

M3042030
DRAFT February 2010

STORMWATER MANAGEMENT PLAN

City of Moberly, Missouri

Moberly!

DRAFT

REVISION

February 2010



Morris & Munger Engineers LLC

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INTRODUCTION

Moberly, Missouri, hereinafter referred to as the City, is located approximately 30 miles north of the Highway 63 and Interstate 70 interchange. The City has a population of approximately 13,700 and covers approximately 11.78 square miles. The City is defined by the United States Census Bureau as a Missouri “regulated municipal separate storm sewer system (MS4)” and holds a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit. As a result of this, the City must also develop a Stormwater Management Plan (SWMP).

The SWMP summarizes the City’s intentions to reduce the amount of pollution in its stormwater runoff in the urbanized areas by addressing the six minimum control measures of concern listed in the NPDES permit. These minimum control measures are as follows:

1. Public Education and Outreach
2. Public Involvement and Participation
3. Construction Site Runoff Control
4. Illicit Discharge Detection and Elimination
5. Pollution Prevention/Good Housekeeping
6. Post-Construction Site Runoff Control

Minimum control measures one and two, Public Education and Outreach and Public Involvement and Participation, will not have separate sections within this plan. Rather, their implementation is incorporated in the discussion of the other four minimum control measures. The City has in the past, and will continue in the future to educate and involve the public on stormwater issues through the City’s website at <http://www.moberlymo.org>, newspaper articles, public hearings, and training.

This SWMP addresses the implementation of the minimum control measures as part of the overall stormwater management program which will include the following: the tasks required for each minimum control measure, a timeline for completion of these tasks, an estimated cost to complete these tasks, the method of enforcement, and the process of maintaining and sustaining the program. This will require the development of ordinances for enforcement and the development of documents to guide developers, engineers, and contractors in meeting these requirements.

Future SWMPs will address updates to the stormwater management program and the stormwater master plan will address specific stormwater issues with proposed capital improvements. This plan will focus on the development and implementation of a stormwater management program with the intent of establishing a strong foundation for the program to build upon in the future. The following sections will include the key items to develop and implement the stormwater program beginning with construction site runoff control.

CONSTRUCTION SITE RUNOFF CONTROL

Benefits of a Construction Site Stormwater Runoff Program

The first step in most construction projects is the removal of existing vegetation and topsoil. Once the topsoil is removed, the earth will be moved around to change the lay of the land, place building foundations, install below-ground utilities, and many other activities; moving earth is a very common and necessary construction activity. After these land disturbance activities occur, the soil at the construction site is vulnerable to being dislodged and transported by precipitation and stormwater runoff. Once this stormwater picks up sediment and carries it from the site, the stormwater is polluted. Other pollutants on the site that have come in contact with the sediment will also be transported by the stormwater. This polluted stormwater runoff from the construction site then flows into storm sewer systems, natural drainageways, and ultimately discharges into local rivers and streams. Sediment is typically the main pollutant of concern for water bodies today. Studies have shown that sediment runoff rates from construction sites are normally 10 to 20 times greater than those from agricultural lands, and 1,000 to 2,000 times greater than those from forest lands. During a short time period, construction sites can contribute more sediment to streams than would usually be deposited naturally over several decades. The resulting situation, combined with the contribution of other pollutants from construction sites, can cause physical, chemical, and biological harm to our nation's waters and the ecology of the water bodies.

In addition to sediment, other pollutants are often present in stormwater runoff from construction sites and may result in degradation of receiving waters. Nutrients (nitrogen and phosphorous) are of specific concern due to their ability to cause significant impairment of stormwater quality. In addition, solid and sanitary wastes, pesticides, oil and grease, concrete truck washout, construction chemicals, construction debris, and metals are carried by stormwater causing a significant negative impact on receiving waters.

Program Implementation

This section of the plan lays out the components of the land disturbance program that the City will implement. The land disturbance program's main audience will include developers, contractors, and engineers. The developers will be required to implement methods for controlling erosion on their sites in order to ensure that the sediment moved by erosion does not leave the site. This will require hiring an engineer(s) to develop a Stormwater Pollution Prevention Plan (SWPPP) for the site to ensure that the erosion and movement of sediment are minimized. The contractor for the earthmoving operations on the site will be required to install the best management practices (BMPs) shown in the SWPPP and maintain them until the site is stabilized with vegetation. The main targeted pollutant on the site is sediment, but items such as construction debris, construction chemicals, and concrete truck washout are included. The construction site runoff control portion of the City's Program will be implemented in three main parts: a land disturbance ordinance, a land disturbance manual, and a land disturbance field manual.

Land Disturbance Ordinance. The first part is the implementation of a land disturbance ordinance. The City will enact the ordinance. It will designate the authority to administer and enforce the land disturbance requirements within the City in accordance with the Missouri Clean Water Law through the NPDES permit. The ordinance will regulate land disturbance activities listed below.

Projects Requiring a Land Disturbance Permit (LDP)

- ◆ *Any project that disturbs 1.0 acre or more of land.*
 - ◆ *Installation of utility lines in excess of 1,000 linear feet.*
 - ◆ *Any clearing, grubbing, grading, or filling operations located within 100 feet of a drainageway.*
 - ◆ *Fill or excavation of 50 or more cubic yards of material, not related to building of a detached single family residential unit.*
 - ◆ *Any project that the City determines to have a potential impact to the health, safety, and welfare of people and/or the environment regardless of the size of the project.*
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Any sites that meet one or more of these criteria will be required to obtain an LDP before conducting any land disturbance activities. The ordinance will give general and overall requirements pertaining to the LDP process; however, most of the requirements and detailed information will be in the land disturbance manual.

Land Disturbance Manual. The second part is the development of a land disturbance manual. This manual's authority is in the land disturbance ordinance. In the future, as changes are needed, they can be made directly to the land disturbance manual instead of changing the original ordinance. This simplifies the process of updating the program and making changes if the ordinance and manual are not functioning properly or are not fulfilling their intent or purpose. The manual will describe the steps for the LDP process, as well as give additional requirements and guidance for the implementation of BMPs on the site.

The main requirement for obtaining an LDP, which will be discussed in the land disturbance manual, will be the submittal of a SWPPP. This plan should include drawings which are prepared, signed, and sealed by a professional engineer registered in the state of Missouri. Non-professional engineers may assist in the development of a SWPPP, but they must conduct their work under the supervision of the professional engineer. The SWPPP drawings should have BMPs for the initial, interim, and final phases of the project. Separate drawings will be submitted for each phase. This is to clarify that both the professional engineer and field personnel know what erosion and sediment controls are appropriate at the outset of construction, during site development, and at the end of construction. The SWPPP must be reviewed and approved by the City before an LDP is issued and land disturbance activities commence.

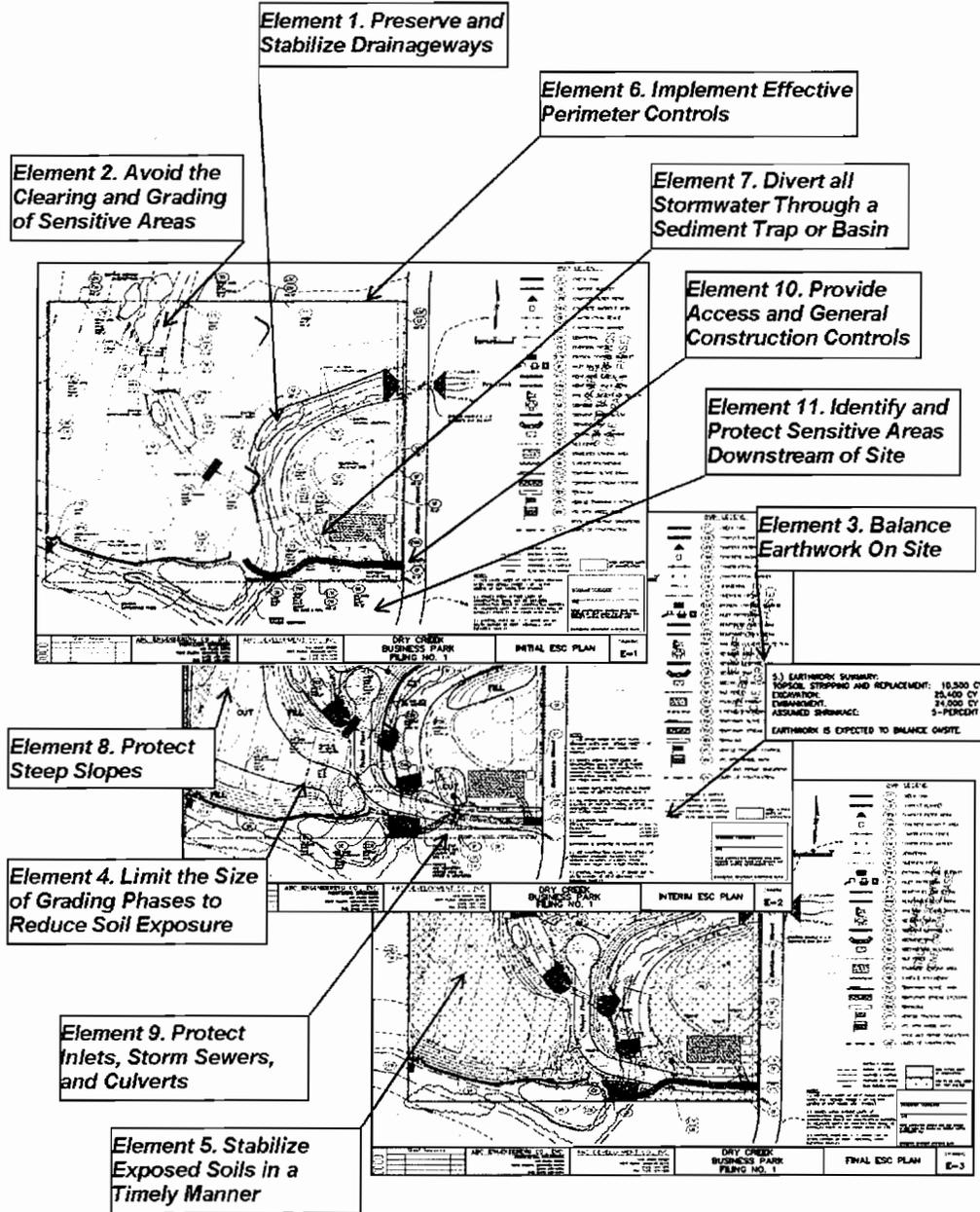
The land disturbance manual will give guidance on the elements of an effective SWPPP to control erosion and sediment. Listed below are eleven elements of SWPPP drawings that are important to follow to produce an effective SWPPP. These elements are also shown on typical SWPPP drawings that can be seen on the following page.

Eleven Elements of Effective SWPPP drawings:

1. *Preserve and Stabilize Drainageways.*
 2. *Avoid the Clearing and Grading of Sensitive Areas.*
 3. *Balance Earthwork on Site.*
 4. *Limit the Size of Grading Phases to Reduce Soil Exposure.*
 5. *Stabilize Exposed Soils in a Timely Manner.*
 6. *Implement Effective Perimeter Controls.*
 7. *Divert all Stormwater Leaving the Site through a Sediment Trap or Sediment Basins.*
 8. *Protect Steep Slopes.*
 9. *Protect Inlets, Storm Sewers, and Culverts.*
 10. *Provide Access and General Construction Controls.*
 11. *Identify and Protect Sensitive Areas Downstream of the Site.*
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The manual should also give guidance on the design, installation, and maintenance of BMPs. The design of BMPs must meet certain standards to effectively control erosion and sediment on sites in the City. These minimum standards should be set forth in the manual for use by engineers responsible for producing SWPPPs. Once a BMP is properly designed, it must then be correctly installed and maintained for it to be effective. Guidance on these processes should be included in the manual.

Prior to preparing the SWPPPs, the City will recommend that a presubmittal meeting with the City be scheduled. This meeting will discuss the various SWPPP requirements that must be met as well as other requirements discussed in the post-construction section of this plan. The meeting will clarify the LDP program, as well as facilitate an initial discussion regarding the general configuration of the controls that may be appropriate for the site. The owner and the professional engineer of the SWPPP should attend the presubmittal meeting.



Eleven Elements of Effective SWPPP Drawings

A preconstruction meeting is another element that will be addressed in the land disturbance manual. The preconstruction meeting should be conducted on-site. The initial BMPs shown on the initial SWPPP drawing should be installed prior to the meeting. No construction should begin prior to the preconstruction meeting other than the installation of the initial BMPs. These initial BMPs will be inspected and approved unless corrections are needed. Once the meeting is concluded and all requirements are met, the final LDP application can be signed and submitted to the City. Construction on the site may not begin until an executed LDP is obtained from the City.

On each site, there should be a designated person, known as the LDP Manager, who will perform quality control on all land disturbance activities. The LDP Manager's duties will include ensuring compliance of city and state land disturbance permits, being the contact person for the City, and performing site inspections. This LDP Manager will be required to inspect the site once every 7 calendar days, as well as no later than 48 hours after a rainfall event of one-half inch or more. During these inspections, the LDP Manager will check the overall effectiveness of the controls for reducing erosion and trapping sediment on the site, while also checking for proper installation and maintenance of the controls. Standard LDP Manager inspection forms will be found in the land disturbance field manual. If problems are found, they must be corrected within the specified amount of time stated in the land disturbance manual and field manual. Records of these inspections will be kept on-site, along with the SWPPPs, so that the City may examine them as necessary. The City may also make inspections of the erosion and sediment controls on the site as necessary for quality assurance. It is important to note that even though the City can perform inspections, it should be the responsibility of the LDP Manager, and not the City, to ensure that the site is in compliance.

LDP violations are categorized into three different levels dependent upon the severity of the violation.

- Level I Violations. Level I Violations are those that pose an immediate, serious risk to the health, safety, or welfare of people and/or the environment. A Level I Violation will result in an immediate issuance of a stop work order. If this occurs, the LDP is rescinded and violators must reapply for an LDP. Prior to receiving the permit, the violator must pay the permit fee again and receive a signed stop work order release. The stop work order release is signed by the City Inspector when the problems that were found are corrected and it is observed that no other work has been performed since the stop work order was issued.
- Level II and III Violations. Level II and III Violations pose less of an immediate risk, with Level III Violations being the least severe. Level II and III Violations may be raised to Level I or II violations if they are not resolved in the time required by the land disturbance manual and field manual. The City will have civil penalties and a method for appealing a violation within the ordinance. At anytime, the City may notify the Missouri Department of Natural Resources (MDNR) and the Environmental Protection Agency (EPA) of a violation of the Clean Water Act. If legal measures are required, then these agencies may assist the City in pursuing civil penalties. Violations of the Clean Water Act may be enforced by the EPA with penalties of up to \$32,500 per day per each violation. The EPA can also require the violator to agree to a consent decree to reduce the civil penalty amount. The consent decree will require the violator to perform additional requirements beyond those required by others that perform land disturbance activities. The consent decree requirements would apply to all future construction sites for that entity for a stipulated time period.

It will be required that all projects needing an LDP post fiscal security. The amount of fiscal security is based upon the probable cost of installing the erosion and sediment controls required on-site for all phases. Fiscal security is necessary to ensure the complete stabilization of the site. The acceptable form of fiscal security will include an irrevocable letter of credit from a local financial institution. Most institutions charge the applicant of the irrevocable letter of credit one percent of the fiscal security per year. If the applicant does not meet the requirements of the permit, the City can obtain monetary resources using the irrevocable letter of credit by contacting the financial institution. If a stop work order release is not signed by the City within 3 weeks of the issuance of the stop work order, the City will use the irrevocable letter of credit to obtain funds to stabilize the site. The City will require a fiscal security to be held for a minimum of 2 years. The City will consider other types of fiscal security, such as cashier's checks and surety bonds, if the applicant requests the use of another type of fiscal security, but for the majority of the permits issued the easiest method of fiscal security is an irrevocable letter of credit. If the construction of the project and/or the stabilization process takes longer than 2 years, the permittee will have to extend the fiscal security. In some cases, there may be lakes, ponds, detention areas, or other impoundment areas downstream from the site that may be impacted by the land disturbance. If the City deems it necessary, the permittee will be required to post fiscal security to ensure the protection of downstream sensitive areas. This should include the estimated cost of restoration of the downstream area if it is impacted in a negative way by land disturbance activities on the site. A good example is sediment deposits in a downstream lake due to upstream land disturbance activities. This should reduce the risk of City involvement in litigation dealing with downstream damages on a site that the City is regulating. It will also require the permittee to be accountable for any damages that are created by land disturbance activities on the site.

Once all work is completed, the site must be prepared for the initial close-out. This should involve activities such as cleaning all streets, sidewalks, inlets, and channels, as well as the installation and maintenance of all final BMPs. All areas should be seeded and mulched, or otherwise stabilized. Once the site is ready for the initial close-out, the City will inspect the site to determine if any corrections are needed. Once the City approves the site, initial close-out acceptance can be issued. After this has occurred, the permittee must inspect the site monthly to ensure that the BMPs are maintained and that vegetation is being established. Once the City agrees that the vegetation has reached the required coverage, the final BMPs can be removed in preparation of the final close-out inspection. Once final close-out acceptance is obtained, the permittee may submit a request form for the release of the fiscal securities. In the event that there has not been a default by the permittee, the fiscal security will then be released.

Land Disturbance Field Manual. The third part of construction site runoff control is a land disturbance field manual. As the name suggests, it contains information from the land disturbance manual needed for work in the field. The field manual contains guidance on the installation and maintenance of acceptable BMPs, as well as the field requirements set forth by the City. Much of this information is already included in the land disturbance manual; however, the field manual will not have all of the information on the LDP process or information for the professional engineer. It will strictly include information that will be useful in the field for

implementing and maintaining the LDP as well as inspection requirements for the LDP Manager.

The key to implementing a successful program requires educating the public on the need for the program, informing the contractors and developers of the requirements of the program, and then enforcing those requirements. Education of the requirements will be achieved through training for developers and contractors. The training will cover the City and MDNR land disturbance requirements and will include information on the following: construction site runoff, construction site maintenance, installation and maintenance of BMPs, the land disturbance ordinance, and permits.

In addition to the training that will be provided, information will also be made available to the public in other ways. The first way is in the form of newspaper articles. One article will cover importance and understanding for the need for erosion and sediment control on construction sites. Another article will also discuss the need for the control and the federal, state, and city requirements that must be met. In this article, there will also be an invitation to contractors and developers to attend the free training previously discussed. The second way information will be made available to the public is by including information about the land disturbance program on the City's website. In this way, the information will be readily available for anyone who seeks it. This information will be updated as needed in order to ensure that it remains current. The information on the website will include not only construction site runoff control, but the other minimum control measures as well.

Table 1: Measurable Goals for Construction Site Runoff Control

Implementation Task	Element Description	Implementation Schedule
<i>MODIFY</i> Complete Land Disturbance Ordinance	Enforcement mechanism.	May 1, 2010
Complete Land Disturbance Manual	Requirements and guidance for land disturbance activity requiring an LDP.	May 1, 2010
Land Disturbance Field Manual	Field requirements and guidance on the installation and maintenance of BMPs.	May 1, 2010
Newspaper Articles	Publish articles on the need for erosion and sediment control on construction sites, the federal/state/city requirements, and include an invitation to free training for contractors and developers.	Mar 1, 2010 July 1, 2010
Include Land Disturbance Information on Website	Information on the land disturbance program will be placed on the Moberly website and updated as necessary.	July 1, 2010
Land Disturbance Training for Contractors and Developers	Presentation/educational classes for contractors and developers to provide education on construction site runoff, construction site cleanliness, BMPs, the city ordinance, permits, and SWPPPs.	July 30, 2010
Enforce Ordinance, Require Permits, and Perform Land Disturbance Quality Assurance Inspections	The City will inspect and enforce the requirements on all sites that have applied and been accepted for an LDP.	Aug 1, 2010

ILLICIT DISCHARGE DETECTION AND ELIMINATION

Benefits of an Illicit Discharge Detection and Elimination Program

Illicit discharges can result in untreated discharges that contribute high levels of pollutants, including heavy metals, toxins, oil and grease, solvents, nutrients, viruses, and bacteria to receiving water bodies. Pollutant levels from these illicit discharges have been shown in EPA studies to be high enough to significantly degrade receiving water quality and threaten aquatic life, wildlife, and human health.

Program Implementation

Illicit discharges are defined as a measurable flow during dry weather containing pollutants and/or pathogens in or leaving a stormwater conveyance structure. A stormwater conveyance structure is defined as pipes, junction boxes, inlet boxes, and open channels used to transport stormwater. Measurable flow in or leaving a stormwater conveyance structure, but containing no pollutants and/or pathogens, is simply considered discharge. The goal of this plan is to remove discharge that is considered illicit. In order to have a successful program to remove illicit discharges, the City will perform the following:

1. Develop the Storm Sewer System Map by collecting information with Geographic Information System (GIS) and Global Positioning System (GPS) software and equipment.
2. Adopt or develop an Illicit Discharge Detection and Elimination Procedure Manual for all , but not limited to, the following:
 - a. Procedures for locating priority areas, including areas with higher probability of illicit connections or sampling to locate impacted reaches.
 - b. Procedures for tracing the source of an illicit discharge, including detection of the location of the source.
 - c. Procedures for removing the source of the illicit discharge.
3. Enforce the removal of illicit discharges through an illicit discharge ordinance.
4. Develop a program for storm drain stenciling through Boy Scouts®, Girl Scouts®, and other organizations.
5. Work with trash collection companies in the City to ensure homeowners can easily discard household hazardous waste products.
6. Educate public employees and the public about the harm of illicit discharges.
7. Develop a program to monitor and inspect public facilities and commercial/industrial properties for any type of illicit discharge and:
 - a. Document any specific complaints received.
 - b. Document inspections and/or findings from each commercial/industrial property.
 - c. Document number of illicit discharges detected.
 - d. Document number of illicit discharges eliminated.
8. Develop a program to locate and inspect all major outfalls, medium outfalls (30" or larger), small outfalls (30" or smaller), and priority areas and:

- a. Inspect/monitor sites on a regular basis (semiannually).
 - b. Document number of illicit discharges detected.
 - c. Document number of illicit discharges eliminated.
 - d. Document number of dye or smoke tests conducted.
9. Develop a spill response plan for the City in cooperation with the MDNR to:
- a. Document any spills that have entered the stormwater conveyance system.
 - b. Identify BMPs that can be used to ensure that spills do not enter the stormwater conveyance system.

An ordinance regulating illicit discharges will be developed for the City. The purpose of the ordinance will be to regulate the contribution of pollutants to the separate storm sewer system by any person; prohibit illicit connections and discharges to the storm sewer system; prevent non-stormwater discharges generated as a result of spills, inappropriate dumping, or disposal from entering the storm sewer system; and establish legal authority to carry out all inspection, surveillance, and monitoring procedures necessary to ensure compliance. The ordinance will require that the City be notified within 24 hours when a person discovers a release of pollutants or non-stormwater discharges that may result in an illicit discharge. Once the problem is corrected, care should be taken to prevent a recurrence of the discharge or spill. The ordinance will also give the City the authority to enter and inspect facilities in order to determine compliance.

Table 2: Measurable Goals for Illicit Discharge Detection and Elimination

Implementation Task	Element Description	Implementation Schedule
Complete ^{modify} Illicit Discharge Ordinance	Enforcement mechanism.	May 1, 2011
Adopt or Develop an Illicit Discharge Detection and Elimination Procedure Manual	Requirements and guidance document.	May 1, 2011
Newspaper Article	Publish article on the need for illicit discharge detection and elimination and federal/state/city requirements.	July 1, 2011
Enforce Illicit Discharge Ordinance	Enforcement mechanism.	Aug 1, 2011
Storm Sewer Map	Storm sewer system map will be up-to-date.	May 1, 2011
Field Data Inspections	Perform inspections of stormwater discharge points, all open channels, and creeks within the City to identify illicit discharges during dry weather conditions.	10% by Sept 1, 2011 25% by Sept 1, 2012 50% by June 1, 2013
Inspections for Public, Commercial, and Industrial Facilities	Perform inspections of industrial and commercial properties to identify any illicit discharges.	10% by Dec 1, 2011 25% by Dec 1, 2012 50% by June 1, 2013

POLLUTION PREVENTION / GOOD HOUSEKEEPING

Benefits of a Pollution Prevention/Good Housekeeping Program

The Pollution Prevention/Good Housekeeping Program is a key element of the SWMP. This measure requires the examination and subsequently altered actions to help ensure a reduction in the amount and type of pollution that: (1) collects on streets, parking lots, open spaces, and storage and vehicle maintenance areas, all of which is discharged into local waterways; and (2) results from actions such as street maintenance, environmentally damaging municipal land development and flood management practices, or poor maintenance of storm sewer systems. While this measure is meant primarily to improve or protect receiving water quality by altering municipal activities, facility operations, and property management, the City can also realize cost savings from such things as spill prevention (thus reducing clean-up costs), inventory control, and reuse/recycling of materials.

Program Implementation

During the 5-year tenure of the SWMP, the City will bring awareness of stormwater quality and its importance to most citizens of the City. Some of these citizens may resist or not see the need for the requirements implemented to ensure the City meets federal and state regulations. Due to this expected resistance, the City needs to be the strongest advocate and make sure it is meeting the same requirements.

The City will develop and implement an operation and maintenance program. The main intent of the program is the prevention of pollutant runoff from municipal operations. In order to achieve this, the City will check all facilities for possible illicit discharges. For example, some of the floor drains may be connected to a storm sewer, and if a person pours something down one of these drains that is considered a pollutant, it then becomes an illicit discharge. The operation and maintenance program will follow guidance in the City's operation and maintenance manual. This manual will consider the following topics:

1. Locations of all City infrastructures.
2. Description of the facilities and activities they perform.
3. Identification of all activities that may cause pollutant runoff.
4. Determination of BMPs that could mitigate the risk of pollutant runoff. This will include spill prevention and control facilities for materials such as paint, solvents, petroleum products, chemicals, toxic or hazardous substances, and substances regulated under the Resource Conservation and Recovery Act (RCRA) or the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Develop requirements to ensure conformance with federal and state regulations concerning dispensing and storage at all on-site fueling facilities.
5. Required annual training by the City on BMPs for each facility.
6. Inspection requirements.
7. Rewards and enforcement methods.

The City will also consider implementing additional environmentally enhancing practices in the manual that are not required for each City facility, for example:

1. Materials/supplies acquisition, storage, and usage, including:
 - a. Material description
 - b. Maximum quantity kept on-hand
 - c. Allowable storage times
 - d. Storage location
2. Waste generation, storage, disposal, and recycling with the following information:
 - a. Waste description
 - b. Maximum storage capacity
 - c. Storage location
 - d. Method of disposal
 - e. Pickup times, contractor name
 - f. Frequency

In order to work with the public to resolve some of these issues, the City will support volunteer groups in their efforts to clean up local streams. It will also conduct a waste tire disposal day through cooperative agreements with other entities in which citizens will have the opportunity to drop off waste tires for a small fee. This will take place once a year, and will help minimize the number of tires that are discarded in landfills and streams. The City will also install storm drain markers on all new drop inlets as well as implement a plan to install storm drain markers on existing drop inlets.

Table 3: Measurable Goals for Pollution Prevention/Good Housekeeping

<i>Implementation Task</i>	<i>Element Description</i>	<i>Implementation Schedule</i>
Complete and Implement O&M Manual for Municipal Operations	Guidance for pollution prevention/good housekeeping.	<i>Jan 1, 2012</i>
Training for City Employees	City operation and maintenance manual.	<i>Mar 1, 2012</i>
Inspections	The City will perform inspections based upon the requirements in the City operation and maintenance manual.	<i>Aug 1, 2012</i>

POST-CONSTRUCTION SITE RUNOFF CONTROL

Benefits of a Post-Construction Stormwater Program

Post-construction stormwater management in areas undergoing new development or redevelopment is necessary because runoff from these areas has been shown to significantly affect receiving water bodies. Many studies indicate that prior planning and design for the control of pollutants, peak discharge, and volume in post-construction stormwater discharges is the most cost-effective approach to stormwater quality management.

There are generally two forms of substantial impacts from post-construction runoff. The first is caused by an increase in the type and quantity of pollutants in stormwater runoff. As runoff occurs over areas altered by development, it picks up harmful sediment and chemicals such as oil and grease, pesticides, heavy metals, and nutrients (e.g., nitrogen and phosphorus). These pollutants often become suspended in runoff and are carried to receiving waters, such as lakes, ponds, and streams. Once deposited, these pollutants can enter the food chain through small aquatic life, eventually entering the tissues of fish and humans. The second kind of post-construction runoff impact occurs by increasing the quantity of water delivered to the water body during storms. Increased impervious surfaces interrupt the natural cycle of gradual percolation of water through vegetation and soil. Instead, water is collected from surfaces such as asphalt and concrete and routed to drainage systems where large volumes of runoff quickly flow to the nearest receiving body of water. The effects of this process include stream bank scouring erosion and downstream flooding, which often lead to a loss of aquatic life and damage to property.

Program Implementation

The goal of this minimum control measure is to improve stormwater quality and to reduce the stormwater rate of discharge and volume by using structural and non-structural best management practices for proposed and existing commercial, industrial, and residential developments. The stormwater management portion of this plan will be implemented in three main parts similar to that of the construction site runoff control: stormwater ordinances, a stormwater manual, and stormwater field manual.

Stormwater Ordinances. The first part is the implementation of the post-construction site runoff control of the stormwater ordinances, which are shown on the next page.

Stormwater Ordinances

1. *Stormwater Conveyance Systems*
 2. *Quantity and Quality of Stormwater*
 3. *Stream Buffer*
 4. *Floodplain*
-

The first two ordinances, stormwater conveyance and quantity and quality of stormwater, apply to new development and redevelopment that contain one-half (1/2) acre or greater of impervious area. All developments that meet this criterion will be required to obtain a stormwater permit from the City prior to any development. The stormwater conveyance ordinance will regulate the design and maintenance of conveyance systems. The second ordinance will be a stormwater quantity and quality ordinance. Similar to the stormwater conveyance ordinance, it will regulate the quality and quantity of stormwater. The third ordinance will be a stream buffer ordinance. It will regulate what activities can be done in and around large existing drainageways. Some activities will not be allowed within the stream buffer and others will require a stream buffer permit. Beyond the stream buffer, the floodway and floodplain will be regulated through the fourth and final stormwater ordinance. These four ordinances will give the City authority to administer and enforce the stormwater requirements. The ordinances will also state what the ordinances apply toward, the intent of ordinances, and enforcement. The ordinances will reference the stormwater manual, which will give more specific requirements and guidance.

Stormwater Manual. The second part of the post-construction site runoff control is the development of a stormwater manual. This manual will give guidance, requirements, and processes for applying for a stormwater permit, design guidance of stormwater infrastructure for conveyance, volume reduction, peak flow reduction, and treatment. The manual will also include processes and guidance for applying for a stream buffer permit or activities in the floodplain.

One of the major requirements to obtain a stormwater permit is the development of a Stormwater Management Concept Plan (SWMCP), which is explained in the stormwater manual. This plan must be sealed by a professional engineer licensed in the state of Missouri. The SWMCP is the very first item that should be submitted to the City before applying for a building permit for a site that requires a stormwater permit, developing a SWPPP, or applying for a stormwater permit. It should lay out the basic plan and procedure for controlling stormwater on the site. It is the initial phase of planning and will require interaction between the City and the professional engineer in order to develop a concept that will reduce the discharge of stormwater and potential pollutants from the site to the maximum extent practicable (MEP). The SWMCP must include restricting post-developed stormwater flow rates to pre-developed flow rates and reducing the volume of stormwater leaving the site. The professional engineer should present multiple options of managing the stormwater; for example, extended detention, reduction of impervious areas, filtering methods, and infiltration on the site. The multiple options should include construction and maintenance cost estimates.

It is essential that the development and approval of the SWMCP be the first step in the process. Having an approved SWMCP will help to ensure a proper and acceptable plan for the later steps of development.

After the City approves the specific concept displayed in the SWMCP, the professional engineer will then be required to develop and submit the Stormwater Management Design Plan (SWMDP). The items of the SWMDP are shown below.

Stormwater Management Design Plan (SWMDP)

- ◆ *Construction Plans, Specifications, Final Design Calculations*
 - ◆ *Critical Requirements Inspection Sheets for all Permanent BMPs*
 - ◆ *Annual Inspection Forms for all Permanent BMPs*
 - ◆ *Maintenance Agreement*
 - ◆ *Fiscal Security*
 - ◆ *Maintenance Plan*
-

This final design must follow the approved concept design from the SWMCP. The construction plans, including calculations performed by the professional engineer and specifications, must be sealed by a professional engineer licensed in the state of Missouri.

The professional engineer will develop a critical requirements inspection check list to be used during construction as well as an annual inspection form for the permanent stormwater BMPs on-site. The City inspector will follow the critical requirements inspection check list during construction and also conduct annual inspections using the inspection forms.

The maintenance agreement will be a legally recorded document which will act as a property deed restriction. The maintenance agreement should include a maintenance plan to ensure that all stormwater systems are properly maintained.

Before a stormwater permit is issued, the applicant must provide fiscal security and a maintenance agreement, which is explained in detail in the stormwater manual. The fiscal security is to ensure that action can be taken by the City, at the applicant's expense, should the applicant not meet the requirements of the stormwater permit, which includes all stormwater infrastructure on-site being completed and in good working order. The fiscal security can come in the form of an irrevocable letter of credit or surety bond. The irrevocable letter of credit can be obtained at most local financial institutions. This form of security requires the permittee to pay one percent of the cost of the fiscal security per year and have collateral for the entire amount of the security. Projects with large capital cost in stormwater facilities may choose to provide a surety bond instead of the irrevocable letter of credit. The surety bond is typically two to three percent of the fiscal security per year, but does not require collateral. Surety bonds generally require more paperwork and more stringent requirements than the irrevocable letter of credit.

When construction is complete and critical requirements on the inspection check list are signed by the City inspector, the owner can apply for an operating permit. In order to maintain an operating permit for the site, the owner must follow the maintenance plan developed by the professional engineer in the SWMDP and pass all annual inspections by the City. In the future, if a stormwater utility is to be adopted by the City, reference the funding section of this plan, any impervious area connected to a BMP with an operating permit would pay an operating permit rate (OPR) instead of the impervious area rate (IR). If the BMP is not being maintained or not working properly, the OPR would revert back to the impervious area rate until the operating permit is renewed.

The operating permit will have an annual fee. The stormwater permit and stream buffer permit fee is a one-time fee as long as it is not revoked, requiring the applicant to reapply for a permit.

The City will archive and track annual inspection data using a database and GIS software. This inspection program will allow the City to collect data on performance and maintenance requirements of specific types of BMPs. This data can be used to update the guidance section of the stormwater manual and the development of maintenance requirements to be included in the operating permits.

Stormwater Field Manual. The final part of post-construction site runoff control is the development of a stormwater field manual. This field manual will set the requirements that the contractor must follow during construction to ensure he/she stays in compliance with the stormwater permit. Some of the requirements are as follows: notifying the City before commencement of any construction activity and notifying the City prior to construction of critical components of stormwater facilities, what is considered a violation.

In the event that the City discovers problems on the site, a violation will be issued. The remedial measures in the violation must be completed by the date set forth in the violation. If they are not completed by the set time, actions including a stop work order and suspension, revocation, or modification of the permit may be taken.

Training will be provided to professional engineers. The training will focus the use of the stormwater manual. In addition to the training that will be provided, information will also be presented in the form of newspaper articles. The articles will also include an invitation to the free training that will be provided for professional engineers. In the future, if a stormwater utility is to be adopted by the City, reference the funding section of this plan, credit would be available to homeowners to reduce their stormwater utility rate for using BMPs. If a stormwater utility is implemented in the future, guidance manuals for homeowners and training will be developed.

Table 4: Measurable Goals for Post Construction Site Runoff Control

Implementation Task	Element Description	Implementation Schedule
Complete Stormwater Conveyance Ordinance	Enforcement mechanism.	Jan 1, 2011
Complete Stormwater Quality & Quantity Ordinance	Enforcement mechanism.	Jan 1, 2011
Complete Stream Buffer Ordinance	Enforcement mechanism.	Jan 1, 2011
Complete Stormwater Manual	Requirements and guidance for developments with an impervious area equal to or greater than one-half (1/2) acre.	Jan 1, 2011
Stormwater Field Manual	Field requirements and guidance.	Jan 1, 2011
Newspaper Article	Publish article on the need for post construction control, federal/state/city requirements, and include an invitation to free training for engineers.	May 1, 2011
Training for Engineers	Presentation/educational classes for engineers focused on education about post-BMPs and the City's requirements.	May 30, 2011
Enforce Ordinance, Require Permits, Post Construction Inspections	The City will inspect and enforce the post construction requirements on all sites.	June 1, 2011
Permit/Site Plan Tracking System	The City will use GPS and GIS to track all construction permits, operating permits, and inspections.	June 1, 2011

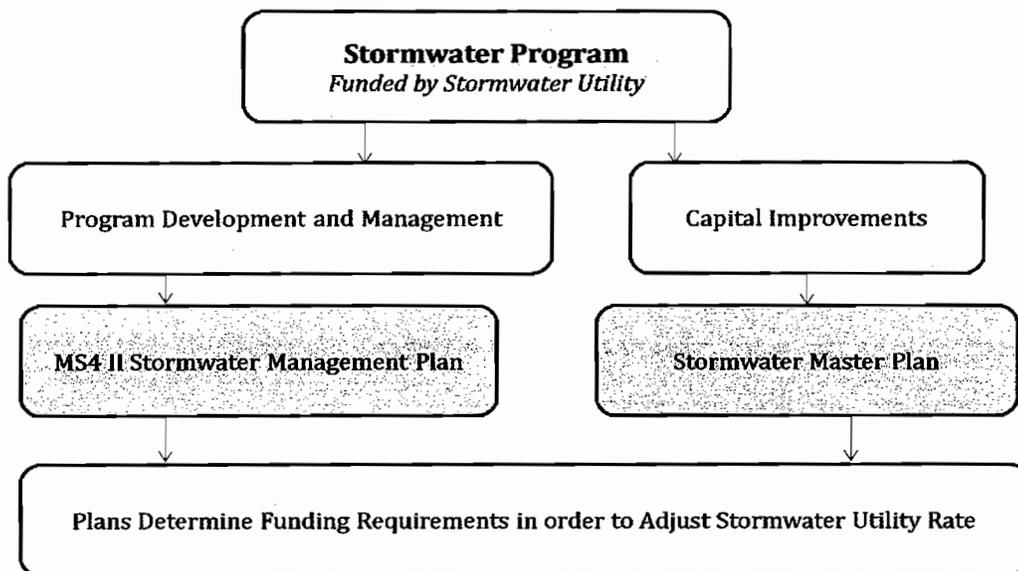
STORMWATER UTILITY

Funding a Stormwater Program

Stormwater Management is a state and federally mandated program that requires the City to regulate stormwater runoff. This mandate does not include state or federal government funding for this program. The City needs funding to fully implement the MS4 Phase II requirements addressed in this Stormwater Management Plan, and to construct, repair, and maintain stormwater infrastructure capital improvements that include, but not limited to, stormwater conveyance, and/or improve water quantity and quality addressed in the Stormwater Master Plan. A fair and sustainable method of funding for this Stormwater Program is to develop a stormwater utility for this City service. This fee would be applied to the owners and developers of property that contain impervious areas such as buildings, paved areas, or any other impermeable surfaces. The fee would apply to property within the City, including both residential and non-residential owners, commercial and industrial property, churches, and state and federal government-owned property. The following parcels are exempt from stormwater utility:

1. Public street right-of-way.
2. Undeveloped parcels.
3. Public-owned parklands, natural areas, and recreational fields.
4. All City-owned property.
5. All water bodies.

On a 5-year cycle, the City will develop and update the Stormwater Management Plan to address program development and management, and the Stormwater Master Plan to address required capital improvements, which will be used to determine the utility rate required over the next 5-year period.



The stormwater utility fee will be based upon an equivalent residential unit (ERU). One ERU is equal to the average square footage of the impervious area of a single household, duplex, or triplex parcel located within the city limits. Typical impervious areas include rooftops, driveways, and parking areas. The square feet of the impervious area of a property would be converted into ERUs. Preliminary planning estimates a total of 10,000 ERUs in the City. This estimate consists of 5,000 single household, duplex, and triplex parcels; and 5,000 ERUs from fourplexes and larger dwelling units, commercial, and industrial parcels.

The number of ERUs is multiplied by the impervious area rate (IR) to determine the monthly service charge for each user. The IR is the monthly charge per ERU.

To meet the intent of the stormwater program impervious areas that are connected to on-site best management practices (BMPs) with an operating permit (ERU_{BMP}) can receive a reduction in the monthly service charge. To obtain an operating permit requires that the BMP be approved by the City and is operational. Then the operating permit rate (OPR) is used instead of the IR. The OPR is a percentage of the IR. The City may choose to have a different OPR depending upon whether the parcel is considered dwelling units or commercial/industrial. The type of BMP used may also affect the OPR. The OPR rate for dwelling units depends on BMPs used to reduce the amount of stormwater and improve the water quality. The OPR for commercial/industrial can also include the use of good housekeeping practices that reduce pollution. The total monthly service charge is summarized in the equation below:

$$\text{Monthly service charge} = [(IR) \times (ERU)]_{\text{without BMPs}} + [(OPR) \times (ERU_{BMP})]_{\text{with BMPs}}$$

Two stormwater credits handbooks will be developed: Residential Stormwater Credit Handbook for single household, duplex, and triplex dwelling units and Commercial Stormwater Credit Handbook for fourplex and larger dwelling units, commercial, and industrial parcels.

Residential Stormwater Credit Handbook. The handbook will be used by homeowners and residential contractors. It will present BMPs with guidance in planning and installation. The BMPs presented in the handbook will include: rain gardens, rain barrels, and other methods of stormwater peak flow reduction, volume reduction, and treatment. Operating permit rate (OPR) percent reduction to the impervious area rate (IR) will be included so the user will know what reductions in stormwater utility rate will be achieved by installing BMPs included in the handbook. The reductions given will depend on the type of BMP installed. Some BMPs do a better job than others. The handbook will present the process of determining the design of the chosen BMP, and submitting the design to the City for approval. After approval by the city, the homeowner or a residential contractor will install the BMP and obtain an operating permit for the BMP, and the impervious area connected to the BMP will be determined in ERU_{BMP} units. After the operating permit is issued, the City will perform annual inspections of the BMP to ensure it is in proper working order.

Commercial Stormwater Credit Handbook. This handbook includes OPR percent reduction to the impervious area rate (IR) for BMPs included in the stormwater manual. In order to receive the included reduction, the owner of the property must obtain a stormwater permit. The requirements of a stormwater permit is the same process that is required for new development and redevelopment that contains one-half (1/2) acre or greater of impervious area; this is regardless of the amount of pervious area on the site or area connected to the proposed BMP. The requirements of the stormwater permit are included in the most current version of the stormwater manual.

Stormwater utility based on impervious area with credits for connected BMPs billings are based on how much each user contributes by allowing the user to reduce their cost by implementing BMPs to reduce their impacts on the stormwater runoff. This encourages users within the City to help control, reduce stormwater discharge, and improve stormwater quality within the City.

In order to implement this stormwater utility, the City needs to complete the following tasks:

1. Determine impervious area on each parcel of land that includes single household, duplex, and triplex dwelling units.
2. Calculate the average impervious area of all parcels in step 1. This average impervious area, to the whole number using general rounding rules, will be the impervious area of one ERU.
3. Determine impervious area of all fourplex and larger dwelling units, commercial, and industrial parcels.
4. Sum all ERUs (Estimated as 10,000 above for preliminary estimate).
5. For the next 5-year period (cycle), determine the required funding from the Stormwater Program.
6. Divide this funding requirement for the next 5 years to an annual amount in order to meet the yearly funding requirement for the Stormwater Program.
7. Divide the yearly funding requirement by 12 to find the monthly funding requirement for the Stormwater Program.
8. Divide the monthly funding requirement for the Stormwater Program by the total number of ERUs. This equals the impervious area rate (IR) per ERU.
9. Develop a Stormwater Utility Ordinance.
10. Educate the public on the Stormwater Program as to why it is needed and how it will be funded. Present what the average cost per household per month will be, which is the

impervious area rate (IR). The cost per month will be included on the user's utility bill. Anyone interested in their exact cost per month prior to it being included on the utility bill can find out by going to the City Utility Office during normal operating hours. Present to the public that credits will be given for BMPs in the future after the program is fully developed.

11. City Council adopts the Stormwater Utility Ordinance.
12. Include the stormwater utility charge (monthly service charge) on existing monthly utility bill.

Table 5: Measurable Goals for Stormwater Utility Development

Implementation Task	Element Description	Implementation Schedule
Determine the number of Equivalent Residential Units (ERUs)	Funding mechanism.	April 1, 2010
Determine the required funding for the Stormwater Program over the next five year period (cycle)	Funding mechanism.	April 1, 2010
Determine the impervious area rate (IR) over the next five year period (cycle)	Funding mechanism.	April 1, 2010
Newspaper Articles	Educate the public on why a stormwater program is needed and how it will be funded	April 5, 2010
Public Hearing	Educate the public on why a stormwater program is needed and how it will be funded, stormwater project it will fund, and the IR per an ERU.	April 10, 2010
Enforce Ordinance, bill stormwater utility monthly	The City will inspect and enforce the post construction requirements on all sites.	May 1, 2010
Complete Residential Stormwater Credit Handbook	Requirements and guidance for reducing stormwater utility bill by installing BMPs	Oct 1, 2011
Complete Commercial Stormwater Credit Handbook	Requirements and guidance for reducing stormwater utility bill by installing BMPs	Oct 1, 2011

The City of Moberly is a regulated municipal separate storm sewer system (MS4) Phase II and is required to hold a National Pollutant Discharge Elimination System (NPDES) Stormwater Permit. The permit requires the City to develop a Stormwater Management Plan for each 5-year period (cycle) of the permit. The City is currently in the second cycle period which started in June 13, 2008 to June 13, 2013. The permit states that the City shall have a fully implemented program within the first cycle period. The current stormwater program does not address MS4 requirements that are included in this plan and may not be considered fully implemented if the City were audited by the Missouri Department of Natural Resource (MDNR) or Environmental Protection Agency (EPA). Morris & Munger Engineers LLC recommends that the City fully implement the MS4 requirement by June 13, 2013 to ensure the City is not within a violation of the permit. Table 6 through 8 estimates the cost to fully implement MS4 requirements.

Table 6: Funding Requirement for MS4 Implementation (2010)

Implementation Task	Who is Performing Work	Cost
Determine the number of Equivalent Residential Units (ERUs)	City Staff	-
Determine the required funding for the Stormwater Program over the next 5-year period (cycle)	City Staff	-
Determine the impervious area rate (IR) over the next 5-year period (cycle)	City Staff	-
Complete the Stormwater Utility Ordinance	Consultant	\$2,500
Newspaper Articles to educate the public on why a stormwater program is needed and how it will be funded	Consultant	\$500
Public hearing to educate the public on why a stormwater program is needed and how it will be funded, stormwater projects it will fund, and the IR per an ERU.	Consultant/City Staff	\$2,500
Complete Land Disturbance Ordinance and Land Disturbance Manual	Consultant	\$40,000
Complete Land Disturbance Field Manual	Consultant	\$12,500
Newspaper Articles for Land Disturbance	Consultant	\$500
Include Land Disturbance Information on Website	City Staff	-
Land Disturbance Training for Contractors and Developers	Consultant	\$5,000
Complete Stormwater Conveyance Ordinance	Consultant	\$2,500
Complete Stormwater Quality & Quantity Ordinance	Consultant	\$2,500
Complete Stream Buffer Ordinance	Consultant	\$2,500
Complete Stormwater Manual	Consultant	\$65,000
Complete Stormwater Field Manual	Consultant	\$20,000
Annual Report	Consultant	\$2,000
Total		\$158,000

EPA?

Table 7: Funding Requirement for MS4 Implementation (2011)

Implementation Task	Who is Performing Work	Cost
Complete Illicit Discharge Detection and Elimination Procedure Manual	Consultant	\$30,000
Newspaper Article for Stormwater Permit Requirements	Consultant	\$500
Training for Engineers on Stormwater Permit Requirements	Consultant	\$7,500
Sewer Map	City Staff	-
Permit/Site Plan Tracking System	City Staff	-
Newspaper Article for Illicit Discharge	Consultant	\$500
Complete Illicit Discharge Ordinance	Consultant	\$2,500
Complete Residential Stormwater Credit Handbook	Consultant	\$25,000
Complete Commercial Stormwater Credit Handbook	Consultant	\$7,500
Illicit Discharge Inspections	City Staff	-
Annual Report	Consultant	\$2,000
Total		\$75,500

Table 8: Funding Requirement for MS4 Implementation (2012)

Implementation Task	Who is Performing Work	Cost
O&M Manual for Municipal Operations	Consultant	\$30,000
Training for City Employees	Consultant	\$7,500
Inspection of Municipal Operations	City Staff	-
Annual Report	Consultant	\$2,000
Total		\$39,500

As stated, it is recommended that the City fully implement the MS4 Phase II requirement by June 13, 2013. The total cost for implementation of the MS4 requirement is estimated to be \$275,500. Assuming the City holds the cost of the Stormwater Program Management and Maintenance cost to \$200,000 per year, which includes: City employees' time, equipment, and repair of storm sewers. Next, including the capital improvement cost of the 12 problem areas detailed in the Stormwater Master Plan the total estimated cost of the stormwater program is shown in the Table 9 below.

Table 9: Estimated Resources Required to Fund Stormwater Program

MS4 Phase II Stormwater Program Development	\$275,500
Stormwater Program Management & Maintenance	\$200,000/annually
Capital Improvements from Stormwater Master Plan	\$4,122,000

Assuming the 10,000 ERUs are within the City as the preliminary estimate states, Table 10 below shows the required cost per ERU to fund the program.

Table 10: Estimated Impervious Area Rate (IR) Required to Fund Stormwater Program

Complete by June 2013 (38 months)	\$13.23 / ERU / Month
Complete in 5 years (60 months)	\$9.00 / ERU / Month
Complete in 10 years (120 months)	\$5.33 / ERU / Month

Table 10 assumes all ERUs will be at the impervious area rate (IR), but some ERUs will be at the operating permit rate (OPR) which will be a percentage of impervious area rate (IR). If an appreciable amount of users take advantage of this credit by installing and maintaining BMPs, the City will need to adjust the impervious area rate (IR) to offset this and ensure the required funds are generated. In the long term, the incentives of using BMPs should reduce the stormwater problems that the City will be required to solve and in turn reduce the utility rate. This will also put the higher cost on the users causing the largest stormwater impacts.