

STORMWATER MANAGEMENT PLAN

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WATER PROTECTION PROGRAM

CITY OF JACKSON, MISSOURI

May, 2007

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Introduction

Under the Storm Water Phase II Rule developed by the Environmental Protection Agency (EPA) and enforced by the Missouri Department of Natural Resources (MDNR) under 10 CSR 20-6.200, all cities with a population of 10,000 to 100,000 must obtain a permit for stormwater discharges from Regulated Small Municipal Separate Storm Sewer Systems (MS4). Basically, this gives a city a permit to discharge stormwater to the water of the state, and mandates certain planning, regulating, and inspection activities that the city must undertake to comply with the permit.

The City of Jackson Missouri has a population of over 10,000, it is therefore a Missouri "regulated MS4" and must obtain a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit. The City must develop a Stormwater Management Plan (SMP) as part of the permitting process. The City will also make annual reports to MDNR on activities regarding stormwater and progress made toward meeting the goals of the SMP. The annual reports will be appended to the plan as Appendix D.

According to the Phase II Rule, small MS4 owners/operators must reduce pollutants in stormwater to the maximum extent practicable to protect water quality. This Stormwater Management Plan summarizes the City of Jackson's intentions to reduce the amount of pollution in its stormwater runoff by addressing the six categories of concern listed in the permit. These categories are as follows:

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

The City will adopt this plan and will seek to improve the plan each year. As circumstances change, new solutions may be necessary to better control pollution in stormwater. This plan is a foundation on which new and innovative ideas and solutions can be developed in the years to come to protect the water quality of our local streams.

City Information

| | |
|------------------------|---|
| Name of City: | City of Jackson |
| Population (2000): | 11,947 |
| Water Supply: | Ground Water Wells |
| Waste Water Treatment: | Activated Sludge Treatment Plant |
| Watersheds: | Cane Creek, Hubble Creek, and Ramsey Branch |
| Geologic Setting: | Central Mississippi Valley Wooded Slopes |
| Average Rainfall: | 45 inches per year |

The City of Jackson is located in the foothills of southeast Missouri, just north of what is known as the "Bootheel" of the state. Jackson is the county seat of Cape Girardeau County. Most of the stormwater runoff flows to Hubble Creek, while a small portion from the northwest corner of town flows to Cane Creek, and a small portion on the east side of town flows to Ramsey Branch. All stormwater ultimately flows to the Mississippi River.

The City of Jackson has some industrial areas including the following manufacturing plants.

1. Coca Cola Bottling Company – local soft drink bottling plant.
2. American Railcar Incorporated – railcar manufacturing facility.
3. Signature Packaging Incorporated – cardboard box manufacturing.
4. Midwest Sterilization Incorporated – bulk sterilization services.
5. Ceramo Pottery – clay flower pot manufacturing.
6. Lenco Incorporated – small batch machining and assembly.
7. Rubbermaid Incorporated – wire shelving manufacturing plant.
8. MFA Agri-Services– livestock feed manufacturing and fertilizer services.
9. CO-OP Service Center – livestock feed manufacturing and fertilizer services.
10. Straightway Farm Services – livestock feed manufacturing and sales.
11. Inter Rail – industrial recycling service.
12. SEMO Readymix – readymix concrete plant.
13. Kasten Clay Products – clay brick manufacturing.

The City encompasses 10.7 square miles, or about 6,834 acres. An extensive stormwater collection system serves the City including seven existing detention basins with seven additional basins planned in new developments or under construction.

Stormwater leaves the city limits at 5 major outfalls as listed in Appendix A. Also included in Appendix A is a map showing the locations of the five major stormwater outfalls.

The City has had an erosion control/land disturbance ordinance in place since 1994 to regulate the use of best management practices (BMPs) when grading property to prevent sediment from leaving the site. It was revised in 2001 as ordinance number 01-07 and is currently included as Section 21, Environment, of the City Code of Ordinances. This ordinance is included in this SWP as Appendix B.

As a result of the Phase II Stormwater Rules, many stormwater controls were added to the City's ordinance regulating subdivision development. Ordinance No. 02-45 was adopted as Section 57, Subdivisions, of the City Code of Ordinances in 2002. Subsection 57-10(h), Storm Drainage, Detention, and Erosion Control is included in this SWP as Appendix C.

Definitions

Stormwater: The rain water that flows off parking lots, yards, and other properties into roadside ditches, storm drains, and streams during a rainstorm.

Municipal Separate Storm Sewer System: A stormwater sewer (drainage) system that is "separate" from the regular domestic sewage system. The stormwater sewer system discharges directly to a stream without treatment of the rainwater.

MS4: An abbreviated term for the phrase "Municipal Separate Storm Sewer System". (One "M" and four "S's".)

Regulated MS4: A Municipal Separate Storm Sewer System that is required to obtain an NPDES Permit and comply with the Missouri stormwater regulations.

MCM: An abbreviated term for "Minimum Control Measure".

Minimum Control Measure: One of the six categories, that at a "minimum," must be addressed in the stormwater management plan. The six categories include Public Information, Public Participation, Illicit Discharges, Construction Site Runoff, Post-construction Runoff, and Pollution Prevention/Good House Keeping. Each of these categories is a Minimum Control Measure.

BMP: An abbreviated term for "Best Management Practice".

Best Management Practice: A type of management, habit, action, practice, type of construction or other ways of doing things that accomplishes the best result – given the circumstances (size, budget, other factors) a city must work under. Each city must look at its own particular situation and determine what BMPs work best to implement the six MCMs.

MEP: An abbreviated term for "Maximum Extent Practicable"

Maximum Extent Practicable: Doing your best to the maximum extent that is practical – given the city's abilities and needs.

NPDES: National Pollutant Discharge Elimination System, as authorized by the Clean Water Act of 1972, this permit program controls water pollution by regulating point sources that discharge pollutants into waters of the United States. Since its introduction in 1972, the NPDES permit program is responsible for significant improvements to our Nation's water quality.

Public Education and Outreach on Stormwater Impacts

The City of Jackson will establish a Public Education and Outreach program to foster support from the community for our efforts in reducing stormwater pollution. The City will seek to inform the community as to the necessity and importance of this effort.

Brochures will be developed for specific target audiences so that they may be handed out during onsite meetings or at City events such as Park Days, or the annual recycling center open house.

Raingarden, erosion control, and stormwater swale brochures can be developed with appropriate homeowner techniques for distribution during meetings with neighbors having issues with stormwater running from one yard onto another. Alternatively, more aggressive and appropriate stormwater BMP's could be included in a separate brochure for contractors and developers.

The City has participated in County-sponsored committees in the past, and will continue to encourage Cape Girardeau County to develop and enact a proposed Erosion Control and Stormwater Management ordinance for the County. This effort will foster a watershed approach to stormwater management, a fundamental tool in improving the quality of streams in the area as few of them are solely influenced by activities in the City of Jackson. The 2006 county stormwater steering committee was composed of representatives from the Cities of Jackson and Cape Girardeau, the head of the Hubble Creek Watershed Improvement District, MDNR representatives, Missouri Department of Transportation, and citizens including farmers, developers, and the head of the Cape Girardeau County Homebuilders Association. A proposed ordinance was developed and presented to the County Commission to regulate non-agricultural development within the county that includes a total area of one acre, or 5,000 square feet or more of total impervious surface area.

The City will consider a 5,000 square feet of impervious surface area limit during our review of existing ordinances. As was discussed at the county forums, a three inch rain on 5000 square feet amounts to 1,250 cubic feet, or over 9,000 gallons of water.

As the Stormwater Management Plan is developed and formalized by City Council approval, press releases will be written explaining the additional efforts that the City will be undertaking in the future to comply with the MS4 permit.

The City will continue to sponsor and host events such as seminars and webcasts to provide education to the engineering, development, municipal, and contractor communities as opportunities become available.

Additional efforts for public education will include scheduling presentations with civic groups and local schools to promote understanding of the need for stormwater pollution prevention by all businesses within the City of Jackson.

Public Involvement and Participation

Public input will be sought on the Stormwater Management Plan. As the Plan is meant to be a living and evolving document, the public's input and assistance will be crucial to the development of a useful and meaningful program.

The City sponsors Park Days every year to clean up and beautify the City Park. Hubble Creek borders park property for approximately one mile. During Park Days, litter is picked up and removed from the creek and along its banks. The creek, with its beautiful rock ledges and arched footbridge, is a focal point of the City Park.

Hubble Creek's watershed ultimately receives nearly all of the runoff from the town. Additional efforts will be made to highlight the impact that the City has on this watershed as work on the Stormwater Management Plan continues. The City will promote the formation of a Stream Team to adopt Hubble Creek through the City Park as part of Park Days and other promotions.

The City currently sponsors biannual Cleanup/Fixup weeks when citizens can place unwanted appliances and large trash items for pickup at the curb free of charge. This prevents the items from sitting outside in back yards and being exposed to stormwater, or ending up deposited in a creek or ditch. The City will continue this practice twice per year.

The City will investigate instituting a Hazardous Waste Roundup once per year as a part of the Cleanup/Fixup days to allow citizens a chance to properly dispose of hazardous materials. This will require budgeting additional resources and finding a means of appropriate disposal. No time goal is set for this activity, as an unknown amount of resources, funds, and scoping will be required to coordinate this effort.

The City's maintenance department accepts used oil, antifreeze, and waste fuel from citizens. There are also several auto parts stores and repair shops around town that accept small quantities of used oil and antifreeze from citizens. One local repair shop runs a special twice per year where they advertise that anyone can bring in any quantity of used oil. The City will include this information in its presentations and information campaigns.

Illicit Discharge Detection and Elimination

The City will establish a program to eliminate discharges that are not made up exclusively of stormwater to storm sewers or receiving water bodies.

Illicit discharges from industrial and commercial facilities will be addressed through brochures to be distributed during presentations to business and civic organizations. These brochures will target pollution prevention practices recommended for commercial and industrial facilities that should be part of all business plans.

These brochures will also be presented annually at one of the monthly City departmental supervisor's meetings, as well as the City's monthly employee forum meetings to inform municipal employees of what to look for and what to report as they move around town during their normal duties. This goal should be accomplished within next year.

To better communicate and monitor where issues may occur within the City's stormwater utility system, an inventory will be performed to locate and catalog stormwater inlets, outlets, and detention basins within the City of Jackson. This process has already begun by requiring electronic versions of as-built development improvements that can be utilized by the City's Geographical Information System (GIS) technician. This goal is not something to be taken lightly, and knowing that the City has been working on the drinking water, electrical, and sanitary sewer utilities for several years, a completion date is difficult to determine. It is estimated that with the new subdivisions being in the system, approximately 5 to 10 % of the system may be mapped. A goal of mapping an additional 15% per year will be established and will hopefully be accelerated as the sanitary sewer, electrical, and water systems are completed.

As noted in Public Involvement and Participation, the City will promote the recycling of waste oil, antifreeze, and other household hazardous wastes to help eliminate these contaminants from ending up in the storm sewer system. This information will be included in all public service announcements.

Construction Site Runoff Control

In 2001 the City passed ordinance number 01-07, an updated erosion control ordinance which is now codified as Section 21, Environment, of the Code of Ordinances. This updated ordinance requires that grading permits be obtained for all development projects that are greater than one acre in area, or that involve more than 500 cubic yards of grading operations. A grading plan, erosion and sedimentation control plan, a Missouri Department of Natural Resources land disturbance permit, and a bond for the estimated grading and erosion control costs are required as part of the permitting process. This section of the City Code was submitted for review along with the MS4 permit application.

Section 21 of the City Code of Ordinances requires that the developer adopt the practices outlined in their MDNR permit, the MDNR manual "Protecting water quality, A field guide to erosion, sediment, and storm water best management practices for development sites in Missouri and Kansas.", and the EPA manual "Storm water management for construction activities". The "Protecting water quality" manual outlines the correct use of many of the most widely used best management practices (BMPs). The MDNR Land Disturbance Permit requires a complete storm water management plan and the City requires that a copy of the MDNR permit and storm water plan be submitted as part of the City's grading permit application. The EPA manual for construction activities outlines most of the known pollution prevention practices to prevent contaminants other than sediment from contaminating stormwater.

Of all the BMPs listed in the reference material and the various stormwater pollution prevention plans submitted along with project plans, none is more widely used or abused than silt fencing. During the past two years we have made significant progress in educating contractors about the correct usage of this BMP. In the recent past it was not uncommon to find silt fence installed running perpendicular to the contours, or without the bottom being trenched in or even secured. Many onsite discussions ensued with contractors and excavators concerning the correct installation methods. Several copies of the "Protecting Water Quality" handbook were distributed and Notices of Violations (NOVs) were issued. About two years ago a local landscaping contractor purchased a silt fence plow for installing silt fence and offered this service, along with steel T-posts that can be recycled. Now approximately ninety percent of the silt fence installed on developments is installed by this method.

Other BMPs are also becoming more prevalent. Rock covered construction entries, rock check dams in swales leading onto, through and leaving the developments, sandbags with geotech fabric around stormwater inlets, and multiple silt basins are now being utilized on many developments around town. The City will continue to encourage the innovative use of new and effective BMPs as they become available.

Mechanically crimping straw mulch to secure it has become fairly common in the past two years as the City has pushed for seeding and mulching on graded areas. Adequate mulching has been stressed as absolutely necessary to prevent erosion of graded areas. Wheat drills with straight disc wheels have been used over straw mulch to plant seed and crimp the straw at the same time. On detention basin banks and other inclines, crimping the straw with tracked vehicles has been fairly successful.

Flocculants, chemicals that promote the settling of silts and clays in stormwater have been utilized at several sites throughout the City in the past few years. These flocculants are useful for settling the negatively charged clays that are prevalent in our area. Their use will be encouraged where they are an appropriate BMP.

A set of four Imhoff settling cones will be purchased within the next six months for testing settleable solids in stormwater runoff. Inspectors will be trained in their use within the next year. While the Imhoff cones will only be utilized in extreme situations, they will assist the inspectors in determining what discharges are within limits, and will allow for baseline modeling.

Post-construction Stormwater Management in New Development and Redevelopment

In 2002 the City adopted ordinance number 02-45, an updated subdivision development ordinance now codified as Section 57, Subdivisions, of the Code of Ordinances. Subsection 57-10(h), Storm Drainage, Detention and Erosion Control specifies that adequate surface and subsurface drainage ways for the removal of stormwater, detention basins, and erosion control shall be provided by the subdivider. The purpose of this section is to ensure that stormwater runoff after the development is completed does not exceed pre-development stormwater runoff. This section of the City Code has been submitted for review along with the MS4 permit application.

Section 57 of the City code requires planning and implementation of stormwater management techniques to mitigate the impact of development on the surrounding area. Both quantity and quality of stormwater are addressed, as the proposed detention basins are required to function as sedimentation basins during the clearing, grading, and construction phases. Maintenance of the basins is to be monitored to ensure that they function to slow the flow of water leaving the site, allowing sediments to remain in the basin. Once the other utility and street improvements have been approved in the development, the basin is cleaned and vegetated per the approved plan.

Not only the detention basins, but all areas within the development must be effectively vegetated prior to final approval and release of the construction bond required by the City. All paths for runoff from the subdivision must be properly addressed. This has been another area of substantial progress within the past few years. One developer planted fescue on areas that are not being utilized so that it can be bailed after it has gone to seed and utilized as mulch and seed on other areas within the subdivision that have been graded. Sod has been utilized in several areas to control erosion not only in swales leaving the property, but one entire detention basin was sodded to control erosion and get the bond released so that construction on homes could begin. The City will not issue building permits in a development until all seeding and mulching has been completed.

The City has been enforcing Sections 21 and 57 of the City code since 2001 and 2002 respectively. Six stormwater detention basins have been completed and seven more are under construction.

Numerous inspections of construction sites and development projects have been performed, but no tracking mechanism has been in place to record this activity. An inspection form and tracking mechanism will be developed as part of the compliance schedule during the first year of this plan.

Pollution Prevention / Good House Keeping for Municipal Operations

The City is currently doing many things to satisfy this requirement of the MS4 permit. Most City service vehicles such as garbage trucks, electrical system service vehicles, water system service vehicles, and wastewater system service vehicles including sludge hauling trucks, are stored inside.

The City's wastewater treatment facility has utilized a stormwater pumping facility to monitor stormwater collected within their facility since 1989. This outfall is listed in their NPDES permit as Wastewater Outfall 002.

In the past year, the City's wastewater treatment plant constructed a new headworks building to cover the barscreen and screenings collection dumpster.

A new facility was constructed in 2005 to house all City sanitation trucks. Now all City sanitation trucks are stored, maintained, and cleaned inside.

A new facility was constructed in 2004 to house all of the City's electric line crew vehicles and associated equipment and materials.

The City has fueling facilities at two locations. Above-ground fuel tanks are located at the police/fire complex, and at the power plant. All fuel tanks are protected by catch basins constructed around them. Monitoring of the tanks occurs on a weekly basis. Fuel tanks and catch basins are inspected on a monthly schedule. A waste oil tank used by the city maintenance department includes a built-in secondary containment vessel. Hazardous materials are stored under roof where possible.

Specialized training and instruction are provided to employees that handle hazardous materials that are used out of doors such as pesticides and fertilizers. This training occurs annually and will be continued at regular safety meetings.

As noted above, City employees will be presented with instructional material covering BMPs for industrial and commercial facilities to monitor activities around town during their normal activities. Many of these BMPs will also apply to municipal facilities.

All departmental supervisors will be asked to conduct inventories of materials and machinery exposed to stormwater runoff in their respective areas and all immediate risks will be addressed. A follow-up survey will be conducted with the City Engineer within one year.

APPENDICES

APPENDIX A

STORMWATER OUTFALL LOCATION, DESCRIPTIONS, AND MAP

CITY OF JACKSON STORMWATER OUTFALLS

OUTFALL 001

| | |
|----------------------------|--|
| Legal Description | NE ¼, NW ¼, Sec 2, T31N, R12E, Cape Girardeau County |
| Latitude: + 37° 23' 58.5" | Longitude: – 89° 41' 35.8" |
| Receiving Water | Tributary to Cane Creek (U) |
| 1 st Classified | Cane Creek (P) |
| USGS/ SUB WATERSHED | 07140107-050005 |

OUTFALL 002

| | |
|----------------------------|---|
| Legal Description | NE ¼, SE ¼, Sec 14, T31N, R12E, Cape Girardeau County |
| Latitude: + 37° 21' 34.9" | Longitude: – 89° 38' 57.7" |
| Receiving Water | Hubble Creek (P) |
| 1 st Classified | Hubble Creek (P) |
| USGS/ SUB WATERSHED | 07140107-060001 |

OUTFALL 003

| | |
|----------------------------|---|
| Legal Description | SE ¼, NW ¼, Sec 18, T31N, R12E, Cape Girardeau County |
| Latitude: + 34° 21' 39.0" | Longitude: – 89° 38' 57.7" |
| Receiving Water | Randol Creek (U) |
| 1 st Classified | Williams Creek (P) |
| USGS/ SUB WATERSHED | 07140107-060001 |

OUTFALL 004

| | |
|----------------------------|---|
| Legal Description | SE ¼, SW ¼, Sec 17, T31N, R13E, Cape Girardeau County |
| Latitude: + 37° 21' 22.3" | Longitude: – 89° 37' 48.9" |
| Receiving Water | Williams Creek (P) |
| 1 st Classified | Williams Creek (P) |
| USGS/ SUB WATERSHED | 07140107-060001 |

OUTFALL 005

| | |
|----------------------------|--|
| Legal Description | SW¼, SE ¼, Sec 21, T31N, R13E, Cape Girardeau County |
| Latitude: + 37° 20' 28.8" | Longitude: – 89° 36' 30.3" |
| Receiving Water | Ramsey Branch (U) |
| 1 st Classified | Ramsey Branch (C) |
| USGS/ SUB WATERSHED | 07140105-150003 |

APPENDIX B

JACKSON CODE OF ORDINANCES SECTION 21

Chapter 21 ENVIRONMENT*

*Editor's note: Formerly, Ch. 21 was designated Ch. 9.5 (see editor's note for Ch. 3).

Article I. In General

Secs. 21-1--21-25. Reserved.

Article II. Site Development; Erosion Control

Division 1. Generally

Sec. 21-26. Purpose.

Sec. 21-27. Scope of authority.

Sec. 21-28. Bond requirement.

Secs. 21-29--21-40. Reserved.

Division 2. Regulations

Sec. 21-41. Erosion and sedimentation control plan content.

Sec. 21-42. Plan approval.

Sec. 21-43. Principles and standards.

Secs. 21-44--21-50. Reserved.

Division 3. Inspection and Violation

Sec. 21-51. Inspections.

Sec. 21-52. Correction.

Sec. 21-53. Violations.

Sec. 21-54. Penalties.

Sec. 21-55. Appeals.

Secs. 21-56--21-65. Reserved.

Division 4. Definitions

Sec. 21-66. Definitions.

Division 5. Application and Adoption

Sec. 21-67. Review/conflict.

Sec. 21-68. Plan to be implemented prior to permit issuance.

ARTICLE I. IN GENERAL

Secs. 21-1--21-25. Reserved.

ARTICLE II. SITE DEVELOPMENT; EROSION CONTROL

DIVISION 1. GENERALLY

Sec. 21-26. Purpose.

The purpose of this article is to control soil erosion on land that is undergoing development for non-agricultural uses and to preserve the natural terrain and waterways of the land within the city. Soil erosion scars the land and creates sediment that clogs storm sewers and road ditches; chokes streams and creates silt bars, all of which pose a threat to public health and safety. The provisions in this article are intended to provide a natural community environment, to prevent soil erosion and to reduce costly repairs to

gullies, washed out fills, water conveyance systems, roads and embankments. Application of the regulations in this article will effectively control soil erosion and sedimentation. (Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-27. Scope of authority.

Any person, firm, corporation, or business proposing to develop land within the city shall apply to the office of the public works director for approval of his or her erosion control plan and issuance of a grading permit as specified in this article. No land shall be graded without the issuance of such permit by the city. However, grading operations for single or two-family residential lots of any size or for commercial and industrial lots which are one (1) acre or less in area and do not involve more than five hundred (500) cubic yards of grading operations shall be exempt from providing a grading application and performance bond.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-28. Bond requirement.

Upon approval of the erosion control plan and the issuance of a grading permit, the public works director shall require the developer to post a performance bond, escrow agreement, lender's agreement, cash or certified check in the amount of all work to be done under the erosion control plan. This shall be in addition to the requirements for completion of other improvements necessary for subdivision plat approval. The bond shall be released upon the completion of grading and erosion control operations.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Secs. 21-29--21-40. Reserved.

DIVISION 2. REGULATIONS

Sec. 21-41. Erosion and sedimentation control plan content.

Grading plans for grading operations in excess of one (1) acre or five hundred (500) cubic yards, whichever is less, site plans, preliminary plat of subdivision, or the subdivision improvement plan shall include the following additional information.

(1) Erosion and sediment control plans submitted to the office of the city clerk shall include two (2) sets of maps and plans with specifications showing proposed excavation, grading or filling, and will include the following:

- a. Full name and address of property owner;
- b. Designation of property address;
- c. Portion of the property that is to be excavated, graded or filled with excavated material;
- d. Location of any sewerage disposal system or underground utility line, any part of which is within fifty (50) feet of the proposed excavation, grading or filling area and the location of any gas transmission pipe line operated at a maximum service pressure in excess of two hundred (200) p.s.i.g., any part of which is within one hundred (100) feet of the proposed excavation, grading or filling area;
- e. Existing grade and topography of the premises and the proposed finish grade and final contour elevation at a contour interval of not more than two (2) feet;

- f. Location and present status of any previous permitted grading operation on the property;
- g. Details of any drainage system proposed to be installed and maintained by the applicant and a comprehensive drainage plan designed to safely handle surface water, streams, or other natural drains following heavy rains during grading operations;
- h. Details of any proposed water impoundment structures, embankments, debris basins, grass or lined waterways, and diversions with the details and locations of proposed stable outlets;
- i. Details of soil preparation and re-vegetation of the finished grade and of other methods of erosion control;
- j. Delineation of the fifty (50) and one hundred (100) year flood plain;
- k. A statement from the property owner or his agent assuming full responsibility for the performance of the operation as stated in the application. This statement shall also contain assurance that all municipal property or streets will be adequately protected and/or repaired, if damaged.
- l. Details on all erosion control structures. The owner will follow all federal, state, and local laws, especially those guidelines as established in Missouri Department of Natural Resources (MDNR's) publication "Protecting water quality."
- m. Commencement and completion dates of the grading project and anticipated construction date of improvements.

(2) The proposed phasing of development of the site, including clearing, rough grading and construction, and final grading and landscaping should 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 sediment control measures, establishment of storm drainage, paving streets and parking areas, and establishment of temporary and permanent vegetative cover. The city engineer may waive specific requirements of the content of submissions upon finding that the information submitted is sufficient to show that the plan and work will comply with the objectives and principles of this article.

(3) Failure to complete the plan by the completion date shall trigger city's use of bonding or escrow requirements. Completion may be extended by the public works director or his designate in writing.

(4) The developer and city staff shall utilize all of the following:

- a. Missouri Department of Natural Resources (MDNR) "Protecting water quality. A field guide to erosion, sediment, and storm water best management practices for development sites in Missouri and Kansas."
- b. Missouri Department of Natural Resources (MDNR) "Storm water permit requirements for land disturbance activities."
- c. Environmental protection agency (EPA) "Storm water management for construction activities."

When conflicts arise between manuals or any other city, state or federal regulation, the most stringent criteria shall control.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-42. Plan approval.

- (a) No non-agricultural grading or clearing operation in excess of one (1) acre or five hundred (500) cubic yards, whichever is less, shall be conducted and no final plat of

subdivision shall be recommended for approval by the erosion control officer or the planning and zoning commission unless the preliminary plat and erosion and sediment control plans indicate that measures to be taken will meet erosion control standards. The standards assure that the best possible means are being used to prevent sediment from being transported from the site by a storm event of two (2) year frequency, twenty-four (24) hour duration storm or less, and that the following principles set forth in section 21-43 will be applicable. (Permit approval/disapproval will be issued within thirty (30) days of erosion and sediment control plan submission.)

(b) Conservation district comments: The erosion control officer may submit the plan for review by the soil and water conservation district. When a plan is so submitted, the district may make comments and recommendations. All such comments and recommendations should be made within fifteen (15) days of the receipt by the district. Such comments may pertain but need to be limited to:

- (1) Erosion and sediment control.
- (2) Soil use limitations.
- (3) Environmental considerations.
- (4) Drainage and flooding.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-43. Principles and standards.

(a) All excavations, grading or filling shall have a finished grade not to exceed a 3:1 (three (3) horizontal to one (1) vertical) slope. Steeper grades may be approved by the city engineer if the excavation is through rock or the excavation or fill is protected (a designed head wall or toe wall may be required). Retaining walls that exceed a height of four (4) feet shall require the construction of safety guards as identified in the 2003 International Building Code or subsequent amendments thereto. Permanent safety guards will be construction in accordance with the 2003 International Building Code.

(b) Grading plans for sites that exceed one (1) acre shall provide for sediment or debris basins, silt traps or filters, staked straw bales, a combination of these measures or other measures approved by the city engineer to remove sediment from runoff waters. The design to be approved by the public works director. Temporary siltation control measures (structural) shall be maintained until vegetative cover is established at a sufficient density to provide erosion control on the site.

(c) Where natural vegetation is removed during grading, vegetation shall be re-established in such a density as to prevent erosion. Permanent type grasses shall be established as soon as possible or during the next seeding period after grading has been completed.

(d) When grading operations are completed or suspended for more than thirty (30) days between permanent grass seeding periods, temporary cover shall be provided according to the public works director's recommendation.

All finished grades (areas not to be disturbed by future improvements) in excess of (5:1) slopes (five (5) horizontal to one (1) vertical) shall be mulched at the rate of one hundred (100) pounds per one thousand (1,000) square feet when seeded.

(e) Provisions shall be made to accommodate the increased runoff caused by changed soil and surface conditions during and after grading. Unvegetated open channels shall be designed so that gradients result in velocities of two (2) feet per second (fps) or less.

Velocities in permanently vegetated open channels shall not exceed five (5) fps. Unvegetated open channels with velocities more than two (2) fps and less than five (5) fps shall be established in permanent vegetation by use of commercial erosion control blankets or lined with rock riprap or concrete or other suitable materials as approved by the public works director. Detention basins, diversions, or other appropriate structures shall be constructed to prevent velocities above five (5) fps.

(f) Ground adjoining development sites (lots) shall be provided with protection from accelerated and increased surface water, silt from erosion, and any other consequences of erosion. Runoff water from developed areas (parking lots, paved sites, and buildings) above the area to be developed shall be directed to diversions, detention basins, concrete gutters, and/or underground outlet systems. Sufficiently anchored straw bales may be substituted with the approval of the public works director.

(g) Development along natural watercourses shall have a minimum thirty (30) foot general maintenance and drainage easement from the top of the existing stream bank. Development shall not encroach on said thirty (30) foot easement. The watercourse shall be maintained and made the responsibility of the appropriate legal entity. Permanent vegetation should be left intact. Variances will include designed stream bank erosion control measures and shall be approved by the public works director. FEMA guidelines shall be followed where applicable regarding site development in flood plains.

(h) All lots shall be seeded and mulched or sodded before an occupancy permit shall be issued except that a temporary occupancy permit may be issued by the director or his designate in cases of undue hardship because of unfavorable ground conditions.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01; Ord. No. 05-118, § 3, 9-19-05) Secs. 21-44--21-50. Reserved.

DIVISION 3. INSPECTION AND VIOLATION

Sec. 21-51. Inspections.

By applying for a grading permit, the applicant consents to the city inspecting the proposed development site and all work in progress.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-52. Correction.

All violations shall be corrected within the time limit set forth by the public works director specified in the issuance of a written notice to correct. All persons failing to comply with such notice shall be deemed in violation of this article.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-53. Violations.

In the event of an ordinance violation, the bond requirement proceeds shall be used by the city to complete the planned sediment and erosion control practices.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-54. Penalties.

Any person violating any provision of this article and found guilty of such violation shall be punished in accordance with section 1-20 hereof; for continuing violations, each day shall be considered a separate offense.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-55. Appeals.

Any person denied a grading permit as herein stated shall have the right to appeal such denial to the board of adjustment of the city within forty-five (45) days of the date of such denial.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Secs. 21-56--21-65. Reserved.

DIVISION 4. DEFINITIONS

Sec. 21-66. Definitions.

For the purposes of this article, the following words and phrases shall have the meanings respectively ascribed to them by this section:

Debris or sediment basin. A barrier or dam built across the waterway or at other suitable locations to retain rock, sand, sediment, gravel, silt, or other materials.

Diversion. A channel with or without a supporting ridge on the lower side constructed across or at the bottom of a slope.

Erosion. The wearing away of the land surface by the action of wind, water, or gravity.

Excavation or cut. The removal, stripping or disturbance of soil, earth, sand, rock, gravel, or other substance from the surface of the earth.

Existing grade. The vertical location of the existing ground surface prior to excavation or filling.

FEMA. Federal Emergency Management Agency.

Fill or filling. The placing of any soil, earth, sand, rock, gravel or other substance on the ground.

Finished grade. The final grade or elevation of the ground surface conforming to the proposed design.

Grading. Any excavation or filling or combination thereof

International Building Code. Refers to the 2003 International Building Code as published by the International Codes Council and all amendments thereto.

International Residential Code. Refers to the 2003 International Residential Code as published by the International Codes Council and all amendments thereto.

Natural watercourse. A channel formed in the existing surface topography of the earth prior to changes made by unnatural conditions.

Open channel. A constructed ditch or channel designed for water flow.

Person. Shall include any partnership, corporation, joint venture, or legal entity.

Sediment. Solid material, mineral or organic, that has been moved by erosion and deposited in a location other than the point of origin.

Silt traps or filters. Staked bales of straw or silt fencing systems that function as a filter and a velocity check to trap fine-grained sediment while allowing satisfactory passage of storm water run-off.

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

Site development. Altering terrain and/or vegetation and constructing improvements

Soil and water conservation district (SWCD). RSMo. Chapter 278.070(4) defines a soil and water conservation district as a locally organized and operated unit of government, functioning under Missouri law, to promote protection, maintenance, improvement, and wise use of the soil and water within the county.

Streambank, top of existing. The usual boundaries, not the flood boundaries, of a stream channel. The top of the natural incline bordering a stream.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01; Ord. No. 05-118, § 4, 9-19-05)

DIVISION 5. APPLICATION AND ADOPTION

Sec. 21-67. Review/conflict.

This article shall be considered by the public works director in his review and recommendation of subdivision plans and developments submitted to the city for approval. Any provision of the city subdivision regulations which is in conflict with this article shall be deemed amended by this article so that the conflicting provision shall be in accordance with the provisions of this article.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

Sec. 21-68. Plan to be implemented prior to permit issuance.

When it has been determined that a detention basin, concrete gutter, etc., must be constructed due to the development of a piece of property, before a building permit can be obtained, the detention basin or structure required for that development must be fully constructed and operational.

(Ord. No. 3317, § 1, 8-1-94; Ord. No. 01-70, § 1, 10-1-01)

APPENDIX C

JACKSON CODE OF ORDINANCES SECTION 57.10(h)

Sec. 57-10. Minimum improvements required.

(h) Storm drainage, detention and erosion control.

Adequate surface and subsurface drainage ways for the removal of storm water, detention basins, and erosion control shall be provided by the subdivider. The purpose of this section is to ensure that storm water runoff after development does not exceed pre-development storm water runoff.

(1) In general.

a. Applicability. All new development within the city shall be subject to the provisions hereof.

b. Fee in lieu of storm water facility construction. Unless the increase amount or velocity of storm water generated by a development of under three (3) acres will cause a major impact on down stream facilities or water courses, a developer/builder shall pay to the city a fee based on the following scale. Said fee shall be known as "storm water credits".

Storm Water Credits

TABLE INSET:

| <u>Lot Size/Area (Acres)</u> | <u>Commercial/Industrial Fee</u> | <u>Residential Fee</u> |
|------------------------------|----------------------------------|------------------------|
| 0.00--0.50 | \$ 400.00 | \$120.00 |
| 0.50--1.00 | 640.00 | 104.00 |
| 1.00--1.50 | 1,080.00 | 98.00 |
| 1.50--2.00 | 1,120.00 | 72.00 |
| 2.00--2.50 | 1,360.00 | 56.00 |
| 2.50--3.00 | 1,600.00 | 40.00 |

In the event it is determined by the director of public works or his designate that the increase flow or velocity of storm water generated by a three (3) acre or less development/subdivision will cause a major effect on downstream facilities or water course, the builder/developer shall comply with the following provisions hereof. The decision of the director of public works shall be final.

c. Scope of storm water system. All developments and subdivisions shall be subject to the provisions hereof. On all developments over three (3) acres in area and on those under three (3) acres which the director of public works has determined may create major impact on downstream facilities or water courses, the extent of the storm water system required shall be based upon an analysis of need prepared by a registered professional engineer in the form of a design report. The design report shall be approved by the director in the preliminary design phase. The development's storm water system shall include a storm drainage system and a detention basin(s) as provided herein. On all developments and subdivisions under three (3) acres, except as otherwise provided herein, the developer shall be required to pay storm water credits as provided herein.

d. Storm water plans/maintenance. The developer shall design storm water detention/retention basins or other storm water control facilities, which said facilities shall be incorporated into subdivision lots thereby providing a method of permanent maintenance by the landowner. The purpose of this approach is to provide practical and aesthetically pleasing storm water control which incorporates basins into areas which can be used by the landowner. Developer shall dedicate permanent storm water basin easements as required by city.

e. Design criteria. The minimum design criteria to be used to design and construct the storm water system shall be established by the following publications, all of which establish minimum design criteria:

1. Missouri Department of Transportation Design Manual--Chapter IX - Hydraulics and Drainage. (Section 9.02 current edition).
2. Missouri Department of Natural Resources Manual--Protecting Water Quality.
3. Missouri Department of Natural Resources--Storm Water Permit Requirements for Land Disturbance Activities PUB002009 current edition.

4. Environmental Protection Agency--Storm Water Management for Construction Activities--EPA 833-R-92-001 current edition.

When conflicts arise between manuals or any other city, state or federal regulation, the most stringent criteria shall control.

f. Design storm frequencies. The minimum rain fall event to be utilized in determining the intensity of rainfall for storm flow calculations shall be based on the following:

TABLE INSET:

| Land Use/Zoning | Storm Return Frequency (Year Storm) | Condition |
|----------------------------|-------------------------------------|---------------|
| Residential | 10 | Developed |
| Commercial | 15 | Developed |
| Industrial | 15 | Developed |
| Parks; Greenbelts, etc. | 10 | Developed |
| Open Channels (see note 1) | 25 | Developed |
| Flood Plains | 100 | Developed |
| Street Culvert Crossings: | | |
| Local | 10 | Developed |
| Collector | 25 | Developed |
| Arterial | 50 | Developed |
| Tributary | 50 | Developed |
| Detention Basin Discharge | 2, 10, 100 | Pre-Developed |

g. Permanent storm water easement. Permanent storm water easements are required to provide adequate access for construction, inspection, and maintenance of storm drainage system components. Easements shall be dedicated to the city. Storm water easements shall have minimum widths as described below. A wider easement width may be required at structures, or if the easement is shared with other utilities or as determined by the city engineer.

1. Storm sewer easements shall be fifteen (15) feet wide or the outside dimension of the conduit plus ten (10) feet (centered on the conduit), which ever is greater. A wider easement will be required if the depth of cover exceeds four (4) feet.

2. Improved open channel easements shall be as wide as the top of bank width plus ten (10) feet on each side, and shall be continuous to the end of the channel.

3. Natural open channel shall be the area between the high bank lines of the channel, plus additional width on each side of the channel as deemed necessary by the city to allow access for maintenance equipment. The minimum width for a natural open channel easement is thirty (30) feet.

4. General easements. In subdivisions, the detention basin, access roads or paths, control structures and outfall pipes are to be located in permanent utility easements dedicated to the city.

h. Storm water plan and design review fees. For purposes of evaluation, projects will be classified in four (4) categories according to acreage:

TABLE INSET:

| <u>Class (Acres)</u> | <u>Review Fee</u> |
|----------------------|-------------------|
| (1) Less than 10 | \$ 80.00 |
| (2) 10 to 25 | 160.00 |
| (3) 25 to 100 | 240.00 |
| (4) > 100 | 300.00 |

This fee shall accompany the storm water plan.

(2) Storm drainage system. Storm drainage systems required by this section shall use surface ditches, storm drains, guttering and other appurtenances which may be required to accomplish the intent hereof.

a. Calculations. In developing a storm water drainage system the development calculations shall be based on the maximum of one (1) fifteen (15) minute rainfall using the following:

TABLE INSET:

| <u>Watershed Area (acres)</u> | <u>Method</u> |
|-------------------------------|--|
| 0--25 | Rational (see Note 1) |
| > 25 | Technical Release 55 (TR-55) (see Note 2) |

Note 1: Rational method shall be as identified in Missouri Department of Transportation Design Manual Chapter IX--Hydraulics and Drainage current edition.

Note 2: Technical release 55 (TR-55) shall be as identified in the NRCS Urban Hydrology for Small Water Sheds.

b. Open channels.

1. Open channels, natural or improved, may be placed to the rear or side of properties upon approval of the city engineer where the design provides adequate protection to the existing and future property and structures. Such protection shall be through the provision of a fifty (50) year flood plain setback and a minimum distance from the top of bank to the setback of thirty (30) feet. This drainage setback line shall be shown on the final plat. Permanent vegetation, existing ground elevation, and grades within the thirty (30) foot setback area shall be left intact and undisturbed on channels with watersheds of one hundred (100) acres or more unless modification is approved in writing by the director or his designate.

2. Area inlets shall be required behind the curbs to intercept overland flows greater than one (1) cfs to prevent flows from crossing sidewalks and/or curbs.

3. Existing open channels may have storm return frequency waived in writing by the public works director or his designate to protect existing vegetation on stream bank. Bridges shall be designed per MoDOT criteria.

c. Curb inlet, junction boxes and other points of entry. Curb inlets shall be installed at intersections and as required at intermediate points to limit gutter flow width during runoff occurring from the design peak discharge from the tributary watershed area to that which will not encroach on the following center width of streets:

TABLE INSET:

| <u>Street Type</u> | <u>Center Width(Feet)</u> |
|--------------------|---------------------------|
| Arterial | 24 |
| Collector | 14 |
| Local | 10 |

Inlets, junction boxes and other points of entry shall be per the city's inlet details and as approved by the city engineer. When locating inlets in sump locations consideration must be made with respect to the major drainage system. A one hundred (100) year design event shall not cause buildings to flood in the event that a single inlet becomes blocked. In new developments the one hundred (100) year design storm elevation shall be mapped on the final plat as a building set back. Overland relief to another inlet or surface channel shall be provided to protect property.

d. Enclosed systems.

1. The outlet of an enclosed system shall discharge into an open channel a minimum of fifty (50) feet upstream of an adjacent property, or sufficient energy dissipation is provided to negate the increases posed by development as approved by the city engineer.

2. Building gutter drainage systems may not be discharged directly into the city's enclosed system.

3. If development plans call for the enclosure of an existing, natural drainage way which carries greater than fifty (50) cfs during the design storm event, the enclosure shall be sized for a fifty (50) year twenty (20) minute storm event. Two (2) feet minimum freeboard shall be required. Upstream inundation shall be checked. Where inundation extends beyond the site property line and exceeds the design water surface elevation of the natural drainway/channel, a backwater ponding easement from the affected off-site property owner(s) shall be required prior to final plan approval. A reduction in the design storm requirement may be granted by the city engineer when existing off-site, downstream storm sewer would be smaller than the required on-site, upstream sewer and the downstream storm sewer are not designed to intercept/pass the fifty (50) year twenty (20) minute storm event.

e. Detention basin. The developer's professional engineer shall provide calculations for a detention basin or basins for the increased storm water runoff resulting from the entire area of the proposed development which may include wet or dry bottom reservoirs.

1. Storage volume. The volume of storage provided in the detention basin shall be sufficient to control the excess storm water runoff added to the watershed from development. A volume calculated should provide for the attenuation of the post-developed discharge to a rate which shall not exceed the pre-developed peak discharge rate. Streets may not be used for storage volume.

2. Release rate. A release rate shall be calculated for a two (2), ten (10) and one hundred (100) year storm as described in subsection (1)(c) for the proposed subdivision in the condition prior to the proposed development. The storm water release rate shall not exceed at any time, the allowable flow rate of downstream storm water facilities. In the event it does, the release rate on the basin shall be reduced to the allowable rate and the storage volume increased.

3. Construction phase. The two (2) year storm design referred to above will only be used during the construction phase of the development for erosion control. As a minimum a silt basin to handle the two (2) year storm shall be constructed at the location of the detention basin prior to the start of major earth moving operations.

4. Time of concentration and infiltration. The design of the development shall be such that the time of concentration is maximized to allow for maximum infiltration.

5. Emergency spillway. An emergency spillway shall be required to release the runoff from a storm greater than a one hundred (100) year twenty-four (24) hour storm as required by regulations from the state department of natural resources.

6. Freeboard. Detention basin shall require a minimum of 2 feet of freeboard from one hundred (100) years storm overflow elevation. Wet bottom facilities may require increased freeboard to prevent damaging from flooding down stream during low frequency storms.

7. Dam design. The professional engineer will be required to submit a dam design for basins greater than one hundred (100) acre feet or as requested by the director. Dams with a height of thirty-five (35) feet or greater will require approval from the Missouri Department of Natural Resources.

8. Landscaping plan. A landscaping plan shall be required on the basin to provide an aesthetically pleasing, park environment for the public or private landowner. The landscaping plan shall be designed and planted by the developer, approved by the city, and maintained by the developer until maintenance guarantee expires.

f. Plan adherence and enforcement. The applicant shall be required to adhere strictly to the storm water management plan as approved. Any changes or amendments to the plan must be approved by the public works director or his designate in accordance with the procedures set forth in this chapter obtaining storm water management plan approval. Public works director or his designate shall be, and are herein, granted inspection rights and right of entry privileges in order to ensure compliance with the requirements of this chapter.

1. Approved projects. The public works director or his designate shall carry out periodic inspections of the project site to insure compliance with this chapter. If it is determined that the project is not being carried out in accordance with the approved storm water management plan, the public works director or his designate is authorized to:

- i. Written notice. Issue written notice to the applicant or owner, specifying the nature and location of the alleged noncompliance, with a description of the remedial actions necessary to bring the project into compliance within a reasonable specified time;
- ii. Stop-work order. Issue a stop-work order directing the applicant or owner to cease and desist all or any portion of the work which violates the provisions of this chapter, if the remedial work identified in the "written notice" is not completed within the specified time.

2. Unapproved projects. With respect to any development or development activity determined by the public works director or his designate to be subject to this ordinance, and being carried out without approval, the public works director or his designate is authorized to follow procedures for corrective action as described for approved projects except that after a stop-work order is issued, the owner does not bring project into compliance, the violation goes directly to the penalty phase.

i. Revocation of approval. Should the applicant or owner not bring the project into compliance with the written notice and stop-work order, he shall then be subject to immediate revocation of his storm water management plan approval and to the penalties described in the following section.

ii. Appeal. Any notice, order or revocation issued pursuant to the above subsections shall become final unless the person named therein requests, in writing, no later than ten (10) days after the date of such notice, order or revocation is served, a hearing before the board of aldermen.

3. Penalties for violation. Violation of the provisions of this chapter or failure to comply with any of its requirements, including conditions and safeguards established in connection with variances or special use permits, shall constitute a misdemeanor. Any person who violates this chapter or fails to comply with any of its requirements shall upon conviction thereof be fined not more than five hundred dollars (\$500.00) or imprisoned for not more than ninety (90) days, or both, and in addition, shall pay all costs and expenses involved in the case. Each day such violation continues shall be considered a separate offense.

g. Liability disclaimer. The performance standard and design criteria set forth herein establish minimum requirements which must be implemented with good engineering practice and workmanship. Use of the requirements contained herein shall not constitute a representation, guarantee, or warranty of any kind by the city or its officers and employees of the adequacy or safety of any drainage management structure or use of land. Nor shall the approval of a storm water management plan and the issuance of a permit imply that land uses permitted will be free from damages caused by storm water runoff. The degree of protection required by these regulations is considered reasonable for regulatory purposes and is based on historical records, engineering and scientific methods of study. Larger storms may occur or storm water runoff heights may be increased by manmade or natural causes. Enforcement of these provisions, therefore, shall not create liability on the part of the municipality or any officer of the municipality with respect to any legislative or administrative decision lawfully made hereunder, nor shall compliance relieve an owner, developer, developer's engineer, and/or permittee from responsibility under any circumstances where liability would otherwise exist.

h. Erosion control. The developer shall comply with the erosion control ordinances of the city found at sections 21-1, et seq. Said ordinances have been considered along with the 2000 revision of these subdivision regulations, and have been amended to

conform with city's subdivision regulations after planning and zoning review and required public hearing. Recodification herein would be superfluous.

APPENDIX D
ANNUAL MS4 REPORTS

**CITY OF JACKSON, MISSOURI
SMALL MUNICIPAL SEPARATE STORM SEWER SYSTEM
2007 ANNUAL REPORT**

STATUS OF COMPLIANCE

The two Minimum Control Measures that the City has made the most progress with are Construction Site Runoff Control and Post-construction Stormwater Management in New Development and Redevelopment. Ordinances have been passed and enforced, and much has been learned about the appropriate use of various best management practices (BMPs).

Construction Site Runoff Control:

In 2001 the City passed ordinance number 01-07, an updated erosion control ordinance which is now codified as Section 21, Environment, of the Code of Ordinances. This updated ordinance requires that grading permits be obtained for all development projects that are greater than one acre in area, or that involve more than 500 cubic yards of grading operations. A grading plan, erosion and sedimentation control plan, a Missouri Department of Natural Resources land disturbance permit, and a bond for the estimated grading and erosion control costs are required as part of the permitting process. This section of the City Code was submitted for review along with the MS4 permit application.

Section 21 of the City Code of Ordinances requires that the developer adopt the practices outlined in their MDNR permit, the MDNR manual "Protecting water quality, A field guide to erosion, sediment, and storm water best management practices for development sites in Missouri and Kansas.", and the EPA manual "Storm water management for construction activities". The "Protecting water quality" manual outlines the correct use of many of the most widely used best management practices (BMPs). The MDNR permit requires a complete storm water management plan and the City requires that a copy of the MDNR permit and storm water plan be submitted as part of the City's grading permit application. The EPA manual outlines most of the known pollution prevention practices to prevent contaminants other than sediment from contaminating storm water.

Of all the BMPs listed in the reference material and the various stormwater pollution prevention plans submitted along with project plans, none is more widely used or abused than silt fencing. During the past two years we have made significant progress in educating contractors about the correct usage of this BMP. In the recent past it was not uncommon to find silt fence installed running perpendicular to the contours, or without the bottom being trenched in or even secured. Many onsite discussions ensued with contractors and excavators concerning the correct installation methods. Several copies of the "Protecting Water Quality" handbook were distributed and Notices of Violations (NOVs) were issued. About two years ago a local landscaping contractor purchased a silt fence plow for installing silt fence and offered this service, along with steel T-posts that

can be recycled. Now approximately ninety percent of the silt fence installed on developments is installed by this method.

Other BMPs have become more prevalent during the past two years, and we would like to believe that this is due to the persistent site visits, educational forums, and the literature that has been distributed. Rock covered construction entries, rock check dams in swales leading onto, through and leaving the developments, sandbags with geotech fabric around stormwater inlets, and multiple silt basins are now being utilized on many developments around town. Still, the largest influence has no doubt been the fact that many contractors are simply turning erosion control and stormwater management over to the one landscape contractor in the area that has taken the opportunity to make a business out of it. Most excavators would rather just move dirt around and hire someone else to do the erosion control than admit that they have to spend time trying to keep the soil on site once they have moved it.

Mechanically crimping straw mulch to secure it has become fairly common in the past two years as the City has pushed for seeding and mulching on graded areas. Adequate mulching has been stressed as absolutely necessary to prevent erosion of graded areas. Wheat drills with straight disc wheels have been used over straw mulch to plant seed and crimp the straw at the same time. On detention basin banks and other inclines, crimping the straw with tracked vehicles has been fairly successful.

In 2005 a 5-inch rain event combined with final grading on several acres in a subdivision development in the watershed of Rotary Lake in the City Park combined to wash enough clay into the lake to make it so cloudy the local fishermen could not catch the trout stocked annually by the Missouri Department of Conservation (MDC). The City and MDC applied gypsum to the lake with some assistance from a local landscape contractor who owns a hydroseeder. As a second phase of that project, the City worked with the developer to install floc-logs in the storm sewer system within the subdivision and in other parts of the watershed. This successful demonstration of floc-logs led to their use in two other subdivisions throughout the past year.

A set of four Imhoff settling cones will be purchased within the next six months for testing settleable solids in stormwater runoff and inspectors will be trained in their use within the next year. While the Imhoff cones will only be utilized in extreme situations, they will assist the inspectors in determining what discharges are within limits, and will allow baseline modeling.

Post-construction Stormwater Management in New Development and Redevelopment:

In 2002 the City adopted ordinance number 02-45, an updated subdivision development ordinance now codified as Section 57, Subdivisions, of the Code of Ordinances. Subsection 57-10(h), Storm Drainage, Detention and Erosion Control specifies that adequate surface and subsurface drainage ways for the removal of storm water, detention basins, and erosion control shall be provided by the subdivider. The purpose of this

section is to ensure that storm water runoff after the development does not exceed pre-development storm water runoff. This section of the City Code has also been submitted for review along with the MS4 permit application.

Section 57 of the City code requires planning and implementation of stormwater management techniques to mitigate the impact of development on the surrounding area. Proposed detention basins are required to function as sedimentation basins during the clearing, grading, and construction phases. Maintenance of the basins is monitored to ensure that they function to slow the flow of water leaving the site, allowing sediments to remain in the basin. Once the other utility and street improvements have been approved in the development, the basin is cleaned and vegetated per the approved plan.

Not only the detention basins, but all areas within the development must be effectively vegetated prior to final approval and release of the construction bond required by the City. All paths for runoff from the subdivision must be properly addressed. This has been another area of substantial progress within the past few years. One developer planted fescue on areas that are not being utilized so that it can be bailed after it has gone to seed and utilized as mulch and seed on other areas within the subdivision that have been graded. Sod has been utilized in several areas to control erosion not only in swales leaving the property, but one entire detention basin was sodded to control erosion and get the bond released so that construction on homes could begin. The City will not issue building permits in a development until the final punch list for improvements has been completed.

The City has been enforcing Sections 21 and 57 of the City code for the past six and five years respectively. Six stormwater detention basins have been completed and seven more are under construction.

Three Notice of Violation (NOV) letters have been issued during the past year to developers due to non-compliance with the erosion control plans for their developments. All three developments were brought into compliance without penalties being assessed. Now it seems that just the mention of an NOV letter gets results within a few days.

Numerous inspections have been performed, but no tracking mechanism has been in place to record this activity. An inspection form will be developed as part of the compliance schedule during the next year.

Public Education and Outreach on Stormwater Impacts:

During the past year, the City sponsored five educational forums for public education on the impact of stormwater in Jackson, the City's ordinances concerning erosion control and stormwater maintenance, and innovative methods of dealing with the impacts of stormwater erosion.

- January 19, 2006 – Changing Course: Streambed Restoration/Stabilization; Webcast presented by American Public Works Association, hosted by the City of Jackson, cosponsored by the Cape County Soil and Water District at Jackson City Hall. This event was advertised to the public and attended by local contractors, city aldermen, local engineering firms, State, and Federal employees.
- April 11, 2006 – Stormwater Management and Erosion Control Workshop; presented in cooperation with Missouri Department of Natural Resources (MDNR) Southeast Regional Office (SERO) and the City of Cape Girardeau, hosted by the City of Cape Girardeau. This workshop was targeted at area contractors, developers, and engineers. The SERO invited over 60 companies and individuals to this workshop with the intent of eliminating the excuse used by contractors that they have never been informed about erosion control and stormwater management.
- May 11, 2006 – Erosion Control and Stormwater Management in the City of Jackson; Presentation given two times at the Missouri Flood Plain and Stormwater Managers Association conference. This presentation was given to provide Association members a local perspective during the same session as a presentation by MDNR land disturbance official.
- July 12, 2006 – Financing Municipal Stormwater Programs; USEPA Webcast, hosted by City of Jackson and Cape County Soil and Water District at Jackson City Hall. This event was advertised to local governments and was attended by city, county, and federal employees.
- July 20, 2006 - Construction Site Run-off; Webcast presented by the American Public Works Association, hosted by the City of Jackson, cosponsored by Cape Girardeau County. This event was advertised to the public and attended by local contractors, city, county, and federal employees.

In addition to the activities outlined above, the City Engineer participated in several meetings of a committee formed by Cape Girardeau County to develop a proposed Erosion Control and Stormwater Management ordinance for use by the County. The committee was composed of representatives from the Cities of Jackson and Cape Girardeau, the head of the Hubble Creek Watershed Improvement District, MDNR SERO, and citizens including farmers, developers, and the head of the Cape Girardeau County Homebuilders Association. A proposed ordinance was developed and presented to the County Commission to regulate non-agricultural development within the county that includes a total area of one acre, or 5,000 square feet or more of total impervious surface area.

The City will consider a 5,000 square feet of impervious surface area limit during our review of existing ordinances. As was discussed at the county forums, a three inch rain on 5000 square feet amounts to 1,250 cubic feet, or over 9,000 gallons of water.

As the Stormwater Management Plan is developed and formalized by City Council approval, press releases will be written explaining the additional efforts that the City will be undertaking in the future to comply with the MS4 permit.

The City will continue to sponsor and host events to provide education to the engineering, development, municipal, and contractor communities as opportunities become available.

Additional efforts for public education will include scheduling presentations with civic groups to promote understanding of the need for stormwater pollution prevention by all businesses within the City of Jackson.

Public Involvement and Participation

The City sponsors a Park Days every year to clean up and beautify the City Park. Hubble Creek borders park property for approximately one mile. During Park Days, litter is picked up and removed from the creek and along its banks. The creek, with its beautiful rock ledges and arched footbridge, is a focal point of the City Park.

Hubble Creek's watershed ultimately receives nearly all of the runoff from the town. Additional efforts will be made to highlight the impact that the City has on this watershed as work on the Stormwater Management Plan continues. The City will promote the formation of a Stream Team to adopt Hubble Creek through the City Park as part of Park Days and other promotions.

The City currently sponsors biannual Cleanup/Fixup weeks when citizens can place unwanted appliances and large trash items for pickup at the curb free of charge. This prevents the items from sitting outside in back yards and being exposed to stormwater, or ending up deposited in a creek or ditch. The City will continue this practice twice per year.

The City will investigate instituting a Hazardous Waste Roundup once per year as a part of the Cleanup/Fixup days to allow citizens a chance to properly dispose of hazardous materials. This will require budgeting additional resources and finding a means of appropriate disposal. No time goal is set for this activity, as an unknown amount of resources, funds, and scoping will be required to coordinate this effort.

The City's maintenance department accepts used oil, antifreeze, and waste fuel from citizens. There are also several auto parts stores and repair shops around town that accept small quantities of used oil and antifreeze from citizens. One repair shop runs a special twice per year where they advertise that anyone can bring in any quantity of used oil. The City will include this information in its presentations and information campaigns.

Illicit Discharge Detection and Elimination

In the past year the city has worked with a local livestock feed producer in town to eliminate a major stormwater collection point from entering the sanitary sewer system.

As we worked to eliminate the stormwater from the sanitary sewer, we also educated the owner on how to prevent the stormwater from contacting contaminants on their property. As a result, the business has installed additional guttering and stormwater controls to route stormwater around their process areas and also instituted additional maintenance and cleaning routines to keep areas of their parking lot free of potential stormwater contaminants.

As part of an official Illicit Discharge Detection and Elimination program required by the MS4 permit, a brochure will be developed in the next year that can be distributed to local civic organizations, businesses and industries outlining stormwater pollution prevention practices that should be part of all business plans.

These brochures will also be presented at one of the monthly City departmental supervisor's meetings, as well as the City's monthly employee forum meetings to inform municipal employees of what to look for and what to report as they move around town during their normal duties. This goal should be accomplished within next year.

To better communicate and monitor where issues may occur within the City's stormwater utility system, an inventory will be performed to locate and catalogue stormwater inlets, outlets, and detention basins within the City of Jackson. This process has already begun by requiring electronic versions of as-built development improvements that can be utilized by the City's Geographical Information System (GIS) technician. This goal is not something to be taken lightly, and knowing that the City has been working on the drinking water, electrical, and sanitary sewer utilities for several years, a completion date is difficult to determine. It is estimated that with the new subdivisions being in the system, approximately 5 to 10 % of the system may be mapped. A goal of mapping an additional 15% per year will be established and will hopefully be accelerated as the sanitary sewer, electrical, and water systems are completed.

As noted earlier, the City will promote the recycling of waste oil, antifreeze, and other household hazardous wastes to help eliminate these contaminants from ending up in the storm sewer system.

Pollution Prevention / Good House Keeping for Municipal Operations

The City is currently doing many things to satisfy this requirement of the MS4 permit. Most City service vehicles such as garbage trucks, electrical system service vehicles, water system service vehicles, and wastewater system service vehicles including sludge hauling trucks, are stored inside.

The City's wastewater treatment facility has utilized a stormwater pumping facility to monitor stormwater collected within their facility since 1989. This outfall is listed in their NPDES permit as outfall 002. In the past year, the City's wastewater treatment plant constructed a new headworks building to cover the barscreen and screenings collection dumpster.

A new facility was constructed in 2005 to house all City sanitation trucks. Now all City sanitation trucks are stored, maintained, and cleaned inside.

A new facility was constructed in 2004 to house all of the City's electric line crew vehicles and associated equipment and materials.

The City has fueling facilities at two locations. Above-ground fuel tanks are located at the police/fire complex, and at the power plant. All fuel tanks are protected by catch basins constructed around them. Monitoring of the tanks occurs on a weekly basis. Fuel tanks and catch basins are inspected on a monthly schedule. A waste oil tank used by city maintenance includes a built-in secondary containment vessel. Hazardous materials are stored under roof where possible.

Specialized training and instruction are provided to employees that handle hazardous materials that are used out of doors such as pesticides and fertilizers. This training occurs annually and will be continued at regular safety meetings.

As noted above, City employees will be presented with material covering BMPs for industrial and commercial facilities to monitor activities around town during their normal activities. Many of these BMPs will also apply to municipal facilities.

All departmental supervisors will be asked to conduct inventories of materials and machinery exposed to stormwater runoff in their respective areas and all immediate risks will be addressed within the next six months. A follow-up survey will be conducted with the City Engineer within one year.

SUMMARY OF STORMWATER ACTIVITIES PLANNED FOR THE NEXT YEAR

Imhoff settling cones will be purchased within the next six months for testing settleable solids in stormwater runoff and inspectors will be trained in their use within the next year.

An inspection form to record stormwater site inspections will be developed during the next year.

As the Stormwater Management Plan is developed and formalized by City Council approval, press releases will be written explaining the additional efforts that the City will be undertaking in the future to comply with the MS4 permit.

The City will continue to sponsor and host events to provide education to the engineering, development, municipal, and contractor communities as opportunities become available.

Additional efforts for public education will include scheduling presentations with civic groups to promote understanding of the need for stormwater pollution prevention by all businesses within the City of Jackson. Press releases will be posted on the local public access channel, Cable TV Channel 5, and will also be posted on the City's website.

The City will consider a 5000 square feet of impervious surface area limit during our review of existing ordinances.

The City will promote the formation of a Stream Team to adopt Hubble Creek through the City Park as part of Park Days and other promotions.

The City will continue to sponsor Cleanup/Fixup week twice per year to allow citizens to place unwanted appliances and large trash items for pickup at the curb.

The City will investigate instituting a Hazardous Waste Roundup once per year as a part of the Cleanup/Fixup days to allow citizens a chance to properly dispose of hazardous materials.

The City's maintenance department, as well as several auto parts stores and repair shops around town accepts used oil, spent fuel, and antifreeze from citizens. One repair shop runs a special twice per year where they advertise that anyone can bring in any quantity of used oil. The City will include this information in its presentations and information campaigns.

A brochure will be developed in the next year that can be distributed to local civic organizations, businesses and industries outlining stormwater pollution prevention practices that should be part of all business plans. This information will also be posted on the local public access channel, Cable TV Channel 5, and on the City's website

Pollution prevention brochures will be presented at one of the monthly City departmental supervisor's meetings, as well as the City's monthly employee forum meetings to inform municipal employees of what to look for and what to report as they move around town during their normal duties. This goal should be accomplished within next year.

To better communicate and monitor where issues may occur within the City's stormwater utility system, an inventory will be performed to locate and catalogue stormwater inlets, outlets, and detention basins within the City of Jackson. This is a long term goal that will be scheduled as resources become available.

All departmental supervisors will be asked to conduct inventories of materials and machinery exposed to stormwater runoff in their respective areas and all immediate risks will be addressed within the next six months. A follow-up survey will be conducted with the City Engineer within one year.