be made in accordance with 40 CFR 124.5, 40 CFR 122.62, or as appropriate 40 CFR 122.63.

4. **Transfer of Operational Authority, or Responsibility for Storm Water Management Program Implementation:** The regulated entity must implement the Storm Water Management Program on all new areas added to the regulated entity's portion of the municipal separate storm sewer system (or for which the regulated entity becomes responsible for implementation of storm water quality controls) as expeditiously as practicable, but not later than one year from addition of the new areas. Implementation may be accomplished in a phased manner to allow additional time for controls that cannot be implemented immediately.

a. Within 90 days of a transfer of operational authority, or responsibility for storm water management program implementation, the regulated entity must have a plan for implementing the regulated entity's Storm Water Management Program on all affected areas. The plan may include schedules for implementation. Information on all new annexed areas and any resulting updates required to the Storm Water Management Program must be included in the annual report.

b. Only those portions of the Storm Water Management Programs specifically required as permit conditions shall be subject to the modification requirements of 40 CFR 124.5. Addition of components, controls, or requirements by the regulated entity(s) and replacement of an ineffective or infeasible BMP implementing a required component of the Storm Water Management Program with an alternate BMP expected to achieve the goals of the original BMP shall be considered minor changes to the Storm Water Management Program and not modifications to the permit.

E. FAILURE TO IMPLEMENT STORM WATER MANAGEMENT PROGRAM (SWMP)

Any permit noncompliance constitutes a violation of the Mississippi Water Pollution Control Law and is grounds for enforcement action against the MS4. In addition, failure by the MS4 to initiate appropriate enforcement actions as defined in the SWMP may be the basis for State determination that the MS4 has failed to take timely enforcement action. In instances where the State determines that the MS4 has not initiated timely and appropriate enforcement action, the State may proceed with any or all enforcement options against the discharger and MS4 under the Clean Water Act.

PART V. LIMITATIONS, MONITORING, AND REPORTING

A. STORM WATER DISCHARGES

Storm water shall be free from:

1. debris, oil, scum, and other floating materials other than in trace amounts

2. eroded soils and other materials that will settle to form objectionable deposits in receiving waters

3. suspended solids, turbidity and color at levels inconsistent with the receiving waters

4. substances in concentrations that would cause violation of State Water Quality Criteria in the receiving waters

B. MONITORING

The coverage recipient must evaluate program compliance, the appropriateness of their identified best management practices, and progress towards achieving their identified measurable goals. Although water quality sampling and analysis may be used by a regulated entity, it is not a requirement of this permit.

C. ANNUAL REPORTS

The coverage recipient must prepare and submit to MDEQ an annual report. The objective of the annual report is to summarize the progress made in implementing the conditions of the permit and elements of the storm water management plan. These annual reports must include, at a minimum:

1. The status of compliance with permit conditions, an assessment of the appropriateness of the coverage recipient's identified BMPs and progress towards achieving the coverage recipient's identified measurable goals for each of the minimum control measures.

2. Results of information collected and analyzed, including monitoring data, if any, during the reporting period.

3. A summary of the storm water activities planned during the next reporting cycle.

4. Proposed changes to the storm water management program, including changes to any BMPs or any identified measurable goals that apply to the program elements.

5. Changes in any identified measurable goals that apply to the program elements.

6. Notice that you are relying on another government entity to satisfy some of your permit obligations (if applicable).

7. The number of small construction projects receiving approval from the MS4. Small construction projects are land disturbance activities of equal to or greater than one (1) acre and less than five (5) acres or are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than one (1) acre and less than five (5) acres. Small construction activity does not include routine maintenance that is performed to maintain the original line and grade, hydraulic capacity, and original purpose of the facility (i.e. an existing ditch, channel, or other similar storm water conveyance, as well as routine grading of existing dirt roads, asphalt overlays of existing roads, and similar maintenance activities).

8. The number of large construction projects receiving approval from the MS4. Large construction projects are land disturbance activities of equal to or greater than five (5) acres or are part of a larger common plan of development or sale with a planned disturbance of equal to or greater than five (5) acres. Large construction activity does not include routine maintenance that is performed to maintain the original line
and grade, hydraulic capacity, and original purpose of a ditch, channel, or other similar storm water conveyance. Large construction activity does not include the routine grading of existing dirt roads, asphalt overlays of existing roads, and similar maintenance activities.

9. Documentation that all control measures being planned or implemented that may address Wasteload Allocation (WLA) provisions of a TMDL, if it is found that a MS4 must implement specific WLA provisions of a TMDL. Also, include a schedule of implementation for all planned controls.

10. Certification that the MS4 NOI and SWMP are up to date. The annual report shall be certified according to Part VI. H. of this permit.

D. REPORTING

The annual reports required in Part V. C. of this permit are to be submitted annually postmarked no later than the 28th day of January**. The first submission may be for less than a 12-month period**. Reports shall be submitted to the OPC at the following address:

Chief, Environmental Compliance and Enforcement Division
Office of Pollution Control, Dept of Environmental Quality
P.O. Box 10385
Jackson, Mississippi 39289-0385

E. RECORDKEEPING

All records, reports and information resulting from activities required by this permit shall be retained for a period of at least three years from the date of the coverage recipient's MS4 NOI, inspection or report. The coverage recipient must make records required by this permit, including the regulated entity's SWMP, available to the public at reasonable times during regular business hours. (The regulated entity may assess a reasonable charge for copying. The coverage recipient may require a member of the public to provide advance notice, not to exceed two working days.)

F. NONCOMPLIANCE REPORTING

1. **Anticipated Noncompliance.** The regulated entity shall give at least 10 days advance notice, if possible, before any planned noncompliance with permit requirements.

2. **Unanticipated Noncompliance.** The regulated entity shall notify the OPC orally within 24 hours from the time he or she becomes aware of unanticipated noncompliance. A written notice shall be provided to the OPC within 5 working days of the time he or she becomes aware of the circumstances. The written report shall describe the cause, the exact dates and times, steps taken or planned to reduce, eliminate, or prevent reoccurrence of the noncompliance and, if the noncompliance has not ceased, the anticipated time for correction.

PART VI. OTHER PERMIT CONDITIONS

A. DUTY TO COMPLY

Any permit noncompliance constitutes a violation of the Mississippi Water Pollution Control Law and is grounds for enforcement action or coverage termination and requiring reapplication in accordance with Part I. E. 1. of this permit.

B. CONTINUATION OF AN EXPIRED GENERAL PERMIT

All general permits and coverages issued by the Permit Board shall remain in full force and effect until the Permit Board makes a final determination regarding any reissuance, modification, or revocation of the permits and coverages.

C. DUTY TO MITIGATE

The regulated entity shall take all reasonable steps to minimize or prevent any discharge in violation of this permit that is likely to adversely affect human health or the environment.

D. DUTY TO PROVIDE INFORMATION

The regulated entity shall furnish to the MDEQ, within a reasonable time, any information which the MDEQ may request to determine compliance with this permit.

E. SIGNATORY REQUIREMENTS

All Notice of Intent forms, reports, certifications, or information submitted to the permitting authority, or that this permit requires be maintained by you shall be signed and certified as follows:

1. The MS4 NOI(s) and SWMP(s) submitted to the OPC shall be signed by a principal executive officer or ranking elected official. For purposes of this section, a principal executive officer of a Federal agency includes (1) the chief executive officer of the agency, or (2) a senior executive officer having responsibility for the overall operations of a principal geographic unit of the agency (e.g., Regional Administrators of EPA).

2. All reports required by this permit, and other information requested by the Permit Board shall be signed by a person described above or a duly authorized representative (see F. below).

F. DULY AUTHORIZED REPRESENTATIVE

A person is a duly authorized to sign submissions to the OPC only if:

1. the authorization is made in writing by a person described in E., above, and submitted to the MDEQ.

2. the authorization specifies either an individual or a position having responsibility for the overall operation of the regulated activity, such as manager, operator, superintendent or one having overall environmental responsibility (a duly authorized representative may be a named individual or any individual occupying a named position).

G. CHANGES TO AUTHORIZATION

If an authorization is no longer accurate because a different individual or position has permit responsibility, a new authorization satisfying the above requirements must be submitted to the MDEQ prior to or together with any reports, information or applications signed by the representative.

H. CERTIFICATION

Any person signing documents under this section shall make the following certification:

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

I. OIL AND HAZARDOUS SUBSTANCE LIABILITY

Nothing in this permit shall relieve the regulated entity from responsibilities, liabilities, or penalties under Section 311 of the Clean Water Act (CWA).

J. PROPERTY RIGHTS

The issuance of this permit does not convey any property rights of any sort, nor any exclusive privileges, nor does it authorize any injury to private property nor any invasion of personal rights, nor any infringement of Federal, State or local laws or regulations.

K. SEVERABILITY

The provisions of this permit are severable, and if any provision of this permit, or the application of any provision of this permit to any circumstance, is held invalid, the application of such provision to other circumstances, and the remainder of this permit shall not be affected thereby.

L. PROPER OPERATION AND MAINTENANCE

The regulated entity shall at all times properly operate and maintain all facilities and systems of treatment and control (and related appurtenances) which are installed or used by the regulated entity to achieve compliance with the conditions of this permit including the storm water pollution prevention plan. Proper operation and maintenance includes adequate laboratory controls with appropriate quality assurance procedures and requires the operation of backup or auxiliary facilities when necessary to achieve compliance with permit conditions.

M. BYPASS PROHIBITION

Bypass (see 40 CFR 122.41(m)) is prohibited and enforcement action may be taken against a regulated entity for a bypass, unless: (1) The bypass was unavoidable to prevent loss of life, personal injury, or severe property damage; **(**2) There were no feasible alternatives to the bypass, such as the use of auxiliary treatment facilities, retention of untreated wastes, or maintenance during normal periods of equipment downtime. This conditions is not satisfied if the regulated entity should, in the exercise of reasonable engineering judgement, have installed adequate backup equipment to prevent a bypass which occurred during normal periods of equipment downtime or preventive maintenance; and **(**3) The regulated entity submitted notices per Part V. F. of this permit.

N. UPSET CONDITIONS

An upset (see 40 CFR 122.41(n)) constitutes an affirmative defense to an action brought for noncompliance with technology-based permit limitations if a regulated entity shall demonstrate, through properly signed, contemporaneous operating logs, or other relevant evidence, that: (1) An upset occurred and the regulated entity can identify the specific cause(s) of the upset, (2) The permitted facility was at the time being properly operated, (3) The regulated entity submitted notices per Part V. F. of this permit). The regulated entity took remedial measures as required under Part VI. C. of this permit. In any enforcement proceeding, the regulated entity has the burden of proof that an upset occurred. No determination made during administrative review of claims that noncompliance was caused by upset, and before an action for noncompliance, is final administrative action subject to judicial review.

O. INSPECTION AND ENTRY

The regulated entity shall allow MDEQ or an authorized representative, upon the presentation of credentials and other documents as may be required by law, to

1. enter upon the regulated entity's premises where a regulated activity is located or conducted or where records must be kept under the conditions of this permit;

2. have access to and copy at reasonable times any records that must be kept under the conditions of this permit; and

3. inspect at reasonable times any facilities or equipment.

P. PERMIT ACTIONS

This permit may be modified, revoked and reissued, or terminated for cause. A request by the regulated entity for permit or coverage modification, revocation and reissuance, or termination, or a certification of planned changes or anticipated noncompliance does not stay any permit condition.

Q. SCIENTIFIC, TECHNICAL AND LEGAL ENVIRONMENTAL ASSISTANCE

As provided in Parts III. A., III. B. and Part IV. B. 1. – 6. above, where a discharge authorized under this permit is determined to cause or have the reasonable potential to cause or contribute to the violation of an applicable water quality standard or other requirement of a regulation promulgated by the Commission or any of the minimum control measures set forth in its SWMP and required by this permit (referred to herein as "Environmental Requirement"), MDEQ shall, in writing, notify the regulated entity of the actual or potential violation of the Environmental Requirement. After receiving such notification from MDEQ, the regulated entity may request MDEQ assistance in determining the source of the pollutant discharge to the MS4, which is causing the MS4 to violate or have the potential to violate the Environmental Requirement. Such requests are proper where MDEQ's scientific, technical, or other environmental knowledge may assist the regulated entity in isolating and addressing sources of actual or potential violation of the Environmental Requirement which are not readily discoverable by the regulated entity after completing the procedures required by the regulated entity's SWMP. When a regulated entity requests MDEQ assistance, MDEQ will provide to the regulated entity available public information relevant to MDEQ's notification.

The Commission shall retain jurisdiction and responsibility to enforce compliance with all applicable Commission regulations and the permit. The regulated entity shall retain jurisdiction and responsibility to enforce compliance with its SWMP, local laws, regulations, and ordinances. MDEQ, as appropriate and able, will provide technical assistance to the regulated entity as it pursues judicial or administrative enforcement procedures. However, the implementation of the SWMP remains the responsibility of the regulated entity.

PART VII. REOPENER CLAUSE

A. REQUIREMENT TO OBTAIN AN INDIVIDUAL OR ALTERNATIVE GENERAL PERMIT

If there is evidence indicating potential or realized impacts on water quality due to storm water discharge covered by this permit, the regulated entity may be required to obtain an individual permit or an alternative general permit in accordance with Part I. E. of this permit or the permit may be modified to include different limitations and/or requirements.

B. PERMIT MODIFICATION

Permit modification or revocation will be conducted according to 40 CFR 122.62, 122.63, 122.64 and 124.5.

PART VIII. DEFINITIONS

All definitions contained in Section 502 of the Act and 40 CFR 122 shall apply to this permit and are incorporated herein by reference. For convenience, simplified explanations of some regulatory/statutory definitions have been provided, but in the event of a conflict, the definition found in the Statute or Regulation takes precedence.

Best Management Practices "BMPs" means schedules of activities, prohibitions of practices, maintenance procedures, and other management practices to prevent or reduce the pollution of State. BMPs also include treatment requirements, operating procedures, and practices to control runoff, spillage or leaks, sludge or waste disposal, or drainage from raw material storage.

Codes of Federal Regulations "CFR" are documents containing all finalized regulations. The contents of 40 CFR are all related to the environmental aspects**.**

"Commission" means the Mississippi Commission on Environmental Quality

Control Measure as used in this permit, refers to any Best Management Practice or other method used to prevent or reduce the discharge of pollutants to waters of the State.

CWA or "The Act" means the Clean Water Act (formerly referred to as the Federal Water Pollution Control Act or Federal Water Pollution Control Act Amendments of 1972) Pub.L. 92-500, as amended Pub. L. 95-217, Pub. L. 95-576, Pub. L. 96-483 and Pub. L. 97-117, 33 U.S.C. 1251 et.seq.

Discharge-Related Activities include: activities which cause, contribute to, or result in storm water point source pollutant discharges; and measures to control storm water discharges, including the siting, construction and operation of best management practices (BMPs) to control, reduce or prevent storm water pollution.

Illicit Connection means any man-made conveyance connecting an illicit discharge directly to a municipal separate storm sewer.

Illicit Discharge means any discharge to a municipal separate storm sewer that is not composed entirely of storm water except discharges pursuant to a NPDES permit (other than the NPDES permit for discharges from the municipal separate storm sewer) and those non-storm water discharges identified in Part I.B.3. of this permit.

Larger Common Plan of Development or Sale means a contiguous area where multiple separate and distinct construction activities are occurring under one plan. The plan in a common plan of development or sale is broadly defined as any announcement or piece of documentation (including a sign, public notice or hearing, sales pitch, advertisement, drawing, permit application, zoning request, computer design, etc.) or physical demarcation (including boundary signs, lot stakes, surveyor markings, etc.) indicating that construction activities may occur on a specific plot.

Major Receiving Water(s) are those waters of the State that are named on an United States Geological Quadrangle Map.

Maximum Extent Practicable "MEP" is the statutory standard that establishes the level of pollutant reductions that operators of regulated MS4s must achieve. The CWA requires that NPDES permits for discharges from MS4s ''shall require controls to reduce the discharge of pollutants to the maximum extent practicable, including management practices, control techniques and system, design and engineering methods.'' Compliance with the conditions of the general permit and the series of steps associated with identification and implementation of the minimum control measures will satisfy the MEP standard. EPA has intentionally not provided a precise definition of MEP to allow maximum flexibility in MS4 permitting. MS4s need the flexibility to optimize reductions in storm water pollutants on a location-by-location basis. EPA envisions that this evaluative process will consider such factors as conditions of receiving waters, specific local concerns, and other aspects included in a comprehensive watershed plan. Other factors may include MS4 size, climate, implementation schedules, current ability to finance the program, beneficial uses of receiving water, hydrology, geology, and capacity to perform operation and maintenance. The pollutant reductions that represent MEP may be different for each small MS4, given the unique local hydrologic and geologic concerns that may exist and the differing possible pollutant control strategies. Therefore, each regulated entity will determine appropriate BMPs to satisfy each of the six minimum control measures through an evaluative process.

EPA envisions application of the MEP standard as an iterative process. MEP should continually adapt to current conditions and BMP effectiveness and should strive to attain water quality standards. Successive iterations of the mix of BMPs and measurable goals will be driven by the objective of assuring maintenance of water quality standards. If, after implementing the six minimum control measures there is still water quality impairment associated with discharges from the MS4, after successive permit terms the regulated entity will need to expand or better tailor its BMPs within the scope of the six minimum control measures for each subsequent permit. EPA envisions that this process may take two to three permit terms.

Measurable Goals are a municipality's storm water program goals, which are intended to gauge permit compliance and program effectiveness.

Municipality refers to a city, town, county, district, association, or other public body created by or under State law and having jurisdiction over disposal of sewage, industrial wastes, or other wastes.

MS4 is an acronym for "Municipal Separate Storm Sewer System" and is used to refer to either a Large, Medium (e.g. "the Jackson MS4"), or Small Municipal Separate Storm Sewer System. The term is used to refer to either the system operated by a single entity or a group of systems within an area that are operated by multiple entities (e.g., the Jackson MS4 includes MS4s operated by the city of Jackson, the Mississippi Department of Transportation (MDOT) - state and interstate highways, their right-of –ways and thoroughfares [including highways, streets, roads, bridges, maintenance facilities, service areas, and rest areas] within the jurisdictional boundary of MDOT, the University Medical Center and others).

Municipal Separate Storm Sewer means a conveyance or system of conveyances (including roads with drainage systems, municipal streets, catch basins, curbs, gutters, ditches, man-made channels, or storm drains): (i) Owned or operated by a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States; (ii) Designed or used for collecting or conveying storm water; (iii) Which is not a combined sewer; and (iv) Which is not part of a Publicly Owned Treatment Works (POTW).

National Pollutant Discharge Elimination System "NPDES" refers to Section 402 of the federal Clean Water Act.

NOI is an acronym for "Notice of Intent" to be covered by this permit and is the mechanism used to "register" for coverage under a general permit.

Permit Board means the Mississippi Environmental Quality Permit Board established pursuant to Miss. Code Ann. § 49-17-28.

Phase II is the second stage of the State and Federal storm water permit regulations.

Regulated Entity is a small MS4 within the State of Mississippi and located fully or partially within an urbanized area as determined by the latest Decennial Census pursuant to 40 CFR '122.32, or designated by MDEQ pursuant to 40 CFR 123.35.

Small Municipal Separate Storm Sewer System refers to all separate storm sewers that are owned or operated by the United States, a State, city, town, borough, county, parish, district, association, or other public body (created by or pursuant to State law) having jurisdiction over disposal of sewage, industrial wastes, storm water, or other wastes, including special districts under State law such as a sewer district, flood control district or drainage district, or similar entity, or an Indian tribe or an authorized Indian tribal organization, or a designated and approved management agency under section 208 of the CWA that discharges to waters of the United States, but is not defined as "large" or "medium" municipal separate storm sewer system (those municipalities with a population of 100,00 or more) . This term includes systems similar to separate storm sewer systems in municipalities, such as systems at military bases, large hospital or prison complexes, and highways and other thoroughfares. The term does not include separate storm sewers in very discrete areas, such as individual buildings.

Storm Water means rainfall runoff, snowmelt runoff, and surface runoff.

Storm Water Management Program "SWMP" refers to a comprehensive program to manage the quality of storm water discharged from the municipal separate storm sewer system.

Total Maximum Daily Load "TMDL" means the calculated maximum permissible pollutant loading to a waterbody at which water quality standards can be maintained. The sum of wasteload allocations (WLAs) and load allocations (LAs) for any given pollutant.

Urbanized Area "UA" is a land area comprising one or more places {core and fringe} with urban limits defined by a population density of 1,000 people per square mile and its contiguous census tracks of 500 people per square mile — that together have a residential population of at least 50,000.

SECTION 2

DESOTO COUNTY
STORMWATER ORDINANCE

RESOLUTION ADOPTING STORMWATER CONTROL ORDINANCE

WHEREAS, the Environmental Protection Agency, in accordance with the Clean Water Act of 1989, has mandated that the political subdivisions of States in certain urban areas, which includes DeSoto County, adopt and implement certain stormwater management practices including, but not limited to, an ordinance setting forth best management practices and stormwater enforcement guidelines; and

WHEREAS, DeSoto County, Mississippi desires to fully and faithfully comply with the Clean Water Act and the mandates of the Environmental Protection Agency and desires to protect the health, welfare and safety of its citizens by thoroughly and properly regulating and controlling stormwater by adopting and implementing stormwater management practices; and

WHEREAS, the DeSoto County Board of Supervisors has exhaustively investigated and pursued the adoption of a ordinance which fully achieves the goals and objectives of the Clean Water Act, the directives of the Environmental Protection Agency, the directives of the Mississippi Department of Environmental Quality and best protects the health, safety and welfare of the citizens of DeSoto County, which ordinance it desires to immediately adopt but begin implementation of effective November 1, 2006.

THEREFORE, BE IT RESOLVED, as follows:

1. The DeSoto County Board of Supervisors hereby adopts a stormwater management practices ordinance, a copy of which is attached hereto, with said ordinance to be implemented and put into effect effective November 1, 2006.

RESOLVED, this the 19th day of December, 2005, upon motion made by Supervisor Tommy Lewis and seconded by Supervisor Allen Latimer and approved by the following vote:

Supervisor Tommy Lewis	yes
Supervisor Bill Russell	yes
Supervisor Gene Thach	yes
Supervisor Allen Latimer	yes
Supervisor Jesse Medlin	yes

Tommy Lewis

Tommy Lewis, President
DeSoto County Board of Supervisors

DATE: 12-19-05

W. E. Davis chancery clerk

W. E. "Sluggo" Davis, Clerk
By: Misty J. Heffner D.C

STORMWATER ORDINANCE

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Stormwater Ordinance, DeSoto County

ORDINANCE NO._____

AN ORDINANCE ESTABLISHING STORMWATER CONTROLS AND MANAGEMENT PRACTICES FOR DESOTO COUNTY, MISSISSIPPI.

WHEREAS, uncontrolled Stormwater drainage and discharge may have a significant adverse impact on the health, safety and general welfare of DeSoto County and the quality of life of its citizens by carrying Pollutants into the receiving waters; and
WHEREAS, DeSoto County is required by Federal law and regulation, particularly Title 33 United States Code (U.S.C.), and 40 Code of Federal Regulations (CFR) Chapter I, Part 122.32 through 122.35, to obtain a National Pollutant Discharge Elimination System (NPDES) Permit from the Mississippi Department of Environment Quality for Stormwater discharges from the DeSoto County Separate Storm Sewer System, hereafter referred to as DeSoto County (MS4).
WHEREAS, the NPDES Permit requires DeSoto County to impose controls to reduce the discharge of Pollutants in Stormwater to the maximum extent practicable using management practices, control techniques and system design and engineering methods, and such other provisions which are determined to be appropriate for the control of such Pollutants.
THEREFORE, BE IT NOW ORDAINED BY THE DESOTO COUNTY BOARD OF SUPERVISORS that this Stormwater Ordinance for DeSoto County, is established and reads as follows:

STORMWATER ORDINANCE

CHAPTER 1: GENERAL PROVISIONS

Section 1-1: Introduction / Purpose

The purpose of this Ordinance is to establish minimum Stormwater management requirements and controls to protect and safeguard the general health, safety, and welfare of the public residing in watersheds within this jurisdiction. This Ordinance seeks to meet that purpose through the following objectives:

1. Minimize increases in Stormwater runoff from any development in order to reduce flooding, siltation and stream bank erosion and maintain the integrity of stream channels.
2. Minimize increases in nonpoint source pollution caused by Stormwater runoff from development that would otherwise degrade local water quality.

3. Minimize the total annual volume of surface water runoff that flows from any specific Site during and following development to not exceed the pre-development hydrologic regime to the maximum extent practicable.
4. Reduce Stormwater runoff rates and volumes, soil erosion and nonpoint source pollution, wherever possible, through Stormwater management controls and to ensure that these management controls are properly maintained and pose no threat to public safety.
5. To regulate the contribution of Pollutants to the municipal separate storm sewer system (MS4) by Stormwater discharges by any user.
6. To prohibit Illicit Connections and Discharges to the municipal separate storm sewer system.
7. To establish legal authority to carry out all inspection, surveillance and monitoring procedures necessary to ensure compliance with this Ordinance.
8. Enable DeSoto County to comply with the NPDES Permit and applicable regulations (at 40 CFR 122.32-35) for Stormwater discharges.

Section 1-2: Compatibility with Other Permit and Ordinance Requirements

All other ordinances and parts of other ordinances inconsistent with any part of this Ordinance are hereby repealed to the extent of such inconsistency or conflict. This Ordinance is not intended to interfere with, abrogate, or annul any other rule or regulation, statute, or other provision of law. The requirements of this Ordinance should be considered minimum requirements, and where any provision of this Ordinance imposes restrictions different from those imposed by any other, rule or regulation, or other provision of law, whichever provisions are more restrictive or impose higher protective standards for human health or the environment shall be considered to take precedence.

Section 1-3: Severability

If the provisions of any article, section, subsection, paragraph, subdivision or clause of this Ordinance shall be judged invalid by a court of competent jurisdiction, such order of judgment shall not affect or invalidate the remainder of any article, section, subsection, paragraph, subdivision or clause of this Ordinance.

Section 1-4. Responsibility for Administration.

DeSoto County shall administer, implement, and enforce the provisions of this Ordinance and may establish an enforcement department to carry forth these functions. Any powers granted or duties imposed upon DeSoto County may be delegated, in writing, by the Board of Supervisors of DeSoto County to the established enforcement department (hereinafter AEA) acting in the beneficial interest of or in the employ of DeSoto County.

Section 1-5: Enactment

This Ordinance shall take effect pursuant to (M.C.A. 19-3-40) for DeSoto County 30 days after the date of its passage.

Section 1-6: Development of a Stormwater Design Manual

DeSoto County shall furnish additional policy, criteria and information including specifications and standards, for the proper implementation of the requirements of this Ordinance in the form of a Stormwater Design Manual.

This manual will include a list of acceptable Stormwater treatment practices, including the specific design criteria for each Stormwater practice. The manual may be annually updated and expanded, at the discretion of DeSoto County, based on improvements in engineering, science, monitoring and local maintenance experience. Stormwater treatment practices that are designed and constructed in accordance with these design and sizing criteria will be presumed to meet the minimum water quality performance standards.

Section 1-7: Definitions

For the purpose of this Ordinance, unless specifically defined below, words or phrases shall be interpreted so as to give them the meaning they have in common usage and to give this article it's most effective application. Words in the singular shall include the plural, and words in the plural shall include the singular. Words used in the present tense shall include the future tense. The word "shall" connotes mandatory and not discretionary; the word "may" is permissive.

Accelerated Erosion: erosion caused by development activities that exceeds the natural processes by which the surface of the land is worn away by the action of water, wind, or chemical action.

Accidental Discharges: a discharge prohibited by this Ordinance into DeSoto County MS4 that occurs by chance and without planning or consideration prior to occurrence.

Applicant: a property owner or agent of a property owner who has filed an application for a Stormwater management permit.

Authorized Enforcement Agency or AEA: employees or designees of DeSoto County designated to enforce this Ordinance.

Best Management Practices or BMPs: schedules of activities, a prohibition of practices, maintenance procedures and other management practices to prevent or reduce the pollution of Stormwater runoff. BMPs also include treatment requirements, operating procedures, and practices to control Site runoff, spillage or leaks, sludge or waste disposal, or drainage from raw materials storage.

Building: any structure, either temporary or permanent, having walls and a roof, designed for the shelter of any person, animal, or property, and occupying more than 100 square feet of area.

Channel: a natural or artificial Watercourse with a definite bed and banks that conducts continuously or periodically flowing water.

Clean Water Act or the Act: the Federal Water Pollution Control Act, as amended, codified at 33 U.S.C. 1251 et. seq.

Clearing: Any activity that removes the vegetative surface cover from land.

Commercial: property devoted in whole or part to commerce, that is, the exchange and buying and selling of commodities or services.

Construction Activity: any clearing, grading, excavating, or equipment usage that will result in the disturbance of the land surface and is subject to NPDES construction permits. These include construction projects resulting in land disturbances of 1 acre or more or projects less than 1 acre that are part of a larger common plan of development as required by 40 CFR 122. The term shall not include:

- Such minor construction activities as home gardens and individual home landscaping, home repairs, home maintenance work and other related activities that result in minor soil erosion;
- Individual service and sewer connections for single or two family residences;
- Agricultural practices involving the establishment, cultivation or harvesting of products of the field or orchard, preparing and planting of pasture land, forestry land management practices including harvesting, farm ponds, dairy operations, and livestock and poultry management practices and the construction of farm buildings;
- Any project carried out under the technical supervision of the Natural Resources Conservation Service of the United States Department of Agriculture;
- Installation, maintenance, and repair of any underground public utility line when such activity occurs in an existing hard surface road, street or sidewalk, provided the activity is confined to the area of the road, street or sidewalk that is hard surfaced and a street, curb, gutter or sidewalk permit has been obtained;

Dedication: the deliberate appropriation of property by its owner for general public use.

Detention: the temporary storage of storm runoff in a Stormwater management practice with the goals of controlling peak discharge rates and providing gravity settling of Pollutants.

Detention Facility: a detention basin or alternative structure designed for the purpose of temporary storage of stream flow or surface runoff and gradual release of stored water at controlled rates.

Developer: a person who undertakes land disturbance activities.

Drainage Easement: a legal right granted by a landowner to a grantee allowing the use of private land for Stormwater management purposes.

Drainage Way: Any channel that conveys surface runoff through a construction activity or land disturbance activity Site.

Erosion Control: Measures that prevent erosion.

Erosion and Sediment Control Plan: a plan that is designed to minimize the accelerated erosion and sediment runoff at a construction activity or land disturbance activity Site.

Fee in Lieu: a payment of money in place of meeting all or part of the Stormwater performance standards required by this ordinance.

Grading: Excavation or fill of material, including the resulting conditions thereof.

Hazardous Materials. Any material, including any substance, waste, or combination thereof, which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause, or significantly contribute to, a substantial present or potential hazard to human health, safety, property, or the environment when improperly treated, stored, transported, disposed of, or otherwise managed.

Contaminated Property: an area where land use or activities generate highly contaminated runoff, with concentrations of Pollutants in excess of those typically found in Stormwater.

Hydrologic Soil Group (HSG): a Natural Resource Conservation Service classification system in which soils are categorized into four runoff potential groups. The groups range from A soils, with high permeability and little runoff production, to D soils, which have low permeability rates and produce much more runoff.

Illegal Discharge. Any direct or indirect non-Stormwater discharge to the Storm Drain System, except as exempted in this Ordinance.

Illicit Connections. An illicit connection is defined as either of the following:
Any drain or conveyance, whether on the surface or subsurface, which allows an illegal discharge to enter the Storm Drain System including but not limited to any conveyances which allow any non-Stormwater discharge including sewage, process wastewater, and wash water to enter the Storm Drain System and any connections to the Storm Drain System from indoor drains and sinks, regardless of whether said drain or connection had been previously allowed, permitted, or approved by an authorized enforcement agency or,
Any drain or conveyance connected from a commercial or industrial land use to the Storm Drain System which has not been documented in plans, maps, or equivalent records and approved by an authorized enforcement agency.

Impervious Cover: those surfaces that cannot effectively infiltrate rainfall (e.g., building rooftops, pavement, sidewalks, driveways, etc).

Industrial Activity. Stormwater activities subject to NPDES Industrial Permits as defined in 40 CFR, Section 122.26 (b)(14).

Industrial Facility: a business engaged in industrial production or service, that is, a business characterized by manufacturing or productive enterprises or a related service business.

Industrial Stormwater Permit: A National Pollutant Discharge Elimination System permit issued to a commercial industry or group of industries that regulates the pollutant levels associated with industrial Stormwater discharges or specifies on-Site pollution control strategies.

Infiltration: the process of percolating Stormwater into the subsoil.

Infiltration Facility: any structure or device designed to infiltrate retained water to the subsurface. These facilities may be above grade or below grade.

Institutional: an established organization, especially of a public or charitable nature.

Junk motor vehicle: for the purpose of this ordinance only, shall mean any vehicle which shall include by way of example but not be limited to the following vehicle types: Automobiles, construction equipment, motorcycles, and trucks which meet all of the following requirements: three years old or older; extensively damaged, such damage including but not limited to any of the following: A broken window or windshield or missing wheels, engine, or transmission; apparently inoperable; without a valid current registration; and has a fair market value equivalent only to the value of the scrap in it

Jurisdictional Wetland: areas inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands include swamps, marshes, bogs, and similar areas.

Land Disturbance Activity: any activity which changes the volume or peak flow discharge rate of rainfall runoff from the land surface. This may include the grading, digging, cutting, scraping, or excavating of soil, placement of fill materials, paving, construction, substantial removal of vegetation, or any activity which bares soil or rock or involves the diversion or piping of any natural or man-made Watercourse.

Land owner: the legal or beneficial owner of land, including those holding the right to purchase or lease the land, or any other person holding proprietary rights in the land.

Multi-Family Residential: an apartment building or other residential structure built for three or more units or lots under common ownership, and condominiums of three or more units.

MS4: Municipal Separate Storm Sewer System. This means DeSoto County separate Stormwater system both natural and manmade as may be subject to the NPDES Storm Water Permit for DeSoto County.

National Pollutant Discharge Elimination System or NPDES Permit: a permit issued pursuant to 33 U.S.C. Chapter 26 Water Pollution Prevention and Control, Subchapter IV Permits and Licenses, Section 1342 that authorizes the discharge of Pollutants to waters of the United States, whether the permit is applicable on an individual, group, or general area-wide basis.

Nonpoint Source Pollution: pollution from any source other than from any discernible, confined, and discrete conveyances, and shall include, but not be limited to, Pollutants from agricultural, silvicultural, mining, construction, subsurface disposal and urban runoff sources.

Non-Stormwater Discharge: any discharge to the Storm Drain System that is not composed entirely of Stormwater.

Notice of Intent or N.O.I.: a written notice by the discharger to the Mississippi Department of Environmental Quality that a person wishes his discharge to be authorized under a general permit authorized by state law or regulation.

Off-Site Facility: a Stormwater management measure located outside the subject property boundary described in the permit application for land development activity.

On-Site Facility: a Stormwater management measure located within the subject property boundary described in the permit application for land development activity.

Perimeter Control: A barrier that prevents sediment from leaving a Site either by filtering sediment-laden runoff, or diverting it to a sediment trap or basin.

Person: any individual, partnership, co-partnership, firm company, trust estate, governmental entity or any other legal entity, or their legal representatives, agents or assigns. The masculine gender shall include the feminine, the singular shall include the plural where indicated by context.

Phasing: Clearing a parcel of land in distinct phases, with the stabilization of each phase before the clearing of the next.

Pollutant: Anything that causes or contributes to pollution. Pollutants may include, but are not limited to: paints, varnishes, and solvents; oil and other automotive fluids; non-hazardous liquid and solid wastes and yard wastes; refuse, rubbish, garbage, litter, or

other discarded or abandoned objects, ordinances, and accumulations, so that same may cause or contribute to pollution; floatables; pesticides, herbicides, and fertilizers; hazardous substances and wastes; sewage, fecal coliform and pathogens; dissolved and particulate metals; animal wastes; wastes and residues that result from constructing a building or structure; and noxious or offensive matter of any kind.

Pollution Prevention Plans: a written Site-specific plan to eliminate or reduce and control the pollution of Stormwater through designed facilities, natural or constructed, and best management practices.

Premises: any building, lot, parcel of land, or portion of land whether improved or unimproved including adjacent sidewalks and parking strips.

Private Property: any building, lot, parcel of land, or portion of land whether improved or unimproved which does not belong to DeSoto County.

Redevelopment: any construction, alteration or improvement exceeding 43,560 square feet in areas where existing land use is high density commercial, industrial, institutional or multi-family residential.

Sediment Control: Measures that prevent eroded sediment from leaving the Site.

Significant Spills: Releases of oil or hazardous substances in excess of reportable quantities under Section 311 of the Clean Water Act (at 40 CFR 110.10 and CFR 117.21) or section 102 of the Comprehensive Environmental Response Compensation and Liability Act (CERCLA), (at CFR 302.4).

Site: A parcel of land, or a contiguous combination thereof, where construction or disturbance activity is performed as a single unified operation.

Stabilization: The use of practices that prevent exposed soil from eroding.

Start of Construction: The first land-disturbing activity associated with a development, including land preparation such as clearing, grading and filling; installation of streets and walkways; excavation for basements, footings, piers or foundations; erection of temporary forms; and installation of accessory buildings such as garages.

Stop Work Order: an order issued which requires that all construction activity on a Site be stopped.

Storm Drainage System: Publicly-owned facilities by which Stormwater is collected and/or conveyed, including but not limited to any roads with drainage systems, municipal streets, gutters, curbs, inlets, piped storm drains, pumping facilities, retention and detention basins, natural and human-made or altered drainage channels, reservoirs, and other drainage structures.

Stormwater or Storm Water: refers to water induced or created from precipitation whether rain, snow or ice and either stored, collected, detained, absorbed, or discharged.

Stormwater Management: the use of structural or non-structural practices that are designed to reduce Stormwater runoff pollutant loads, discharge volumes, and/or peak flow discharge rates.

Stormwater Pollution Prevention Plan (SWPPP): A document which describes the Best Management Practices and activities to be implemented by a person or business to identify sources of pollution or contamination at a Site and the actions to eliminate or reduce pollutant discharges to Stormwater, Stormwater Conveyance Systems, and/or Receiving Waters to the Maximum Extent Practicable.

Stormwater Retrofit: a Stormwater management practice designed for an existing Site that previously had either no Stormwater management practice in place or a practice inadequate to meet the Stormwater management requirements of the Site.

Stormwater Runoff: flow on the surface of the ground, resulting from precipitation.

Stormwater Treatment Practices (STPs): measures, either structural or nonstructural, that are determined to be the most effective, practical means of preventing or reducing point source or nonpoint source pollution inputs to Stormwater runoff and water bodies.

Toxic Pollutant: any pollutant or combination of Pollutants listed as toxic in 40 CFR Part 401 promulgated by the Administrator of the Environmental Protection Agency under the provisions of 33 U.S.C. 1317.

Variance: The modifications of the minimum Stormwater management requirements contained in this Ordinance for specific circumstances where strict adherence of the requirement would result in unnecessary hardship and not fulfill the intent of this Ordinance.

Wastewater: any water or other liquid, other than uncontaminated Stormwater, discharged from a facility.

Water Quality: characteristics that are related to the physical, chemical, biological, and/or radiological integrity of Stormwater.

Watercourse: a permanent or intermittent stream or other body of water, either natural or man-made, which gathers or carries surface water.

Waterway A channel that directs surface runoff to a Watercourse, or to the public storm drain.

Waterway Buffer: an area separating a waterway or body of water from buildings and/or structures. Typically, buffers are maintained in a "natural" or vegetative state providing environmental and aesthetic benefits.

CHAPTER 2: ILLICIT DISCHARGES AND CONNECTIONS

Section 2-1. Introduction

The purpose of this chapter is to provide for the health, safety, and general welfare of the citizens of DeSoto County through the regulation of non-storm water discharges to the Storm Drainage System to the maximum extent practicable as required by federal and state law. This chapter establishes methods for controlling the introduction of Pollutants into the municipal separate storm sewer system (MS4) in order to comply with requirements of the National Pollutant Discharge Elimination System (NPDES) permit process.

Section 2-2. Applicability.

This chapter shall apply to all water entering the Storm Drain System generated on any developed and undeveloped lands unless explicitly exempted by DeSoto County.

Section 2-3. Ultimate Responsibility

The standards set forth herein and promulgated pursuant to this Ordinance are minimum standards; therefore this Ordinance does not intend nor imply that compliance by any person will ensure that there will be no contamination, pollution, nor unauthorized discharge of Pollutants.

Section 2-4. Discharge Prohibitions.

2-4.1 Prohibition of Illegal Discharges

No person shall discharge or cause to be discharged into DeSoto County Storm Drain System or Watercourses any materials, including but not limited to Pollutants or contaminants or waters containing any Pollutants that cause or contribute to a violation of applicable water quality standards, other than Stormwater. Contaminants include, but are not limited to, the following: trash or debris, construction materials; petroleum products (including but not limited to, oil, gasoline, grease, fuel oil, or hydraulic fluids); antifreeze and other automotive products; metals (in either particulate or dissolved form); flammable or explosive materials, radioactive material; batteries (including but not limited to, lead acid automobile batteries, alkaline batteries, lithium batteries, or mercury batteries), acids; alkalis (or bases), paints, stains, resins; lacquers (or varnishes); degreasers (and/or solvents), drain cleaners, pesticides, herbicides, fertilizers, steam cleaning wastes, soaps, detergents, ammonia, chlorine; bromine and other disinfectants, heated water; animal waste from commercial animal or feeder lot operations; leaking sanitary sewers and connections; recreational vehicle waste, animal carcasses, food

wastes, medical wastes, collected lawn clippings, leaves, branches; bark and other fibrous materials; collected silt, sediment, or gravel; dyes (except as noted below); chemicals not normally found in uncontaminated water; any hazardous material or waste not listed above; washing of fresh concrete for cleaning and/or finishing purposes or to expose aggregates; junk motor vehicles, and leaking solid waste disposal containers.

The commencement, conduct or continuance of any illegal discharge to the Storm Drain System is prohibited except as described as follows:

1. The following discharges are exempt from discharge prohibitions established by this ordinance: water line flushing or other potable water sources, landscape irrigation or lawn watering, diverted stream flows, rising ground water, uncontaminated ground water infiltration to storm drains, uncontaminated pumped ground water, foundation or footing drains (not including active groundwater dewatering systems), crawl space pumps, air conditioning condensation, swimming pools, springs, non-commercial washing of vehicles, natural riparian habitat or wet-land flows, fire fighting activities, and any other water source not containing Pollutants.
2. Discharges specified in writing by the AEA as being necessary to protect public health and safety.
3. Dye testing is an allowable discharge, but requires a verbal notification to the authorized enforcement agency prior to the time of the test.
4. The prohibition shall not apply to any non-Stormwater discharge permitted under an NPDES permit, waiver, or waste discharge order issued to the discharger and administered under the authority of the Federal Environmental Protection Agency, provided that the discharger is in full compliance with all requirements of the permit, waiver, or order and other applicable laws and regulations, and provided that written approval has been granted for any discharge to the Storm Drain System.

2-4.2 Prohibition of Illicit Connections

The construction, use, maintenance or continued existence of illicit connections to the Storm Drain System is prohibited. This prohibition expressly includes, without limitation, illicit connections made in the past, regardless of whether the connection was permissible under law or practices applicable or prevailing at the time of connection.

A person is considered to be in violation of this Ordinance if the person connects a line conveying sewage to the MS4, or allows such a connection to continue.

Section 2-5. Suspension of MS4 Access

2-5.1 Suspension due to Illicit Discharges in Emergency Situations

The AEA may, without prior notice, suspend MS4 discharge access to a person when such suspension is necessary to stop an actual or threatened discharge which presents or may present imminent and substantial danger to the environment, or to the health or welfare of Persons, or to the MS4 or Waters of the United States. If the violator fails to comply with a suspension order issued in an emergency, the AEA may take such steps as deemed necessary to prevent or minimize damage to the MS4 or Waters of the United States, or to minimize danger to Persons.

2-5.2 Suspension due to the Detection of Illicit Discharge

Any Person discharging to the MS4 in violation of this Ordinance may have his MS4 access terminated if such termination would abate or reduce an illicit discharge. The AEA will notify a violator of the proposed termination of its MS4 access. The violator may petition the AEA for a reconsideration and hearing.

A Person commits an offense if the Person reinstates MS4 access to premises terminated pursuant to this Section, without the prior approval of the AEA.

Section 2-6. Requirement to Prevent, Control, and Reduce Stormwater Pollutants by the use of Best Management Practices.

AEA will adopt requirements identifying Best Management Practices for any activity, operation, or facility which may cause or contribute to pollution or contamination of Stormwater, the Storm Drain System, or waters of the U.S. The owner or operator of a Commercial or Industrial establishment shall provide, at his own expense, reasonable protection from accidental discharge of prohibited materials or other wastes into the Storm Drain System or Watercourses through the use of these structural and non-structural BMPs. Further, any Person responsible for a property or premise, which is, or may be, the source of an Illicit Discharge, may be required to implement, at said person's expense, additional structural and non-structural BMPs to prevent the further discharge of Pollutants to the MS4.

Section 2-7. Watercourse Protection.

Every person owning property through which a Watercourse passes shall keep and maintain that part of the Watercourse within the property free of trash, debris, excessive vegetation, and other obstacles that would pollute, contaminate, or significantly retard the flow of water through the Watercourse. In addition, the owner shall maintain existing privately owned structures within or adjacent to a Watercourse, so that such structures will not become a hazard to the use, function, or physical integrity of the Watercourse.

Section 2-8. Notification of Spills, Illicit Discharges or Connection.

Notwithstanding other requirements of law, as soon as any person responsible for a facility or operation, or responsible for emergency response for a facility or operation has information of any known or suspected release of materials which are resulting or may result in Illicit Discharges or Pollutants discharging into Stormwater, the Storm Drain System, or water of the U.S., said person shall take all necessary steps to ensure the discovery, containment, and cleanup of such release. In the event of such a release of hazardous materials said person shall immediately notify emergency response agencies of the occurrence via emergency dispatch services. In the event of a release of non-hazardous materials, said person shall notify the AEA in person or by phone or facsimile no later than the next business day. Notifications in person or by phone shall be confirmed by written notice addressed and mailed to the AEA within three business days

of the phone notice. If the discharge of prohibited materials emanates from a Commercial or Industrial establishment, the owner or operator of such establishment shall also retain an on-Site written record of the discharge and the actions taken to prevent its recurrence. Such records shall be retained for at least three years.

CHAPTER 3:STORMWATER MANAGEMENT FOR LAND DEVELOPMENT

Section 3-1. Introduction

Land development projects and associated increases in impervious cover alter the hydrologic response of local watersheds and increase Stormwater runoff rates and volumes. This Stormwater runoff contributes to increased quantities of water-borne Pollutants, flooding, stream channel erosion, and sediment transport and deposition. Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized through the regulation of Stormwater runoff from development Sites. Regulation of Stormwater runoff discharges from land disturbance activity and construction activity Sites is in the public interest and will prevent threats to public health and safety. Therefore, DeSoto County establishes this set of water quality and quantity policies applicable to all surface waters to provide reasonable guidance for the regulation of Stormwater runoff for the purpose of protecting local water resources from degradation.

Section 3-2. Applicability

This Ordinance shall be applicable to all subdivision or Site plan applications, unless eligible for an exemption or granted a waiver by the AEA under the specifications of Section 3-3 of this Ordinance. This Ordinance also applies to land development activities that are smaller than the minimum applicability criteria if such activities are part of a larger common plan of development that meets the following applicability criteria, even though multiple separate and distinct land development activities may take place at different times on different schedules.

To prevent the adverse impacts of Stormwater runoff, the AEA has developed a set of performance standards that must be met at new development Sites or modifications to existing Sites. These standards apply to any Land Disturbing Activity or Construction Activity disturbing 1 or more acre of land. The following activities may be exempt from these Stormwater performance criteria:

1. Any logging and agricultural activity which is consistent with an approved soil conservation plan or a timber management plan prepared or approved by the (Soil and Water Conservation District) as applicable.
2. Additions or modifications to existing single family structures.
3. Developments that do not disturb more than 1 acre of land, provided they are not part of a larger common development plan;
4. Repairs to any Stormwater treatment practice deemed necessary by the AEA.

When a Site development plan is submitted that qualifies as a redevelopment project as defined in this Ordinance, decisions on permitting and on-Site Stormwater requirements shall be governed by special Stormwater sizing criteria found in the Stormwater Design Manual. This criteria is dependent on the amount of impervious area created by the redevelopment and its impact on water quality. Final authorization of all redevelopment projects will be determined after a review by the AEA.

Section 3-3. Waivers to Stormwater Management Requirements

3-3.1. Waivers for Providing Stormwater Management

All applicants shall provide for Stormwater Management, unless they file a written request to waive this requirement. Requests to waive the Stormwater Management Plan requirements shall be submitted to the AEA for approval.

The minimum requirements for Stormwater Management may be waived in whole or in part upon written request of the applicant, provided that at least one of the following conditions applies:

1. It can be demonstrated that the proposed development is not likely to impair attainment of the objectives of this Ordinance.
2. Alternative minimum requirements for on-Site management of Stormwater discharges have been established in a Stormwater management plan that has been approved by the AEA and that is required to be implemented by local ordinance.
3. Provisions are made to manage Stormwater by an off-Site facility. The off-Site facility is required to be in place, to be designed and adequately sized to provide a level of Stormwater control that is equal to or greater than that which would be afforded by on-Site practices and has a legally obligated entity responsible for long-term operation and maintenance of the Stormwater practice.
4. Non-structural practices are provided that reduce the generation of Stormwater from the Site, the size and cost of Stormwater storage and provide partial removal of many Pollutants are to be used at the Site. These non-structural practices are explained in detail in the Stormwater Design Manual and the amount of credit available for using such practices shall be determined by the AEA.

In instances where one of the conditions above applies, the AEA may grant a waiver from strict compliance with Stormwater Management provisions that are not achievable, provided that acceptable mitigation measures are provided. However, to be eligible for a variance, the applicant must demonstrate to the satisfaction of the AEA that the immediately downstream waterways will not be subject to:

1. Deterioration of existing culverts, bridges, dams, and other structures;
2. Deterioration of biological functions or habitat;
3. Accelerated stream bank or streambed erosion or siltation;
4. Increased threat of flood damage to public health, life and property.

Furthermore, where compliance with minimum requirements for Stormwater Management is waived, the applicant will satisfy the minimum requirements by meeting

one of the mitigation measures selected by the AEA. Mitigation measures may include, but are not limited to, the following:

1. The purchase and donation of privately owned lands, or the grant of an easement to be dedicated for preservation and/or reforestation. These lands should be located adjacent to the stream corridor in order to provide permanent buffer areas to protect water quality and aquatic habitat.
2. The creation of a Stormwater Management facility or other drainage improvements on previously developed properties, public or private, that currently lack Stormwater Management facilities designed and constructed in accordance with the purposes and standards of this Ordinance.
3. Monetary contributions (Fee-in-Lieu) to fund Stormwater Management related studies including regional wetland delineation studies, stream-monitoring studies for water quality and macro invertebrates, stream flow monitoring, and threatened and endangered species studies.

If the AEA decides to grant an applicant a waiver of Stormwater Management Requirements, this in no way relieves the applicant from preventing illicit discharges. Therefore, the applicant shall be liable to comply with all federal and state regulations regarding illicit discharges.

3-3.2. Fee in Lieu of Stormwater Management Practices.
Where the AEA waives all or part of the minimum Stormwater Management requirements, or where the waiver is based on the provision of adequate Stormwater facilities provided downstream of the proposed development, the applicant shall be required to pay a fee in an amount as determined by the AEA.

When an applicant obtains a waiver of the required Stormwater Management, the monetary contribution required shall be in accordance with a fee schedule (unless the developer and the Stormwater authority agree on a greater alternate contribution) established by the AEA, and based on the cubic feet of storage required for Stormwater Management of the development in question. All of the monetary contributions shall be made by the developer prior to the issuance of any building permit for the development.

3-3.3. Dedication of land
In lieu of a monetary contribution, an applicant may obtain a waiver of the required Stormwater Management by entering into an agreement with the AEA for the granting of an easement or the dedication of land by the applicant, to be used for the construction of an off-Site Stormwater Management facility. The agreement shall be entered into by the applicant and the AEA prior to the recording of plats or, if no record plat is required, prior to the issuance of the building permit.

Section 3-4. General Performance Criteria for Stormwater Management

Unless judged by the AEA to be exempt or granted a waiver, the following performance criteria shall be addressed for Stormwater Management at all Sites:

1. All Site designs shall establish Stormwater Management Practices to control the peak flow rates of Stormwater discharge associated with specified design storms and reduce the generation of Stormwater. These practices should seek to utilize pervious areas for Stormwater treatment and to infiltrate Stormwater runoff from driveways, sidewalks, rooftops, parking lots, and landscaped areas to the maximum extent practical to provide treatment for both water quality and quantity.
2. Annual groundwater recharge rates shall be maintained, by promoting infiltration through the use of structural and non-structural methods. At a minimum, annual recharge from the post development Site shall mimic the annual recharge from pre-development Site conditions.
3. To protect stream channels from degradation, a specific channel protection criteria shall be provided as prescribed in the Stormwater Design Manual.
4. Stormwater discharges to critical areas with sensitive resources (i.e., swimming beaches, recharge areas, water supply reservoirs) may be subject to additional performance criteria, or may need to utilize or restrict certain Stormwater Management Practices.
5. Certain Industrial Sites are required to prepare and implement a Stormwater Pollution Prevention Plan (SWPPP), and shall file a Notice of Intent (NOI) under the provisions of the National Pollutant Discharge Elimination System (NPDES) general permit. The SWPPP requirement applies to both existing and new Industrial Sites.
6. Stormwater discharges from land uses or activities with higher potential Pollutant loadings, known as “contaminated properties”, may require the use of specific structural STPs and Pollution prevention practices.
7. Prior to design, applicants are required to consult with the AEA to determine if they are subject to additional Stormwater design requirements.
8. The calculations for determining peak flows as found in the Stormwater Design Manual shall be used for sizing all Stormwater Management Practices.

Section 3-5. Basic Stormwater Management Design Criteria

3-5.1. Minimum Control Requirements

All Stormwater Management Practices will be designed so that the specific storm frequency storage volumes (e.g., recharge, water quality, channel protection, 25 year, 100 year) as identified in the current Stormwater Design Manual are met, unless the AEA grants the applicant a waiver or the applicant is exempt from such requirements.

In addition, if hydrologic or topographic conditions warrant greater control than that provided by the minimum control requirements, the AEA reserves the right to impose any and all additional requirements deemed necessary to control the volume, timing, and rate of runoff.

3-5.2 Site Design Feasibility

Stormwater Management Practices for a Site shall be chosen based on the physical conditions of the Site. Among the factors that should be considered:

- Topography

- Maximum Drainage Area
- Depth to Water Table
- Soils
- Slopes
- Terrain
- Head
- Location in relation to environmentally sensitive features or ultra-urban areas

Applicants shall consult the Stormwater Design Manual for guidance on the factors that determine Site design feasibility when selecting a Stormwater Management Practice.

3-5.3. Conveyance Issues
All Stormwater Management Practices shall be designed to convey Stormwater to allow for the maximum removal of Pollutants and reduction in flow velocities. This shall include, but not be limited to:

- Maximizing of flow paths from inflow points to outflow points
- Protection of inlet and outfall structures
- Elimination of erosive flow velocities
- Providing of underdrain systems, where applicable

The Stormwater Design Manual shall provide detailed guidance on the requirements for conveyance for each of the approved Stormwater Management Practices.

3-5.4. Treatment/Geometry Conditions
All Stormwater Management Practices shall be designed to capture and treat Stormwater runoff according to the specifications outlined in the Stormwater Design Manual. These specifications will designate the water quantity and quality treatment criteria that apply to an approved Stormwater Management Practice.

3-5.5. Landscaping Plans Required
All Stormwater Management Practices must have a landscaping plan detailing both the vegetation to be in the practice and how and who will manage and maintain this vegetation. A registered landscape architect or soil conservation district or soil conservation expert must prepare this plan.

3-5.6. Non-Structural Stormwater Practices
The use of non-structural Stormwater Treatment Practices is encouraged in order to minimize the reliance on structural practices. Credit in the form of reductions in the amount of Stormwater that must be managed can be earned through the use of non-structural practices that reduce the generation of Stormwater from the Site. These non-structural practices are explained in detail in the Stormwater Design Manual and applicants wishing to obtain credit for use of non-structural practices must ensure that these practices are documented and remain unaltered by subsequent property owners.

Section 3-6. Maintenance and Repair of Stormwater Facilities

Maintenance Covenants
Maintenance of all Stormwater Management facilities shall be ensured through the creation of a formal maintenance covenant that must be approved by the AEA and recorded into the land record prior to final plan approval. As part of the covenant, a schedule shall be developed for when and how often maintenance will occur to ensure proper function of the Stormwater Management facility. The covenant shall also include plans for periodic inspections to ensure proper performance of the facility between scheduled cleanouts.

The AEA, in lieu of a maintenance covenant, may accept dedication of any existing or future Stormwater Management facility for maintenance, provided such facility meets all the requirements of this chapter and includes adequate and perpetual access and sufficient area, by easement or otherwise, for inspection and regular maintenance.

CHAPTER 4:EROSION AND SEDIMENT CONTROL

Section 4-1. Introduction

During the construction process, soil is the most vulnerable to erosion by wind and water. This eroded soil endangers water resources by reducing water quality, and causing the siltation of aquatic habitat for fish and other desirable species. Eroded soil also necessitates repair of sewers and ditches, and the dredging of lakes. In addition, clearing grading during construction causes the loss of native vegetation necessary for terrestrial and aquatic habitat, and to provide a healthy living environment for citizens of DeSoto County.

As a result, the purpose of this Chapter is to safeguard Persons, protect property, prevent damage to the environment and promote the public welfare by guiding, regulating, and controlling the design, construction, use, and maintenance of any development or other activity which disturbs or breaks the topsoil or results in the movement of earth on land in DeSoto County.

Section 4-2. Applicability

No Person shall be granted a permit for Land Disturbing Activity or Construction Activity which would require the uncovering of 1 or more acres without the approval of an Erosion and Sediment Control Plan by the AEA.

No permit is required for the following activities:
1. Any emergency activity that is immediately necessary for the protection of life, property or natural resources.
2. Existing nursery and agricultural operations.

Section 4-3. Design Requirements

Grading, Erosion Control practices, Sediment Control practices, and waterway crossings shall meet the design criteria set forth in the Stormwater Design Manual, and shall be adequate to prevent transportation of sediment from the Site to the satisfaction of DeSoto County's AEA.

4-3.1 Clearing and Grading

Clearing and grading of natural resources, such as forests and wetlands, shall not be permitted, except when in compliance all other chapters of this Ordinance.

Clearing techniques that retain natural vegetation and retain natural drainage patterns, as described in Stormwater Design Manual, shall be used to the satisfaction of the AEA.

Phasing shall be required on all Sites disturbing greater than twenty acres, with the size of each phase to be established at plan review and as approved by the AEA.

Clearing, except that necessary to establish sediment control devices, shall not begin until all sediment control devices have been installed and have been stabilized.

Cut and fill slopes shall be no steeper than 2:1, except as approved by the AEA to meet other community or environmental objectives.

4-3.2 Erosion Control

Soil must be stabilized within five days of clearing or inactivity in construction.

If vegetative Erosion Control methods, such as seeding, have not become established within two weeks, the AEA may require that the Site be revegetated, or that a non-vegetative option be employed. The following criteria shall apply to revegetation efforts:

- Reseeding must be done with an annual or perennial cover crop accompanied by placement of straw mulch or its equivalent of sufficient coverage to control erosion until such time as the cover crop is established over ninety percent (90%) of the seeded area.
- Replanting with native woody and herbaceous vegetation must be accompanied by placement of straw mulch or its equivalent of sufficient coverage to control erosion until the plantings are established and are capable of controlling erosion.
- Any area of revegetation must exhibit survival of a minimum of seventy-five percent (75%) of the cover crop throughout the year immediately following revegetation. Revegetation must be repeated in successive years until the minimum seventy-five percent (75%) survival for one (1) year is achieved.

On steep slopes or in drainage ways, special techniques that meet the design criteria outlined in Stormwater Design Manual shall be used to ensure stabilization.

Soil stockpiles must be stabilized or covered at the end of each workday.

At the close of the construction season or any termination of construction greater than two weeks, the entire Site must be stabilized, using a heavy mulch layer, or another method that does not require germination to control erosion.

Techniques shall be employed to prevent the blowing of dust or sediment from the Site.

Techniques that divert upland runoff past disturbed slopes shall be employed.

4-3.3 Sediment Controls

Sediment controls shall be provided in the form of settling basins or sediment traps or tanks, and perimeter controls.

Where possible, settling basins shall be designed in a manner that allows adaptation to provide long-term Stormwater Management.

Adjacent properties shall be protected by the use of a vegetated buffer strip, in combination with perimeter controls.

4-3.4 Waterways and Watercourses

When a wet Watercourse must be crossed regularly during construction, a temporary stream crossing shall be provided, and an approval obtained from the AEA.

When in-channel work is conducted, the channel shall be stabilized before, during and after work.

All on-Site Stormwater conveyance channels shall be designed according to the criteria outlined in Stormwater Design Manual.

Stabilization adequate to prevent erosion must be provided at the outlets of all pipes and paved channels.

4-3.5 Construction Site Access

A temporary access road shall be provided at all Sites.

Other measures may be required at the discretion of the AEA in order to ensure that sediment is not tracked onto public streets by construction vehicles, or washed into storm drains.

CHAPTER 5:REGULATED INDUSTRIAL SOURCES

Section 5-1. Introduction

The purpose of this chapter is to control Stormwater runoff from industrial sources in order to minimize, to the maximum extent practicable, Pollutants discharged from industrial sources into DeSoto County MS4. This reduction may be achieved by a combination of management practices, control techniques, system design, engineering methods, and plan review.

Section 5-2. Applicability.

This chapter applies to all facilities that have Stormwater discharges associated with Industrial Activity, including Construction Activity. This section shall not apply to Industries which qualify for "No Exposure Exemption" from MDEQ, and DeSoto County will accept these exemptions in lieu of requiring Stormwater Management Plans.

Section 5-3. Availability of Information on Discharger to Public; use of Information Accepted as Confidential

All information and data on a discharger obtained from reports, questionnaires, permits, monitoring programs, and from inspection shall be available to the public without restriction unless the discharger specifically requests confidential treatment and is able to demonstrate to the satisfaction of the AEA that the release of such information would divulge information regarding processes or methods which would be detrimental to the discharger's competitive position. Information accepted by the AEA as confidential shall not be transmitted to the general public by the AEA unless written permission has been obtained from the discharger or under court order or as is required by the Mississippi Public Records Act. Any report, questionnaire, or other item required to be submitted by the discharger that contains such confidential data will be submitted in duplicate with one version containing the information and the second copy showing the information deleted that has been claimed as confidential. To the extent practicable, the AEA shall protect all information that is designated as confidential by the owner or its representative.

Section 5-4. Information Required

All industries discharging into DeSoto County Storm Drainage System shall provide the AEA with a copy of their Notice of Intent (NOI). A copy of the Storm Water Pollution Prevention Plan (SWPPP) must be kept on the Industrial Site and available for inspection and copying at reasonable times by the AEA.

Section 5-5. Stormwater Pollution Prevention Plan (SWPPP) Requirements

Any Person subject to an Industrial or Construction activity NPDES storm water discharge permit shall comply with all provisions of such permit. Proof of compliance

with said permit may be required in a form acceptable to the AEA prior to the allowing of discharges to the MS4.

The Storm Water Pollution Prevention Plan (SWPPP) must follow, at a minimum, the outline of the plan listed in the facility's NPDES Storm Water Permit language.

The AEA will adopt requirements identifying Best Management Practices for any activity, operation, or facility which may cause or contribute to pollution or contamination of Stormwater, the Storm Drain System, or waters of the U.S. Compliance with all terms and conditions of a valid NPDES permit authorizing the discharge of storm water associated with Industrial Activity, to the extent practicable, shall be deemed compliance with the provisions of this section. These BMPs shall be part of a Stormwater Pollution Prevention Plan (SWPPP) as necessary for compliance with requirements of the NPDES permit.

Section 5-6. Reporting

Any facility required to sample under the NPDES Storm Water Permit shall provide a copy of the periodic monitoring report to the AEA.

The AEA may require reporting by dischargers of Stormwater runoff to the Stormwater Drainage System, where an NPDES storm water permit is not required, to provide information. This information may include any data necessary to characterize the storm water discharge.

Section 5-7. Accidental Discharges

In the event of a significant spill or any other discharge which could constitute a threat to human health or the environment, the owner or operator of the facility shall give notice to the AEA and the local field office of the Mississippi Department of Environmental Quality as required by state and federal law following the Accidental Discharge.

If an emergency response by governmental agencies is needed, the owner or operator should also call DeSoto County Emergency Management Agency immediately to report the discharge. A written report must be provided to the AEA within five days of the time the discharger becomes aware of the circumstances, unless this requirement is waived by the AEA for good cause shown on a case-by-case basis, containing the following particulars:

1. A description of the discharge, including an estimate of volume
2. The exact dates, times, and duration of the discharge
3. Steps being taken to eliminate and prevent recurrence of the discharge, including any planned modification to contingency, SWPPP, or maintenance plans
4. A Site drawing should be rendered that shows the location of the spill on the impacted property, the direction of flow of the spill in regards to the topographical grade of the property, the impacted Watercourse(s), and the property or properties adjacent to the spill Site.

The discharger shall take all reasonable steps to minimize any adverse impact to the DeSoto County MS4, including such accelerated or additional monitoring as necessary to determine the nature and impact of the discharge. The interruption of business operations of the discharger shall not be a defense in an enforcement action necessary to maintain water quality and minimize any adverse impact that the discharge may cause.

It shall be unlawful for any entity, whether an individual, residential, commercial, or industrial entity, to fail to comply with the provisions of this section.

Section 5-8. Fraud and False Statements

Any reports required by this Ordinance or rules adopted hereunder and any other documents required by the AEA to be submitted or maintained by the discharger shall be signed by a responsible corporate official and certified as accurate to the best of their personal knowledge after appropriate investigation. It shall be subject to the enforcement provisions of this Ordinance and any other applicable local and state laws and regulations pertaining to fraud and false statements. Additionally, the discharger shall be subject to the provisions of 18 U.S. Code Section 309 of the Clean Water Act, as amended, governing false statements and responsible corporate officials.

CHAPTER 6: PERMIT PROCEDURES AND REQUIREMENTS

Section 6-1. Permit Required

No Applicant shall receive any of the building, grading or other land development permits required for land disturbance activities without first meeting the requirements of this Ordinance prior to commencing the proposed activity.

6-1.1. Application Requirements

Unless specifically excluded by this Ordinance, any land owner or operator desiring a permit for a Land Disturbance Activity shall submit to the AEA a permit application on a form provided by the AEA for that purpose.

Unless otherwise excepted by this Ordinance, a permit application must be accompanied by the following in order that the permit application is considered: a Final Stormwater Management Plan; and a non-refundable permit review fee.

The Final Stormwater Management Plan shall be prepared to meet the requirements of this Ordinance, and fees shall be those established by DeSoto County.

6-1.2 Application Review Fees

The fee for review of any land development application shall be based on the amount of land to be disturbed at the Site, and the fee structure shall be established by DeSoto County.

6-1.3. Application Procedure
Applications for Land Disturbance Activity permits must be filed with the AEA on any regular business day.

Permit applications shall include the following: two copies of the final Stormwater Management Plan and any required review fees.

Within fifteen business days of the receipt of a complete permit application, including all documents as required by this Ordinance, the AEA shall inform the applicant whether the final Stormwater Management Plan is approved or disapproved.

If the Final Stormwater Management Plan is disapproved, the applicant may revise the Final Stormwater Management Plan. If additional information is submitted, DeSoto County's AEA shall have fifteen business days from the date the additional information is received to inform the applicant that the final plan is either approved or disapproved.

If the permit application and final Stormwater Management Plan are approved by the AEA, all appropriate Land Disturbance Activity permits shall be issued.

6-1.4. Permit Duration
Permits issued under this section shall be valid from the date of issuance through the date the AEA notifies the permit holder that all Stormwater management practices have passed the final inspection required under permit condition.

Section 6-2. Requirements for Stormwater Management Plan Approval

6-2.1. Stormwater Management Plan Required for All Developments.
No application for development will be approved unless it includes a Stormwater Management Plan detailing in concept how runoff and associated water quality impacts resulting from the development will be controlled or managed and otherwise complies with this Ordinance. This plan must indicate whether Stormwater will be managed on-Site or off-Site and, if on-Site, the general location and type of practices.

The Stormwater Management Plan(s) shall be referred for comment to all other interested agencies, and any comments must be addressed in a final Stormwater Management Plan. This final plan must be signed by a licensed professional engineer (PE), who will verify that the design of all Stormwater Management Practices meet the submittal requirements outlined in the Submittal Checklist found in the Stormwater Design Manual. No building, grading, or sediment control permit shall be issued until a satisfactory final Stormwater Management Plan, or a waiver thereof, shall have undergone a review and been approved by the AEA after determining that the plan or waiver is consistent with the requirements of this Ordinance.

6-2.2. Final Stormwater Management Plan Requirements
A final Stormwater Management Plan must be submitted for approval. The final Stormwater Management Plan shall meet the requirements of Section 6, Stormwater

Management Plan, of the Stormwater Design Manual which shall include, but is not limited to:

1. Contact Information: The name, address, and telephone number of all persons having a legal interest in the property and the tax reference number and parcel number of the property or properties affected.
2. Topographic Base Map: A 1" = 200' topographic base map of the Site which extends a minimum of 200 feet beyond the limits of the proposed development and indicates existing surface water drainage including streams, ponds, culverts, ditches, and wetlands; current land use including all existing structures; locations of utilities, roads, and easements; and significant natural and manmade features not otherwise shown.
3. Calculations: Hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in this Ordinance. Such calculations shall include (i) description of the design storm frequency, intensity and duration, (ii) time of concentration, (iii) Soil Curve Numbers or runoff coefficients, (iv) peak runoff rates and total runoff volumes for each watershed area, (v) infiltration rates, where applicable, (vi) culvert capacities, (vii) flow velocities, (viii) data on the increase in rate and volume of runoff for the design storms referenced in the Stormwater Design Manual, and (ix) documentation of sources for all computation methods and field test results.
4. Soils Information: If a Stormwater management control measure depends on the hydrologic properties of soils (e.g., infiltration basins), then a soils report shall be submitted. The soils report shall be based on on-Site boring logs or soil pit profiles. The number and location of required soil borings or soil pits shall be determined based on what is needed to determine the suitability and distribution of soil types present at the location of the control measure.
5. Maintenance Covenant: The design and planning of all Stormwater Management facilities shall include detailed maintenance and repair procedures to ensure their continued function. These plans will identify the parts or components of a Stormwater Management facility that need to be maintained and the equipment and skills or training necessary. Provisions for the periodic review and evaluation of the effectiveness of the maintenance program and the need for revisions or additional maintenance procedures shall be included in the plan. The Maintenance Covenant must also comply with Sections 3-6 and 7-4 of this Ordinance.
6. Landscaping plan: The applicant must present a detailed plan for management of vegetation at the Site after construction is finished, including who will be responsible for the maintenance of vegetation at the Site and what practices will be employed to ensure that adequate vegetative cover is preserved. This plan must be prepared by a registered landscape architect or by the soil conservation district.
7. Erosion and Sediment Control Plan: The applicant shall submit an erosion and sediment control plan which shall include:
   a.) A sequence of construction of the development Site, including stripping and clearing, rough grading, construction of utilities, infrastructure, and buildings, and final grading and landscaping. Sequencing shall identify the expected date on which clearing will begin, the estimated duration of exposure of cleared areas,

and the sequence of clearing, installation of temporary erosion and sediment measures, and establishment of permanent vegetation.

b.) All erosion and sediment control measures necessary to meet the objectives of this local regulation throughout all phases of construction and permanently, after completion of development of the Site. Depending upon the complexity of the project, the drafting of intermediate plans may be required at the close of each season.

c.) Seeding of mixtures and rates, types of sod, method of seedbed preparation, expected seeding dates, type and rate of lime and fertilizer application, and kind and quantity of mulching for both temporary and permanent vegetative control measures.

d.) Modifications to the plan

1). Major amendments of the erosion and sediment control plan shall be submitted to the AEA and shall be processed and approved, or disapproved, in the same manner as the original plans.

2). Field modifications of a minor nature may be authorized by the AEA by written authorization to the permittee.

8. Other Environmental Permits: The applicant shall assure that all other applicable environmental permits have been acquired for the Site prior to approval of the final Stormwater design plan.
9. Preconstruction Site Checklist: The applicant shall submit the Preconstruction Site Runoff Control Checklist provided in Section 3.3.1 of the Stormwater Design Manual.

Section 6-3. Performance Bond/Security.

The AEA may, at its discretion, require the submittal of a performance security or bond prior to issuance of a permit in order to insure that the Stormwater practices are installed by the permit holder as required by the approved Stormwater Management Plan. The amount of the installation performance security shall be the total estimated construction cost of the Stormwater Management Practices approved under the permit, plus 25%. The performance security shall contain forfeiture provisions for failure to complete work specified in the Stormwater Management Plan.

The installation performance security shall be released in full only upon submission of "as built plans" and written certification by a registered professional engineer that the Stormwater practice has been installed in accordance with the approved plan and other applicable provisions of this ordinance. The AEA will make a final inspection of the Stormwater practice to ensure that it is in compliance with the approved plan and the provisions of this ordinance. Provisions for a partial pro-rata release of the performance security based on the completion of various development stages can be done at the discretion of the AEA.

CHAPTER 7: INSPECTION AND MONITORING

Section 7-1. Introduction

Inspection programs may be established on any reasonable basis, including but not limited to: routine inspections; random inspections; inspections based upon complaints or other notice of possible violations; inspection of drainage basins or areas identified as higher than typical sources of sediment or other contaminants or Pollutants; inspections of businesses or industries of a type associated with higher than usual discharges of contaminants or Pollutants or with discharges of a type which are more likely than the typical discharge to cause violations of state or federal water or sediment quality standards or the NPDES Stormwater permit; and joint inspections with other agencies inspecting under environmental or safety laws. Inspections may include, but are not limited to: reviewing maintenance and repair records; sampling discharges, surface water, groundwater, and material or water in drainage control facilities; and evaluating the condition of drainage control facilities and other Stormwater treatment practices.

Section 7-2. Monitoring of Industrial Discharges

7-2.1. Applicability.
This section applies to all facilities that have Stormwater discharges associated with industrial activity, including construction activity.

7-2.2. Access to Facilities.
The AEA shall be permitted to enter and inspect facilities subject to regulation under this Ordinance as often as may be necessary to determine compliance with this Ordinance. If a discharger has security measures in force which require proper identification and clearance before entry into its premises, the discharger shall make the necessary arrangements to allow access to representatives of the AEA.

Facility operators shall allow the AEA ready access to all necessary areas of the premises for the purposes of inspection, sampling, examination and copying of records that must be kept under the conditions of an NPDES permit to discharge Stormwater, and the performance of any additional duties as defined by state and federal law.

The AEA shall have the right to set up on any permitted facility such devices as are necessary in the opinion of the AEA to conduct monitoring and/or sampling of the facility's Stormwater discharge.

The AEA has the right to require the discharger to install monitoring equipment as necessary. The facility's sampling and monitoring equipment shall be maintained at all times in a safe and proper operating condition by the discharger at its own expense. All devices used to measure Stormwater flow and quality shall be calibrated to ensure their accuracy.

Any temporary or permanent obstruction to safe and easy access to the facility to be inspected and/or sampled shall be promptly removed by the operator at the written or oral request of the AEA and shall not be replaced except as permitted by the AEA. The costs of clearing such access shall be borne by the operator.

Unreasonable delays in allowing the AEA access to a permitted facility is a violation of a Stormwater discharge permit and of this Ordinance. A person who is the operator of a facility with a NPDES permit to discharge Stormwater associated with Industrial Activity commits an offense if the person denies the AEA reasonable access to the permitted facility for the purpose of conducting any activity authorized or required by this Ordinance.

If the AEA has been refused access to any part of the premises from which Stormwater is discharged, and he/she is able to demonstrate probable cause to believe that there may be a violation of this Ordinance, or that there is a need to inspect and/or sample as part of a routine inspection and sampling program designed to verify compliance with this Ordinance or any order issued hereunder, or to protect the overall public health, safety, and welfare of the community, then the AEA may seek issuance of a search warrant from any court of competent jurisdiction.

7-2.3. Sampling at Industrial Facilities

Samples of storm water collected for compliance monitoring shall be representative of the discharge. Sampling locations will be those defined in the NPDES Permit. Sampling and analyses shall be in accordance with 40 CFR Part 122.21 and 40 CFR Part 136 and/or applicable Permit language.

Samples that may be taken by the AEA and/or his designated representatives for the purpose of determining compliance with the requirements of this Ordinance or rules adopted hereunder may be split with the discharger if requested before the time of sampling.

The AEA may require a Stormwater discharger to install and maintain at the discharger's expense a suitable manhole or sampling facility at the discharger's facility or suitable monitoring access to allow observation, sampling, and measurement of all Stormwater runoff being discharged into the DeSoto County Storm Drainage System. Sampling manhole or access shall be constructed in accordance with plans approved by the Division and shall be designed so that flow measurement and sampling equipment can be installed. Access to the manhole or monitoring access shall be available to the AEA and/or his designated representatives at all times.

Section 7-3. Land Development Inspection

7-3.1. Right-of-Entry for Inspection

When any new drainage control facility is installed on private property, or when any new connection is made between private property and a public drainage control system,

sanitary sewer or combined sewer, the property owner shall grant to the AEA the right to enter the property at reasonable times and in a reasonable manner for the purpose of inspection. This includes the right to enter a property when it has a reasonable basis to believe that a violation of this Ordinance is occurring or has occurred, and to enter when necessary for abatement of a public nuisance or correction of a violation of this Ordinance.

7-3.2. Inspection

The AEA or designated agent shall make inspections as hereinafter required and shall either approve that portion of the work completed or shall notify the permitee wherein the work fails to comply with the erosion and sediment control plan as approved. Plans for grading, stripping, excavating, and filling work bearing the stamp of approval of the AEA shall be maintained at the Site during the progress of the work. In order to obtain inspections, the permitee shall notify the AEA at least two (2) working days before the following:

1. Start of Construction
2. Erosion and sediment control measures are in place and stabilized.
3. Site Clearing has been completed
4. Rough Grading has been completed
5. Final Grading has been completed
6. Close of the Construction Season
7. Final Landscaping

The permitee or his/her agent shall make regular inspections of all control measures in accordance with the inspection schedule outlined on the approved erosion and sediment control plan(s). The purpose of such inspections will be to determine the overall effectiveness of the control plan, and the need for additional control measures. All inspections shall be documented in written form and submitted to the AEA at the time interval specified in the approved permit.

The AEA or its designated agent shall enter the property of the applicant as deemed necessary to make regular inspections to ensure the validity of the reports filed.

7-3.3. As Built Plans

All applicants are required to submit actual “as built” plans for any Stormwater Management Practices located on-Site after final construction is completed. The plan must show the final design specifications for all Stormwater Management facilities and must be certified by a professional engineer licensed in the State of Mississippi. A final inspection by the AEA is required before the release of any performance securities can occur.

Section 7-4. Stormwater Management Facilities Maintenance

7-4.1. Requirements for Maintenance Covenants

All Stormwater Management facilities must undergo, at the minimum, an annual inspection to document maintenance and repair needs and ensure compliance with the

requirements of this Ordinance and accomplishment of its purposes. These needs may include; removal of silt, litter and other debris from all catch basins, inlets and drainage pipes, grass cutting and vegetation removal, and necessary replacement of landscape vegetation. Any maintenance needs found must be addressed in a timely manner, as determined by the AEA, and the inspection and maintenance requirement may be increased as deemed necessary to ensure proper functioning of the Stormwater Management facility.

7-4.2. Records of Installation and Maintenance Activities.
Parties responsible for the operation and maintenance of a Stormwater Management facility shall make records of the installation and of all maintenance and repairs, and shall retain the records for at least 3 years. These records shall be made available to the AEA during inspection of the facility and at other reasonable times upon request.

CHAPTER 8: ENFORCEMENT

Section 8-1. Violations

Any activity that is commenced or is conducted contrary to this Ordinance may be restrained by injunction or otherwise abated in a manner provided by law.

Section 8-2. Notice of Violation.

When the AEA determines that an activity is not being carried out in accordance with the requirements of this Ordinance, it shall issue a written notice of violation to the owner of the property. The notice of violation shall contain:
1. The name and address of the owner or applicant;
2. The address when available or a description of the building, structure or land upon which the violation is occurring;
3. A statement specifying the nature of the violation;
4. A description of the remedial measures necessary to bring the activity into compliance with this Ordinance and a time schedule for the completion of such remedial action;
5. A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;

Such notice may require without limitation:
1. The performance of monitoring, analyses, and reporting;
2. The elimination of illicit connections or discharges;
3. That violating discharges, practices, or operations shall cease and desist;
4. The abatement or remediation of Stormwater pollution or contamination hazards and the restoration of any affected property; and
5. Payment of a fine to cover administrative and remediation costs (per Section 8-12); and
6. The implementation of source control or treatment BMPs.

If abatement of a violation and/or restoration of affected property is required, the notice shall set forth a deadline within which such remediation or restoration must be completed. Said notice shall further advise that, should the violator fail to remediate or restore within the established deadline, the work will be done by a designated governmental agency or a contractor and the expense thereof shall be charged to the violator.

Section 8-3. Appeal of Notice of Violation

Any person receiving a Notice of Violation may appeal the determination of the AEA. The notice of appeal must be received within 10 days from the date of the Notice of Violation. Hearing on the appeal before the DeSoto County Board of Supervisors shall take place within 15 days from the date of receipt of the notice of appeal. The decision of the DeSoto County Board of Supervisors shall be final, yet the permittee shall have the right to appeal to a Circuit Court within 10 days of this decision.

Section 8-4. Enforcement Measures after Appeal

If the violation has not been corrected pursuant to the requirements set forth in the Notice of Violation, or, in the event of an appeal, within 30 days of the decision of the DeSoto County Board of Supervisors upholding the decision of the AEA, then representatives of the AEA shall enter upon the subject private property and are authorized to take any and all measures necessary to abate the violation and/or restore the property. It shall be unlawful for any person, owner, agent or person in possession of any premises to refuse to allow the government agency or designated contractor to enter upon the premises for the purposes set forth above.

Section 8-5. Cost of Abatement of the Violation

Within 30 days after abatement of the violation, the owner of the property will be notified of the cost of abatement, including administrative costs. The property owner may file a written protest objecting to the amount of the assessment within 10 days. If the amount due is not paid within a timely manner as determined by the decision of the AEA or by the expiration of the time in which to file an appeal, the charges shall become a special assessment against the property and shall constitute a lien on the property for the amount of the assessment.

Any person violating any of the provisions of this article shall become liable to DeSoto County by reason of such violation. The liability shall be paid in not more than 12 equal payments. Interest at the rate of 8 percent per annum shall be assessed on the balance beginning on the 30th day following discovery of the violation.

Section 8-6. Injunctive Relief

It shall be unlawful for any person to violate any provision or fail to comply with any of the requirements of this Ordinance. If a person has violated or continues to violate the

provisions of this Ordinance, the AEA may petition for a preliminary or permanent injunction restraining the person from activities which would create further violations or compelling the person to perform abatement or remediation of the violation.

Section 8-7. Violations Deemed a Public Nuisance

In addition to the enforcement processes and penalties provided, any condition caused or permitted to exist in violation of any of the provisions of this Ordinance is a threat to public health, safety, and welfare, and is declared and deemed a nuisance, and may be summarily abated or restored at the violator's expense, and/or a civil action to abate, enjoin, or otherwise compel the cessation of such nuisance may be taken.

Section 8-8. Stop Work Orders

Persons receiving a notice of violation will be required to halt all construction activities. This "stop work order" will be in effect until the AEA confirms that the development activity is in compliance and the violation has been satisfactorily addressed. Failure to address a notice of violation in a timely manner can result in civil, criminal, or monetary penalties in accordance with the enforcement measures authorized in this ordinance.

Section 8-9. Restoration of Lands

Any violator may be required to restore land to its undisturbed condition. In the event that restoration is not undertaken within a reasonable time after notice, the AEA may take necessary corrective action, the cost of which shall become a lien upon the property until paid.

Section 8-10. Holds on Occupation Permits

Occupation permits will not be granted until corrections to all Stormwater practices have been made and accepted by the AEA.

Section 8-11. Revocation of Permit

In the event that any person holding a Site development permit pursuant to this Ordinance violates the terms of the permit, or implements Site development in such a manner as to materially adversely affect the health, welfare, or safety or persons residing or working in the neighborhood or development Site so as to be materially detrimental to the public welfare or injurious to property or improvements in the neighborhood, the AEA may suspend or revoke the Site development permit.

Section 8-12. Civil and Criminal Penalties

In addition to or as an alternative to any penalty provided herein or by law, any person who violates the provisions of this Ordinance shall be punished by a fine not to exceed One-Thousand Dollars ($1,000) or by imprisonment for a period not to exceed six

months, or both such fine and imprisonment. Such person shall be guilty of a separate offense for each day during which the violation occurs or continues.

DeSoto County may recover all attorney's fees court costs and other expenses associated with enforcement of this Ordinance, including sampling and monitoring expenses.

Section 8-13. Remedies not Exclusive

The remedies listed in this Ordinance are not exclusive of any other remedies available under any applicable federal, state or local law and it is within the discretion of the authorized enforcement agency to seek cumulative remedies.

Approved by: _____

Date _____

SECTION 3

OPERATION AND PROCEDURE REPORT FORMS AND CHECKLISTS

TABLE OF CONTENTS

SECTION 3.1

AGENCY REVIEW AND PROCEDURES

SECTION 3.1.1

STANDARD OPERATING PROCEDURES FOR CONSTRUCTION ACTIVITIES

Standard Operating Procedures
For Construction Activities

1. A Permit Application, Permit Review Fee, and Final Stormwater Management Plan is submitted to the authorized enforcement agency (AEA) for review. The AEA may also require a performance security bond prior to issuance of a permit.
    a. Has all criteria been met?
    (Refer to applicable sections of stormwater ordinance and this manual)
    b. Have necessary easements been acquired?

2. Plans must be reviewed by the AEA within 15 days of submittal.

3. If denied, any modifications or additional information required must be in submitted by written application.

4. The AEA shall have 15 days to review additional information.

Permit will be issued contingent upon submittal and approval of all items mentioned above. If Permit is denied, all land use will be suspended until all above mentioned items are approved.

5. Inspections on the Stormwater Management Plan measures should be performed weekly by the Applicant. Both the Illicit Discharge Routine Inspection Checklist (Section 3.2.1) and the Comprehensive Inspection Checklist for Construction Sites (Section 3.3.2) shall be completed weekly and remain on-site. This weekly log will be submitted to the Owner upon completion.

6. In the event of a Stormwater Management Plan failure, the AEA must notify the party or parties listed on the application in writing. In this event, the Illicit Discharge Non-Routine Inspection Checklist (Section 3.2.2) and Comprehensive Inspection Checklist for Construction Sites (Section 3.3.2) shall be completed by the AEA.

7. The AEA shall report their finding(s) and corrective action(s) needed to the party or parties listed on the application in writing. In addition, if illicit discharges are found, the AEA shall also submit a Report Form for Illicit Discharges (Section 3.2.3) to the Applicant.

8. Except during an emergency, the AEA will require corrective measures within 48 hours of notification of the applicant.

9. During an emergency, the AEA may take immediate action, and then notify the Applicant as soon as possible.

10. Upon land disturbance completion, the Applicant shall notify the AEA so a final completion inspection can be performed.

3.1.2

RECOMMENDED NONCOMPLIANCE ENFORCEMENT ACTIONS

Recommended Noncompliance Enforcement Actions

When the AEA determines that an activity is not being carried out in accordance with the requirements of the Ordinance, Final Stormwater Management Plan and/or this manual, it shall issue a written notice of violation to the owner of the property. The notice of violation shall contain:

1. The name and address of the owner or applicant;
2. The address when available or a description of the building, structure or land upon which the violation is occurring;
3. A statement specifying the nature of the violation;
4. A description of the remedial measures necessary to bring the activity into compliance with this Ordinance and a time schedule for the completion of such remedial action;
5. A statement of the penalty or penalties that shall or may be assessed against the person to whom the notice of violation is directed;

Such notice may require without limitation:

1. The performance of monitoring, analyses, and reporting;
2. The elimination of illicit connections or discharges;
3. That violating discharges, practices, or operations shall cease and desist;
4. The abatement or remediation of stormwater pollution or contamination hazards and the restoration of any affected property; and
5. Payment of a fine to cover administrative and remediation costs; and
6. The implementation of source control or treatment BMPs.

Any person receiving a Notice of Violation shall have 2 days to correct the Stormwater practices pursuant to the requirements of the Notice of Violation, and request a follow-up field verification from the AEA.

Please see the Stormwater Ordinance for violation appeal and penalty procedures.

SECTION 3.2

ILLICIT DISCHARGE
INSPECTION AND REPORT FORMS

3.2.1

ROUTINE INSPECTION CHECKLIST

Routine Dry Weather Inspection Checklist
for Illicit Discharges

Date:

Inspector:

Site Location and Description:

Is this a weekly/monthly/bi-monthly/quarterly/semi-annual/annual inspection?

Date of last inspection:

GENERAL

1. Is this an inspection of city/county stormwater conveyance systems?
2. Is this an inspection of a city/county facility?
3. Is there a SWPPP on site?
4. Is the SW Manager on site?
5. Is there a training program provided for employees? Yes or No
   How often? Date of last training workshop? Date of next training workshop?
6. How often is inspection conducted?
7. Are there records and internal reports kept on site?
8. Are there spill prevention and response procedures in place?
9. What are the Weather Conditions?
   Last Rain Event:
   Amount of Rain:
10. If wet weather, is stormwater runoff leaving site? Is the runoff discolored, odiferous, or oily? What could be the source of the discoloration, odor or sheen?
11. If dry weather, is non-stormwater discharge evident? Is the runoff discolored, odiferous, or oily? If yes, what is the source?

SITE SPECIFIC INFORMATION

1. Site Description:
   Facility:
   Roadway:
   Ditch:
   Culvert:
   Catch Basin:
   Storm Sewers:

2. Circle General Condition of Site and Describe.

   Poor Fair Good Excellent

3. Describe the type of outfall (pipe, natural discharge point, foundation drain, etc). What condition is it in?

4. Is an Observable Non-stormwater Discharge Noted?

5. Describe Non-stormwater Discharges.

6. Are there reasons for suspicions of source (clues: discolored water, fungus, oily, motor fluids, grass clippings and leaf letter, animal waste, septic tank, sewer lines failing, exposed fill nearby, past landfill, pump site, industrial source nearby, black water source, gray water source, etc.)?

7. Describe the Location of Discharge and Depict on Map

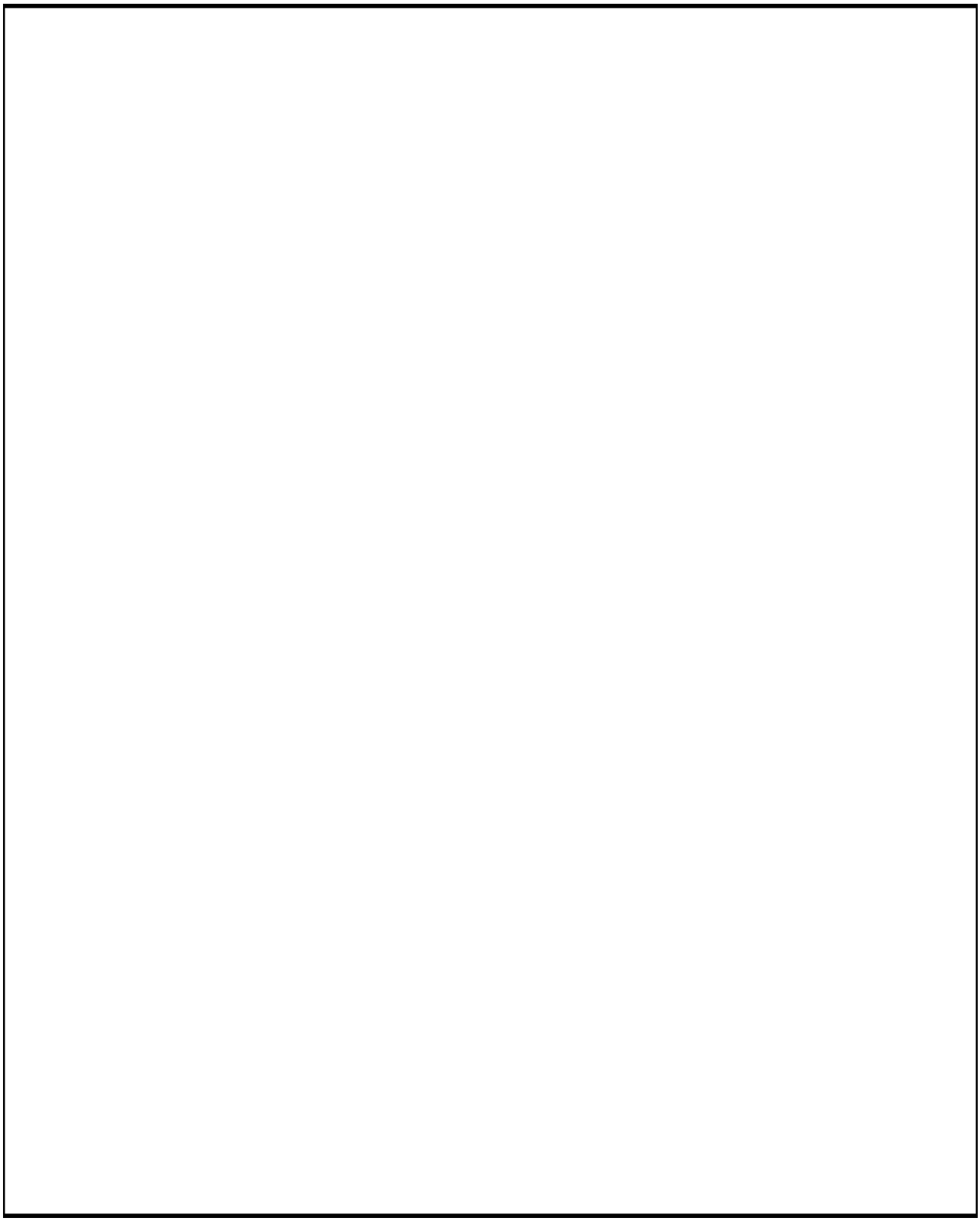
8. Describe the Source of Discharge

9. Describe the Corrective Actions Recommended:

10. Other Observations or Comments:

11. Reviewed By:

12.Reported To:



Sketch/Map

3.2.2

NON-ROUTINE INSPECTION CHECKLIST

Non-Routine Inspection Checklist
for Illicit Discharges

Date:

Inspector:

WEATHER

What are the Weather Conditions?

Last Rain Event:
Amount of Rain:

If wet weather, is stormwater runoff leaving site? Is the runoff discolored, odiferous, or oily? What could be the source of the discoloration, odor or sheen?

If dry weather, is non-stormwater discharge evident? Is the runoff discolored, odiferous, or oily? If yes, what is the source?

SITE SPECIFIC INFORMATION

1. Site Description:
   Facility:
   Roadway:
   Ditch:
   Culvert:
   Catch Basin:
   Storm Sewers:

2. Circle General Condition of Site and Describe.

   Poor Fair Good Excellent

3. Describe the type of outfall (pipe, natural discharge point, foundation drain, etc). What condition is it in?

4. Is an Observable Non-stormwater Discharge Noted?

5. Are there reasons for suspicions of source (clues: discolored water, fungus, oily, motor fluids, grass clippings and leaf letter, animal waste, septic tank, sewer lines failing, exposed fill nearby, past landfill, pump site, industrial source nearby, black water source, gray water source ,etc.)?

6. Describe Non-stormwater Discharge.

a. Odor Yes No
Description:

b. Color Yes No
Description:

c. Sheen Yes No
Description:

d. Stressed flora Yes No
Description:

e. Stressed fauna Yes No
Description:

f. Visible discharge Yes No
Description:

7. Describe the Location of Discharge and Depict on Map.

8. Describe the Source of Discharge.

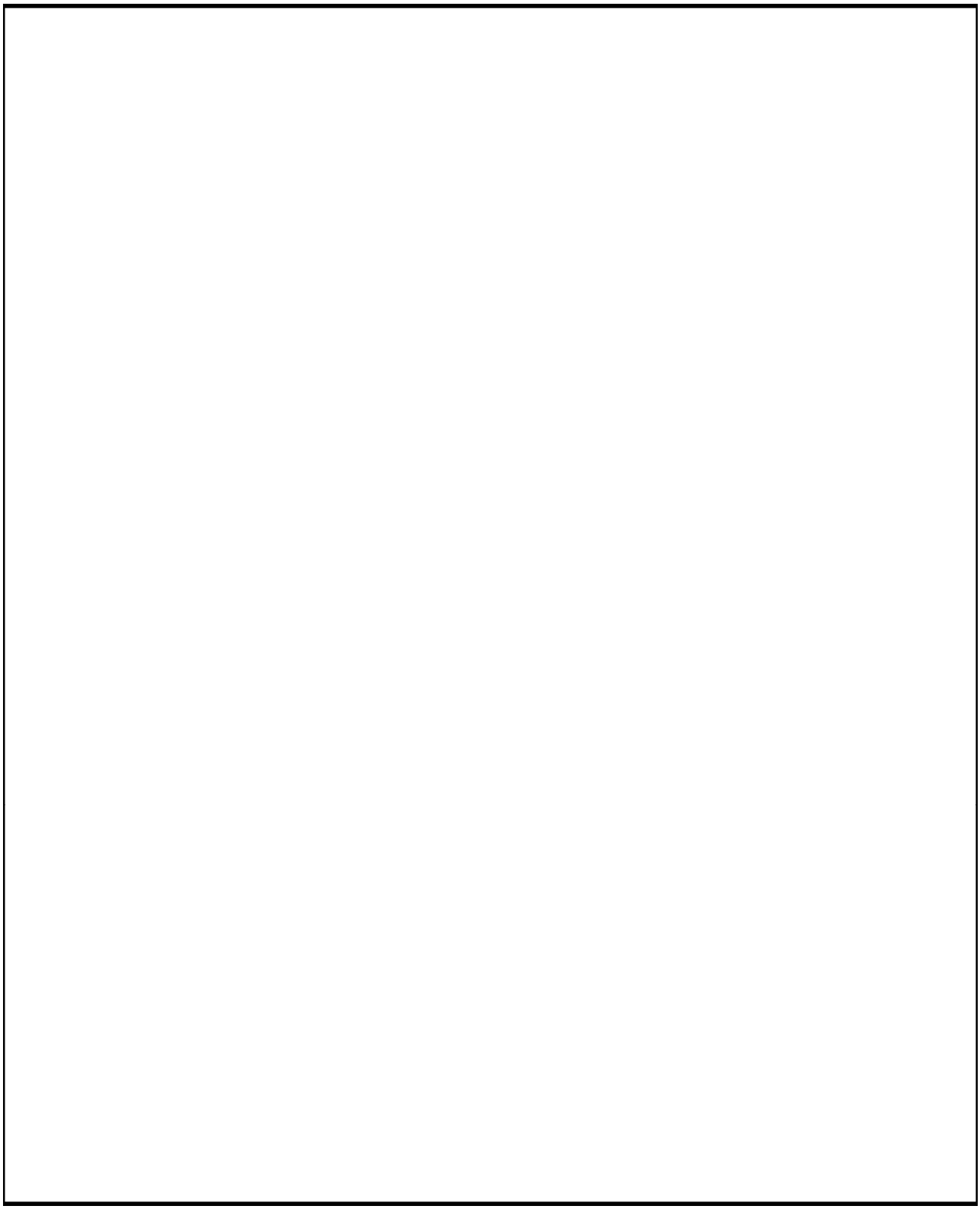
9. Describe the Corrective Actions Recommended:

10. Was the owner notified of corrective actions needed? How?

11. Other Observations or Comments:

12. Reviewed By:

13. Reported To:



Sketch/Map

3.2.3

REPORT FORM
FOR ILLICIT DISCHARGES

Reporting Form for Illicit Discharges

Date:

Inspector:

1. What prompted the inspection?

2. Site Description. Also, Locate Site on Map and Attach:

3. Description of the Non-Stormwater Discharge:

4. Owner of Site:
   a. Name:
   b. Address:
   c. Phone Number:
   d. E-mail:

5. General Conditions of Site:

6. Problems Noted and Corrective Actions Recommended:

7. Was the owner notified of corrective actions needed? How?

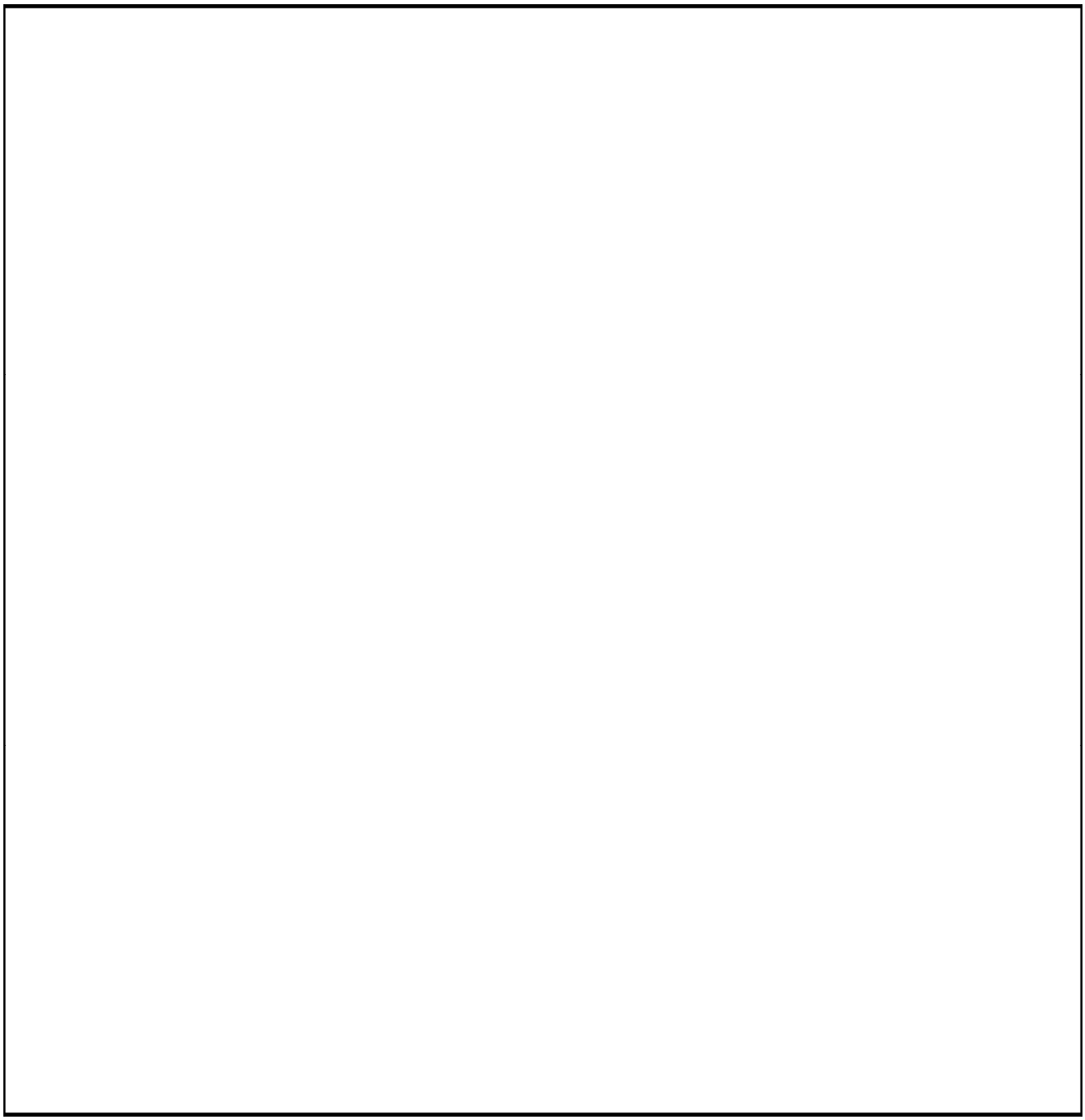
8. Other Observations or Comments:

9. Corrective Action Taken:

10. Date of Corrective Action Taken:

11. Reviewed By:

12. Reported To:



Sketch/Map

SECTION 3.3

CONSTRUCTION / POST CONSTRUCTION CHECKLISTS

3.3.1

PRE-CONSTRUCTION SITE CHECKLIST

Pre-Construction Site Runoff Controls Checklist

This Checklist is to be filled out before construction begins for all developments which anticipate land disturbance during construction. The checklist shall accompany the Building Permit, Site Plan or Public Works Permit. The purpose of the checklist is to monitor compliance with local Land Development Codes, the Stormwater Regulations of the Environmental Protection Agency, and the Stormwater Regulations of the Mississippi Department of Environmental Quality.

1. What is the land area disturbed by the construction of this project?

_____acres

2. If the land area is greater than one acre, has compliance with the requirements of the Mississippi Department of Environmental Quality and the United States Environmental Protection Agency been attained? _____Yes _____ No

3. List below the best management practices that will be used in the completion of this project.

_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

For additional information about best management practices and compliance with stormwater provisions of Federal, State, and Local regulations, contact the Code Enforcement Department.

3.3.2

COMPREHENSIVE INSPECTION CHECKLIST FOR CONSTRUCTION SITES

Comprehensive Inspection Checklist for Construction Sites

Date:

Weather:
Last Rain Event:
Amount of Rain:

If wet weather, is stormwater runoff leaving site? Is runoff transporting sediment and debris?

If dry weather, is non-stormwater discharge evident? If yes, what is the source?

Inspector:

Next Inspection Needed:

Permit Number:

Size of Land Disturbance Activity:

Owner:
Name:
Address:
Phone Number:
E-mail:

Contractor:
Name:
Address:
Phone Number:
E-mail:

Site Description:

Construction Stage:

Location:

Stage of Construction:

General Information	Yes	No	Comments
1. Is the Permit Found on Site?			
2. Is the SWPPP Found on Site?			
3. Are Best Management Practices Installed per SWPPP?			
4. What BMPs are Employed? a. Land Grading b. Permanent Diversions c. Preserving Natural Vegetation d. Construction Entrances e. Check Dams f. Filter Berms g. Grass Lined Channels h. Riprap i. Chemical Stabilization j. Mulching k. Permanent Seeding l. Sodding m. Soil Roughening n. Geosynthetic o. Gradient Terraces			

General Information	Yes	No	Comments
p. Soil Retention			
q. Temporary Slope Drain			
r. Vegetated Buffer			
s. Construction Sequences			
t. Temporary Diversion Dikes			
u. Wind Fences and Sand Fences			
v. Brush Barrier			
w. Silt Fence			
x. Sediment Basins and Rock Dams			
y. Sediment Filters and Sediment Chambers			
z. Sediment Trap			
aa. Storm Drain Inlet			
bb. General Construction Site Waste Management			
cc. Spill Prevention and Control Plans			
dd. Vehicle Maintenance and Washing Area			
ee. Contractor Certification and Inspection Training			
ff. Construction Reviewer			
gg. BMP Inspection and Maintenance			

hh. Model Ordinances			
5. Do Structural Controls Appear to Be Working?			
6. Are Structural Controls Failing?			
7. Structural Controls Absent?			
Sediment	**Yes**	**No**	**Comments**
8. Are Perimeter Trapping Measures in Place and Functioning Properly?			
9. Have Sediment Trapping Practices been Installed in the Proper Location and Before Extensive Grading Begins?			
10. Is Sediment Present On-site in Area that Requires Protection?			
11. Are Streets Adjacent to Project Site Free of Sediment Tracking?			
12. Is Mud or Soil on Public Roads or at Intersections with Public Roads?			
13. Is Sediment Leaving the Site and/or Impacting Adjacent Property?			
Erosion	**Yes**	**No**	**Comments**
14. Are Soils Eroding?			
15. Are There any Bare Areas which Require Temporary or Permanent Stabilization Such as Seeding, Mulching, etc.?			
16. Are all Finished Cut and Fill Slopes Adequately Stabilized?			
17. Do Any Structural Practices Show Evidence of Overtopping, Breaks, or Erosion?			

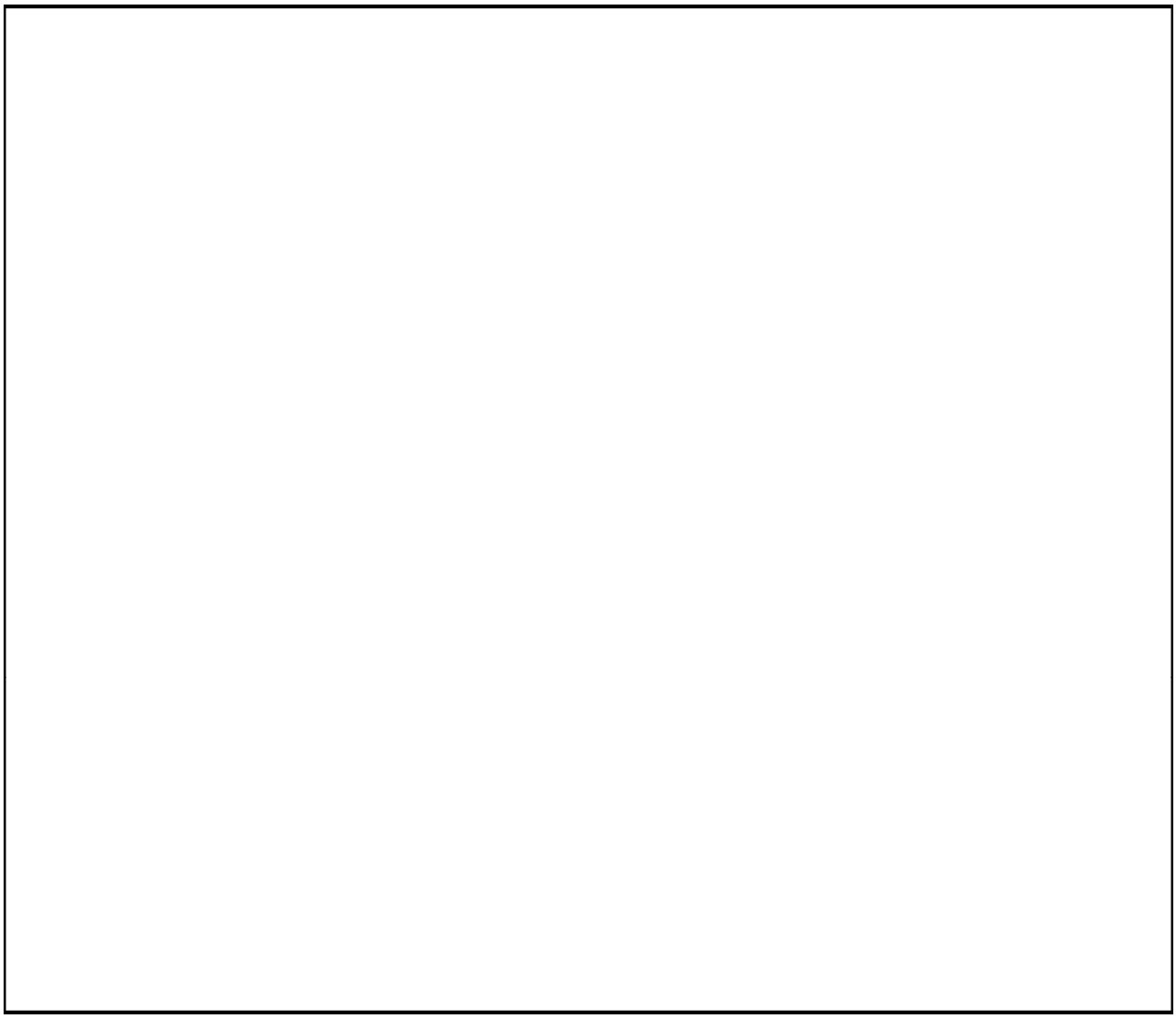
18. Are all Earthen Structures Seeded and Mulched? Is Vegetation Providing Adequate Protection?			
Debris and Construction Wastes	**Yes**	**No**	**Comments**
19. Is the Construction Site Free of Debris and Construction Wastes?			
20. Are There any Debris Piles with Petroleum Cans, Chemical Containers or Other Sources of Possible Pollution?			
Runoff Conveyance and Control	**Yes**	**No**	**Comments**
21. Are all On-site Drainage Channels and Outlets Adequately Stabilized? (Channel Lining, Seeding, Outlet Stabilization, etc.?)			
22. Are all Operational Storm Sewer Inlets Protected so that Sediment will not Enter the System?			
23. Is there Evidence of Increased Off-site Erosion Since the Project Began?			
24. Are Downstream Waterways and Property Adequately protected from Increases in Stormwater Runoff?			
Maintenance	**Yes**	**No**	**Comments**
25. Do any Seeded Areas Require Fertilizer, Reseeding or Additional Mulch?			
26. Do any Structural Practices Require Repair or Clean out?			
27. Have Temporary Structural Practices That are no Longer Needed Been Removed?			

Other	Yes	No	Comments
28. Is any Work Occurring in Streams?			
29. Is Channel Damage Being Minimized?			
30. Is Stabilization or a Temporary Storm Crossing Needed?			
31. Are Utility Trenches being Backfilled and Seeded Properly?			
32. Are the Erosion and Sediment Controls Maintained in Accordance with Design Guidelines?			
33. Are the BMPs for the Different Construction Phases in Accordance with the SWPPP?			
34. Are the BMPs being Installed in Accordance with Actual Construction Progress?			
35. Does the SWPPP Require Sufficient BMPs to Ensure Erosion and Sediment are Controlled?			
36. Does the Site have Adequate BMPs to Ensure Erosion and Sediment are Controlled?			
37. Overall, Does the Site BMPs Appear to be Effective?			

General Conditions of Site:

Problems Noted and Corrective Actions Recommended:

Other Observations or Comments:



Sketch/Map

Corrective Action Taken:

Date:

Reviewed By:

Reported To:

SECTION 4

BEST MANAGEMENT PRACTICES

SECTION 4.1

INTRODUCTION

DISCUSSION OF BMPS

SIX MINIMUM CONTROL MEASURES

PE – Public Education and Outreach:
Public education programs or outreach activities must be implemented to educate the community on the impacts of stormwater runoff and the methods to reduce pollutants in stormwater runoff.

PI – Public Involvement and Participation:
The public should be included in developing, implementing, and reviewing the stormwater management program.

ID – Illicit Discharge Detection and Elimination:
A program to detect and eliminate illicit discharges must be developed and implemented.

CS – Construction Site Stormwater Runoff Control:
A program must be developed, implemented and enforced to reduce pollutants from construction activities that result in land disturbance activities of one acre or greater (including projects less than one acre that are part of a larger plan).

PS – Post Construction Stormwater Management in New Development and Redevelopment
A program must be developed, implemented and enforced to reduce stormwater runoff from new development and redevelopment sites of one acre or greater (including projects less than one acre that are part of a larger plan).

PP – Pollution Prevention and Good Housekeeping for Municipal Operations:
An operation and maintenance program must be developed (including training) to reduce pollutant runoff from municipal operations.

Illicit Discharge Detection and Elimination, Construction Site Runoff Controls, and Post Construction Site Runoff Controls shall only be discussed for the purposes of this manual. The BMP's for these three minimum control measures are detailed in Section 4.3, BMP Profiles and Design Standards.

SECTION 4.2

BMP SELECTION GUIDE

BMP SELECTION GUIDE

Construction Considerations	Site Condition	Best Management Practice
Municipal		Model Ordinances Ordinance for Post Const. Runoff Zoning
Developer	Design Considerations	Alternative Turnarounds Bioretention Catch Basins / Inserts Conservation Easements Eliminating Curbs & Gutters Green Parking In-Line Storage Infrastructure Planning Manufactured Products for Stormwater Inlets Narrower Residential Streets On-Lot Treatment Open Space Design Sand & Organic Filters Stream Crossing (Permanent) Urban Forestry
Contractor	Required	BMP Inspection and Maintenance Construction Reviewer Contractor Certification & Inspector Training General Construction Site Waste Management Spill Prevention & Control Plans
	Recommended	Vehicle Maintenance & Washing
Sequence	All disturbed areas	Construction Sequence

Construction Considerations	Site Condition	Best Management Practice
Installing Access Routes, Slope Runoff Control	Land Slopes < 5%	Construction Entrance / Exit Construction Road Stabilization Diversion Dust Control Filter Berms Grassed Filter Strips Land Grading Mulching Sediment Basin Silt Fence Storm Drain Inlet Protection Straw Bale Barrier Stream Crossing Surface Roughening Temporary Seeding Tree Preservation Trees & Shrubs Topsoiling Vegetated Buffer Water Bar
	5 – 12%	(same as above plus) Check Dam Geotextiles Gradient Terrances Lined Waterway or Outlet
Clearing and Grading	Disturbed Areas	Brush Barriers Buffer Zone Chemical Stabilization Diversion Dust Control Grassed Waterway Grassed Filter Strips Land Grading Lined Waterway or Outlet Sediment Basin Silt Fence Straw Bale Barrier Vegetated Buffer

Construction Considerations	Site Condition	Best Management Practice
Sediment Retention (Measures to be installed before major land disturbance begins)	Disturbed Areas < 2 acres	Silt Fence Straw Bale Barrier
	2 – 5 acres	(same as above plus) Check Dam Diversion Sediment Basin
	> 5 acres	(same as above plus) Grade Stabilization Structure Slope Drains
Borrow and Waste Disposal Topsoil Stockpiling	All Disturbed Areas	Diversion Mulching Permanent Seeding Sediment Basin Sediment Filters Sediment Trap Silt Fence Soil Retention Temporary Seeding Topsoiling Trees and Shrubs Vegetated Buffer
Stabilizing Streambanks	Design Velocity < 5 ft/sec	Geotextiles Grassed Waterway Mulching Permanent Seeding Rip-Rap Rock Outlet Protection Vegetative Streambank Stabilize
	> 5 ft/sec	Detention Basin Geotextiles Paved Flume Rip-Rap Retention Ponds Rock Outlet Protection

Construction Considerations	Site Condition	Best Management Practice
Runoff Control	Drainage Area < 5 acres	Check Dam Concrete Grid & Modular Pave Diversion Infiltration Trench Grassed Waterway Land Grading Level Spreader Lined Waterway or Outlet Mulching Parking Lot Storage Paved Flume Rock Outlet Protection Slope Drains Storm Drain Inlet Protection Temporary Seeding Topsoiling
	> 5 acres	(same as above plus) Detention Basin Grade Stabilization Structure Infiltration Basin
Special Site Problems	Seepage Area or High Water Table	Subsurface Drain
	Polluted Runoff Water	Constructed Wetlands Stormwater Retention Basin Underdrains and Stormwater Filtration Systems
	Illicit Discharges	Failing Septic Systems Illegal Dumping Industrial / Business Discharges Recreational Sewage Sanitary Sewer Overflow Wastewater Connection to Storm Drain System
	Consistent Strong Winds	Wind & Sand Fences Vegetative Dune Stabilization

Construction Considerations	Site Condition	Best Management Practice
Utilities and Building Construction	Disturbed Areas	Diversion Mulching Permanent Seeding Silt Fence Sodding Temporary Seeding Topsoiling

SECTION 4.3

BEST MANAGEMENT PRACTICE PROFILES AND DESIGN STANDARDS

SECTION 4.3.1

ILLICIT DISCHARGE DETECTION AND ELIMINATION

ID – Illicit Discharge Detection and Elimination

EPA Requirements and Guidance:

EPA requires the designated city/county to develop, implement and enforce a program to detect and eliminate illicit discharges. The program must include the following:

- A storm sewer system map depicting the location of all outfalls and the names and location of all waters that receive discharges from those outfalls;
- Ordinance or other regulatory mechanism to effectively prohibit non-stormwater discharges into the storm sewer system;
- A plan to detect and address non-stormwater discharges including illegal dumping to the system; and
- A plan to inform public employees, businesses, and the general public of hazards associated with illegal discharges and improper disposal of waste.

The programs should address the following categories of non-stormwater discharges or flows (i.e., illicit discharges) only if they are identified as significant contributors of pollutants to a small MS4: water line flushing, landscape irrigation, diverted stream flows, rising groundwater, uncontaminated groundwater infiltration, uncontaminated pumped groundwater, discharges from potable water sources, foundation drains, air conditioning condensation, irrigation water, springs, water from crawl space pumps, footing drains, lawn watering, individual residential car washing, flows from riparian habitats and wetlands, dechlorinated swimming pool discharges, and street washwater.

The program should include measures to detect and address illicit discharges and should include the following four components: procedures for locating priority areas likely to have illicit discharges; procedures for tracing the source of an illicit discharge; procedures for removing the source of the discharge; and procedures for program evaluation and assessment. EPA recommends visually screening outfalls during dry weather and conducting field tests of selected pollutants as part of the procedures for locating priority areas. Illicit discharge education actions may include storm drain stenciling, a program to promote, publicize, and facilitate public reporting of illicit connections or discharges; and distribution of outreach materials.

Listed below are the most common BMP's associated with Illicit Discharge Detection and Elimination. Design criteria for these BMP's can be found in this section.

Failing Septic Systems Identification and Elimination

Benefits:

- *Reduction of a major sources of biological impairment in waterbodies.*
- ***Reduction of a major sources of nutrient enrichment in waterbodies.***
- ***Provides relief from negative economic impacts to fishing and tourism due to shellfish bed closures and beach closings.***

Limitations:

- *Individual failing septic systems are difficult to locate and often costly to identify.*
- *On-site inspection is often the only way to verify failing systems and will require landowner cooperation or regulatory*

Costs:

- *Detection costs will vary upon detection method used, area inspected, and staff availability. Costs for repair or replacement of failing systems will vary according to site conditions and system type.*

Discussion:

Failing septic systems are listed as a major source of surface water contamination in the state by the MDEQ. A failing septic system is one that discharges effluent with pollutant concentrations exceeding established water quality standards. Non-urban areas are typically the areas of concern, and old systems and systems installed near water bodies are of special concern. A community should design a program to prevent new septic systems from failing and to detect and correct existing systems that are failing. Successful programs can reduce a major source of fecal coliform and biological oxygen demand contamination in runoff and should include requirements for routine inspections and mandatory maintenance provisions. Program elements could include the following: Educating homeowners and installers, conducting visual inspections to identify areas of concern, monitoring areas of concern, creating ordinances to require proper installation in suitable areas, testing soils before installation, and mapping areas of concern.

Illicit Connections Identification and Elimination

Benefits:

- *Identifying illicit connections can systematically eliminate illegal connections and discharges of untreated wastewater, thereby improve water quality.*
- *Identifying illicit connections can increase public and business sector awareness of illicit discharges.*

Limitations:

- *Identification of illicit connections requires availability of trained staff to conduct investigations.*
- *Identification of illicit connections require access to private property to conduct investigations and may require landowner*

Quick Facts

- 1 drop of oil can pollute 100 gallons of water
- 100/500 Tons/Acres of topsoil is lost each year by wind and water erosion on unprotected construction sites.
- Pet waste can leach into the ground water and pollute drinking water.

Costs:

- *Costs for implementing an identification program will vary depending upon watershed size, density and age of buildings, and types of land use. Costs will include trained staff and manhours to conduct investigations. Case studies in Michigan estimated the cost for two field staff and administrative support at $182,000 to $187,000 annually (Ferguson et al, 1997).*

Discussion:

This measure involves locating and identifying illegal and/or improper connections to a storm drainage system and receiving waters. Water sampling should be conducted to identify which areas are most likely to contain illicit discharges. Programs can include use of maps and construction drawings to aid in identification efforts. Public outreach measures such as advertising and use of community hotlines are often valuable methods of identification. Methods of detection include field-testing of dry weather discharges, visual inspections, piping schematic review, smoke testing, and dye testing. Programs have demonstrated the ability to provide dramatic improvements to water quality by elimination of illegal connections. Programs require labor costs for inspections to identify sources of discharge and may require legal considerations for access to private property.

Illegal Dumping Identification and Elimination

Benefits:

- *Programs that encourage public education and involvement increase public awareness of problems associated with illegal dumping. Citizen reporting and cleanup of illegal dumping along with government guidance and participation can reduce the work load of detecting and cleaning up illegal dumping.*

Limitations:

- *Most local government agencies will find it logistically impossible to provide staff to adequately monitor for all illegal dumping.*

Costs:

- *Costs can be greatly reduced by educating citizens and encouraging participation in programs such as storm drain stenciling and by encouraging reporting of illegal dumping, however, staff to investigate, cleanup, and enforce penalties will still be required.*

Discussion:

Illegal dumping involves disposal of waste in an unpermitted area. Illegal dumping can involve dumping into storm drains, along roadsides, and often directly into water bodies. A successful program can eliminate a source of untreated pollutants and reduce costly cleanups. Costs for routine monitoring of suspect sites may require costs for labor and may not be feasible options in every situation. Public education and outreach to involve citizen reporting can be cost effective methods. Programs should include penalties for illegal dumping and the penalties must be enforced.

Industrial/Business Connections Identification and Elimination

Benefits:

- *Prevention of groundwater and surface water contamination by improper industrial and business connections.*

Limitations:

- *Individual improper connections are difficult and often costly to identify.*
- *On-site inspection is often the only way to verify improper connections and will require landowner cooperation or regulatory intervention.*

Costs:

Estimates for visual inspections range from $1,250 to $1,750 per square mile (Claytor and Brown, 1996).

Discussion:

This measure involves the identification and elimination of illegal or inappropriate connections of industrial and business wastewater sources to the storm drain. Illicit industrial connections can include examples such as cross connections with sanitary sewers and floor drains improperly connected to storm drain pipes. Methods of detection include examples such as field-testing of dry weather discharges, visual inspections, piping schematic review, smoke testing, and dye testing. Programs have demonstrated the ability to provide dramatic improvements to water quality by elimination of illegal connections. Programs require labor costs for inspections to identify sources of discharge and may require legal considerations for access to private property.

Identification and Elimination of Sewage Associated with Marine Activities

Benefits:

- *Reduction in biological pathogens in waterbodies.*
- *Reduction in oxygen demanding pollutants.*
- *Reduction in hazardous chemicals in waterbodies.*

Limitations:

- *May require installation of pumpout stations for recreational sewage tanks.*
- *Public awareness is often the major limitation to proper disposal of recreational sewage.*

Costs:

- *Cost for pumpout stations vary according to the size of the marina and type of system chosen. The average cost for pumpout station installation has been estimated to be $5,323 (RI Sea Grant, 1992). Federal aid may be available to help pay for up to 75% of installation costs for pumpout stations.*

Discussion:

Recreational sewage includes wastewater generated from outdoor activities such as boating and camping. Areas of concentrated recreational usage can contribute substantial amounts of chemical, bacterial, and nutrient contamination to waterbodies. Education of boaters and campers is essential to a successful elimination program. Successful programs can reduce a significant and often overlooked source of surface water contamination. Programs may require the installation of pump-out equipment for tanks. State and federal programs may provide aid in installation costs.

Sanitary Sewer Overflows Identification and Elimination

Benefits:

- *Eliminating sanitary sewer overflows prevents raw sewage from entering waterbodies, thus eliminating a major risk to human health and aquatic ecosystem health.*

Limitations:

- *Determining causes and providing solutions for overflows can be costly.*

Costs:

- *Repairs to overflowing sanitary sewer systems can be expensive. Regular inspection of sewer lines can reduce the need for costly repairs by detecting problems early. Costs for replacement and rehabilitation of undersized and outdated systems should be a component of sanitary sewer system planning.*

Discussion:

Sanitary sewer overflow programs involve the detection and correction of releases of raw sewage from a separate sanitary sewer system prior to reaching a treatment facility. A schedule for regular maintenance of sewer lines is a good way to avoid expensive repairs. Economic impacts from overflows can be significant and can involve shellfish bed closures, bans on fish consumption and inhibit recreation and tourism. An inspection program can eliminate a source of human health risks and can provide maintenance and repair cost savings for sewer system operation. Methods of detection include examples field-testing of dry weather discharges, visual inspection, piping schematic review, smoke testing, and dye testing. The EPA CMOM program is an example of a program that encourages self-inspection and reporting of sanitary sewer overflows.

Wastewater Connections to the Storm Drain System Identification and Elimination

Benefits:

- *Prevention of untreated wastewater from entering storm drains and contaminating surface water.*
- *Protection of human and aquatic ecosystem health.*

Limitations:

- *Individual improper connections are difficult and often costly to identify.*
- *On-site inspection is often the only way to verify improper connections and will require landowner cooperation or regulatory intervention.*

Costs:

- *Costs for implementing an identification program will vary depending upon watershed size, density and age of buildings, and types of land use. Costs will include training staff and manhours to conduct investigations.*

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Bacteria tainting Biloxi waterfront

By PATRICK PETERSON
THE SUN HERALD

BILOXI — The beach near Rodenberg Avenue remains closed more than a week after a motel operator was charged with dumping raw sewage into a storm drain that flows directly into the Mississippi Sound.

"After these rains, there's been another spike in bacteria levels," said Lloyd Sharp, director of the Coast office of the state Department of Environmental Quality.

Sharp said this week's heavy rains should help flush sewage from the storm drain near the Super 8 Motel, just east of Rodenberg. The beach closed June 19 and had been closed four times in 2001.

Dominic Bui, who operates the Super 8 Motel at 1678 Beach Blvd., will appear in Biloxi community court on July 9 on two misdemeanor charges of dumping sewage into a storm drain. Bui has repaired the private sewage lift station that had been bypassed with a pump and about 50 feet of hose. Bui faces $2,000 or more in fines and up to six months in jail.

DEQ attorneys plan to help Biloxi prosecute Bui because city penalties are more severe than the state's. The state will monitor Bui's repairs and future operations.

"We want to keep an eye on it," said DEQ attorney Chuck Barlow.

Some beachfront businesses are considering legal action against Bui for lost business. Daytime business has fallen at Wet and Wild Beach Club since the beach closed last week, said owner Mark Balius.

"You've got signs blocking the whole beach," Balius said.

Discussion:

This measure involves the detection and elimination of illicit connection of wastewater lines dumping to storm drains. Wastewater connections to the storm drain system typically occur as cross connections of wastewater drains to storm drains within a facility. Methods of detection include examples such as field-testing of dry weather discharges, visual inspections, piping schematic review, smoke testing, and dye testing. Programs have demonstrated the ability to provide dramatic improvements to water quality by elimination of illegal connections. Programs require labor costs for inspections to identify sources of discharge and may require legal considerations for access to private property.

SECTION 4.3.2

CONSTRUCTION SITE RUNOFF CONTROLS

CS – Construction Site Runoff Controls

EPA Requirements and Guidance:

The designated city/county must develop, implement, and enforce a program to reduce pollutants in any stormwater runoff to a small MS4 from construction activities that disturb one or more acres. Reduction of stormwater discharges from a construction activity disturbing less than one acre must be included in the program if that construction activity is part of a larger common plan of development or sale that would disturb one acre or more. At a minimum, the program must include the development and implementation of the following: An ordinance or other regulatory mechanism to require erosion and sediment controls, as well as sanctions to ensure compliance, to the extent allowable under State, Tribal, or local law.

Construction site operators must implement appropriate erosion and sediment control (ESC) best management practices and must (1) control waste such as discarded building materials, concrete truck washout, chemicals, litter, and sanitary waste at the construction site that may cause adverse impacts to water quality; (2) establish procedures for site plan review which incorporate consideration of potential water quality impacts; (3) establish procedures for receipt and consideration of information submitted by the public; and (4) establish procedures for site inspection and enforcement of control measures.

Examples of sanctions to ensure compliance include non-monetary penalties, fines, bonding requirements, and/or permit denials for non-compliance. EPA recommends that procedures for site plan review include the review of individual pre-construction site plans to ensure consistency with local (ESC) requirements. Procedures for site inspections and enforcement of control measures could include steps to identify priority sites for inspection and enforcement based on the nature of the construction activity, topography, and the characteristics of soils and receiving water quality. The designated city/county is encouraged to provide appropriate educational and training measures for construction site operators and may wish to require a stormwater pollution prevention plan for construction sites within their jurisdiction that discharge into their system.

Listed below are the most common BMP's associated with Construction Site Runoff Control. Design criteria for these BMP's can be found in this section or in the "Planning and Design Manual for the Control of Erosion, Sediment and Stormwater" (ESC Manual) published by the Mississippi Department of Environmental Quality, Mississippi Soil & Water Conservation Commission and the USDA Soil Conservation Service. BMP's denoted by an asterisk (*) shall be designed according to ESC Manual design standards.

BMP Inspection and Maintenance

Benefits:

- *Regular inspection and maintenance ensure BMPs are properly functioning and effective. This may be the single most important and most overlooked practice for construction site stormwater management.*

Limitations:

- *The only real limitation to inspection and maintenance program is that to be effective, a sincere effort is required by the contractor.*

Costs:

- *Costs associated with time.*

Discussion:

BMP inspection and maintenance programs involve requirements for checking and repairing stormwater management practices. Inspection and maintenance of BMPs are essential for the effectiveness of stormwater management measures. Program requirements should include schedules for routine inspections (such as after every significant rainfall), time frames for repair of damaged or failing measures, and provide guidance (such as inspection forms tailored to the types of practices being implemented). Inspection and maintenance requirements should be suited to the types of BMPs that are being used, and providing inspector training is an effective means of ensuring proper inspection and maintenance. Documentation including inspection forms, dates, rainfall data, conditions observed, deficiencies noted, and corrective actions taken should be maintained.

Brush Barrier

Benefits:

- *Brush barriers are inexpensive methods used to reduce stormwater velocities and filter suspended particles from runoff.*

Limitations:

- *Brush barriers are not effective for high velocity flow. Brush barriers may not be applicable for sites where little useable brush material is generated during clearing. Material used to create brush barriers will have to be removed upon completion of construction. The materials used to construct brush barriers will decompose.*

Costs:

- *USEPA estimates brush barriers can be constructed for a cost ranging from $390 to $620 (no size indicated).*

Effectiveness:

- *Brush barriers are not effective for high velocity flows and may become clogged with sediment.*

Discussion:

Brush barriers are sediment control structures constructed of materials such as tree limbs, roots, stone, or other such debris produced during site clearing. This material is piled together along the perimeter of a site to provide for reduction of stormwater flow and removal of sediments. Brush barriers are often constructed of fragmented plant materials and covered with a geotextile material for stabilization and improved efficiency. Brush barriers are typically limited to sites where sufficient material is produced from clearing and to sites with small drainage areas and slopes less than 2:1 and less than 100 feet long. Brush barriers are not intended to manage high velocity runoff. Brush barriers often become clogged with sediments quickly and also decompose; limiting the amount of time the measure is effective.

Check Dams

Discussion:

Check dams are small, temporary dams constructed across a swale or channel and are designed to reduce stormwater flow velocity. Although gravel dams have proven to be the most effective at stabilizing channels, they can be constructed of various materials such as stone, gravel, logs, and straw bales. Long channels should use multiple dams spaced appropriately for the slope and channel flow. Placing dams in live channels should not be used unless approved by the appropriate regulatory agency. Dams should be used in conjunction with other BMPs such as grassed channels, and should be inspected after each storm. Improperly designed dams may not be adequate for the stormwater velocity, and failure can exacerbate erosion.

Benefits:

- *Check dams have been shown to provide greater stabilization for stormwater ditches than silt fence or straw bales.*
- *Check dams are characterized as having low costs and easy installation.*

Limitations:

- *Check dams are designed to slow stormwater runoff velocity and are not intended to be used alone as they provide primarily quantity benefits and little improvement to water quality. If improperly installed, check dams may lead to accelerated erosion. Check dams are used as a temporary practice until permanent stabilization measures are installed.*

Costs:

- *Costs of check dams will depend on necessary size and availability of material. USEPA estimates check dams constructed of rock to average about $100 per dam. Other materials such as logs or sandbags may be used. All methods will require regular inspection and possible maintenance.*

Chemical Stabilization

Benefits:

- *Chemical stabilization can reduce erosion from slopes where vegetation cannot be established.*

Limitations:

- *Chemical stabilization can create impervious surfaces resulting in increased runoff. The potential environmental impacts of the chemicals used are unknown. Chemical stabilization is typically more expensive than vegetative practices. Chemical stabilization provides a temporary solution to erosion control.*

Costs:

- *Costs depend on chemicals used and methods of application. EPA reports costs for a common chemical stabilizer to range from $4 to $35 per pound, which will cover one acre and does not include costs for application.*

Discussion:

Chemical stabilizers are materials used to provide temporary soil stabilization and are typically composed of vinyl, asphalt, and rubber. The chemical stabilizers, also called palliatives or soil binders, are sprayed onto the surface of exposed soils to protect against erosion from stormwater runoff or wind. Chemical stabilizers can provide immediate erosion control and can be applied in situations where establishment of vegetation is not effective. Chemical stabilizers may be used in conjunction with seeding in some cases. Chemical stabilizers offer temporary soil stabilization. Manufacturer's recommendations for application should be followed closely to avoid developing an impermeable coat or result in adverse environmental effects resulting from over-application.

Construction Entrances

Benefits:

- *Removal of mud from construction vehicles can reduce the amount soils and sediments leaving a site. Off-site tracking of mud by construction vehicles can contribute to significant particulate inputs into the storm drain system, especially in urban areas where curbs and gutters are present.*

Limitations:

- *Stabilization of entrances and exits with gravel or grating may be only minimally effective at removing mud from vehicles. Washing operations are the most effective method for removing mud from vehicles before leaving a site, but require a water source and collection area for the used wash water. Some sites may require multiple entrances and exits to accommodate adequate access and high*

Costs:

Stabilized construction entrance	$1,000-4,000
Annual maintenance	$1,500
Entrance with wash rack	$1,000-5,000
Annual maintenance	$2,200

(Source USEPA, 1993)

Discussion:

Construction entrances consist of graveled or grated areas located where vehicles enter and leave a site and are designed to provide a buffer to reduce the amount of mud and soil transported from the site to adjacent roadways. This measure is best used where wet conditions or long-term projects are anticipated and should be used with other access measures such as maintaining construction paths, building paths out of low areas, and restricting vehicle access in wet areas. An effective construction entrance reduces muddy roadways, reduces transport of sediments and improves site appearance. This measure may require vehicle washing and additional construction costs.

Construction Reviewer

Benefits:

- *Construction reviewer programs can ensure implementation and maintenance of stormwater BMPs. Construction reviewer programs can provide measures for enforcement of regulations. Construction reviewer programs often use third party personnel are hired by the contractor and who report to the regulatory agency on the findings of regular inspections, thereby reducing the work load for the government agency.*

Limitations:

- *Agency staffing is often inadequate to provide sufficient numbers of inspections at all construction sites.*

Costs:

- *Costs are minimal but include additional staff time to ensure proper implementation and maintenance.*

Construction reviewers periodically inspect construction sites to ensure that contractors have installed and maintained their erosion and sediment controls properly (Source: University of Connecticut Cooperative Extension System, 2000)

Discussion:

Construction reviewer programs involve providing personnel to inspect construction sites, prepare reports of the inspection findings, and refer the project to the proper enforcement agency if problems are not corrected. Construction reviewers provide for enforcement of construction site stormwater management programs, which is an essential element of successful stormwater management programs. Construction reviewer programs should ensure the program personnel are educated on the proper methods of sediment and erosion controls. Many states and municipalities do not have the resources to provide a sufficient number of reviewers to implement an effective construction reviewer program. Some local governments have adopted programs to certify third party inspectors to conduct site inspections and report to the local authority. In most cases, the cost for providing inspectors is paid for by the contractor or developer. These third party reviewer programs have proven successful at reducing the workload for the agencies in charge of construction inspections and reducing downtime for developers.

Construction Road Stabilization

Benefits:

- *Properly located and stabilized construction roads can significantly reduce on-site erosion during construction.*

Limitations:

- *For rural areas of low traffic volume.*

Costs:

- *Costs vary and depend on the materials used for road stabilization. With proper grading and stabilization with stone, a contractor can save money by reducing erosion, avoiding dust problems, and improving overall efficiency of the construction operation.*

Discussion:

Ensure that construction routes follow the natural contour of the terrain where possible. Avoid steep slopes, excessively wet areas, and highly erodible soils. Controlling surface runoff from the road surface and adjoining area is a key erosion control consideration. Construction traffic routes are especially susceptible to erosion because they become compacted and rutted and collect and convey runoff water along their surfaces, often at erosive velocities. Provide surface drainage and divert excess runoff to stable areas. This practice is also applicable to logging roads, travel lanes, access roads, etc.

Construction Sequencing

Benefits:

- *Construction sequencing helps prevent erosion and sediment problems from occurring. Construction sequencing can provide erosion control by planning in advance to implement management practices when and where appropriate. Construction sequencing can be used during any land disturbance activity.*

Limitations:

- *Weather and contractor/materials availability may cause interruptions in construction schedules.*

Costs:

- *Costs are typically low and include labor costs associated with developing the plan.*

Discussion:

Construction sequencing is a nonstructural practice involving a planned work sequence to coordinate the timing of disturbance activities and installation of control practices. Key runoff points are identified, existing vegetation to be preserved is identified, and the most effective BMP methods are identified. Costs associated with this measure are typically low and include labor costs associated with developing a written plan for the coordination of construction activities and stormwater management practices.

Contractor Certification And Inspector Training

Benefits:

- *Contractor education can result in improved awareness of stormwater management programs and procedures. Inspector training can help enforce compliance and reduce the burden on local agencies.*

Limitations:

- *Contractor and inspector training and certification programs require considerable effort on the part of the regulators or government agencies concerned.*

Costs:

- *Costs are minimal but may include costs associated with time and with training materials.*

Municipalities can establish training programs to educate contractors about erosion and sediment control practices

Discussion:

One of the most important factors to successfully implementing construction site stormwater management controls is the knowledge and experience of the contractor. Contractor certification programs that require contractors to meet education requirements for supervisory personnel are often used to provide the knowledge necessary to implement a successful stormwater management at their construction sites. Many municipalities utilize construction inspectors to ensure that the appropriate stormwater control measures are being utilized at construction site. Training and education for inspectors is essential to the performance of their duties as well. Inspectors are typically employed by the contractor to provide routine inspection of stormwater management systems at construction sites. Contractor certification and construction inspector programs can be built-in requirements of erosion and sediment control programs for permitted land disturbance and construction projects. Contractor certification and inspector training programs will require the development of the curriculum for training courses, staff to teach the courses, and staff to review reports and inspect sites to ensure contractors and inspectors are complying with the erosion and sediment control program.

Dust Control

Benefits:

- *Provides immediate protection in dry areas.*

Limitations:

- *Must be periodically applied and is not a long term solution.*

Costs:

- *Costs vary and depend on the size of the construction site, method used and weather conditions.*

Discussion:

Large quantities of dust can be generated during land grading activities for commercial, industrial, or subdivision development, especially during dry, windy weather. In planning for dust control, it is important to schedule construction activities so that the least area of disturbed soil is exposed at one time. Install temporary or permanent surface stabilization measures immediately after completing a land grading unit. For disturbed areas not subject to traffic, vegetation (temporary or permanent) provides the most practical and effective means of dust control. Other control measures include mulching, sprinkling, spraying adhesive or calcium chloride, wind barriers, and surface roughening by tillage. Maintain dust control measures properly through dry weather periods until all disturbed areas have been permanently stabilized.

Filter Berms

Benefits:

- *Filter berms can be an effective method for removing sediments from runoff if properly implemented. Filter berms can slow runoff and encourage sheet flow of runoff.*

Limitations:

- *Filter berms are temporary measures and do not have a long life span. They require regular maintenance in areas where inputs of mud and sediments are high. They are not intended for use on steep slopes or for areas with high velocity flows.*

Costs:

- *Costs for filter berms are typically low and will depend on size and availability of materials. Costs for labor to construct and maintain the practice are the majority of the costs.*

Discussion:

Filter berms are typically gravel or stone ridges that are designed as temporary methods to slow stormwater flow from traffic areas (roadways). Filter berms allow sediments to settle or be filtered out of runoff. Berms should be spaced across a slope according to the steepness of the slope (spaced closer together for steeper slopes) and are intended for use on gently sloping areas. Berms should be inspected after each storm and must be replaced once sediments build up in the voids. Failing filter berms can actually increase erosion and can concentrate flows at the point of failure.

General Construction Site Waste Management

Benefits:

- *Waste management is applicable to all construction sites and is easily and inexpensively implemented. Waste management can achieve reductions in pollutant sources before they are carried away by stormwater runoff.*

Limitations:

- *Time will be required for employee training and for supervisory inspections to ensure that waste management practices are being followed at a work site.*

Costs:

- *Costs associated with site waste management are relatively low. Some costs will be incurred to train employees and inspect site.*

Discussion:

Construction site waste management involves proper use, storage, and disposal of surplus and waste building materials such as concrete and demolition debris, etc., and hazardous materials such as fuels, lubricants, and paint products. Construction wastes can pose a potential threat to the general environment, which includes the threat of impacts to water quality from material transported from construction sites by stormwater runoff. Effective waste management programs require employee training and supervision to ensure that storage, handling, and disposal requirements are being adequately met. Frequent inspections of waste storage and disposal areas should be conducted to ensure proper procedures are being followed.

EPA Stormwater Phase II BMP Inventory

CS-13

Geotextiles

Benefits:

- *Geotextiles can aid in stabilizing disturbed soils and in establishment of permanent vegetative cover. Geotextiles can provide greater protection than vegetation alone in areas of high velocity runoff such as channels.*

Limitations:

- *Some types of geotextiles (non-biodegradable) may ultimately need to be removed and disposed of. Improper installation can cover up erosion underneath the fabric.*

Costs:

- *Costs for geotextiles vary depending on the type of materials chosen and can range from $0.50 to $10.00 per yd^2 (Source- SWPRC, 1991). Costs for installation will vary depending on site conditions. Maintenance costs will include regular inspection and costs will depend upon type of material chosen and whether it will need to be removed.*

Discussion:

Geotextiles are porous fabrics used to stabilize disturbed soils. Geotextiles are often used to aid in the establishment of vegetation by holding seeds, fertilizers, and soils in place and by providing protection from the forces of winds, rains, and runoff. Geotextiles are typically constructed of woven or bonded materials. Some use synthetic materials such as polypropylene, polyester, nylon, polyvinyl chloride, glass, and various mixtures of these materials. Some use biodegradable materials such as mulch matting constructed by binding wood, paper, cotton, or coconut fibers into sheets. Geotextile matting can be used in place of mulch and is useful for aiding in establishment of vegetation on highly erosive surfaces such as steep slopes and stream channels. Geotextile netting can be used to hold matting and mulch in place. Geotextiles can also be used as temporary cover for erosion control, as well as an intermediate layer between riprap and soil to prevent soil from eroding from underneath the riprap. One limitation associated with geotextiles are that improperly applied matting that does not maintain contact with the soil may allow for erosion underneath and away from view. Additionally, some synthetic geotextiles may need to be removed and disposed of eventually. Costs for geotextiles are low to moderate but require labor costs for installation and inspection.

Gradient Terraces

Benefits:

- *Gradient terraces can reduce erosion of disturbed soils by redirecting runoff away from steep slopes and onto stabilized outlets. Gradient terraces can slow runoff across a site.*

Limitations:

- *Gradient terraces are not useful for slopes that are excessively steep or for soils that are sandy, rocky, or shallow. Gradient terraces are not effective if adequate outlets are not provided.*

Costs:

- *Costs are low and typically involve labor and equipment to construct and maintain terraces.*

Discussion:

Gradient terraces are earthen embankments or ridge-and-channel systems that are designed to reduce erosion from steep slopes by redirecting stormwater flow. Careful design is essential to the success of gradient terraces. Planning must take into account the outlet points for stormwater, as well as adequate spacing and ridge height. Soils that are sandy or rocky are not suited for this measure. Gradient terraces are useful in areas where high erosion rates are expected and where vegetation establishment is not possible. Gradient terraces can direct stormwater flow from unvegetated areas to areas where vegetation can provide filtration and velocity reduction for sediment-laden runoff.

Grass-Lined Channels

Benefits:

- *Grass-lined channels provide stabilization of channel soils, slow runoff, provide for settling of sediments, and increase infiltration.*
- *By providing a stabilized method for conveyance of stormwater runoff, grass-lined channels can reduce the need for additional downstream management and treatment measures.*
- *Grass lined channels are aesthetically pleasing.*

Limitations:

- *Grassed channels primarily provide transport of runoff and can be used along with additional stormwater management practices in order to provide improved pollutant removal efficiencies.*
- *Improper design can cause elevated velocities and volumes of runoff resulting in changes in hydrology of receiving waters as well as failure and erosion of the channel.*
- *Establishment and maintenance of a dense growth of vegetation may require regular inspection and some maintenance in the beginning.*

Costs:

- *Costs are typically lower than other methods of stabilization, but will vary according to size and methods used for establishment of vegetation.*
- *Maintenance costs typically consist of mowing and removal of accumulated sediments and debris.*

Discussion:

Grass-lined channels use established vegetation for erosion control, velocity reduction, water quality improvement, and infiltration. This measure is useful for directing stormwater flow around or across a site, thus reducing gully erosion and sediment levels in runoff. Grass lined channels are often used to convey runoff to other BMPs, thus providing a pretreatment measure. Grass-lined channels are also aesthetically pleasing. Grass-lined channel should not be used where slopes are steep (>5%) or where flow rates are high (>5 ft/second).

Land Grading

Benefits:

- *Land or site grading is useful for reducing steep slopes and is useful in planning for runoff management. Land grading typically requires minimal costs to implement.*

Limitations:

- *Improper grading can disrupt natural stormwater runoff patterns and may cause poor drainage, high runoff velocities, and increased peak flows. Time is required to design grading plans to incorporate stormwater runoff management measures.*

Costs:

- *Costs involve time for planning grading measures to include stormwater management and erosion control, which may result in additional excavation/fill activities to implement.*

Discussion:

Land grading involves reshaping the ground surface to planned grades and currently is a common practice at most construction sites. Land grading is used to provide suitable topography for the intended development and can also be used to aid in the management of stormwater runoff during and after construction. Stormwater flow management should be incorporated into the initial site design and should seek to maintain predevelopment flow patterns and hydrology to the maximum extent practicable. Clearing and grading should be limited to the areas necessary for building activities and equipment traffic.

Lined Waterway Outlet

Benefits:

- *Reduces flow velocities in channels where grass would be ineffective*

Costs:

Riprap is cheaper and less expensive to repair. Costs vary and depend on site requirements.

Discussion:

Where flow velocities exceed allowable limits for grassed waterways, more durable liners such as riprap or paving should be used. Riprap liners are considered flexible and are usually preferred to rigid liners. Riprap is less costly, adjusts to unstable foundation conditions, is less expensive to repair, and reduces outlet flow velocity. Paved channels are preferred where space is limited, slopes are very steep, or the channel setting warrants the use of special paving materials. Care must be taken to see that foundation conditions are stable and high exit velocities can be controlled to protect the receiving stream. Riprap or paved channels can be constructed with grass-lined side slopes where site conditions warrant. Riprap will be installed over the proper filter (geotextile) or bedding unless the soil investigation indicates otherwise.

Model Ordinances

Benefits:

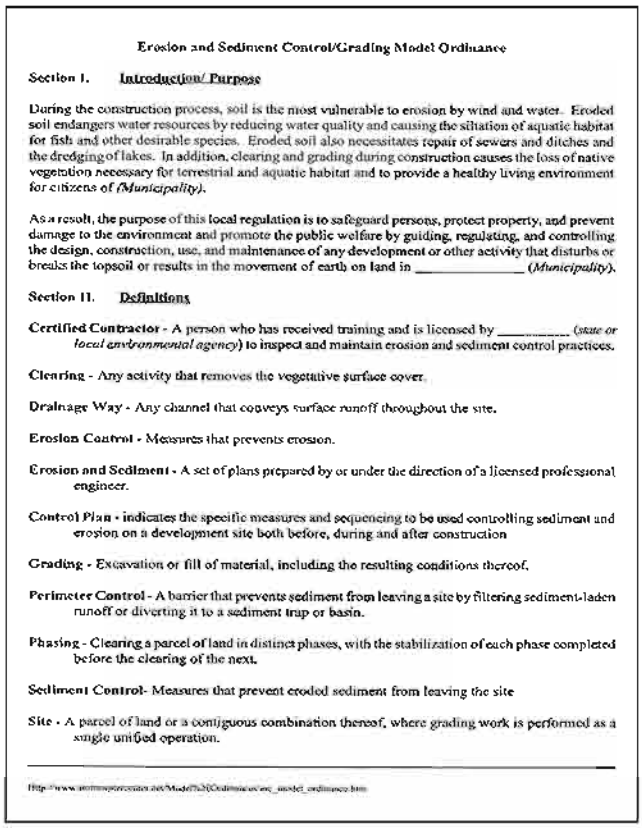
- *Regulatory means to enforce best management practices to improve water quality and reduce stormwater runoff.*

Limitations:

- *Must be enforced with penalties.*

Costs:

- *Costs vary and depend on ordinance requirements. Costs are associated with training employees and with inspection and enforcement.*



Erosion and Sediment Control/Grading Model Ordinance

Section I. Introduction/ Purpose

During the construction process, soil is the most vulnerable to erosion by wind and water. Eroded soil endangers water resources by reducing water quality and causing the siltation of aquatic habitat for fish and other desirable species. Eroded soil also necessitates repair of sewers and ditches and the dredging of lakes. In addition, clearing and grading during construction causes the loss of native vegetation necessary for terrestrial and aquatic habitat and to provide a healthy living environment for citizens of *(Municipality)*.

As a result, the purpose of this local regulation is to safeguard persons, protect property, and prevent damage to the environment and promote the public welfare by guiding, regulating, and controlling the design, construction, use, and maintenance of any development or other activity that disturbs or breaks the topsoil or results in the movement of earth on land in _____ *(Municipality)*.

Section II. Definitions

Certified Contractor - A person who has received training and is licensed by _____ *(state or local environmental agency)* to inspect and maintain erosion and sediment control practices.

Clearing - Any activity that removes the vegetative surface cover.

Drainage Way - Any channel that conveys surface runoff throughout the site.

Erosion Control - Measures that prevents erosion.

Erosion and Sediment - A set of plans prepared by or under the direction of a licensed professional engineer.

Control Plan - indicates the specific measures and sequencing to be used controlling sediment and erosion on a development site both before, during and after construction

Grading - Excavation or fill of material, including the resulting conditions thereof.

Perimeter Control - A barrier that prevents sediment from leaving a site by filtering sediment-laden runoff or diverting it to a sediment trap or basin.

Phasing - Clearing a parcel of land in distinct phases, with the stabilization of each phase completed before the clearing of the next.

Sediment Control- Measures that prevent eroded sediment from leaving the site

Site - A parcel of land or a contiguous combination thereof, where grading work is performed as a single unified operation.

Discussion:

Municipalities can adopt model ordinances in order to establish requirements for utilization of recommended stormwater management practices. These local regulations are intended to safeguard the public, protect property, and prevent damage to the environment. Ordinances can require permit submittal and approval for land disturbing activities, stormwater management plans, specific design requirements, inspections, and enforcement. Site inspection and enforcement actions are often essential to ensure the effectiveness of ordinances. Ordinances must clearly define the roles and responsibilities of each involved agency to ensure the goals set forth in the ordinances are achieved.

Mulching

Benefits:

- *Mulching is a low cost method of soil stabilization. Mulches can provide stabilization of soils and prevent erosion during seed stabilization. Mulching can be used for temporary protection of disturbed soils. It provides immediate protection to soils that are exposed. It also helps retain moisture.*

Limitations:

- *Mulching may be washed away during storms. Mulching must be maintained and periodically replaced if intended for use as long term soil stabilization. Mulching is a temporary method used until permanent cover is established. Mulching may delay seed germination due to reducing soil surface temperatures.*

Costs:

- *Costs for mulching will depend upon materials used. Maintenance requirements and costs may vary according to slope, soil types, and rainfall. USEPA estimates costs for seed and mulch to average $1,500/acre.*

Effectiveness:

- *Use of mulch varies according to material used. Mulch has been shown to reduce soil erosion from 53 to 99.8 percent over bare soil and to reduce water velocity from 24 to 78 percent.*

Discussion:

Mulching is a temporary erosion control practice in which materials such as grass, hay, wood chips, wood fibers, straw, or gravel are placed onto exposed or recently planted soils. Mulching is most often used in conjunction with revegetation measures such as seeding. Mulch can aid in holding seed, soil moisture, and fertilizer in place during establishment of vegetation. Mulch materials may be applied loose or formed into mats for greater stability. Mulch matting can be anchored in place and can be constructed completely of biodegradable materials. Matting application on slopes requires secure contact to the soil to avoid erosion underneath the mating. Netting can be used to hold loose mulch in place; however, non-biodegradable materials may need to be removed eventually.

Paved Flume

Benefits:

- *Can be readi;y installed in most locations*
- *Offer large freeboard capacity at a low cost*
- *Less subject to failure from blockage then closed drains*
- *Require little maintenance*

Costs:

- *Costs vary and depend on site conditions.*

Discussion:

Paved Flumes are small concrete-lined channels designed to convey storm runoff down steep slopes. They are part of the permanent erosion control system for the development. In planning paved flumes, give special attention to flow entrance conditions, stability of the foundation, outlet energy dissipation, and freeboard capacity. The upper portion of the side slopes may be grassed to improve appearance and reduce cost.

Permanent Diversions

Benefits:

- *Diversions can eliminate sources of runoff pollution by redirecting stormwater runoff away from erodible soils or other pollutant sources.*
- *High level o f effectiveness.*
- *If planned properly, diversions can be installed during site and land grading activities.*

Limitations:

- *Stormwater diversion berms must be stabilized to avoid erosion of the channel and may require additional time and labor for design, construction, and maintenance.*
- *Diversions concentrate stormwater runoff necessitating a stable outlet.*

Costs:

- *Costs for diversions are generally low and would include design, construction, and maintenance.*

Discussion:

Permanent diversion berms and structures control stormwater runoff by using a channel and an earthen ridge to divert flow around areas sensitive to erosion. Diversions are most often constructed of earthen materials with vegetative cover and are best used with channel linings such as vegetation or matting. Diversions are typically used wherever the direction and velocity of runoff from up slope areas need to be controlled. Channels must be designed to manage peak storm flow and must be stabilized to prevent erosion of the channels. Design considerations are adaptable to site conditions; however, all designs should provide adequate outlets to manage the concentrated stormwater flows created.

Permanent Seeding

Benefits:

- *Permanent seeding provides long-term stabilization of soils. Permanent seeding is a low-cost low-maintenance method. Permanent seeding can reduce erosion, slow runoff velocities, increase infiltration, reduce runoff volumes, and filter sediments. Permanent seeding is suitable for a wide range of sites and conditions.*

Limitations:

- *Permanent seeding does not immediately stabilize soils and erosion during seed establishment. Additional stabilization methods and runoff controls may be necessary during establishment. Seed selection and effectiveness are dependant on the seasons and may not be effective during parts of the year. Additional time and labor may be required to prepare the seed bed and to reseed patches where establishment was unsuccessful.*

Costs:

- *USEPA reports costs for seeding to range from $200 to $1,000 per acre and average $400 per acre. Estimates for maintenance costs range from 15 to 25 percent of the capital costs and average 20% (USEPA, 1993).*

Effectiveness:

- *USEPA reports that permanent vegetative cover can reduce the amount of suspended solids in runoff by between 50 and 100 % with an average of 90%.*

Discussion:

Permanent seeding is the establishment of perennial vegetation from seed to control erosion from runoff on recently disturbed soils. Permanent seeding is a useful method for erosion control in areas where permanent vegetative cover is the most practical or effective method of stabilizing soils. This measure is economical and adaptable to different site conditions. Permanent seeding provides a wide range of options for plant materials and methods of establishment. Careful planning is vital to the success of permanent seeding. Proper planning includes identifying plant materials best suited to the site and soil conditions, proper seed bed preparation, timely planting, and proper maintenance to ensure establishment and survival.

Riprap

Benefits:

- *Riprap stabilizes soils in areas that receive concentrated flows and provides for reduction of runoff velocity. Riprap has a wide range of applications and is typically a low cost material.*

Limitations:

- *Riprap is typically not recommended for slopes greater than 2:1. Proper design to ensure the correct size of stones for the application is critical to the success.*

Costs:

- *Cost for riprap depends on availability, amount, method of delivery, and stone size.*

(Source- Mayo et al., 1993)

Discussion:

Riprap is a permanent layer of stones designed to stabilize banks and protect soil from erosion in areas of concentrated flows. Examples of common places to use riprap include outlet structures, slope drains, channel bottoms and side slopes, temporary check dams, and grade stabilization structures. Riprap can reduce stormwater velocities in channels by providing angular surfaces, and riprap can protect underlying soils from the forces of stormwater runoff. However, riprap should be limited to slopes of less than 2:1, and measures using riprap should be carefully designed and inspected to ensure proper function.

Rock Outlet Protection

Benefits:

- *Good energy dissipater*
- *Easy installation*

Costs:

- *Low costs.*

Discussion:

Erosion at the outlet of channels, culverts, and other structures is common and can cause structural failure with serious downstream problems. It is necessary that exit velocities into streams be nonerosive for site conditions. Rock outlet protection is often installed to provide the necessary energy dissipation. A riprap–lined apron is the most commonly used structure for this purpose, because it has relatively low cost and can be installed easily on most sites. Other types of outlet protection include concrete impact basins and paved outlets.

Sediment Basins and Rock Dams

Benefits:

- *Sediment basins and rock dams can reduce runoff velocities and reduce levels of suspended solids in runoff by intercepting stormwater flow leaving a site and allowing time for sedimentation.*

Limitations:

- *Sediment basins and rock dams should not be used in locations where failure would threaten human life or property including roads and utilities. Sediment basins and rock dams should never be used in live streams. Sediment basins and rock dams have demonstrated little or no effectiveness at removing dissolved pollutants from runoff. Some land loss is associated with sediment basins.*

Costs:

- *USEPA (1993) reports costs for basins with less than 50,000 ft^3 storage volume to average \$0.60/ ft^3 and for basins with greater than 50,000 ft^3 storage volume an average of \$0.30/ft^3.*

Costs:

- *USEPA estimates removal efficiency rates of suspended solids for sediment basins to average 70%. One study (Barfield and Clar, in Smolen et. al., 1988) reported that for sediment basins in southeastern coastal plain areas that used the design A=0.01q, where A is basin surface area and q is peak inflow rate in ft^3/second, an average sediment removal efficiency rate of greater than 75% was observed.*

Discussion:

Sediment basins and rock dams are two separate yet similar practices that both provide for temporary capture of stormwater and controlled release stormwater to allow for settling of suspended sediments. Sediment basins can be constructed using earthen berms, shallow excavation, or a combination of both. Sediment basins can be designed as either temporary or permanent measures. Basin designs typically employ a riser or culvert drain and designs range from dry pools to wet permanent pools. Rock dams use an embankment of rock and gravel to provide gradual drainage from the pool. Proper design is crucial to successful operation in order to ensure the appropriate size pool for the drainage area. Improper design can result in rupture of the embankment walls creating a greater input of sediments into the runoff. Both practices should be sited in drainage swales or low areas that receive runoff from the site, but neither should ever be placed in a live stream. Embankments and excavations should be vegetated immediately following their construction. Regular inspection and maintenance is essential to ensure effectiveness of sediment basins and rock dams.

Sediment Filters and Sediment Chambers

Benefits:

- *Sediment filters can remove many pollutants from stormwater runoff. Sediment filters can be modified in a wide range of design variations to suit site conditions and desired applications. Sediment filters can use various filter materials in order to target specific pollutant types.*

Limitations:

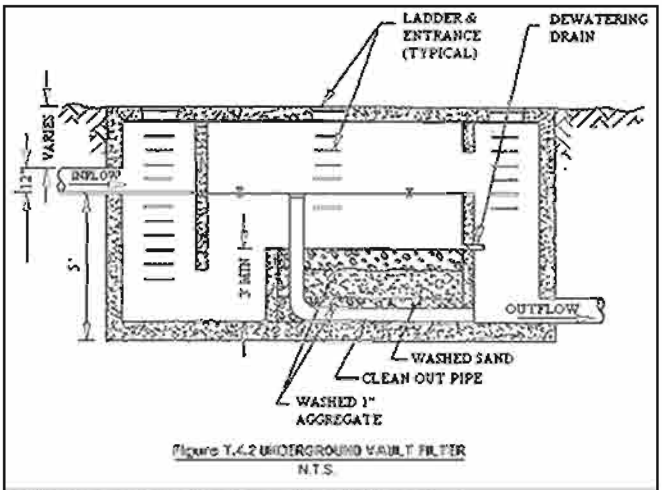
- *Sediment filters provide little or no reduction in stormwater volumes or velocities. Sediment filters require frequent inspection and regular maintenance. Sediment filters should not be used for sites with a drainage area greater than 10 acres.*

Costs:

- *MWCOG (1992) estimates construction costs for sand filters to range from $3.00 to $10.00/ft^3 of runoff treated. The same report estimates annual maintenance costs at about 5% of construction costs.*

Effectiveness:

- *Effectiveness will depend greatly upon the types of pollutants, the volume of runoff, and the design of the filter.*



Schematic representation of a sediment filter

Discussion:

Sediment filters and sediment chambers involve the use of a filter medium to remove suspended sediments and other particulate matter from stormwater runoff. Sediment chambers are one particular type of sediment filter and are often used as one stage in a sediment filter system. Sediment filters are typically composed of four basic parts: inflow regulation, pretreatment, filter bed, and outflow mechanism. Sediment filters can be designed in a variety of ways from confined systems to unconfined, on-line or off-line, and aboveground or below. Sediment filters have applications for construction and post-construction sites. Sediment filters should not be used for sites with a drainage area greater than 10 acres. Maintenance is an important aspect of proper function. Maintenance should include inspection and cleaning, and depending on the source and nature of the runoff the filter receives, may require annual replacement of the filter media at a minimum. If the potential for regulated pollutants is high at a site, sediments may need to be tested to ascertain the appropriate disposal method.

Sediment Trap

Benefits:

- *Sediment traps are similar to sediment basins on a smaller and temporary scale, and can be used with other temporary practices to slow runoff and reduce suspended solids.*

Limitations:

- *Sediment traps should not be used for drainage areas greater than 5 acres. Sediment traps are temporary measures and should not be used for longer than 2 years. Sediment traps do not maintain a lengthy detention time compared to other similar methods and often provide less effective removal of fine sediments such as silts and clays.*

Costs:

- *USEPA (1993) estimates average construction costs for sediment traps at $0.60 per ft^3 of storage volume.*

Effectiveness:

- *USEPA estimates removal efficiency rates of suspended solids for sediment basins to average 60%. One study (Barfield and Clar, in Smolen et. al., 1988) reported that for sediment basins in southeastern coastal plain areas that used the design A=0.01q, where A is basin surface area and q is peak inflow rate in ft^3/second, an average sediment removal efficiency rate of greater than 75% was observed.*

Sediment traps are used to collect sediment-laden runoff from disturbed areas on construction sites

Discussion:

Sediment traps are small impoundments formed by excavation of a depression or placement of an earthen berm across a drainage way or at a point of discharge. Sediment traps are used to detain stormwater runoff and allow sediments to settle. Sediment traps are typically temporary measures (<24 months) and are often used along with other BMPs such as entrance/exit wash stations and outlets to diversion channels to achieve an effective stormwater management system. Sediment traps typically use a rock spillway or outlet point to slow the release of stormwater runoff. Sediment traps should not be used for drainage areas greater than 5 acres and should allow at least 1,800 ft^3/acre of drainage area. Regular inspection and maintenance should be conducted to ensure proper function. Inspection for proper drainage and erosion of banks should be conducted, and maintenance should include removal of accumulated sediments.

Silt Fence

Benefits:

- *Silt fences reduce the offsite transport of sediments in stormwater runoff. Silt fences are generally low cost and widely applicable. Silt fences do not require a lot of clearing and grubbing before installation.*

Limitations:

- *Silt fences are not recommended for managing high velocities, concentrated flows. Obstructions to adequate installation such as boulders or roots can hinder the effectiveness of silt fences. Silt fences require regular inspection and maintenance.*

Costs:

- *USEPA (1992) estimates installation costs for silt fence at $6.00 per linear foot. SWRPC (1991) estimates installation costs to range from $2.30 to $4.50 per linear foot.*

Effectiveness:

- *USEPA reports that properly installed and maintained silt fences constructed of filter fabric have an average removal efficiency rate of 70% for suspended solids, 80 to 90% for sand, 50 to 80% for silt-loam, and 0 to 20% for silt-clay-loam soils.*

Discussion:

Silt fences are temporary structural controls designed to intercept stormwater and prevent or minimize sediment and debris in runoff, especially from rill or sheet erosion. Silt fences are most effective for a drainage area of no more than ¼ acre per 100 feet of fence with a maximum gradient of 50% and in ditches or swales where drainage area is no more than 2 acres and where flow velocity will not exceed 1 ft^3/second. Silt fences are inexpensive, easily constructed, and effective for sediment removal from runoff. Silt fences require regular inspections and may require regular maintenance. Silt fences have a life span of approximately 6 months at most. Silt fences require proper design and installation for effective erosion control.

Slope Drain

Benefits:

- *Temporary slope drains can prevent erosion from concentrated flows on unstabilized slopes. They can provide protection during slope stabilization or until other permanent practices are in place.*
- *Easy installation and low maintenance costs.*

Limitations:

- *Temporary slope drains must be sized to accommodate the anticipated runoff from the drainage area and are not recommended for areas greater than 5 acres. Failures can result from blockage*

Costs:

- *Low maintenance costs.*

Discussion:

Temporary slope drains are used as conduits for conveyance of runoff across slopes subject to erosion. Temporary slope drains can be used to provide drainage down slopes until permanent drains or soil stabilization measures have been established. Temporary slope drains can provide an effective means of discharging concentrated stormwater flow; therefore, gully erosion is avoided. Design of temporary slope drains should consider the size of the conduit used verses the area drained and should provide stabilized inlet and outlet areas.

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Sodding

Benefits:

- *Sodding can provide immediate vegetative cover and erosion control. Sodding is an effective method of soil stabilization and erosion control. Sod can provide cover in many situations where seeding may fail.*
- *Can be used to establish vegetation where other methods are unacceptable.*

Limitations:

- *Sodding is typically more expensive than other methods of establishing vegetation. Sodding requires well prepared soils, transportation and installation costs, and often watering during establishment. High installation costs and early maintenance demands are associated with sodding.*

Costs:

- *USEPA reports costs for sodding range from \$0.10 to \$1.10 per ft^2 and average \$0.20 per ft^2. Annual maintenance costs are estimated at 5% of the capital costs (USEPA, 1993).*

Effectiveness:

- *USEPA reports sodding can reduce total suspended solids in runoff by as much as 99%. Individual rates may vary depending on installation and site soils.*

Discussion:

Sodding is a useful method of rapidly stabilizing crucial areas such as channels and areas were aesthetics are important such as residential areas. Sodding typically provides more reliable results and less maintenance than seeding. Sod can be applied to areas where seeding is difficult, such as steep slopes and can be applied during times of the year when seeding is not a practical option. Sod is more expensive than seeding, and costs include purchase, transportation, installation, and maintenance.

Soil Retention

Benefits:

- *Soil retention structures are useful for sandy or rocky soils with steep slopes that may not allow for other methods of stabilization. Retention structures can be used to provide slope reduction for steep slopes.*

Limitations:

- *Retention structures should be designed by a professional engineer.*

Costs:

- *Costs for slope reduction are similar to those for grading. Structural retention methods are often moderately to very expensive and include costs for design, materials, and construction.*

Discussion:

Soil retention involves structures or practices designed to hold soil in place or keep contained within a sited boundary. Methods of soil retention range from grading slopes to shoring excavated areas with structural supports. Soil retention methods include structural methods using wood, steel, or concrete. Soil retention is useful in areas where other measures such as vegetative practices are ineffective. Proper design of soil retaining structures is essential to the proper function and should consider such factors as site drainage patterns and expected soil loads. A professional engineer should be consulted for the design, and regular inspections and maintenance should be conducted to ensure proper function.

Spill Prevention and Control Plans

Benefits:

- *Spill prevention and control plans can reduce the amount of exposure of hazardous materials to ground and surface water. An effective plan can result in cost savings in the event of an accidental spill.*

Limitations:

- *Time will be required for employee training and preparation of the response plan and materials.*

Costs:

- *Relatively low costs associated with creating plan. Some cost associated with training employees*

Effectiveness:

- *Prevention is an effective measure.*

Discussion:

Spill prevention and control plans involve written instructions for preventing, responding to, stopping, containing, cleaning up, and disposing of wastes generated by an accidental spill of hazardous material. Spill prevention and control plans should provide measures for training employees in the proper methods of preventing and responding to spills, and written step-by-step instructions should be maintained at the site. Spill prevention and control plans are applicable to sites where hazardous materials are used or stored. Plans should identify the presence and locations of any hazardous materials used or stored on site as well as identifying the location and procedures for use of appropriate emergency spill response equipment. Plans should identify individuals responsible for implementing the plan, give the proper safety measures for each type of waste, and identify the appropriate authorities to contact such as fire department, HAZMAT response teams, and hospitals. Plans must be kept current to meet changing site conditions and personnel. Mock response practice situations are useful methods for evaluating the preparedness of personnel and the effectiveness of the spill prevention and control plan.

Storm Drain Inlet Protection

Benefits:

- *Prevent soil and debris from entering a storm drain. Can reduce clogging of storm drains during construction.*

Limitations:

- *Storm drain inlet protection measures are intended to provide temporary protection during construction. They should be used in combination with additional measures such as sediment traps. Storm drain inlet protection measures are not intended for drainage areas greater than 1 acre. Frequent inspection and maintenance are necessary.*

Costs:

- *USEPA (1993) estimates costs for installing storm drain inlet protection to average $100 per inlet. Maintenance costs can be as much as installation costs. The SWRPC (1991) estimates installation costs of inlet protection measures to range from $106 to $154.*

Effectiveness:

- *USEPA reports low effectiveness for erosion and sediment control, long-term pollutant removal, and habitat and stream protection.*

Discussion:

Storm drain inlet protection measures are designed to prevent suspended particles from entering storm drain inlets. Several methods are available such as excavation around the perimeter of drop inlets, fabric or hay bales, block and gravel, or other materials such as straw booms or sock barriers around inlets. Use of storm drains during construction can provide a useful method of temporary diversion around disturbed soils, and inlet protection measures can prevent sediments and other suspended particles from entering the drains. Inlet protection measures should not be used for drainage areas greater than one acre and are most effective when used in combination with other practices to create a stormwater management system. Frequent inspection and maintenance is necessary to ensure proper function and detect failures early.

Straw Bale Barrier

Benefits:

- *Reduces the velocity of flow*
- *Allows deposition*
- *Retains sediment*
- *Diverts small volumes of flow to protected outlets*

Limitations:

- *Cannot be placed across concentrated flow areas such as streams and ditches*
- *Need to be replaced every 3 months.*

Costs:

- *Low costs.*

Discussion:

Straw bale barriers are a temporary sediment barriers consisting of a row of entrenched and anchored straw bales erected on small disturbed areas to capture sediment from sheet flow. Because straw bale barriers are not designed to withstand high heads, the drainage area must be restricted and the barrier located so that the water depth does not exceed 1 foot at any point. In the design of straw bale barriers, exercise care to prevent failure from undercutting, overtopping, or end running. Check straw bale barriers after each significant rainfall, remove the necessary sediment, and make repairs promptly.

Stream Crossing (temporary)

Benefits:

- *Allow full stream flow*
- *Allow site access with out harming water sources*

Limitations:

- *Certain construction vehicles may be too heavy to use.*

Costs:

- *Can be very expensive to construct.*

Discussion:

Stream crossings are direct sources of water pollution. They cause flooding and safety hazards. If washed out or damaged, they can also cause construction delays. Plan the development to complete work on each side separately to minimize stream crossings. Stream crossings are of three types: bridges, culverts, and fords. In selecting a stream crossing practice consider: frequency and kind of use, stream channel conditions, overflow areas, potential flood damage, surface runoff control, safety requirements and installation and maintenance costs. Temporary crossings may overflow during peak storm periods, however, the structure and approaches must remain stable.

Subsurface Drain

Benefits:

- *Improve soil-water conditions for vegetative growth*
- *Prevent sloughing of steep slopes due to groundwater seepage*
- *Stabilize wet foundation conditions*

Costs:

- *Costs vary due to various climatic and geographic conditions which a site can experience.*

Discussion:

A subsurface drain is often needed in construction operations and in developing areas to remove excess water from the soil. Drains usually consist of perforated, flexible conduit installed in a trench at a designed depth and grade. The conduit is often placed in a sand-gravel filter or gravel envelope and sized to carry the design flow. Backfill over the drain should be an open, granular soil of high permeability. Make sure the soil to be drained has sufficient depth and permeability to permit proper installation of an effective drainage system. An adequate outlet must be available. Properly designed and installed drains require little maintenance.

Surface Roughening

Benefits:

- *Soil roughening can slow runoff, increase infiltration, and help hold seeds from washing away.*
- *Soil roughening can be implemented on most sites where grubbing and clearing are conducted.*
- *Soil roughening can be used on all disturbed slopes and it has minimal costs.*
- *Soil roughening improves vegetation establishment and provides instant protection for bare soil.*

Limitations:

- *Soil roughening provides only moderate erosion control.*
- *Soil roughening is not effective for substantial rainfall events.*
- *Roughening with heavy equipment may serve to compact soils and hinder seed establishment.*
- *Soil roughening is a temporary practice for freshly graded areas and is not intended to provide long term erosion control.*

Costs:

- *Costs associated with soil roughening are primarily limited to the operation of equipment.*

Discussion:

Soil roughening is a temporary erosion control measure used to create relief in recently disturbed soils. Soil roughening can be accomplished by several methods such as tracking construction equipment, disking, or harrowing to create horizontal grooves parallel to the contour of the land. Soil roughening can reduce the velocity of stormwater runoff allowing for better infiltration, and soil roughening aid in providing a place for seeds to take hold. Excessive roughening should be avoided in areas where mowing will be necessary for maintenance.

Temporary Diversion Dikes

Benefits:

- *Diversion dikes can reduce pollutants in runoff by diverting runoff away from pollutant sources or by redirecting polluted runoff to other stormwater management practices.*

Limitations:

- *Diversion channels are subject to concentrated flows that may lead to erosion of the channel and increased sediments in the runoff.*

Costs:

- *Estimated costs for constructing diversion dikes involve site preparation and site development. The Southeastern Wisconsin Regional Planning Commission (SWRPC, 1991) estimated the total costs for a 100 ft. long, 1.5 ft. wide dike with 3:1 side slopes to cost between $162 to $500.*

Discussion:

Temporary diversion dikes typically consist of compacted earthen dikes located at the top or at the bottom of a sloped area of disturbed soils. Temporary diversion dikes are designed to control the velocity and/or route of stormwater runoff. Up-slope placement serves to divert runoff away from disturbed areas and down-slope placement serves to redirect runoff from erosion prone areas towards sediment trapping measures. Diversion dikes are not meant to replace other practices such as vegetative cover, but instead are intended to be used where vegetative cover is not practical, such as in areas of constant disturbance that will not be brought to final grade for many months. Earthen diversion dikes may themselves require some form of stabilization to avoid erosion of the dike. Diversion dikes are intended for temporary use and require regular inspection and maintenance.

Temporary Seeding

Benefits:

- *Protects earthen sediment control practices*
- *Stabilizes denuded areas that will not be brought to final grade for several weeks or months*
- *Provides nurse crop for permanent vegetation*
- *Provides residue for soil protection and seedbed preparation*
- *Helps prevent dust production during construction*

Discussion:

Protective cover must be established on all disturbed areas within 30 days after a phase of grading is completed. Temporary seeding and mulching are the most common methods used to meet this requirement. Annual plants that are adapted to site conditions and that sprout and grow rapidly should be used for temporary plantings. Proper seedbed preparation and the use of quality seed are also important. Because temporary seeding provides protective cover for less than one year, areas must be reseeded annually or planted with perennial vegetation.

Top Soiling

Benefits:

- *Higher organic matter present*
- *More friable consistency*
- *Greater available water holding capacity and nutrient content*

Limitations:

- *Subsoil could be as good as the top soil for seedbeds*
- *Needs to be on-site room for storage*

Costs:

- *Costs vary and in some cases, handling costs may be too high to make this practice cost effective*

Discussion:

Topsoil, which provides the major zone for root development and biological activities for plants, should be stockpiled and used wherever practical for establishing permanent vegetation. Topsoiling is a common practice where ornamental or high maintenance turf will be grown. It may be also required to establish vegetation on shallow soils, soils containing potentially toxic materials, very stony areas, and soils of critically low pH. Do not place top soil on slopes steeper than 2:1 to avoid slippage. The topsoil stockpile should be surrounded by silt fence.

Tree Preservation & Protection

Benefits:

- *Vegetation provides erosion control, reduction of runoff volumes and velocities, and infiltration. Existing vegetation can provide greater runoff management than newly seeded areas, has no lag time for establishment, has a higher filtering capability than newly seeded vegetation, typically requires less maintenance than newly landscaped areas, enhances aesthetics, and costs less than replanting.*

Limitations:

- *Desirable natural vegetation may not exist at all sites. Planning is required to identify vegetation to be preserved. Design of site structures may not allow preservation of vegetation and equipment movement must have necessary room to maneuver.*

Costs:

- *Costs may include increased labor for identifying vegetation to be preserved and for maneuvering around vegetated areas. Costs for clearing and grubbing can be reduced and costs for replanting and landscaping can be reduced. The efficient infiltration can produce cost savings by reducing the need for gutters and storm drains. This measure can also produce a more aesthetically desirable site, which can yield a more valuable property.*

Discussion:

Preserving existing vegetation involves selective clearing during site development and is designed to incorporate existing desirable vegetated areas into the final site plan. Preserving the natural vegetation at a site is an effective measure when applicable. It is also often the most common sense approach to producing a finished site with vegetated areas. The only costs associated with this measure are additional planning prior to site preparation activities and the added time to maneuver around vegetation. Existing mature plant communities have the capacity to maximize infiltration of stormwater, and the organic soils associated with these mature plant communities can provide a measure of treatment for many common chemical pollutants. Preserving existing vegetation can result in actual cost savings.

Vegetated Buffers

Benefits:

- *Vegetated buffers can reduce runoff velocity, increase infiltration, filter pollutants, separate areas that require protection from disturbance activities, and stabilize soils. They are particularly useful for providing protection to wetland areas, floodplains, and stream banks.*

Limitations:

- *Vegetated buffers may not be cost effective if the cost of land is high. Adequate space is needed for effective function*

Costs:

- *Costs vary with size of buffer. May not be cost effective if cost of land is high.*

Effectiveness:

- *USEPA reports that several studies have demonstrated greater than 90% reductions in sediment and nitrate concentrations.*

Discussion:

Vegetated buffers are areas of vegetation maintained to provide protection of neighboring areas from pollutants carried in stormwater runoff. The vegetated buffers are usually located along the perimeter of a construction site. Vegetated buffers that are properly designed and maintained can reduce the velocity of runoff, provide for infiltration, and act as filters to trap sediment. Vegetated buffers require adequate space to be effective stormwater management tools and the greater the slope, the greater the space required for the buffer. Vegetation in existing areas must be preserved, or bare areas revegetated with a mix of plant types to establish an effective buffer. Vegetated buffers have been shown to provide high levels of pollutant removal efficiencies, but may not provide much protection against concentrated flows.

Vehicle Maintenance and Washing

Benefits:

- *Vehicle maintenance and washing practices at construction sites can reduce the amount of sediment tracked onto roads and exposed to stormwater. Also oil and water separators or other management practices are encouraged at a vehicle maintenance and washing area to capture contaminated washwater. Proper disposal of wastes and wastewater generated at the maintenance and wash areas is encouraged.*

Limitations:

- *Costs will be associated with additional time it takes to wash trucks, management washwater, and dispose of water.*

Costs:

- *Costs will be associated with additional time it takes to wash trucks, management washwater, and dispose of water.*

Discussion:

The measure involves the use of designated areas specifically designed to reduce inputs of pollutants derived from the maintenance and washing of construction vehicles and equipment. Construction equipment and vehicles are potential sources of petroleum and lubricant products. Maintenance, parking and washing areas should be designed to minimize the threat from leaks, spills, and wastewater runoff. Methods can include designating covered and paved areas to conduct maintenance and washing, developing a spill prevention and control plan for maintenance areas, inspection and maintenance of equipment and vehicles, and written procedures for handling, storage, and disposal of wastes and wastewater. Wastewater from maintenance and washing areas should be treated as industrial process wastes and drains should be connected to a sanitary sewer system or other treatment facility and not connected to the storm drain system. Proper disposal of wastes generated from maintenance areas is an important component of this measure, and the local waste management authority should be consulted as to the proper disposal methods for each particular waste product.

Water Bar

Benefits:

- *Prevents erosion from long narrow slopes.*

Costs:

- *Usually low cost but dependent on usage and climate.*

Discussion:

Narrow rights-of-way, logging roads, etc., on long slopes used by vehicles can be subject to severe erosion. Surface disturbance and tire compaction promote gully formation by increasing the concentration and velocity of runoff. Water bars limit the accumulation of erosive volumes of water by diverting surface runoff at predesigned intervals. Water bars are constructed by forming a ridge and channel diagonally across the slopping right-of-way. Each outlet should be stable, considering the cumulative effect of upslope diversion outlets. The height and side slopes of the ridge and channel are designed to divert water and allow vehicles to cross.

Wind Fences and Sand Fences

Benefits:

- *Low cost and easy installation characterize wind and sand fences.*

Limitations:

- *Wind and sand fences are not to be used to control sediment transported in stormwater.*

Costs:

- *There are low costs associated with wind fences and sand fences.*

Effectiveness:

- *Wind and sand fences are not effective in controlling sediment in stormwater.*

Discussion:

Sand fences are barriers of small, evenly spaced wooden slats or fabric erected to reduce wind velocity and to trap blowing sand. The spaces between the fence slats allow wind and sediment to pass through but reduces the wind velocity, which causes sediment deposition along the fence. Wind fences are particularly useful for areas where dry arid conditions exist and for beachfront areas. Wind fences are most effective when placed perpendicular to the prevailing winds and are less effective in areas where wind directions are changing frequently. Wind fences do not control sediments transported in stormwater.

SECTION 4.3.3

POST CONSTRUCION SITE RUNOFF CONTROLS

PC – POST CONSTRUCTION SITE RUNOFF CONTROLS

EPA Requirements and Guidance:

EPA requires the designated city/county to address stormwater runoff from new development and redevelopment projects disturbing one or more acres that discharge into a small MS4, including projects less than one acre that are part of a larger common plan of development or sale. Controls must be in place to prevent or minimize water quality impacts. The program must include the following:

- Strategies which include a combination of structural and/or non-structural best management practices (BMPs) appropriate for the community;
- Ordinance or other regulatory mechanism to address post-construction runoff from new development and redevelopment projects to the extent allowable under State, Tribal or local law;
- Adequate long-term operation and maintenance of BMPs.

EPA recommends that the BMPs chosen be appropriate for the local community, minimize water quality impacts, and attempt to maintain pre-development runoff conditions. In choosing appropriate BMPs, EPA encourages participation in locally based watershed planning efforts, which attempt to involve a diverse group of stakeholders.

EPA recommends that the program include a planning process that identifies the program goals (i.e. minimize water quality impacts resulting from post-construction runoff from new development and redevelopment), implementation strategies (i.e. adopt a combination of structural and/or non-structural BMPs), operation and maintenance policies and procedures, and enforcement procedures. In developing the program, one should consider assessing existing ordinances, policies, programs and studies that address stormwater runoff quality. In addition to assessing these existing documents and programs, the designated city/county should provide opportunities to the public to participate in the development of the program.

The program should include non-structural and structural controls. Non-structural BMPs are preventative actions that involve management and source controls. Examples are as follows:

- Policies and ordinances that (1) provide requirements and standards to direct growth to identified areas, (2) protect sensitive areas such as wetlands and riparian areas, (3) maintain and/or increase open space (including a dedicated funding source for open space acquisition), (4) provide buffers along sensitive water bodies, (5) minimize impervious surfaces, and (6) minimize disturbance of soils and vegetation;

- Policies or ordinances that (1) encourage infill development in higher density urban areas and areas with existing infrastructure; (2) encourage education programs for developers and the public about project designs that minimize water quality impacts; and (3) encourage measures such as minimization of percent impervious

area after development and minimization of directly connected impervious areas.

Structural BMPs include: storage practices such as wet ponds and extended-detention outlet structures; filtration practices such as grassed swales, sand filters and filter strips; and infiltration practices such as infiltration basins and infiltration trenches.

Listed below are the most common BMP's associated with Post Construction Site Runoff Control. Design criteria for these BMP's can be found in this section or in the "Planning and Design Manual for the Control of Erosion, Sediment and Stormwater" (ESC Manual) published by the Mississippi Department of Environmental Quality, Mississippi Soil & Water Conservation Commission and the USDA Soil Conservation Service. BMP's denoted by an asterisk (*) shall be designed according to ESC Manual design standards.

Alternative Turnarounds

Benefits:

- *Reduce impervious area.*

Limitations:

- *Reduce space for emergency vehicles.*
- *Zoning laws may restrict use and may need to be revised.*
- *Concerns regarding property values.*

Costs:

- *Unknown*

Discussion:

Alternative turnarounds involve using optional design practices to replace cul-de-sacs. Using alternative turnarounds can reduce the overall impervious area associated with residential streets. Design options include reduction of cul-de-sac radii, designing loop roads, and using pervious landscaped islands in the center of cul-de-sacs. Local zoning laws may restrict the use of alternative turnarounds and may require modification before alternative turnarounds can be implemented. Inadequate space for access of service and emergency vehicles and perceived property value impacts are often concerns of residents and developers and should be considered carefully before recommending alternative turnarounds.

EPA Stormwater Phase II BMP Inventory

PC-02

Bioretention

Benefits:

- *Provides pollutant removal through filtration and biological activities.*
- *Reduces rate of runoff velocity.*
- *Increases aesthetic quality.*

Limitations:

- *Are not useful for large drainage areas.*
- *Provide little overall reduction on runoff volumes.*
- *Are subject to clogging similar to other filtration and infiltration measures.*
- *Construction and maintenance costs may be higher than typical filtration methods.*

Discussion:

Bioretention involves the use of on-site vegetated landscaped areas designed to receive and treat stormwater runoff. Bioretention methods attempt to remove for sediment and pollutants and reduce peak storm flows by mimicking the processes of natural vegetated landscapes. Bioretention areas are often designed for parking lot islands or residential areas. The use of bioretention areas allows great flexibility, and they can be designed to suit a wide range of site conditions. Many designs employ the use of perforated pipe underdrains contained in a layer of coarse aggregate or sand to collect treated runoff and convey the runoff to storm drain systems. Bioretention areas should be sized to handle the anticipated storm volume. Sizes for bioretention areas typically require about 5% or the drainage area to be effective. Emergency drainage should be provided for unexpected storms and can be achieved by including in the design a gutter connected to the storm drain system. Bioretention areas should not be used in areas where the practice may intersect with high groundwater tables. Costs for constructing bioretention areas may be higher than alternative methods, but costs may overlap with planned landscaping and can reduce total project costs by reducing the need for additional measures.

BMP Inspection and Maintenance

Benefits:

- *Ensure proper function and effective implementation of site BMPs.*
- *Protects water quality from impacts of failing practices.*

Limitations:

- *Require sincere cooperation from developers and contractors to conduct inspections and maintain BMPs.*
- *Inspectors must be knowledgeable of proper design and maintenance criteria for the BMPs in question.*

Costs:

Maintenance costs vary depending upon the specific practice in question and may involve materials, equipment, and labor. Inspection costs involve time and staff to conduct inspections and report findings. Additional costs may be necessary to train inspectors.

Discussion:

BMP inspection and maintenance is essential for continued proper function of stormwater management control measures. Inspection and maintenance helps to ensure the proper function of measures and reduce repair needed for failing measures. Under the Stormwater Phase II Program, small MS4 facilities have the responsibility to implement BMP inspection and maintenance programs along with establishing regulations and penalties for violations. Persons familiar with the measures utilized should conduct inspections of BMPs. Maintenance of BMPs should be considered prior to implementation of the practice to establish inspection and maintenance requirements and responsibilities.

Buffer Zones

Benefits:

- *Provide protection of water bodies from pollution, erosion, and heating.*
- *Increase infiltration and remove pollutants.*
- *Provide for stream bank protection by maintaining natural floodways.*
- *Can add aesthetic appeal to urban water bodies and provide area for recreation and habitat for wildlife.*
- *Can reduce costly erosion control and bank stabilization measures in urban streams.*

Limitations:

- *Not effective for managing or treating concentrated flows.*
- *Require large area to be effective.*

Costs:

Studies have shown that buffers can increase property values. Costs involve time and staff to create, enforce, and maintain buffer zones.

Discussion:

Buffer zones involve the protection or establishment of vegetated areas along waterbodies. Buffer zones can provide protection from polluted runoff, reduction of runoff velocities and volumes, flood attenuation, and protection for aquatic and terrestrial wildlife. Establishment of buffer zones can involve the preservation of existing riparian corridors or the creation/restoration of vegetated areas designed to manage stormwater runoff. Adequate space to provide the desired function is essential to success and should be considered carefully. Vegetative cover should be composed of a variety ranging from grasses to mature forest. When selecting the vegetative cover, one should consider stormwater inputs and the desired functions the buffer will provide. Guidelines should be established for activities that are allowed within the buffer area. Buffer zones can incorporate many other stormwater management practices such as urban forestry, grassed swales, bio-engineered erosion control, conservation easements, and education programs.

Catch Basins/ Catch Basins Inserts

Benefits:

- *Catch basins can be used in most traditional storm sewer systems.*
- *Remove suspended pollutants such as litter, debris, and sediments.*
- *Inserts can improve the removal rates for dissolved components and fine particles.*

Limitations:

- *Reported removal rates are lower than wet ponds, sand filters, and stormwater wetlands.*
- *Catch basins can resuspend sediments and other pollutants if not regularly cleaned.*
- *Catch basins alone are not effective at removing dissolved pollutants or fine sediments.*

Discussion:

Catch basins are inlets to the storm drain system. They are typically used with curb inlets or grates and a sump to allow for settling and capturing of sediment, debris, and pollutants. Catch basins are best utilized as a pretreatment measure for another stormwater management practice. The efficiency of pollutant removal depends greatly on size and maintenance. Proper design is essential to ensure the size of the inlet and sump are suited to the amount of stormwater flow received. Proper maintenance and cleaning are important to maximize the storage area available and allow for the greatest pollutant removal rate. Catch basins can capture sediments effectively until they reach approximately 60% capacity in the sump (Pitt, 1985). After 60% capacity is reached, sumps can act to resuspend sediments. Cleaning should be conducted annually at a minimum. More frequent cleaning of catch basins serving industrial sites increased the sediment collected from 30 lbs/year during annual cleaning to 180 lbs/year during monthly cleaning (Mineart & Singh, 1994). Efficiency can also be improved by the use of inserts that can be designed to remove specific types of pollutants such as oil and grease, sediment, trash, and debris.

Costs:

USEPA reports typical precast catch basins to cost between $2,000 and $3,000. Retrofit inserts range from $400 to as much as $10,000.

Effectiveness:

Little published information is available for catch basins and inserts.

Concrete Grid & Modular Pavement

Benefits:

- *Reduces runoff volumes.*
- *Reduces pollutants in runoff.*
- *Reduces need for additional stormwater management measures.*
- *Increases infiltration and groundwater recharge.*

Limitations:

- *Studies have shown a relatively high failure rate.*
- *Should not be used in area of heavy traffic.*
- *Costs are high compared to traditional pavements.*
- *Maintenance requirements are relatively high.*
- *May not be useful for areas with high pollutant loads due to risks to groundwater contamination.*

Discussion:

Porous pavement is a permeable pavement surface that allows runoff pass through the paved surface and infiltrate into the subsoil. There is more than one type of porous pavement, and examples include porous asphalt, pervious concrete, and stone pavers. Porous asphalt and pervious concrete closely resemble traditional products in appearance, but eliminate fine particles from the design mix leaving additional voids for water to move through. Stone pavers are usually concrete systems of interlocking blocks with gaps allowing grass to grow between. All three types of systems use a crushed stone layer underneath the surface to provide infiltration of stormwater and operate in much the same way as other infiltration methods. Likewise, porous pavement systems have the same limitations as other infiltration methods. Porous pavement should not be used in areas that may receive high sediment loads or high concentrations of hazardous chemicals. Initial studies have demonstrated high failure rates due to clogging that have generally been attributed to poor design, construction, and maintenance. Maintenance should include regular sweeping and washing to remove particles that may lead to clogging.

Conservation Easements

Benefits:

- *Conservation of sensitive areas and buffer areas can protect waterbodies from the impacts of development.*

Limitations:

- *May not be practical in heavily urban areas where availability of suitable land is low.*
- *Easements may eventually be broken and land held may be developed.*

Costs:

- *No costs associated with easements unless costs of legal services are incurred. Tax benefits are provided.*

Discussion:

Conservation easements involve landowners voluntarily setting aside private property with limitations on the amount and type of development that is allowed on the property. Conservation easements can be an effective tool for protecting water quality from runoff by restricting development in sensitive areas such as wetlands or riparian corridors. Landowners can often receive tax benefits for placing land in conservation easements, while turning over maintenance duties to state or land trust agencies. The use of conservation easements to protect sensitive areas from development may have limited use in many urban areas where available land is scarce.

Constructed Wetlands

Benefits:

- *Remove pollutants through settling and biological activity.*
- *Can be designed to provide flood control.*
- *Can provide benefits to wildlife.*
- *Can provide aesthetic benefits.*

Limitations:

- *Requires relatively large amounts of space to construct.*
- *Improper design and maintenance can result in breeding ground for mosquitoes and other potential nuisance wildlife and plant species.*
- *Flooding can potentially release nutrients from wetlands during dormant periods.*
- *Extensive design and maintenance are required for successful implementation.*

Discussion:

Stormwater wetlands are among the most effective stormwater controls at removing pollutants. Constructed wetlands are similar to wet detention basins (ponds) that receive and store stormwater, allowing for pollutant settling. In addition to storage, stormwater wetlands use wetland plants to provide for pollutant uptake and removal. Stormwater wetlands can also provide for groundwater recharge, flood control, and channel protection. Stormwater wetlands are designed and constructed specifically for stormwater treatment and are often fundamentally different from natural wetlands. Stormwater should not be diverted into existing wetlands. Many different variations of constructed wetlands exist, making them applicable to almost any situation with the exception of some urban situations. For example, stormwater wetlands can be designed in combination with wet ponds. Stormwater wetland systems can be designed to provide an aesthetic benefit. Siting and design of stormwater wetlands are crucial to the success of constructed wetlands and should be conducted by trained professionals considering soils, hydrology, drainage area and inputs, and plant types to be used. A pretreatment measure for removal of coarse sediments and an emergency spillway are typical design considerations. Stormwater wetlands typically require a large drainage area (>25 acres) and take up considerable surface area. Improper design can lead to problems such as mosquito breeding, failure of vegetation establishment, and failure to maintain an adequate pool. Maintenance requirements such as management of vegetation and removal of accumulated sediments are important to the establishment and continued function of stormwater wetland systems.

Dry Extended Detention Ponds

Benefits:

- *Dry extended detention ponds provide flood control by reducing peak flows during storm events.*
- *Ponds allow settling of suspended particles such as sediments.*
- *Dry extended detention ponds are inexpensive measures compared to other methods of treating the same drainage area.*

Limitations:

- *Dry extended detention ponds provide only moderate pollutant removal when compared to many comparable practices, and provide little or no removal of dissolved pollutants. Small temporary pools may provide breeding ground for mosquitoes. Construction can cause damage in stream channels or stream buffers. Dry ponds have been shown to decrease property values. Maintenance to remove litter and control vegetation will be required. The area required for construction may limit use in densely urban areas.*

Discussion:

Dry extended detention ponds are known by many names such as dry ponds and extended detention ponds. These ponds are designed to receive stormwater runoff and release the stormwater at rates comparable to pre-development runoff rates. Dry ponds allow settling of suspended particles; therefore, reducing suspended particles in the stormwater. These ponds serve as flood controls if sized according to anticipated storm volumes. Unlike wet detention ponds, dry ponds do not maintain a large permanent pool, although small pools are often designed near the outlets and inlets. Detention basin size is dependent on the drainage area from which it receives runoff. Dry ponds are capable of receiving runoff from large areas and are not recommended for sites with drainage areas of less than 10 acres. Dry ponds are applicable to a wide range of sites; however, the area needed to construct a dry pond may limit usefulness for densely urban areas. Dry ponds typically provide only moderate removal pollutant rates and are ineffective at removing dissolved pollutants. To maximize pollutant removal, dry ponds may be used in conjunction with additional practices (ex. oil and water separator as a pretreatment method for runoff from parking lots). Initial studies have indicated that dry ponds may detract from property values, and dry ponds that maintain a temporary pool may become a breeding ground for mosquitoes. Regular inspection and maintenance are required to ensure proper function.

Eliminating Curbs and Gutters

Benefits:

- *Reduces runoff velocities and volumes.*
- *Can provide removal of pollutants (curbs and gutters provide none).*

Limitations:

- *Pavement edges can crack and fail.*
- *Shoulder and grassed swales may require more maintenance than gutters.*
- *Local ordinances may restrict the elimination of curbs and gutters.*

Costs:

Engineered vegetated swales are a less expensive means of stormwater conveyance than curb and gutter systems (CWP, 1998).

Discussion:

Elimination of curbs and gutters promotes the use of grassed swales to receive and convey stormwater runoff from roadways and yards as a replacement for curbs and gutters. Elimination of curbs and gutters can allow for greater infiltration of runoff, reduction of runoff velocities and volumes, removal of pollutants, and lower overall costs for stormwater management measures. Local zoning laws or ordinances often require curbs and gutters and may need to be revised before this measure can be implemented. Grassed swales occupy more space than curbs and gutters and may not be suitable for all situations. Sites with impermeable soils, dense development, or high water tables may not be suited for this practice. Maintenance requirements typically include activities such as mowing and removal of accumulated sediments and debris.

Grade Stabilization Structure

Benefits:

- *Controls head cutting and major gully erosion in channels*
- *Maintenance is minimal*

Costs:

- *Costs can be very expensive up front depending on the type structure used.*

Discussion:

Grade stabilization structures are used to control the grade in natural or constructed channels to prevent erosion. They may be vertical drop weir spillways, chutes, or pipe drop structures and may be of reinforced concrete, steel sheet piling, concrete block, riprap, corrugated metal, plastic, or concrete pipe, depending on site conditions. This should be used in locations where beds of intersecting channels are at different elevations, and where flatter grades are needed in proposed channels to control velocities. Locate these structures in straight channel sections. Stabilize foundation materials, and ensure that flood bypass capability is able to protect the structure from flows greater than design. The design of large structures (100cfs or greater) should be undertaken only by a qualified engineer, experienced in hydraulics and structural design. Inspections should be made periodically and after all major storms.

Grassed Filter Strips

Benefits:

- *Slow runoff and provide filtering of pollutants, especially sediments.*

Limitations:

- *Filter strips require a large amount of surface area (often equal to the surface of the drainage area) to be effective.*
- *Careful design and maintenance are critical to successful implementation.*
- *Filter strips provide little effectiveness in managing concentrated flows.*

Grassed filter strips protect water quality by filtering pollutants before they reach the water (Source: USDA, 1997)

Discussion:

Grassed filter strips (vegetated filter strips, filter strips) are vegetated areas designed to treat surface flow from adjacent surfaces by reducing runoff velocities, filtering sediments and other pollutants, and allowing infiltration. Vegetated filter strips were originally used in agriculture to treat runoff from crop fields before entering water bodies. It has been proven that with proper design and maintenance, filter strips can provide relatively high pollutant removal from sheet flow. Gravel diaphragms (level spreaders) are often used to provide even sheet flow to filter strips. They are most useful in urban practices for treating runoff from roads and highways, small impervious areas such as parking lots and roof downspouts, and as a pretreatment method used in connection with structural practices. Vegetated filter strips may not be useful in many heavily urbanized areas due to the large surface area they require to be effective. Filter strips are not designed to treat runoff from concentrated flows.

Grassed Swales

Benefits:

- *Provide reduction of runoff velocity.*
- *Provide pollutant removal.*
- *Provide infiltration of runoff.*
- *Can be useful alternatives to traditional storm sewer systems, providing greater pollutant removal and lower construction costs.*

Limitations:

- *Are not intended to manage runoff from larger drainage areas.*
- *If slopes are too steep or vegetation is too sparse, grassed swales will have little effectiveness.*
- *Are not intended to receive high runoff velocities as the potential for erosion of channel vegetation exists.*

Discussion:

Grassed swales (vegetated swales, grassed channels) are open channels designed specifically to treat and attenuate stormwater runoff for a specified water quality volume. This measure builds upon the traditional drainage ditch and incorporates additional design features to produce a treatment and conveyance system. Vegetative swales are most useful for sites with slopes less than 4 percent, permeable soils, and drainage areas under 5 acres. Steep slopes can produce high runoff velocities and reduce filtering and infiltration rates, and too large a drainage area can require too large a swale to be practical. Proper design is essential for effective pollutant removal. Proper slope, size per drainage area, and proper vegetation selection and establishment are important considerations for effective vegetative swales. Different designs for the vegetative swales are available. Usefulness depends on site conditions and desired function. Grassed channels are more like traditional drainage ditches and rely on lower velocity storm flow for filtering and infiltration. Dry swales are similar to bioretention methods and are designed for rapid infiltration. Dry swales often use a soil bed of sand with an underdrain system of gravel and perforated pipe. This method allows for high pollutant removal and some floodwater attenuation. Wet swales incorporate a shallow permanent pool and wetland vegetation to provide stormwater management. This method can provide high pollutant removal rates, as well as flood attenuation. One potential drawback is the standing water may be seen as a nuisance if used in commercial or residential settings. Maintenance for grassed swales consists mainly of managing the vegetation to maintain a thick coverage.

Green Parking

Benefits:

- *Reduces impervious area*
- *Reduces runoff values*
- *Treats stormwater runoff*

Limitations:

- *Educating people on benefits is a challenge and changing old habits can be difficult.*

Costs:

- *Unknown*

Discussion:

Green parking involves methods for reducing the impervious area associated with parking lots. Methods involve controlling the number of new lots created, minimizing the sizes and number of spaces, utilizing alternative pavers in overflow parking areas, using bioretention and reversed elevation landscaping, encouraging shared parking lots, and providing economic incentives for structured parking. Many parking lot designs include far more space than actually necessary. By effectively implementing green parking practices impervious cover can be significantly reduced, runoff volumes can be reduced, treatment of stormwater can be provided, and overall reduction of stormwater management costs can be achieved.

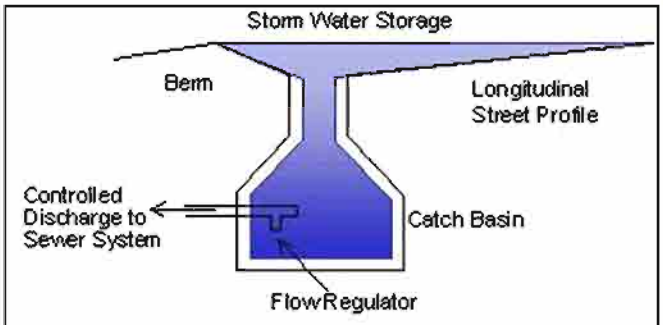
In-Line Storage

Benefits:

- *Can reduce peak runoff flows.*

Limitations:

- *Provides no pollutant removal or water quality improvements.*
- *Improper design can lead to upstream flooding.*



Catch basins can be equipped with flow restrictors to temporarily detain storm water in the conveyance system

Costs:

Are relatively low cost and require little maintenance.

Discussion:

In-line storage involves using devices to slow the flow of runoff by detaining flows within the storm drain system. In-line storage includes a number of different methods to achieve the reduction of runoff flow such as check dams. The use of in-line storage practices can reduce peak flows, but are not designed to provide pollutant removal. Improper design or siting can produce flooding upstream.

Infiltration Basins

Benefits:

- *Provide reductions of peak flows and reductions in overall runoff volume.*
- *Recharge ground water.*
- *Provide removal of pollutants.*

Limitations:

- *Requires permeable soils to be effective.*
- *Should not be used in areas with high ground water tables.*
- *Studies have shown high rates of failure.*
- *Maintenance requirements are typically high.*
- *Often have poor public perception due to lack of aesthetic appeal.*

Costs:

One study estimates construction costs at $2.00 per ft³ for a 0.25-acre basin (SWRPC, 1991).

Effectiveness:

One study (Schueler, 1987) estimates average removal rates based on land disposal of waste water at:

- *Total suspended solids: 75%*
- *Nitrogen:..... 55-60%*
- *Metals:..... 85-90%*
- *Bacteria..... 90%*

Discussion:

Infiltration basins utilize a shallow impoundment designed to receive and capture stormwater runoff and allow the water to infiltrate into the groundwater. Infiltration basins require very specific conditions of soils and groundwater tables to be applicable. When properly designed and maintained infiltration basins can provide effective sediment and pollutant removal as well as groundwater recharge. Soils should have a minimum infiltration rate of 0.5 inches per hour with no greater than 20 percent clay content for infiltration practices to be effective. Holding time in infiltration measures should be around 24 hours. Risk of contamination to groundwater is a major limitation to infiltration basins, and design should ensure at least a 2 to 5 feet separation distance between the bottom of the basin and the seasonally high water table. Infiltration basins are recommended for use in treating small drainage areas (<10 acres) and small storms. Failure rates are typically high for infiltration basins due to reduction of soil permeability from sedimentation and from improper design and maintenance.

Infiltration Trench

Benefits:

- *Provides groundwater recharge.*
- *Reduces runoff volumes.*
- *Removes pollutants through filtration.*

Limitations:

- *Should not be used in areas with high ground water tables.*
- *Maintenance requirements are typically high.*
- *Studies have demonstrated relatively high failure rates.*
- *Require permeable soils to e effective.*

Discussion:

Infiltration trenches are rock or gravel filled excavations designed to receive stormwater runoff with no outlet. Infiltration trenches have the same specific design restrictions as other infiltration practices: separation from groundwater to prevent groundwater contamination, permeable soils to allow adequate infiltration rates, and low sediment inputs to prevent clogging. Infiltration trenches have a wide range of design variations suitable to various site conditions, and are often used along with other practices to form a stormwater treatment system. Basic design components common to all variations include pretreatment (such as grassed channels) to remove larger particles, treatment areas of large stones to provide storage for anticipated runoff volumes, and conveyance measures to ensure that the trench is not overwhelmed (such as overflow drains). Soils should have a minimum infiltration rate of 0.5 inches per hour, typically with no greater than 20 percent clay content for infiltration practices to be effective. Holding time in infiltration measures should be around 24 hours. Design should ensure at least a 2 to 5 feet separation distance between the bottom of the basin and the seasonally high water table. Infiltration trenches are recommended for sites with drainage areas less than 5 acres. Infiltration trenches have the potential to become clogged rapidly in areas with high inputs of suspended particles. Inspection should be conducted regularly to check for clogging of the system. Monitoring wells are often placed inside the trench to provide a method of checking infiltration rates. Preventative maintenance (such as measures to reduce inputs of suspended particles) is more cost-effective than repairs to a failing system, which may involve replacement of the rock or gravel layer.

Infrastructure Planning

Benefits:

- *Infrastructure planning helps shape future use of an area and helps communities avoid urban sprawl.*

Limitations:

- *Developers must be on board with .planning efforts to ensure success.*

Costs:

- *Costs associated with developing plan may include staff time required to study area, meet with stakeholders. Training developers and others will also be a cost.*

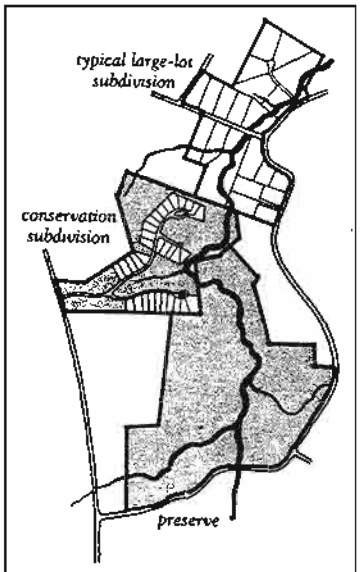


Figure 5
THREE PARCELS ON A STREAM VALLEY

Developers can design streets and pedestrian paths to maximize convenience and safety while at the same time minimizing impervious surface area (Source: The Rouse Company, no date)

Discussion:

Infrastructure planning involves making wise decisions to direct growth and development. Areas of previous development are preferred over undeveloped land, and areas with existing utilities are preferred over areas where utilities will have to be expanded. Scattered, undirected development called urban sprawl can increase impacts to water quality from stormwater runoff and strain local governments' ability to economically provide utilities and other public services. Urban sprawl often encroaches upon undeveloped areas while leaving behind unused land that has already been developed. The first step in infrastructure planning is to identify areas suited for development and redevelopment. The second step is to provide incentives for developers to encourage cooperation. Incentives include such as subsidies for developing recommended areas and higher rates to discourage development in new areas. Infrastructure planning can incorporate stormwater runoff management and protection of water quality by discouraging intensive development near water bodies and reducing the amount of new land cleared for development.

Level Spreader

Benefits:

- *Provide a nonerosive outlet for concentrated runoff by dispersing flow uniformly across a stable slope*

Limitations:

- *Designed to release small volumes of water and should be limited to 5 acres*

Costs:

- *Low cost structures*

Discussion:

Conduct level spreaders in undisturbed soil. The lip must be level to ensure uniform spreading of storm water runoff and the outlet slope uniform to prevent the flow from concentrating. Water containing high sediment loads should enter a sediment trap before release in a level spreader. A level spreader should be utilized where concentrated flows would otherwise enter a buffer zone or vegetative filter area.

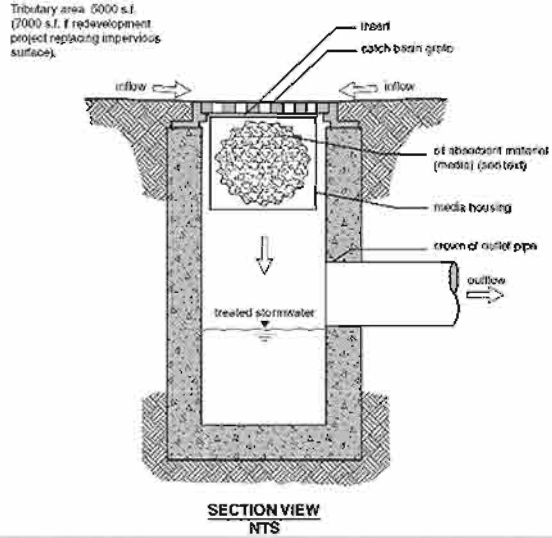
Manufactured Products for Stormwater Inlets

Benefits:

- *Provide removal of suspended particles and floatable pollutants.*

Limitations:

- *Independent studies suggest only moderate pollutant removal rates result from use of manufactured products, especially for dissolved pollutants and fine particles.*
- *Regular inspection and frequent maintenance are necessary.*



The typical design of a catch basin insert is a set of filters that are specifically chosen to address the pollutants expected at that site (Source: King County, Washington, 2000)

Discussion:

Manufactured products for stormwater inlets treat stormwater at the point it enters into the storm drain. Examples include such products as hydrodynamic separators (swirl separators) and catch basin inserts. Both are available in various designs suited for varying site conditions. Swirl separators are typically precast units that use internal components to create a swirling motion as the stormwater passes through to provide energy for settling out of suspended particles. Initial studies suggest pollutant removal rates are relatively low, and recommended uses are for pretreatment to other stormwater management practices. Catch basin inserts simply fit into most existing catch basins and storm drain inlets and provide filtration of the runoff entering the drain. Catch basin inserts can be made of several different types of materials to provide removal of specific pollutants such as specialized fabrics for the capture of oil and grease pollutants. Both methods discussed above are most effective for removing floatables and particulates such as litter and debris. Regular inspection and intensive maintenance are required for effective use of manufactured products for stormwater inlets in order to remove debris and buildup.

Narrower Residential Streets

Benefits:

- *Reduction in impervious area for residential developments.*

Limitations:

- *Public and developer fears of inadequate on-street parking, safety, inadequate space for emergency and large vehicle access, and inadequate space for utility corridors.*
- *Local ordinances may restrict use of narrower residential streets.*

Costs:

Based on a cost of $15/yd^2, reduction of street width by 4 ft. can result in a cost savings of $35,000 per mile.

Effectiveness:

5-20% overall reduction in impervious area for residential developments (Schueler, 1995).

Discussion:

Narrower residential streets involves reducing the width of paved surface used to create roadways in residential areas. Common design practices for residential streets allow space for two parking lanes and two moving lanes. Reduction of the width of these streets by as little as a few feet can significantly reduce impervious areas in residential neighborhoods. Local or state zoning laws and ordinances often require minimum widths for residential streets and may need to be modified before this measure can be applied. Narrower streets are suitable for areas where traffic is less than 5oo or fewer average daily trips or streets that serve about 50 single-family homes. Narrower streets should not be considered for high traffic streets such as arteries or for streets where traffic is expected to increase over time. Concerns over inadequate parking space, car and pedestrian safety, access for service and emergency vehicles, and placement of utilities are common objections to reducing residential street widths.

On-Lot Treatment

Benefits:

- *Reduce runoff and increase infiltration.*
- *Reduce the need for additional stormwater management measures.*

Limitations:

- *Requires cooperation of homeowners.*
- *Only treat runoff from a portion of total residential impervious area.*

Costs:

Materials such as rain barrels cost approximately $100 and dry wells cost approximately $200. Cisterns are more expensive and costs depend greatly on size and materials used.

Discussion:

On-lot treatment refers to practices designed to receive and treat stormwater runoff from individual residential lots. The use of on-lot treatment can be an effective method of maintaining pre-development hydrology, providing for groundwater recharge, avoiding increased flow rates associated with impervious surfaces, and helping maintain low-flow volumes in receiving streams. On-lot treatment uses two basic methods: infiltration and collection. Examples of on-lot treatment practices include cisterns, rain barrels, dry wells, and grassed swales. Pollutant removal rates can be high if pollutants are contained in the runoff. The practice is typically used to collect runoff from rooftops. Systems designed to collect runoff from lawns and rooftops can provide greater protection from many of the pollutants associated with residential runoff such as fertilizers. Public education regarding the proper use of pesticides and fertilizers should be utilized to reduce the risk of contamination to groundwater. In areas with high water tables near the surface, infiltration methods should be avoided. On-lot treatment requires cooperation of the residents. On-lot treatment does not address impervious surfaces such as streets, which can make up a large percentage of a residential area's impervious surface.

Open Space Design

Benefits:

- *Provide reduction in pollutants.*
- *Provide reduction in runoff volumes and velocities.*
- *Provides aesthetic quality, area for recreation, and habitat for wildlife.*

Limitations:

- *Developers often fear open space subdivisions will be less marketable, or that the review process will take too long.*
- *Local ordinances may restrict the use of many open space principals.*
- *Requires homeowner's cooperation for maintenance of open space.*

Costs:

Open space design can provide cost savings as less area is cleared and the need for stormwater management practices is reduced. One example (Liptan and Brown, 1996) demonstrated a cost savings of $800 per lot for site development. Other examples report average cost savings for infrastructure ranging from 11 to 66%.

Effectiveness:

CWP (1996) reports nutrient levels in runoff decreased by 45 to 60% when two conventional subdivisions were replaced by open space subdivisions.

Discussion:

Open space design involves concentrating development on a given site in order to preserve open areas and green space. Open space design involves rethinking typical site development practices giving extra consideration to preserving the natural integrity of the site. Areas that can provide overall benefits to the end product, such as stream corridors, are identified for preservation. Open space design can reduce negative impacts from stormwater runoff associated with development such as increased runoff from impervious surfaces and pollutant inputs. Open space design has been shown to reduce construction costs while increasing property values. Costs associated with additional stormwater management measures, clearing costs, and downstream flooding due to increased runoff volumes can be reduced using open space design. Local ordinances can put restrictions on development that may prohibit many of the components of open space design and may need to be revised in order to implement open space design. Developers' misconceptions of open space design principals (fears of longer plan reviews, higher costs, and lower market value) are often major limitations to implementation. Open space designs should include provisions for the acceptable uses and maintenance of open spaces.

Ordinances for Post-Construction Runoff

Benefits:

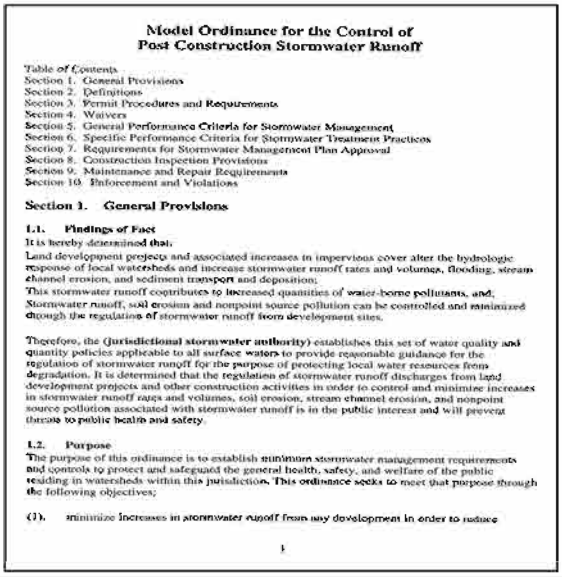
- *Provide enforceable measures to minimize storm water runoff from a site.*
- *Provide enforceable measures to improve water quality of runoff from a site.*
- *Provide a means of mandating and enforcing stormwater management practices for development.*

Limitations:

- *Cost for drafting, implementing, and enforcing ordinances.*

Costs:

Costs include time for personnel to develop, implement, and enforce ordinances.



Model Ordinance for the Control of Post Construction Stormwater Runoff

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Section 1. General Provisions

1.1. Findings of Fact
It is hereby determined that:
Land development projects and associated increases in impervious cover alter the hydrologic response of local watersheds and increase stormwater runoff rates and volumes, flooding, stream channel erosion, and sediment transport and deposition;
This stormwater runoff contributes to increased quantities of water-borne pollutants, and;
Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized through the regulation of stormwater runoff from development sites.

Therefore, the **(jurisdictional stormwater authority)** establishes this set of water quality and quantity policies applicable to all surface waters to provide reasonable guidance for the regulation of stormwater runoff for the purpose of protecting local water resources from degradation. It is determined that the regulation of stormwater runoff discharges from land development projects and other construction activities in order to control and minimize increases in stormwater runoff rates and volumes, soil erosion, stream channel erosion, and nonpoint source pollution associated with stormwater runoff is in the public interest and will prevent threats to public health and safety.

1.2. Purpose
The purpose of this ordinance is to establish minimum stormwater management requirements and controls to protect and safeguard the general health, safety, and welfare of the public residing in watersheds within this jurisdiction. This ordinance seeks to meet that purpose through the following objectives:

(1). minimize increases in stormwater runoff from any development in order to reduce

1

Discussion:

Ordinances for post-construction runoff promote public welfare by guiding, regulating, and controlling the design, construction, use, and maintenance of any development or other land disturbance activity. Ordinances should be designed to meet the needs of the community; therefore, the issues of concern in a given community must be identified. Several resources are available that provide guidance for the development of stormwater management ordinances. Ordinances for stormwater management typically involve general provisions, definitions of terms, permitting requirements and procedures, waiver eligibility, performance and design criteria, plan review requirements and procedures, inspection and maintenance requirements and procedures, and enforcement and penalty provisions. The best-planned and most well written ordinances are useless unless they are enforced.

Parking Lot Storage

Benefits:

- *Protects downstream areas from flooding*
- *Protects from stream channel degradation*
- *Protects from pollutant loads caused by urban development*

Costs:

- *Costs can be minimal if incorporated into surface parking lot storage, but expensive if subsurface storage is utilized.*

Discussion:

This practice involves the use of impervious parking areas or landscape islands as temporary impoundments during rainstorms. Parking ot stormwater systems can be designed to temporarily detain stormwater in specially designated areas, and release it at a controlled rate. It is important that these facilities be designed to minimize potential safety hazards and inconvenience to motorists and pedestrians.

Sand and Organic Filters

Benefits:

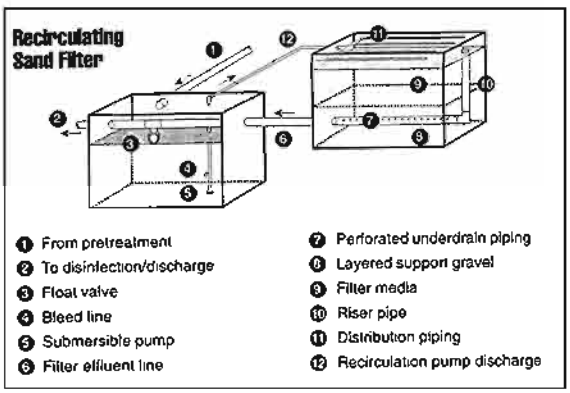
- *Sand filters can provide effective pollutant removal.*
- *Sand filters are applicable to a wide variety of site conditions.*

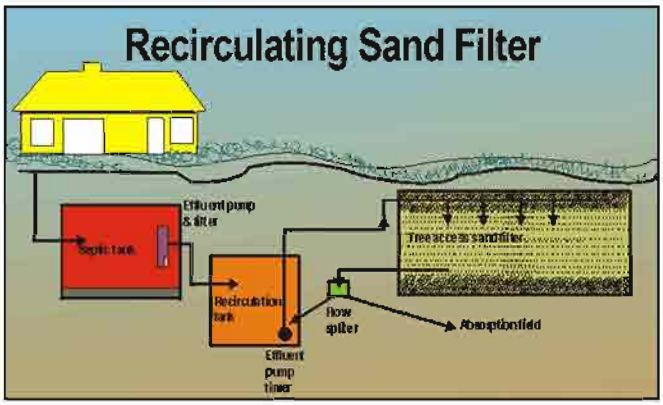
Limitations:

- *Sand filters provide very little flow or volume reduction.*
- *Sand filters require frequent inspection and high maintenance.*
- *Sand filters are not suited for treating large drainage areas.*

Costs:

Little data is available for costs. Brown and Schueler (1997) estimate construction costs to average $5.00 per ft^3 of stormwater treated.





Discussion:

Sand and organic filters typically involve a simple two-stage design with the first stage allowing for settling of coarse particles, and the second stage using a sand or organic material filter media to remove smaller suspended particles. Treated runoff leaving the sand filter can then be conveyed to the storm drain system. Several design variations of the basic two-stage setup can be applied to suit site conditions and can include both aboveground and below-ground designs, perimeter filters, and sand or organic material filter media. Most designs require several feet of drop (depending on the size) to provide adequate flow through the system. Sand filters are often used in combination with other management practices to from stormwater management systems. Filters are typically not designed to treat large areas or large volumes of runoff. Design should include sizing the filter apparatus to accommodate the anticipated volumes of runoff and provide overflow devices or flow splitters to allow for unexpected volumes. Intense maintenance is required for the operation of sand filters, and the settling basins and filter materials must be regularly inspected to check for sediment accumulation.

Stream Crossing (permanent)

Benefits:

- *Structures will not erode, overtop, or cause flooding*

Costs:

- *Costs can be extremely expensive and depend on the type of crossing.*

Discussion:

Stream crossings are direct sources of water pollution. They cause flooding and safety hazards and can be expensive to construct. If washed out or damaged, they can also cause costly construction delays. Plan the development to complete work on each side separately to minimize stream crossings. Stream crossings are of three general types: bridges, culverts, and fords. In selecting a stream crossing practice consider: frequency and kind of use, stream channel conditions, overflow areas, potential flood damage, surface runoff control, safety requirements and installation and maintenance costs.

Trees, Shrubs, Vines, and Ground Covers

Benefits:

- *Provide superior, low-maintenance, long-term erosion protection*
- *Useful where site aesthetics are important*
- *Useful on steps or slopes where maintenance is difficult*
- *Useful for wildlife habitat improvement*
- *Useful as windbreaks or screens*

Costs:

- *Costs vary but are generally low and depend on the types of vegetation used.*

Discussion:

There are many different species of plants from which to choose, but care must be taken in their selection. It is essential to select planting material suited to both the intended use and specific site characteristics. None of the plants, however, are capable of providing the rapid cover possible by using grass and legumes. Vegetative plants must include close-growing plants or adequate mulch with all plantings of trees, shrubs, vines, and ground covers.

Urban Forestry

Benefits:

- *Urban forests provide breaks in impervious cover.*
- *Increase aesthetic appeal.*
- *Increased property values.*

Limitations:

- *Ordinances and easements used to establish urban forestry programs may be contrary to development pressures in some areas.*

Costs:

- *Costs vary and depend on program elements. Grants may be available for certain projects.*

Discussion:

Urban forestry is a branch of traditional forestry that focuses on trees and forests in and around towns and cities. Urban forests can increase infiltration of stormwater, provide shading, and increase the aesthetic quality of an area. Urban forests have been shown to increase property values in an area. Programs should identify critical areas that are suited for implementation of urban forest initiatives. In developing urban forestry programs, preservation of existing trees is preferred. Programs should establish guidelines for selecting and protecting desirable trees during site clearing. Maintenance for forested areas is minimal and will depend greatly on the uses of the area.

Vegetative Dune Stabilization

Benefits:

- *Protect backshore areas from ocean storms, shoreline erosion, and encroachment by migrating sand.*
- *Grasses grow upward through accumulating sand to hold it as the dune grows.*

Costs:

- *Low costs are generally associated with vegetative planting.*

Discussion:

Adapted native vegetation can be used to stabilize coastal dunes and sandy areas disturbed by construction, and to rebuild frontal dunes. The perennial grasses, American beachgrass, sea oats, and bitter panicum, are the primary dune stabilizers and have been extensively planted for this purpose. Vegetative planting is the most effective way to establish these grasses. Primary considerations in planting dune grass include finding a source of plant material and timing plantings so they have maximum chance of success. American beachgrass is excellent for initial dune stabilization but is often not persistent. If 10 percent sea oats and bitter panicum are included in beachgrass plantings these will fill in bare spots and provide persistent cover. Sand fences accelerate sand accumulation and can be used in combination with vegetation to rebuild frontal dunes.

Vegetative Streambank Stabilization

Benefits:

- *Aesthetically pleasing*
- *Provide a habitat for fish and wildlife*
- *Afford a self-maintaining cover*
- *Less expensive and damaging to the environment*

Costs:

- *Costs are low*

Discussion:

Upstream development accelerates streambank erosion by increasing the velocity, frequency, and duration of low. A s a result, many natural streams that were stable become unstable following urbanization. Streambanks may be stabilized by selected vegetation or by structural means. In many cases, a combination of vegetative and structural measures should be used. Wherever possible, it is best to protect banks with living plants that are adapted to the site. Evaluate the erosion potential of the stream carefully and establish appropriate vegetation whenever site conditions permit. Stream channel velocities for the 10-year storm should generally be less than 6 ft/s for effective stabilization by vegetative means. A private consulting engineer should be contacted for the design of this practice.

Wet Extended Detention Ponds

Benefits:

- *Provide flood control by reducing peak flows.*
- *Provide pollutant removal through settling and biological action.*
- *Have long life span.*
- *Can treat large drainage area.*
- *Can increase property values.*

Limitations:

- *Space required for construction may limit use in densely urban areas.*
- *Maintenance to control sedimentation and vegetation may be required.*

Discussion:

Wet extended detention ponds are often called stormwater ponds, detention ponds, and wet ponds. These basins are designed to receive stormwater runoff and maintain a permanent pool of water year round. Wet ponds are among the most cost-effective stormwater practices. Wet ponds are also one of the most effective practices at removing stormwater pollutants. The ponds can provide pollutant and sediment removal as well as attenuation of floodwaters. Stormwater detention time allows for settling of suspended particles and plant and algae provide uptake of several major stormwater pollutants. Storage capacity above the normal permanent pool level can provide additional time for settling and room for reduction of peak stormwater flows. Wet ponds are capable of receiving runoff from a large area and typically require a drainage area of greater than 25 acres to maintain a permanent pool. Studies have shown that wet ponds can actually increase property values. Wet ponds may not be feasible for use in heavily urbanized areas where adequate space is not available. Inspection and maintenance of wet ponds may be required and may include removal of accumulated sediments and management of aquatic vegetation.

Zoning




Benefits:

- *Provide stormwater management by requiring better site designs.*
- *Can serve to wisely manage development by establishing special requirements designed to protect sensitive areas such as forested areas or riparian corridors.*

Limitations:

- *Local political and economic issues may present obstacles to zoning restrictions in some areas.*

Costs:

- *Costs may be associated with the time it takes to revise current zoning and land use regulations, gain support and adopt new zoning regulations.*

Discussion:

Zoning for stormwater management involves developing classification schemes for land use that consider the threats to water quality from stormwater runoff. Zoning is a tool used to develop comprehensive, long term, effective planning for land use. Zoning can be a powerful tool for stormwater management and can prevent potential stormwater runoff problems during the design phase of development. Zoning for stormwater should first identify the water resources that could potentially be impacted by development in a given area, then address measures suitable to providing safeguards to these resources.

SECTION 5

HYDROLOGY

INTRODUCTION

Hydrology is an important part of designing and installing erosion control practices. The analysis of peak flow, runoff volume, and time distribution of flow is fundamental to the design of stormwater drainage facilities. The purpose of this chapter is to describe approved methods of hydrological analysis for the design of the stormwater best management practices discussed in this manual. In order to comply with State design standards, the "Planning & Design Manual for the Control of Erosion, Sediment & Stormwater", published by the Mississippi Department of Environmental Quality, the Mississippi Soil & Water Conservation Commission, and the USDA Soil Conservation Service, shall govern the hydraulic design for all stormwater best management practices.

Listed below are the most commonly used hydrology design procedures. The "Planning & Design Manual for the Control of Erosion, Sediment & Stormwater" explains these methods in further detail.

1. Soil Conservation Service EFM2 method is the recommended method. This method develops a runoff curve number from watershed conditions and provides peak flow and total runoff through relationships to desired 24-hour rainfall frequency, watershed steepness, and drainage area. This method is available on computer disk and is a user friendly program.

2. Soil Conservation Service Service TR55 provides a more detailed peak runoff analysis for urban areas. This method expands procedures used in EFM2 to include options for urban area conditions and allows for input for accelerated runoff travel time in streets, gutters, paved ditches, etc. This method is available on computer disk which automates the manual procedure outlined in the TR.

3. The Rational Method may be used to compute peak flows for drainage areas less than or equal to 25 acres. Rational method is calculated using the equation Q=CiA, where Q is the flow in cubic feet per second, C is a variable related to the ground surface absorptivity, i is the rainfall intensity for a desired rainfall frequency (25 years) in inches per hour, and A is the drainage area in acres. This method is available in numerous textbooks.

4. U.S. Geological Survey Magnitude and Frequency Procedures is based on four regionalized equations. Drainage area, channel slope, and channel length are used to estimate peak discharges for a wide range of watershed sizes.

Other methods may be acceptable upon AEA approval. The planner and designer must be aware that hydrology determination errors could allow unnecessary flooding and damage for underdesigned conditions or impose extra cost for overdesign situations. The best, on-site judgment and determination should be made and is the responsibility of the designer.

Best management practices for temporary erosion and sediment control during the construction period shall be designed with a minimum 2 year-24 hour storm capacity

with the contractor assuming repair/replacement risk for occurrence of a storm larger than 2 year. Permanent stormwater best management practices shall be designed for a minimum 25 year-24 hour storm capacity with the 100 year-24 hour storm being checked for causing inundation problems. If the capacity of the downstream stormwater facilities are exceeded by the proposed improvements when being considered with a fully developed up stream drainage basin using the present or proposed zoning, additional storage and or discharge restrictions will be utilized as deemed practical by the AEA.

SECTION 6

STORMWATER MANAGEMENT PLAN

The purpose of a Stormwater Management Plan is to aid individuals in complying with state and federal regulations dealing with the control of nonpoint source (NPS) pollution. The plan should include a listing of the most effective and practical best management practices (BMP's) designed to minimize pollution resulting from stormwater runoff and off-site sediment deposition during land disturbance activities.

A Stormwater Management Plan should conform to the following outline:

1. A brief narrative

2. Planned BMP's and vegetative practices

3. An operation and maintenance plan for BMPs

4. Drawings and specifications of BMPs

5. A vicinity U.S. Geological Survey quadrangle map

6. A site topographic

7. A site development map

8. A site erosion, sediment, and stormwater control map

9. Name, address, and telephone number of the parties responsible for developing and implementing the plan.

10. Continuing education of all employees to inform them of plan requirements

The specific number of maps, practices, drawings, specifications, and calculations required depends on the size and complexity of the land disturbing activity. The plan should be organized and presented in a clear, concise manner with sufficient design and background information included to facilitate review by the AEA and other reviewing personnel. In general, an acceptable Stormwater Management Plan should contain as a minimum:

1. A brief narrative to include:

   a. Project description (purpose, size of area to be disturbed, location, common address, and a certified legal description of site).

   b. Existing and proposed site description, including topography, principal drainage ways, floodplain/floodway limits, resource protection areas such as wetlands, lakes, ponds, setbacks (stream buffers, drinking water wells, and septic systems), land cover condition, predominant vegetation, landscaping plan, percent of impervious area, limits of clearing, and the associated increase of runoff volume from a 25-year 24-hour storm event.

c. Adjacent property. (This should include the identification of land use and cover conditions.)

d. Mapping of predominant soils from USDA soil surveys as well as location of any site-specific borehole investigations that may have been performed.

2. Planned Best Management Practices to include:

a. Beginning and completion date of construction activities

b. A sequence of all construction-related BMP and vegetative activities. Include any winter shut-downs.

c. Preconstruction conference is recommended and should be scheduled one week prior to land disturbance to orientate contractors to the Stormwater Management Plan. Notice of the preconstruction conference date should be provided to the Office of Pollution Control one week prior to the meeting.

d. A listing of erosion and sediment control BMP's to minimize pollution during construction along with location and installation schedule for each.

e. A listing of stormwater pollution control BMP's to minimize pollution after construction has ended along with location and installation schedule for each.

3. Operation and Maintenance (O&M) plan for BMP's.

a. Temporary measures: a plan for the schedule of maintenance during construction along with any operational criteria. This should also include routine inspection checklists for illicit discharge and on-site construction review (Sections 3.2.1 and 3.3.2).

b. Permanent measures: a plan for the long term maintenance and operation including entities responsible (address and phone number), financial obligations for continued O&M, designated access for maintenance, and schedule of O&M activities.

c. Maintenance during and after construction may include practice reestablishment, repair, sediment removal, mowing, etc.

4. Detailed drawings and specifications of BMP's with supporting calculations.

a. Detailed drawings in manuals can be utilized along with standard engineering drawings of structures and measures so long as site specific elevations, dimensions, etc., are shown on drawings.

b. Support data and calculations should be sufficient to allow reviewers to

reproduce design procedure of structures and measures. Sources of information should be cited.

c. One permanent benchmark will be clearly labeled on drawing if needed to plan measures. If elevations are tied to a USGS benchmark description and elevation of benchmark will be provided.

5. Vicinity USGS Quad map – This map should identify the location of:

   a. Land disturbing activity

   b. Site stormwater discharge

6. Site Topographic Map – This will provide existing and proposed construction site topography while locating drains, property lines, construction work limits, and any utilities. Scale will be no less than 1" = 60', and a minimum of 2-foot contours are recommended. Trees to be preserved will be located on this map.

7. Site Development Map – This map should identify the location of buildings and associated paved areas, raw materials or finish product stock pile areas, equipment storage areas, processing areas, construction entrances, access or haul roads, and finished grades on a duplicate of the site topographic map.

8. Site erosion, sediment, and stormwater control map – This map should identify the location and size of all BMPs (temporary and permanent) on a duplicate of the site topographic map along with the location of all permanent construction and associated paved areas and finished grades. This map should identify all existing and proposed conveyance systems including perennial streams, intermittent streams, grass channels, swales, storm drains, etc.

9. Names, address, and telephone number of the contact personnel responsible for developing and implementing the plan.

10. Continuing education plan for all employees to inform them of plan requirements.

    a. As work progresses and various subcontractors and/or new employees are brought into the work site, each should be familiarized with plan. At the beginning of each workweek, scheduled items of the plan to be implemented during that week should be brought to the attention of the impacted work force.

    b. O & M training will be provided to personnel responsible for continued operation of the completed project. This should include an annual review of schedule for maintenance activities.

Specific maps, practices, drawings, specifications, and/or calculations may be required depending on the size and complexity of the land disturbing activity. In addition to the minimum measures mentioned above, the following requirements are recommended for inclusion when available and applicable for review:

1. Existing and proposed structural elevations (e.g., invert of pipes, manholes, etc).

2. Representative cross-section and profile drawings and details of structural stormwater management practices and conveyances (i.e., storm drains, open channels, swales, etc.).

3. Existing and proposed condition analysis for time of concentration, runoff rates, volumes, velocities, water surface elevations, and routing showing the methodologies used and supporting calculations.

4. Final sizing calculations for structural stormwater management practices including, contributing drainage area, storage, and outlet configuration.

5. Stage discharge or outlet rating curves and inflow and outflow hydrographs for storage facilities (e.g., stormwater ponds and wetlands).

6. Final analysis of potential downstream impact/effects of the project.

7. Dam breach analysis

8. Additional Operation and Maintenance Plan items which could include:

    a. Description of applicable easements

    b. Description of funding source

    c. Testing and disposal of sediments that will likely be necessary

        i. Evidence of acquisition of all applicable local and non-local permits

        ii. Evidence of acquisition of all necessary legal agreements (e.g., easements, covenants, land trusts)

        iii. Waiver requests

The “Planning & Design Manual for the Control of Erosion, Sediment & Stormwater” provides a sample erosion, sediment, and stormwater control plan which can be followed when creating the Stormwater Management Plan explained in this chapter.

APPENDIX A

DIRECTORY

DIRECTORY OF DESIGNATED STORMWATER PHASE II ENTITIES

DeSoto County

Contact	Title of Contact	Address	Phone Number
Jessie L. Meldin	District 1 Supervisor	365 Losher Street, Hernando, MS 38632	662-429-5590
Gene Thach	District 2 Supervisor	365 Losher Street, Hernando, MS 38632	662-429-5590
Bill Russell	District 3 Supervisor	365 Losher Street, Hernando, MS 38632	662-429-5590
Allen Latimer	District 4 Supervisor	365 Losher Street, Hernando, MS 38632	662-429-5590
Tommy Lewis	District 5 Supervisor	365 Losher Street, Hernando, MS 38632	662-429-5590
Michael Garriga	County Administrator	365 Losher Street, Suite 300, Hernando, MS 38632	662-429-1460
Russell Dorris	County Road Manager	2339 Gwyn Road, Nesbit, MS 38651	662-429-1466
Andy Swims	County Engineer	365 Losher Street, Suite 300, Hernando, MS 38632	662-429-1347
Scott Young	Assistant County Engineer	365 Losher Street, Suite 300, Hernando, MS 38632	662-429-1347
Sam Russell	GIS Manager	365 Losher Street, Suite 300, Hernando, MS 38632	662-429-1306

Horn Lake

Contact	Title of Contact	Address	Phone Number
Nat Baker	Mayor	3101 Goodman Road West, Horn Lake, MS 38637	662-342-3502
Amy Lay	Ward 1 Alderman	3101 Goodman Road West, Horn Lake, MS 38637	662-280-7420
Chris Sheley	Ward 2 Alderman	3101 Goodman Road West, Horn Lake, MS 38637	662-280-7420
Tim Smith	Ward 3 Alderman	3101 Goodman Road West, Horn Lake, MS 38637	662-280-7420
Tom Polzin	Ward 4 Alderman	3101 Goodman Road West, Horn Lake, MS 38637	662-280-7420
Derek Downing	Ward 5 Alderman	3101 Goodman Road West, Horn Lake, MS 38637	662-280-7420
John Jones	Ward 6 Alderman	3101 Goodman Road West, Horn Lake, MS 38637	662-280-7420
Donnie White	At Large Alderman	3101 Goodman Road West, Horn Lake, MS 38637	662-280-7420
Gerald Davis	Interim City Engineer	8849 Hamilton, Southaven, MS 38671	662-342-7273

DIRECTORY OF DESIGNATED STORMWATER PHASE II ENTITIES (continued)

Olive Branch

Contact	Title of Contact	Address	Phone Number
Samuel P. Rikard	Mayor	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-895-3166
Aubrey Coleman	Ward 1 Alderman	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-895-5744
Randy Cowgill	Ward 2 Alderman	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-890-4504
Joyce Haslip	Ward 3 Alderman	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-895-5488
Maurice Wallace	Ward 4 Alderman	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-895-2602
Stephen Benson	Ward 5 Alderman	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-893-5667
Dale Dickerson	Ward 6 Alderman	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-895-2543
George Collins	At Large Alderman	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-895-3308
Steve Bigelow	City Engineer	9200 Pigeon Roost Road, Olive Branch, MS 38654	662-892-9350
David Haines	Director of Public Works	10175 HWY 178, Olive Branch, MS 38654	662-895-2827
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Southaven

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