City of Griffin
Stormwater Master Plan

Prepared for:

City of Griffin

Public Works Department
Stormwater Division

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Customer Service Manual (1998)

Stormwater Utility Action Plan (1997)

Policy Papers (1997)

Level of Service Model (2003)

MS4 Notice of Intent (2009)

MS4 Operations & Maintenance Standard Operating Procedure (2011)

Stormwater Ordinance (Chapter 94 Utilities, Article IV)

Establishing a Stormwater Utility Ordinance (97-1)

Stormwater Utility Service Charge Ordinance (97-8)

Stormwater Utility Amendment Ordinance (99-)

Erosion & Sediment Control Ordinance (Chapter 42 Environment, Article III)

Illicit Discharge Ordinance (Chapter 42 Environment, Article IV)

Floods Ordinance (Chapter 50)

Stormwater Design Manual (2007)

Shoal Creek Monitoring Plan (2009)

Cabin Creek Monitoring Plan (2009)

Shoal Creek Watershed Assessment (2010)

Cabin Creek Watershed Assessment (2010)

Potato Creek Protection Plan (2010)

Cabin Creek Protection Plan (2011)

Shoal Creek Protection Plan (2011)

Stormwater Utility Rate Structure Analysis (1997)

Stormwater Utility Service Charge Credit Technical Manual (2011)

Watershed Hydrology and Water Quality Modeling Report (2010)

Section 319 (h) Nonpoint Source Pollution Control Program Watershed Project Final Report- City of Griffin North Griffin Drainage Basin (2003)

Final Report for TEA-21 Urban BMP Project (2004)

Bacterial Source Tracking (BST) in the Potato Creek Watershed (2004)

City Floodplain Map

1 Introduction

In 1997, the City of Griffin, Georgia (City) established a formal Stormwater Management Program and created the Stormwater Division. To fund this new separate division, a Stormwater Utility was implemented, the first in the State of Georgia.

The City Stormwater Utility's mission is to provide a comprehensive program for watershed management which includes: seeking out alternative funding mechanisms to enhance Griffin's stormwater management system; establishing programs to address infrastructure problems; cost effective design and construction of the necessary improvements; providing leadership through the implementation of Best Management Practices (BMPs) that will enhance water quality throughout the region; and improving the overall quality of life for our citizens.

A Stormwater Master Plan was prepared for the City in 2003 (Integrated Science and Engineering 2003) to present the Stormwater Division's organizational structure and function as it relates to the Stormwater Utility. The Stormwater Division and the Utility have been in place for over 12 years now, and much has been accomplished. The Division has proven itself to be a valuable and effective entity in stormwater management, as well as an asset to community, and the Utility has continued to provide a reliable source of funding for stormwater management activities. This 2011 Stormwater Master Plan presents the current direction of the Stormwater Division in light of the programs that are currently in place, the City's National Pollutant Discharge Elimination System (NPDES) Municipal Separate Storm Sewer System (MS4) permit commitments, and the Watershed Management Plans that have recently been completed for the Shoal Creek, Cabin Creek, and Potato Creek Watersheds.

The City lies on the divide between the Atlantic Ocean and Gulf of Mexico drainage areas. Drainage for the City's MS4 is discharged to six watersheds that are part of the Flint and Ocmulgee River basins. Cabin Creek located in the north and northeastern sections of the City drains to the Ocmulgee River before entering the Atlantic Ocean. The rest of the City drains to Heads, Shoal, Wasp, Honey Bee or Potato Creek, which are part of the Flint River Watershed and drain to the Gulf of Mexico (Figure 1-1).

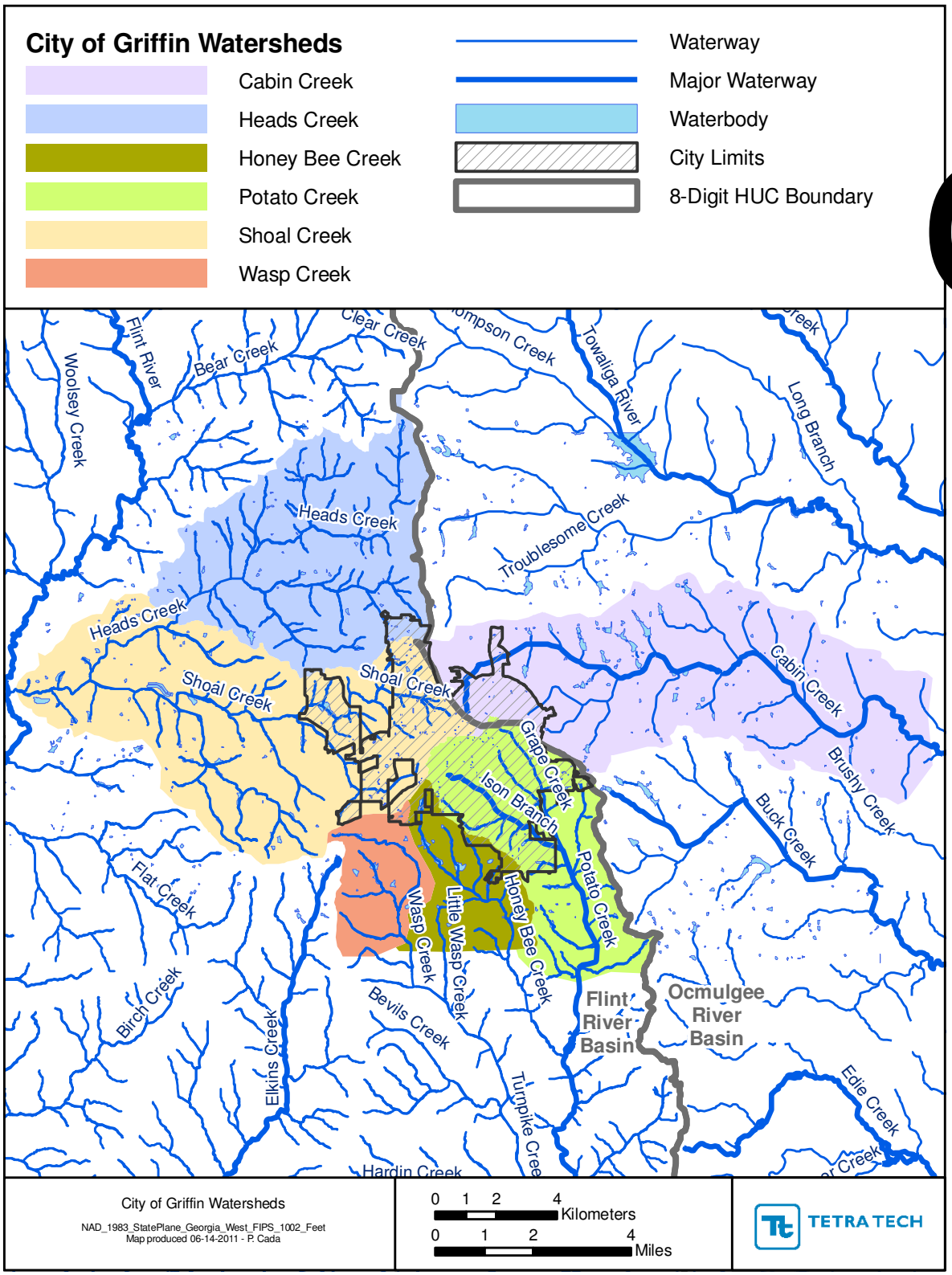

Figure 1-1 City of Griffin Watersheds

2 Program Definition

The purpose of this Stormwater Master Plan is to propose a course of action for the Stormwater Division with respect to the Division's commitments and financial and programmatic goals.

In order to establish the appropriate course of action, this Master Plan will also detail the current operational structure of the Stormwater Division, summarize work and projects that have been done in the Division since it started, summarize existing conditions and watershed-scale problems identified in the Watershed Assessments, and summarize activities proposed in the Protection Plans to improve watershed conditions.

2.1 Program Priorities

Stormwater program priorities were developed to guide the program and focus Division efforts on key responsibilities. The program priorities focus on developing and implementing a comprehensive, cohesive approach to stormwater management. Priorities are organized by category below.

Management and Administration

a) Manage the Stormwater Utility.

b) Administer financial programs.

c) Identify stormwater problems and needs in the city.

d) Implement public information activities in support of the program.

e) Maintain record keeping systems.

f) Research inter-local agreements to optimize local government resources.

g) Maintain a Geographic Information System (GIS) inventory of stormwater infrastructure.

Water Quality

a) Fulfill ongoing NPDES stormwater quality permit requirements.

b) Conduct long-term water quality monitoring and identify water quality problems.

c) Implement cost effective stormwater BMPs to address problem areas.

Engineering and Planning

a) Design capital improvements for high-priority projects.

Operations

a) Develop/maintain a system condition inventory.

b) Develop a system of prioritization for repairs and capital improvement projects (CIP).

c) Conduct routine maintenance services as needed.

Regulation and Enforcement

a) Actively enforce current regulations.

b) Regularly inspect key private stormwater systems to verify maintenance.

c) Upgrade City regulations, codes, and requirements as needed.

Capital Improvements

a) Identify and prioritize CIP.

b) Address land acquisition, easements, and rights-of-entry for capital improvement and operating needs.

2.2 Policy Statements

Policies provide the framework (philosophy, timing, direction) and set the boundaries for stormwater management services to be provided by the City. The policies directly impact the need for labor, materials, equipment, and other capital investments, which in turn define the level of financial commitment required. The policies presented within this plan are designed to guide the development of the Stormwater Master Plan. The statements were developed to be compatible with existing policies, and to meet future needs based on analysis and interviews with elected officials, staff members, and local professionals in the City.

2.2.1 Institutional Policy Statements

Policy Area 1: Management

a) Departments of the City will work collectively to reduce flooding; protect groundwater and surface water resources; and improve water quality and wildlife habitat within the MS4.

b) The program is long-term, comprehensive, and cohesive.

c) The City establishes and maintains a budget for coordinating, planning, designing, constructing, operating, repairing, extending, and improving flood control and storm and surface water facilities, systems, and services.

d) The City's responsibilities do not include those systems, facilities, and services that fall outside the MS4. However, the City establishes cooperative agreements with other agencies or jurisdictions to ensure compatible storm and surface water efforts within the area or facilities draining to or through the City's MS4.

e) The City has authority to maintain, operate, reconstruct, review, and approve and to make additions, extensions, and betterments to the MS4 within City limits.

f) As necessary, the City shall make and enforce rules and regulations including:

- Protection of the public health, safety, and welfare.
- Design criteria or level of service for stormwater facilities, systems, and service.
- Establishment and collection of fees including plan review and fees for regional facilities.
- Collection procedures, establishing stormwater utility rates and timing of user fee bills.
- Protection of the drainage facilities, improvements, and properties controlled by the City and prescription for their appropriate use.
- Requirements for stormwater facilities associated with development or redevelopment.

g) The City issues, at least annually, a report to the City Commission regarding the status of flood control and storm and surface water drainage services and responds in a timely manner to drainage issues within City limits.

h) The City's Director of Public Works and Utilities reviews policy at least annually for adequacy and completeness, and shall make recommendations to the City Commission for modifications or revisions to present policy when necessary.

i) The City develops and continues an ongoing program of drainage and flood control as well as in-service training for City employees related to these issues. Topics vary in nature and shall continue to expand the knowledge/understanding of City staff involved in any aspect of storm and surface water management.

j) Responsibility is established through liaison with appropriate agencies for coordinating implementation of state and federal program requirements including:

- The National Flood Insurance Program.
- The Water Quality Act of 1987.
- Georgia Water Quality Control Act.
- Georgia Erosion and Sedimentation Control Act.

k) The City designates personnel responsible for interagency coordination.

Policy Area 2: Coordination with Other Programs/Plans

a) The City provides, when appropriate, review of flood control plans and MS4 drainage issues within City limits.

b) The City coordinates with the local planning commission during periods of plan review and updates the Comprehensive Plan for the City.

c) Plans prepared by the City incorporate the zoning requirements detailed by the City's Unified Development Code.

d) Cooperation of agencies, jurisdictions, and other entities (including the land development industry), which impact or are impacted by the City's program, shall be sought to coordinate the requirements of external programs, new development and public works facilities with the basin wide plans.

e) The City coordinates with affected Departments to incorporate stormwater management facilities into parks whenever appropriate and cost effective.

f) The City coordinates stream monitoring and regulation enforcement with the County Health Department and the Georgia Environmental Protection Division.

g) As required, the City meets with the County Department of Public Works to ensure clear definition of program responsibilities and boundaries, and to resolve any conflicts in maintenance efforts.

h) The City coordinates its floodplain management program with the Federal Emergency Management Agency (FEMA) and the Community Rating System (CRS), particularly with respect to public information.

i) The City coordinates with the appropriate agencies through the Fire Communications Bureau to ensure that emergency response plans for hazardous material releases are sufficiently protective of the MS4.

Policy Area 3: Emergency Preparedness/Disaster Control

a) Participate in development of plans for coordination or response to all types of emergencies which could affect the quality or quantity of water, including:

- Flooding within City limits.
- Spills of hazardous materials.
- Major pipeline breaks.
- Flooding.

The plans should include clear statements of roles and responsibilities for each of the federal, state and local agencies involved in emergency response.

b) Annually conduct a full-scale implementation of the flood control response including: road closures, media notification, detours, and all other aspects of the emergency response program.

c) The City periodically reviews Hazardous Material Prevention Control (Hazmat) Ordinance and Hazardous Material Spill Preparation and Control Plan (HMPC) to ensure adequacy of measures to protect and prevent contamination of the MS4.

Policy Area 4: Development Submittals

a) All drainage plan submittals are prepared in accordance with the current edition of the City's Stormwater Design Manual and presented in print and digital format.

b) All persons or organizations proposing to construct new or alter existing stormwater management facilities must submit plans and hydrology reports for these facilities to the City for review and approval prior to construction.

c) Stormwater management facilities for new development or redevelopment should have the capacity for stormwater runoff from the site, as well as the area draining to the site. Such facilities shall discharge into a watercourse, drainage channel or other MS4 facility.

d) New development and redevelopment will provide engineered stormwater control measures to ensure that: a) no increase in flooding or erosion occurs as a result of the development, b) peak stormwater runoff rates after development of the site do not exceed peak rates prior to development and c) stormwater runoff is not a significant source of water pollution.

e) Those who propose new development bear the costs of the public facilities and services made necessary by such development. When existing essential services are inadequate, the developer may be asked to make improvements to eliminate present inadequacies if such improvement would be considered appropriate at the proposed location.

f) The City Public Works and Utilities Department reviews and approves the portion of development plans that pertain to drainage, pollutant removal systems, erosion and sediment control, and the Floodplain Management Ordinance.

g) New Planned Unit Developments shall preserve natural features such as steep slopes, floodplains, erodible soils, and bodies of water. Drainage plans shall reflect these preservation requirements.

Policy Area 5: Erosion and Sedimentation Control

a) Developers are required to use BMPs for erosion and sedimentation control during and after site preparation and construction activities.

b) Construction projects are phased as needed to minimize the area of exposed soils at any one time.

c) Erosion and sediment control plans are guided by the following principles consistent with the requirements set forth by the Georgia Soil and Water Conservation Commission and comply with all other federal, state, and regional programs:

- Development should be fitted to the existing natural site drainage features.
- Existing vegetation shall be retained wherever possible.
- Mulching and vegetation of denuded areas shall be required within 14 days of disturbance of soil.
- Runoff shall be diverted away from denuded areas.
- Required stormwater management facilities and erosion and sediment control BMPs shall be installed prior to the construction of other facilities to mitigate impacts during construction.
- Sediment will be entrapped on-site. Erosion and sediment control measures must be routinely inspected and maintained.

d) All waterways including: lakes, streams and ditches must be buffered and protected from water pollution effects of site preparation, construction activities, on-lot sewage disposal and urban stormwater runoff.

e) Development on unstable or wet soils is allowed only if adequate measures are taken to prevent subsidence or slippage of soils or structures.

Policy Area 6: Floodplain Management

a) Development in the floodway of the 100-year floodplain is restricted by: a) prohibiting the location or expansion of structures and storage areas in the floodway, b) allowing the restoration of existing structures located in the floodway only if the structural restorations do not increase the elevation and/or velocity of the 100-year flood and if flood proofing measures are taken, c) other aspects of the National Flood Insurance Program.

b) Development in the floodway fringe of the 100-year floodplain is restricted by: a) prohibiting the location or expansion of development which would create a significant increase in floodwater elevations and b) elevating new or substantially improved residential structures above the 100-year flood level and c) providing adequate flood protection, through elevation or flood proofing, for new and substantially improved nonresidential structures.

c) Emergency access shall be provided for development located in flood-prone areas.

Policy Area 7: Land

a) Maintenance access easements are designed to: provide access for maintenance and repair of MS4 facilities and minimize negative visual impacts. Facilities associated with the MS4 shall be place, to the extent possible, on common easements. These easements are a minimum of 20 feet and permanent.

b) When proposed improvements benefit the adjoining property, easements are obtained without compensation unless the value of the easement exceeds the benefits received.

Policy Area 8: Records Management

a) The City has developed, in conjunction with its automated mapping program, an ordered approach for management, organization, and maintenance of its stormwater management facilities.

Policy Area 9: Inspection

a) The City inspects the construction of all new and modified stormwater facilities as necessary to ensure quality control.

Policy Area 10: Enforcement

a) Enforcement of regulations is provided by City Environmental Code Officers within the Public Works and Utilities Department. Wherever appropriate, Environmental Code Officers shall work with additional enforcement agencies to ensure regulatory requirements are met. In particular, the City shall work with enforcing agencies to meet the following requirements:

- No deposits of any matter that would in any way restrict or disrupt flow may be deposited in the floodways of any stream unless the applicable permits have been obtained allowing such deposition of matter.
- No persons shall throw, drain, or otherwise discharge, cause, or allow others under their control to throw, drain, or otherwise discharge into the municipal separate storm sewer system any pollutants or waters containing any pollutants, other than stormwater.
- For the purpose of regulating land-disturbing activities, every person shall be required, at a minimum, to follow protections at least as stringent as the state general permit and BMPs, including sound conservation and engineering practices to prevent and minimize erosion and resultant sedimentation, which are consistent with, and no less stringent than, those practices contained in the "Manual for Erosion and Sediment Control in Georgia."

b) A one and one-half percent (1.5%) late charge shall be billed based on the unpaid balance of any storm water utility service charge that becomes delinquent. The stormwater utility service charge may be billed and collected along with other City utility services.

Policy Area 11: Customer/Public Response

a) The City operates and maintains a complaint response system in order to assure effective and timely response to all surface and stormwater drainage complaints and shall issue an annual report to the City Commission as to the number and type of drainage complaints received and the response made to the complaints by the City.

b) Customer/public response is addressed in the City's *Customer Service Manual* dated July 21, 1998. The manual addresses the procedures to be followed when a call from a customer is of general nature.

Policy Area 12: Public Information Involvement

a) Public relations options are addressed in the City's *Stormwater Utility Action Plan* dated February 25, 1997 and provide the framework for carrying out the public awareness and education programs.

b) The City continues to inform the public through specific public awareness campaigns and ongoing "baseline" public informational programs and activities. Specific activities include: presentations, information brochures, fact sheets, white papers, news articles, radio shows, informational meetings, testimonials, individual meetings, customer service, and project booklets.

c) The City explores opportunities for public involvement in the maintenance and protection of the MS4 and enhancement of water quality in the City's watersheds.

d) The City has initiated a complaint response outreach program, which will provide information to customers located in chronic problem areas regarding the history of the problem, actions being taken by the City to mitigate the drainage problem and the timing of the corrective action.

Policy Area 13: Research

a) The City developed a prioritized list of topics requiring further research and promotes such research through local funds along with assistance from State and Federal grants. Topics could include:

- Effectiveness of stormwater management practices and their implementation.
- Development of an ongoing monitoring program to identify baselines and trends of pollutant loadings.
- Rain gauges, flow gauges, and watershed modeling.
- Real time control of stormwater control devices.
- Local involvement of general public for achievement of watershed management.

2.2.2 Financial Policy Statements

Policy Area 1: General

a) In order to accomplish the purposes, goals and objectives of the City stormwater program, a stormwater service charge is administered by the City on all real property within City limits.

b) All monies collected through stormwater service charges are separately identified and accounted for in the City's financial records, and all expenses related to stormwater drainage, flood control, and pollution abatement shall be separately identified and accounted for by the City.

c) The City's stormwater service charge is fair and reasonable and bears a substantial relationship to the cost of providing service and facilities.

d) The primary basis for the service charge shall be each property's contribution to runoff.

e) Service charges for all single-family residential property (including duplex living units) shall be uniform.

Policy Area 2: Funding Options

a) Funding for the City's stormwater activities includes, but are not limited to:

- Stormwater utility fee.
- Bonds.
- Special service charges.
- System development charges.
- In-lieu of construction fees.
- Developer extension fees.
- State and Federal funding.

b) The City may borrow money and issue negotiable revenue bonds to acquire, construct, maintain, add to, improve, and to perform necessary functions.

c) A detailed description of the above funding strategies is examined and documented in the *Policy Papers* and summarized in the *Stormwater Utility Action Plan* dated February 25, 1997.

Policy Area 3: Rate Structure

a) Rate studies are to be conducted biannually.

b) Service charges for residential properties of two or fewer dwelling units reflect the relatively uniform effect that residential development has on runoff and stormwater services and shall therefore be billed on the basis of a uniform schedule.

c) There shall be two classifications of property for determination of service charges:

- Class A: Single-family residential properties.
  - A1: Greater than 1,600 square feet of impervious surfaces.
  - A2: Less than 1,600 square feet of impervious surfaces.
- Class B: Multi-family (3 families or more) residential property and non-residential property.

d) Rates for each property are computed by multiplying the number of Equivalent Residential Units (ERU – the amount of impervious area on a residential property) times a charge per ERU as follows:

- The current charge per ERU shall be $4.47.
- All Class A1 properties are billed as one ERU.
- All Class A2 properties are billed six tenths (0.6) ERU.
- All Class B properties are billed a service charge computed by measuring the amount of impervious surface on the property and dividing this figure by 2,200 square feet (the typical amount of impervious surface on a residential parcel). This quotient is then rounded to the next highest whole number and multiplied by the rate per ERU.

e) The City is subject to the service charges except as noted in "Service Charge Credit" policies.

f) Single Family Residential properties will be charged based on the size of the impervious surface. If the impervious surface is less than 1,600 square feet, the owner will be charged $2.97 per month. If the impervious surface is 1,600 square feet or more, the owner will be charged $4.47 per month. Non-single-family properties will be charged by the total number of ERUs found on the property. The owner of the property is responsible for the stormwater utility fee. If the property is occupied by a tenant and they pay utility fees, stormwater billing could be paid by the renter but ultimately the proper owner is responsible for the payment of the fee.

For multiple occupancy properties, such as shopping centers, the City may either allocate the user fee among the occupants of the parcel or may deem that a single billing to the parcel's owners, agents, or associations is appropriate. The billed party is responsible for payment of the drainage service charges.

Policy Area 4: Billing Method

a) The City bills and collects all utility charges on a monthly basis, including the stormwater utility user fee.

b) The appeal and service charge adjustment process shall be reviewed annually to ensure that recurring problems are identified and that adequate consideration is given to unusual circumstances.

c) Appeals to the service charge shall be submitted to the City's Public Works and Utilities Director in writing. The City's Public Works and Utilities Director shall provide

recommendations to the City Manager for judgment. Subsequent appeal may be made to the City Board of Commissioners within 15 days of the City Manager's judgment.

d) Service charges which remain unpaid for longer than 30 days shall be considered delinquent; the City may terminate public water and sewer services to the property for which payment is delinquent, as well as pursue other legal remedies.

Policy Area 5: Service Charge Credits and Exemptions

a) The City may give consideration to specific or unusual service requirements and general benefits accruing to or from properties as a result of providing their own stormwater management facilities.

b) The City may reduce the service charge for certain properties if permanent stormwater management facilities are engineered, constructed, and maintained in accordance with City rules, regulations and standards and the stormwater management facilities result in a reduction of actual contribution of runoff to the MS4. Sites with temporary facilities are not eligible for reductions in the service charge.

c) The City has an educational credit for the public school system for teaching the "Water Wise" program to the entire student population along with other educational media.

Policy Area 6: Asset Management

a) The City has established an overall asset control function within its management structure.

b) The Director of Public Works and Utilities defines the categories of assets to be monitored within the overall systems.

c) Criteria are established which set the utilization levels for all assets.

d) Standards are documented for ensuring the security of all assets.

e) The City, through its Director of Public Works and Utilities, has developed an asset management database within the City's work order management system (HYPERWEB). This centralized database will contain utilization, location and life cycle information on key assets including equipment, vehicles and facilities.

2.2.3 Engineering Policy Statements

Policy Area 1: Planning/Design

a) The Stormwater Master Plan (SWMP) shall promote sound development policies which respect, preserve, and (wherever possible) enhance the City's watercourses.

b) Drainage planning and design shall be based on the principle of not increasing or transferring detrimental drainage effects to other areas and where appropriate, the mitigation of existing problems.

c) The 25-year storm event shall be used in sizing storm drains that serve public streets and rights-of-way. Storm sewers and culverts conveying water under public streets shall be sized to carry runoff from the 100-year storm event without overtopping the road. All other storm-sewer systems shall be sized for the 50-year storm event. The *Stormwater Design Manual* and the *Level of Service Manual* specify the design criteria for drainage infrastructure.

d) Basement or subsurface living area floor drains (with the exception of shower stall drains), not conveying sanitary wastes, which drain by any means, may discharge into the MS4 or onto an impervious area on the surface of the ground.

e) As set forth in wastewater discharge regulations, stormwater shall not be admitted to sanitary sewers designed and intended to be used exclusively as carriers of domestic sewage and suitable industrial wastes.

f) The City has established and published criteria for drainage planning and design in the *Stormwater Design Manual* (Paragon 2007). Technical criteria for construction, operation and maintenance of drainage systems has also been developed relative to all public and private drainage facilities/requirements. Such criteria is reviewed and revised periodically, but at least every five years, to reflect new knowledge, changing circumstances, and adjustments in overall comprehensive goals and objectives.

g) The City has prepared this Stormwater Master Plan as a comprehensive guidance document for the Stormwater Division. The Plan will be updated regularly to reflect the current policies and priorities of the stormwater program.

h) Stormwater Pollution Prevention Plans (SWPPP) will be reviewed as part of the site plan review process. The SWPPP must addresses the acquisition, improvement, construction, inspection, development, installation, modification, management, operation, maintenance, repair, replacement, control, demolition, pollution abatement, abandonment, and regulation of:

- Public storm and surface water drainage services, facilities, and systems.
- Collection, treatment, disposal or elimination of stormwater.
- Control of stormwater drainage.
- Storage and use of stormwater drainage.
- Mitigation of pollutant through design and treatment systems.
- Storage of stormwater to regulate flows within drainage systems or facilities of receding waters.
- Facilities to prevent overflow and flooding of stormwater onto real property.
- Elimination or reduction of damage from flooding.
- Correction of water conditions that may jeopardize public health, safety, or welfare.

i) The City has developed a comprehensive capital improvement program that: a) is based on recognized community needs and objectives, b) makes effective use of existing facilities or low-cost capital improvements that result in significant service improvements, c) supports revitalization efforts in older areas of the community, d) ensures essential services are available to an area within the same general time frame, e) provides service to undeveloped pockets of land within urbanized areas, f) considers combinations of structural and non-structural measures, and g) is consistent with the following prioritization criteria establish by the City:

- Health and safety.
- Property damage.
- Environmental impact.
- Cost effectiveness.
- Solvability.
- Geographic dispersion.
- Affected resources.

- Economic impact.
- Long- and short-term consequences.
- Prior/outstanding commitments.
- Public awareness.

j) Multiple uses of drainage facilities are encouraged provided the use does not adversely impact the functional design of the system.

k) Design of facilities incorporates the following considerations:

- Water conservation.
- Safety.
- Disruption of emergency services.
- High groundwater conditions.
- Possible impacts to sanitary sewer system.
- System security.
- Access for facilities maintenance.
- Mosquito control.
- Stormwater facilities which require storage of water will be designed in a manner which does not promote conditions conducive to mosquito breeding, rats, pests or other conditions potentially harmful to public health.

l) Treatment methods proposed for control of mosquito breeding associated with any portion of the stormwater system will be reviewed with/approved by the Health Department.

m) Any work proposed within the banks of waters of the state including any improvement, excavation, construction or alteration will be reviewed and approved by the Army Corps of Engineers (that apply to their codes and regulations).

n) Setbacks from lakeshores for new structures will be studied and, if appropriate, shall be established by the City.

Policy Area 2: Construction of Public and Private Facilities

a) All construction projects shall have and implement erosion/sedimentation control plans.

b) All construction within a floodplain shall be reviewed and permitted by the City.

c) Based on Section 404 of the Clean Water Act, Army Corps of Engineers Permits shall be obtained for the following activities:

- Dams or dikes in navigable waters of the United States (navigable waters, in its legal sense, may include any water body, including intermittent streams, ponds, and wetlands).
- Other structures or work including excavation, dredging, filing, and/or disposal activities in navigable waters of the United States.
- Activities that alter or modify the course, condition, location, or capacity of a navigable water of the United States.
- Discharge of dredged or fill materials into waters of the United States.

d) Projects requiring U.S. Army Corps of Engineers 404 permits shall also obtain State Stream Buffer Variance Approval.

e) The following practices shall be incorporated into construction of any facilities:

- Discharges should not restrict or impede the movement of aquatic species indigenous to the waters or the passage of normal or expected flows or cause the relocation of waters (unless the primary purpose of the fill is to impound waters).
- Minimize the adverse impacts on the aquatic system associated with the discharge of impounded waters.
- Avoid discharges into wetlands or breeding and nesting areas.
- Heavy equipment working in wetlands shall be placed on mats.

f) A comprehensive inventory of stormwater and flood control systems, pocket ponding locations, sink holes, flooding areas, developed areas lacking storm sewer systems, and storm system easements shall be prepared and maintained as a database for future capital projects and problem correction activities.

g) Prioritization of capital improvements will be as described in the *MS4 Operation and Maintenance SOP*. Design and construction of the projects shall be in accordance with the current edition of the City's *Stormwater Design Manual*.

h) A conditional use permit shall be obtained for all excavation and filling operations in accordance with provisions contained in the current edition of the development code for the entire City.

i) Fill material shall be nonpolluting, inorganic noncombustible materials and soils. Standards for major excavation and filing include:

- 50 foot setbacks from all property lines.
- Provisions for surface water disposal during and after completion of operation.
- No impacts on groundwater or surface water offsite.

Policy Area 3: Water Quality

a) The following materials shall not be discharged or allowed to run, leak, or escape into any aspect of the MS4, except with the full knowledge and written consent of the permit holder and the Public Works and Utilities Director.

- Greases, oils, and oil sludge from garages, repair shops, machine shops, industrial and other establishments.
- Paints and waste products from paint manufactories.
- Any petroleum product or other product which by reason of its nature or quality may cause a fire or explosion, or in any way be injurious to persons or detrimental to the system.
- Other deleterious materials as described in the City Stormwater Ordinance.

b) Discharge of toxic pollutants shall be prohibited.

c) All industrial stormwater discharges into the City's MS4 must either be covered by an Industrial Storm Water General Permit or by the City's Phase II MS4 permit.

2.2.4 Maintenance and Operations Policy Statements

Policy Area 1: General

a) A detailed program strategy for the day-to-day operation and maintenance elements of the program is developed; the program is reviewed and updated annually.

b) The maintenance program is, wherever possible, preventive and proactive in nature. As such, clear standards for maintenance service levels are established based on research, staff experience and established system priorities.

c) Property owner and developers shall be responsible for the maintenance of all drainage facilities including inlets, pipes, culverts, channels, ditches, and detention basins located on their land unless modified or dedicated and accepted for public use and responsibility by the subdivider's agreement.

d) The City operates and maintains the Flood Protection System to at least the standards and requirements set by the U.S. Army Corps of Engineers and the "Manual of Flood Control Regulations – Maintenance and Operations of Flood Control Works".

e) The City maintenance agreements for pipes, ditches, and stormwater management facilities as well as easements are cross-referenced to the recorded plat and specify the following:

- Vegetation should not interfere with facilities operation and should not be removed in a manner which exposes bare soil, unless there is an approved erosion control plan.
- No obstructions should be over or within the boundaries of the facility.
- No modifications to the facility shall occur without the City's approval.

f) Common area associated with new developments, which are also used for stormwater management facilities must have clear maintenance plans submitted at the time of approval by the City which include a delineation of the method for collecting maintenance costs.

g) Easements are provided for installation, maintenance and repair of stormwater management facilities on subdivisions in accordance with the City Ordinance Section 22-128.

h) The City monitors the design, operation, maintenance, inspection, construction, and use of all storm sewers, storm drains, and stormwater management facilities within City limits, and has exclusive jurisdiction for the design, construction, inspection, operation and maintenance of public stormwater facilities.

i) The City has a prioritized plan to inspect, maintain, repair, remove, construct, and operate the stormwater management facilities on all City streets, boulevards, alleys, viaducts, sidewalks, curbs, street crossing, grade separation, and other public ways and easements and all drains, ditches, culverts, canals, streams, levees, tunnels, stormwater management facilities, and appurtenances within City limits, unless otherwise authorized by agreement with the City.

j) Every stormwater management facility is legally defined in either a deed or on a recorded plat and the entity responsible for maintenance is specified.

3 Background and Authority

The City's policies must be consistent with the regulatory requirements of local, regional, state, and federal entities. The most applicable of these regulatory requirements are described in the following sections.

Clean Water Act

The Clean Water Act (CWA) establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Two types of discharges are defined: point and nonpoint source discharges. The CWA has three main requirements as follows:

- Municipalities are required to effectively prohibit non-storm water discharges into the publicly owned or operated storm drain system.
- Municipalities are required to control discharge of pollution into the storm drain system to the maximum extent practicable.
- Municipalities are required to have one system-wide permit rather than individual discharge permits for each point.

Although pollutants entering storm and surface water systems are primarily nonpoint in nature, discharges from the storm and surface water systems have been defined as point sources (40 CFR Section 122.45). As a result, storm and surface water systems are subject to the permitting process of the CWA's NPDES. NPDES permitting is described in Section 6.

Georgia Water Quality Control Act

The Georgia Water Quality Control Act provides for the establishment of water quality standards, as well as policies and procedures for waterbodies that do not meet these standards. Under Section 303(d) of the CWA, the Georgia Environmental Protection Division (EPD) must assign a designated use for Georgia's waterways and develop water quality standards based on the designated use. Georgia currently has five categories of designated uses including; drinking water supplies, recreation, fishing, wild and scenic river, and coastal fishing. The majority of the streams in the Metro Water District are designated as fishing and/or drinking water. The water quality standards for each designated use are developed by Georgia EPD, based on Environmental Protection Agency (EPA) water quality guidelines.

Monitored waters that do not meet their state water quality standards are considered impaired and published in the State's 303(d) list of impaired waters, per the Clean Water Act. Substantial changes to the 2008 Georgia 303(d) list were made to comply with EPA guidance. Assessed waters are now placed into one of five categories. The goal of the five-category system is to increase clarity. According to the CWA, the 303(d) list identifies waters not meeting their designated uses and for which Total Maximum Daily Loads (TMDLs) have not been completed for the parameters of concern. Once the TMDL is completed, the water will no longer be on the 303(d) list regardless of whether it meets its designated use. With the new five-category system, Georgia EPD adjusted the ranking method for TMDL development to reflect the existing basin rotation schedule. Other changes to the 2008 303(d) list include discontinuation of the term "partially supporting" and inclusion of "EPA added waters" or stream segments assessed by EPA as part of the TMDL development process (MNGWPD 2009).

TMDL Program

A TMDL is the calculation of the maximum amount of a pollutant of concern that a specific segment of a waterbody can receive and still meet water quality standards. The TMDL represents the sum of allowable

loads of a single pollutant from all contributing sources (including nonpoint sources) and includes a margin of safety and seasonal variations in water quality.

TMDL = sum of load allocations (nonpoint sources) + sum of wasteload allocations (point sources) + margin of safety

Pursuant to various sections of the Clean Water Act, Georgia EPD must assign a designated use for Georgia's waterways and develop a list of impaired waters that do not meet water quality standards. The Section 303(d) list is a subset of the Section 305(b) list of impaired waters that consists only of segments where Georgia EPD must establish TMDLs that allocate pollutant loads among point and nonpoint sources of pollution, including stormwater.

As a result of legal action in Georgia, the rapid scheduled development of TMDLs and later implementation plans for Georgia's river basin groups began in 1998 and continues for newly listed segments following Georgia's basin group planning cycle. Following an initial interagency agreement between Georgia EPD and U.S. EPA Region IV, every TMDL includes a boilerplate "Initial TMDL Implementation Plan" that provides guidelines for and schedules the subsequent preparation of a more detailed "Revised TMDL Implementation Plan". The Revised TMDL Implementation Plans identify the management practices and activities needed to reduce the pollutant load and restore water quality. TMDL Implementation Plans can be found on the Georgia EPD website (MNGWPD 2009).

Phase II MS4 Program

The Phase II MS4 Program focuses on small municipalities and is administered by the EPA, which issues NPDES Phase II Stormwater Permits. The program's main objective is to control nonpoint source pollution of waterways in urban areas to the maximum extent practicable. The Phase II Permit requires the community to prepare a Notice of Intent which describes the Best Management Practices (BMPs) to be implemented to fulfill the EPA's goals. Phase II permittees are required to comply with the following set of six minimum measures:

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

Phase II permittees submit an annual report form to Georgia EPD demonstrating progress towards permit requirements. The report form is available on Georgia EPD's website.

Georgia Erosion and Sedimentation Control Act

Georgia's Erosion and Sedimentation Control Act (ESCA) was first passed in 1975 to protect Georgia's waters from soil erosion and sediment deposition. The Act requires permits for land-disturbing activities on sites one acre or larger as well as an erosion, sedimentation and pollution control (ES&PC) plan for preventing and/or minimizing erosion and sedimentation from the activity. In addition, the regulations require undisturbed buffers between the land-disturbing activity and streams to minimize adverse impacts to water quality. Development is not allowed within 25 feet of most streams in Georgia and 50 feet for trout streams. Unlike the NPDES Construction Permit, the ESCA is administered primarily through the Local Issuing Authority (LIA). Plan review checklists, updated in 2008, are available by development type on the Georgia Soil and Water Conservation Commission website. In 2003, O.C.G.A. § 12-7-19 amended the ESCA to include mandatory certification for all individuals involved in any aspect of land disturbance activities in Georgia by December 31, 2006. The amendment also included mandatory fees

per acre of disturbed land to fund enforcement programs for Georgia EPD and for the LIA. While similar to the NPDES Construction Permit, the ESCA further outlines the responsibilities of the LIA. Georgia EPD has asked LIA's to educate the development community on the need to file an NOI under the NPDES Construction Permit, which are processed by Georgia EPD.

The buffer variance procedure and criteria, amended in 2004, provides a list of exempted activities that may be allowed by the LIA and a list of activities that will be considered for a variance by Georgia EPD. The rule also outlines the minimum information needed for the buffer variance application and the details for buffer mitigation plans, if required. Enforcement of the buffer variance procedure requires support from the LIA in identifying waters of the state within their jurisdiction, related to new development and redevelopment projects. Georgia EPD has released a field guide to assist local governments in making stream determinations that is available on their website (MNGWPD 2009).

National Flood Insurance Act

The National Flood Insurance Act of 1968 led to the creation of the National Flood Insurance Program (NFIP) and offered new flood protection to homeowners. Participation in the NFIP is voluntary, based on an agreement between local communities and the Federal government which states that if a community will adopt and enforce a floodplain management ordinance to reduce future flood risks to new construction in "special flood hazard areas", the Federal government will make flood insurance available within the community as a financial protection against flood losses.

In 2001, FEMA promulgated hazard mitigation planning regulations pursuant to the Disaster Mitigation Act of 2000. FEMA established the 10-step CRS process that identified four essential parts to mitigation planning and created a point-based evaluation system. The CRS rewards communities that undertake floodplain activities beyond the requirements with lower flood insurance premiums. A Class 1 rating requires the most credit points and gives the greatest premium reduction; Class 10 receives no premium reduction. A community that does not apply for the CRS, or does not obtain the minimum number of credit points is automatically categorized a Class 10 community (MNGWPD 2009).

Watershed Management Plans

In addition to the Federal NPDES wastewater permit requirements, Georgia EPD requires watershed monitoring plans, watershed assessments, and watershed protection plans from all publicly-owned treatment works (POTWs) greater than 1.0 MGD or for new or expanding facilities. Recognizing that existing and additional wastewater capacity supports growth, the local wastewater providers must address the potential for water quality impacts from stormwater runoff and nonpoint source pollution that would result from that growth. The specific requirements for each of these three elements are detailed in guidance documents on Georgia EPD's website.

4 Administrative/Organizational

The Stormwater Division is part of the City's Public Works and Utilities Department. Administration of the Division is focused on the tasks listed as Management and Administration priorities in Section 2.1. Resources currently include 15 staff members, 46 vehicles (including trucks, trailers, construction equipment, and special purpose vehicles) and numerous hand tools and other small equipment. The City also has technological resources, including a GIS inventory of stormwater infrastructure and Cityworks, a work order program for handling citizen requests. Additionally, there are city ordinances and numerous manuals and guidance documents that lay out regulations, procedures, and recommendations related to stormwater issues.

4.1 Staffing and Budget

The current stormwater program staffing and budget is summarized in Table 4-1.

Table 4-1 Current Stormwater Division Staffing and Budget

Function	Budget*	Number of employees
Administration	$398,280	4
Environmental Monitoring	$157,260	2
Operations and maintenance	$1,112,620	9
Capital Improvements	$362,250	N//A
Totals	$2,030,410	15

*Fiscal year 2010-2011

4.2 Funding

The Stormwater Division relies on the stormwater utility as a constant source of funding. However, the department has been successful at obtaining other sources of funding. Below are examples of projects completed under various funding sources.

Clean Water Act Section 319 grant

Potato Creek Biota – Two projects have been developed to: (1) address the sedimentation issue that is occurring within the watershed; (2) construct stormwater runoff BMPs and stream restoration projects that are focused on known erosion and sedimentation issues; and (3) reduce the total annual sediment load discharged to downstream receiving waters (i.e. Potato Creek). The two proposed project locations are situated within the headwaters of Potato Creek. The *County Library Water Quality Improvement Project* is anticipated to reduce the annual sediment load within the TMDL listed segment of Potato Creek. In addition, the project concept would allow for an educational component to the overall project in conjunction with the library facility. The *City Golf Course Water Quality Improvement Project* is anticipated to reduce the annual sediment load within the downstream areas of the watershed including the listed segment of Potato Creek that this branch flows into.

Sand Filter Grant – The objective of this project is to evaluate the effectiveness of the modified version of the Delaware Sand Filter to address non-point source pollutants present in stormwater runoff using various media readily available in the State of Georgia. Work on this project started on 2008, and the study will be complete in March 2012. This project is described further in Section 7.

Potato Creek Fecal – The EPA established a fecal coliform TMDL for Potato Creek in 1998. A TMDL Implementation Plan was developed by the McIntosh Trail Regional Development Center (RDC) in 2001 as part of the state-wide effort by the RDCs to produce implementation plans for all TMDLs. In an effort to develop a more cost effective field application of tracking fecal coliform sources, the RDC applied for a 319 grant in 2003. A partnership with the University of Georgia (UGA) was developed in this project with UGA providing research quality investigation into the sources of fecal coliform in the Potato Creek Watershed.

Education – The objective of the project is to identify degraded aquatic ecosystems and identify projects for restoration after the investigation shows it will improve the environment, is in the public interest and is cost effective. The education and training BMPs would be developed and utilized in all aspects of the City's holistic approach to watershed management. The BMPs would be incorporated into each department's watershed management strategy and information disseminated though a variety avenues.

GEMA - The City submitted a comprehensive application to the Georgia Emergency Management Agency (GEMA) for a Hazardous Mitigation Grant to construct drainage improvements in the Lyndon Basin. The City was successful in securing grant funds from GEMA to assist with the design and construction. This project was completed in 1999.

GEFA - The City secured the first State Revolving Fund (SRF) loan specifically for stormwater improvement projects in 1997. The SRF loan was secured through the Georgia Environmental Facilities Authority (GEFA) which provides low interest loans to assist with the design and construction of capital improvement projects. The City submitted a comprehensive application and package to GEFA in order to secure the funding.

STIP - The Stormwater and Transportation Improvement Program (STIP) is funded by the Special Purpose Local Option Sales Tax (SPLOST) Program "voted in" by the citizens of Spalding County and the City in 1996. Revenues from SPLOST are utilized by the County and the City for the design and construction of infrastructure improvement projects related to stormwater management and transportation.

4.3 Guidance Documents

Stormwater Ordinance

The City developed its first stormwater ordinance in January 1997 that established a dedicated funding source for the City to use to meet its future stormwater management program operational and capital investment needs. In other words, the utility would be used to effectively manage, protect, control, regulate, use, and enhance stormwater systems and facilities in Griffin in concert with the management of other water resources. The ordinance states that all property owners and developers of real property within the City shall provide, manage, maintain, and operate on-site stormwater systems sufficient to collect, convey, detain, and discharge stormwater in a safe manner consistent with all City development regulations, and the laws of the State of Georgia and the United States. Any failure to meet this obligation shall constitute a nuisance and be subject to an abatement action filed by the City in the Municipal Court.

After the first stormwater ordinance was adopted, the City conducted a cost of services analysis and rate study to identify an equitable approach to funding stormwater management services and facilities. The resulting schedule of service charges was established in the second stormwater ordinance, which was issued in August 1997. That ordinance called for utility fees based on burden of stormwater quality control service requirements and costs posed by various properties throughout the City. Also identified in that ordinance was a provision for stormwater utility service charge credits (see next section), specification on how the stormwater service charge bills would be delivered and collected, and establishment of an effective date when the utility would go into effect.

A third stormwater management ordinance was issued in 1999. That ordinance was revised to meet new state regulations that required restating the legal structure and organization of the stormwater utility as a dedicated enterprise fund of the City. The 1999 ordinance authorized the formation of an organizational and accounting entity dedicated specifically to the management, maintenance, protection, control, regulation, use, and enhancement of stormwater systems in Griffin. The utility would operate under the direction of a Public Works and Utilities Director appointed by the City Manager. The ordinance also redefined the stormwater management problems, needs, goals, program priorities, and funding opportunities of the City. The 1999 ordinance is structured so that credit is given to property owners that are reducing the impact of stormwater generated by their property. By reducing the peak discharge of stormwater from their property, the owners are helping the City protect properties downstream. All properties, other than single family residential properties, which have constructed stormwater management facilities and maintain them in accordance with City defined standards (see below), may be eligible for a percentage reduction, or credit, in that property's stormwater service fee.

The current stormwater management ordinance also includes post-development regulations, which were added to the ordinance in 2007. The ordinance requires developers to prepare a stormwater management plan and specifies stormwater management plan requirements. It also addresses post-development stormwater runoff quality and quantity impacts by requiring the use of BMPs (structural and non-structural) to achieve technical performance criteria. The ordinance itself establishes the major requirements, while the Stormwater Design Manual outlines the more detailed requirements, including design specifications.

The Stormwater Ordinance (Chapter 94 Utilities, Article IV) can be found on the Municipal Code Corporation web site at www.municode.com. Additional stormwater related ordinances for the City are listed below. Those that are not available on the Municipal Code web site can be found on the City web site at www.cityofgriffin.com.

Establishing a Stormwater Utility (97-1)
Stormwater Utility Service Charge (97-8)
Stormwater Utility Amendment (99-)
Erosion & Sediment Control (Chapter 42 Environment, Article III)
Illicit Discharge Ordinance (Chapter 42 Environment, Article IV)
Floods (Chapter 50)

Stormwater Design Manual

The purpose of the Stormwater Design Manual (Paragon 2007) is to provide information on the selection, design and implementation of urbanized stormwater run-off control devices. The Manual provides procedures to be used in order to achieve compliance with the City Ordinances, including performance standards that should be met at development sites to prevent adverse impacts of stormwater runoff.

MS4 Operation and Maintenance SOP

The City Municipal Separate Storm Sewer System (MS4) Operations & Maintenance Standard Operating Procedure (SOP) specifies responsibilities and procedures for inspecting and cleaning of the City's drainage conveyance system. The goal of this SOP is to ensure the drainage conveyance system is

accurately mapped in ESRI GIS format, new stormwater facilities are entered into the existing GIS inventory and inspection and maintenance procedures are outlined for stormwater facilities and anthropogenic and natural drainage systems.

Watershed Management Plans

On May 6, 2004 Georgia EPD issued Guidance for developing a watershed management plan that includes three components: a Watershed Monitoring Plan, a Watershed Assessment, and a Watershed Protection Plan. The City, in preparation for its wastewater treatment plant NPDES permit renewal, developed watershed plan documents that meet the Georgia EPD requirements.

The following documents, prepared by Tetra Tech, have been submitted to Georgia EPD:

Shoal Creek Monitoring Plan (2009)
Cabin Creek Monitoring Plan (2009)
Shoal Creek Watershed Assessment (2010)
Cabin Creek Watershed Assessment (2010)
Potato Creek Protection Plan (2010)
Cabin Creek Protection Plan (2011)
Shoal Creek Protection Plan (2011)

The Monitoring Plans and Watershed Assessments have been approved by Georgia EPD; the three Protection Plans are currently under review.

5 The Stormwater Utility

The Stormwater Utility was established concurrently with the Stormwater Division as a funding mechanism. The Stormwater Utility addresses the issue of stormwater pollutants and their removal or elimination before entering the stormwater system. Furthermore, the Utility provides the opportunity to integrate various technologies to manage stormwater and wastewater using a holistic approach. The utility funding is being used to help fund the repair and maintenance of stormwater structures to help prevent flooding problems caused by rainfall that washes off impervious surfaces. Impervious surfaces are those areas within developed land, which prevent or significantly impede the natural infiltration of stormwater into the soil. Common impervious surfaces include roof tops, solid decks, asphalt streets, driveways, patios, parking areas, brick or concrete pavements, swimming pools, and buildings.

All property owners are being charged a stormwater utility fee fairly and proportionately for the demand they put on the system. A utility is the most predictable, equitable, and stable source of revenue. The utility divides the fees equitably among property owners of developed properties so that each owner pays only for the demand they put on the system. The amount of impervious area on all properties for non-single family parcels is derived using aerial topography and field measurements. Aerial photography is used to determine the median amount of impervious area. Owners of non-single-family-residential are eligible for a credit if they have and maintain a stormwater management facility on their property in accordance with the City's policies. Information concerning specific service charges is presented in the Policy Statements section of this plan.

The objectives of the Stormwater Utility are to deliver a higher level of service in stormwater management through: Watershed Management; Stormwater Quality; and Public Education, Involvement, and Participation.

The utility rate that has been established for the Stormwater Utility is based on ERUs, which represent the amount of impervious area on a property, including roof, patio, drive, etc. The standard ERU in Griffin is based on 2,200 sq. ft. of impervious area. For commercial properties, the utility payment is calculated by dividing the number of square feet of impervious surfaces on the property by 2,200 and then multiplying by the current rate ($/ERU).

ERUs = sq. ft. of impervious surface on a commercial property/2,200

Payment = ERUs * current rate per ERU

For example, a commercial property with 15,000 sq. ft. of impervious surface, with a current rate of $4.47/ERU, the payment would be calculated as follows:

1) ERU: (15,000 sq. ft. / 2,200) = 6.81 ERUs
2) Round to 7 ERUs
3) Payment: (7 ERUs * $4.47 /ERU) = $31.29/month

For residential properties, the monthly rate is a set fee based on the sq. ft. of impervious area (roof and drive). There are two rate categories — homes with less than 1,600 sq. ft. are charged $2.97/month and homes with greater than 1,600 sq. ft. are charged $4.47/month.

Stormwater Utility Manuals that have been prepared by the Division include a *Stormwater Utility Action Plan*, a *Stormwater Utility Rate Structure Analysis*, and a *Stormwater Utility Service Charge Credit Technical Manual*. These documents provide details on the structure and operation of the Stormwater Utility. Information on the City's Stormwater Utility can also be found on the City's website at:

http://www.cityofgriffin.com.

6 Regulatory Compliance

6.1 NPDES MS4 Commitments

The Federal Water Quality Control Act of 1987 amended Section 402 of the CWA, requiring the EPA to establish regulations setting forth NPDES permit application requirements for storm water discharges. Polluted stormwater runoff is commonly transported through MS4s, from which it is often discharged untreated into local waterbodies. The EPA developed the MS4 stormwater program to comply with the Clean Water Act and prevent harmful pollutants from being washed or dumped into an MS4.

- Phase I, issued in 1990, requires *medium* and *large* cities or certain counties with populations of 100,000 or more to obtain NPDES permit coverage for their stormwater discharges.
- Phase II, issued in 1999, requires regulated small MS4s in urbanized areas, as well as small MS4s outside the urbanized areas that are designated by the permitting authority, to obtain NPDES permit coverage for their stormwater discharges.

The City is regulated as a Phase II MS4, and is covered by a general permit. Operators of regulated small MS4s are required to design their programs to reduce the discharge of pollutants to the "maximum extent practicable" (MEP); protect water quality; and satisfy the appropriate water quality requirements of the Clean Water Act. Phase II designated small MS4s are required to meet the following obligations:

- A regulated small MS4 operator must develop, implement, and enforce a stormwater management program designed to reduce the discharge of pollutants from their MS4 to the "maximum extent practicable," to protect water quality, and to satisfy the appropriate water quality requirements of the CWA. The rule assumes the use of narrative, rather than numeric, effluent limitations requiring implementation of BMPs.
- The small MS4 stormwater management program must include the following six minimum control measures: public education and outreach; public participation/involvement; illicit discharge detection and elimination; construction site runoff control; post-construction runoff control; and pollution prevention/good housekeeping.
- A regulated small MS4 operator must identify its selection of BMPs and measurable goals for each minimum measure in the permit application. The evaluation and assessment of those chosen BMPs and measurable goals must be included in periodic reports to the NPDES permitting authority.

The most recent Phase II MS4 permit was issued in 2007 as General NPDES Stormwater Permit No. GAG610000. This General Permit covers many small MS4s throughout the state, including the City. The permit expires December 6, 2012.

The Phase II program for MS4s is designed to accommodate a general permit approach using a Notice of Intent (NOI) as the permit application. The operator of a regulated small MS4 must include in its permit application, or NOI, its chosen BMPs and measurable goals for each minimum control measure.

The most recent NOI for the City is available on the City's website:

http://www.cityofgriffin.com.

Navigate to: Departments/PublicWorks/Stormwater/MS4Permit.

6.2 TMDL Program

The TMDL Program deals primarily with non-point source pollution, a source of pollution that does not have a specific point of discharge. Non-point source pollution comes from stormwater running off land into streams, including runoff from agriculture, logging, lawns, roads, parking lots, and construction sites. A TMDL is the total amount of the pollutant that can be put into the waterway without making it exceed the state water quality standard.

Every two years Georgia EPD prepares an Integrated 305(b)/303(d) List, which includes all waters assessed by the State. The 303(d) list is a subset of this list, and includes only those reaches classified as Category 5. Reaches are designated as Category 5 if data indicate that at least one designated use is not being supported and TMDL(s) need to be completed for one or more pollutants. For each stream on the list, the state must define a TMDL for pollutants that exceed state water quality standards. Once a TMDL is set, a determination must be made as to how much of the TMDL can be contributed by each of the sources of the pollutant including point and non-point sources of pollution. TMDLs have been completed for all impaired stream reaches in Griffin; therefore, none of the streams in Griffin are on the 303(d) list.

According to the 2010 Integrated 305(b)/303(d) List, Grape Creek, a major tributary of Potato Creek, is supporting its designated use of Fishing. Potato Creek, from its headwaters to US Highway 333, is on the not supporting list for its designated use of Fishing, for violating the criteria of Biota due to sedimentation. A TMDL for sediment (Biota Impacted) was completed for Potato Creek in 2003.

In 1990, 1998, 1999, and 2000, the Department of Natural Resources (DNR) Wildlife Resources Division (WRD) conducted studies of fish populations at a number of monitoring sites in the Flint River Basin, including Potato Creek. WRD used the Index of Biotic Integrity (IBI) and modified Index of Well-Being (IWB) to identify affected fish populations. The IBI and IWB values were used to classify the populations as Excellent, Good, Fair, Poor, or Very Poor. Stream segments with fish populations rated as Poor or Very Poor were listed as Biota Impacted. The Biota Impacted designation indicates that studies have shown a significant modification of the biological community. The general cause of low IBI scores in Potato Creek is the lack of fish habitat due to stream sedimentation. The TMDL for Potato Creek is summarized in Table 6-1.

Table 6-1 TMDL for Potato Creek

Parameter	Waste Load Allocation (WLA)	Load Allocation (LA) Non-Point	Margin of Safety (MOS)	TMDL	Percent Reduction
Biota (F) (Sediment) 2003 TMDL report	91.3 tons/yr	9,260 tons/yr	implicit	9,351 tons/yr	17%

The Georgia EPD lists Cabin Creek on its 2010 Integrated 305(b)/303(d) List of impaired streams that do not meet their designated uses. Cabin Creek is on the not supporting list for its designated use of fishing. Three criteria were violated: Biota, Toxicity, and Fecal Coliform. Total Maximum Daily Loads (TMDLs) for these three parameters were established in 2002. New TMDLs were established for Biota and Fecal Coliform in 2007. The 303(d) listing attributes the impairments to an industrial facility point source and to urban run-off/urban effects. The entire length of Cabin Creek is listed, from the headwaters to the confluence with the Towaliga River. Of the 16 miles of stream listed by Georgia EPD as non-supporting, approximately 1.2 miles are physically located within the City limits.

A TMDL for Dissolved Oxygen was established for Cabin Creek in 2002. Cabin Creek has since been delisted for Dissolved Oxygen impairment.

The most recent TMDLs are summarized in Table 6-2.

Table 6-2 TMDLs for Cabin Creek

Parameter	Waste Load Allocation (WLA)	Load Allocation (LA) Non-Point	Margin of Safety (MOS)	TMDL	Percent Reduction
Chronic Toxicity 2002 TMDL Report	• Griffin Cabin Creek WWTP - 1.0 Toxicity Units • Springs Industries, Inc. - 1.0 Toxicity Units • I-75 South Mobile Homes, Jackson - 1.0 Toxicity Unit	0.0 Toxicity Units	Implicit	1.0 Toxicity Units	N/A
Fecal Coliform 2007 TMDL Report	4.84×10^{11} counts/30 days • Griffin Cabin Creek WWTP – Avg. monthly flow (MGD): 1.5 Avg. monthly FC (No./100mL): 200 • Springs Industries, Inc.- Avg. monthly flow (MGD): 1 Avg. monthly FC (No./100mL): 400	1.15×10^{12} counts/30 days	2.15×10^{11} counts/30 days	2.15×10^{12} counts/30 days	64
Biota (Sediment) 2007 TMDL Report	257.2 tons/yr • Griffin Cabin Creek WWTP – TSS monthly avg. (mg/L): 30 TSS weekly avg. (mg/L): 45 • Springs Industries, Inc.- TSS monthly avg. (kg/day): 470 TSS weekly avg. (kg/day): 941	223.1 tons/yr	Implicit	480.3 tons/yr	51.1
Dissolved Oxygen 2002 TMDL Report	826 lbs/day	44 lbs/day	Implicit	767 lbs/day	18 (WLA) 0 (LA)

Wasp Creek is listed for not supporting its designated use of fishing due to biota on the 2010 Integrated 305(b)/303(d) List of impaired streams that do not meet their designated uses. The listing attributes the impairments to nonpoint sources. A Total Maximum Daily Load (TMDL) for five miles of Wasp Creek was finalized in 2008. The listed area is from the Wasp Creek headwaters to its confluence with Little Wasp Creek; approximately 80 acres of the Wasp Creek watershed are located within City limits. The TMDL for Wasp Creek is summarized in Table 6-3.

Table 6-3 TMDL for Wasp Creek

Parameter	Waste Load Allocation (WLA)	Load Allocation (LA) Non-Point	Margin of Safety (MOS)	TMDL	Percent Reduction
Biota (F) (Sediment) 2008 TMDL report	0.3 tons/yr	37.1 tons/yr	implicit	5.5 tons/day	0%

Shoal Creek and its tributaries were not assessed, and are therefore not listed for any impairment on the Georgia EPD 2010 Integrated 305(b)/303(d)

6.3 New Regulations

There are rule changes and new regulations at the Federal and State levels that will affect all city and county governments by 2012. There are two new plans that will impact how water is managed, the State Water Plan and the Water Conservation Implementation Plan. Both of these plans will bring numerous changes to all citizens of the State of Georgia. The City is currently preparing to meet these new requirements and mandates.

State Water Plan

In 2004, the Georgia General Assembly passed the Comprehensive State-wide Water Management Planning Act to establish a set of policies to govern water management decisions. Following two years of development and public comment, the Comprehensive State-wide Water Management Plan (State Water Plan) was adopted by the Georgia General Assembly on January 18, 2008. The overall goal of the plan is to manage "water resources in a sustainable manner to support the state's economy, to protect public health and natural systems, and to enhance the quality of life for all citizens" (MNGWPD 2009).

The State Water Plan calls for state-wide regional water planning to provide the necessary local and regional perspectives to ensure each of Georgia's ten water planning region's water resources are sustainably managed through at least 2050. Ten Regional Water Plans will outline management practices to meet future water needs. The Regional Water Plans will: 1) address both water quantity and water quality challenges; 2) include forecasts of future water supply and wastewater treatment needs; and, 3) identify practices to ensure that future needs can be met. The City lies within both the Upper Flint and Middle Ocmulgee water planning regions.

Future action items that may affect Griffin's Watershed and Stormwater Plans include adoption of an E. coli bacteria water quality standard, calculations of assimilative capacity to balance stormwater and wastewater loads, recommendations for consumptive use that may consider stormwater treatment, and an increased future focus on restoration of impacted waters.

Georgia EPD will establish guidelines and criteria for local plans to be implemented by the planning districts statewide. As the state water planning process progresses, the City will evaluate and update its water resources plans and programs as needed to stay in compliance with the State Water Plan guidelines and criteria.

Water Conservation Implementation Plan

The Water Conservation Implementation Plan (WCIP) was developed by the Georgia EPD, in partnership with individuals representing the diverse water users of the state, to create a culture of conservation and guide Georgians toward more efficient use of our state's finite water resources. It serves as a resource for institutional water users and may assist with prioritizing water conservation, maximizing water efficiency

and protecting water resources without causing harm to the economy or quality of life that Georgians enjoy. The WCIP will be used to guide decisions related to water use and water management by:

1. Educating water users about water conservation practices and the goals they can accomplish,
2. Informing regional water plan preparation that will be overseen by regional water planning councils,
3. Helping water use sectors collectively improve water use efficiency, and
4. Informing DNR rule-making regarding water conservation requirements in permitting.

7 Watershed-based Stormwater Planning

The Georgia Stormwater Manual (Atlanta Regional Commission 2001) recommends that planning take place at both the watershed and smaller "subwatershed" scales. Typically, the broad, "big picture" planning takes place at the watershed level, and the more refined objectives and implementation plans are pursued at a subwatershed level. Finally, individual projects and controls are carried out at the project or catchment level. Often times it may be more efficient to plan at the watershed scale and to assess the effectiveness of plan implementation at the subwatershed scale, where indicator response is more apparent. The City has adopted this watershed-based approach to stormwater management.

The City lies on the divide between the Atlantic Ocean and Gulf of Mexico drainage areas. Drainage for the City's MS4 is discharged to six watersheds that are part of the Flint and Ocmulgee River basins. Cabin Creek located in the north and northeastern sections of the City drains to the Ocmulgee River before entering the Atlantic Ocean. The rest of the City drains to Heads, Shoal, Wasp, Honey Bee or Potato Creek, which are part of the Flint River Watershed and drain to the Gulf of Mexico (Figure 1-1).

On May 6, 2004 Georgia EPD issued Guidance for developing a watershed management plan that includes three components: a Watershed Monitoring Plan, a Watershed Assessment, and a Watershed Protection Plan. The City, in preparation for its wastewater treatment plant NPDES permit renewal, developed watershed plan documents that meet the Georgia EPD requirements.

An initial Watershed Assessment was prepared for Potato Creek by Integrated Science and Engineering (ISE) in 2001. A second Potato Creek Watershed Assessment and a Potato Creek Watershed Management Plan were completed in 2005. The Watershed Assessment, prepared by Paragon Consulting Group, updated the 2001 Assessment to comply with the 2004 Guidance, provided an analysis of data through 2005, and documented the City's past monitoring effort. The Watershed Management Plan, also prepared by Paragon Consulting Group, fulfilled the requirements of a Watershed Protection Plan. These documents have been reviewed and approved by the Georgia EPD. A Potato Creek Watershed Protection Plan update was prepared by Tetra Tech in 2010 and submitted to Georgia EPD for review, and serves to update the Potato Creek Watershed Protection Plan based on water quality data, studies, and activities in the watershed through 2009.

A Cabin Creek Watershed Monitoring Plan and a Watershed Assessment were prepared by Tetra Tech in 2009 and have both been approved by the EPD. A Watershed Protection Plan was completed in 2010 and has been submitted to EPD for review, as the final component of the Cabin Creek Watershed Management Plan.

A Shoal Creek Watershed Monitoring Plan and a Watershed Assessment were prepared by Tetra Tech in 2009 and have both been approved by the EPD. A Watershed Protection Plan was completed in 2010 and has been submitted to EPD for review, as the final component of the Shoal Creek Watershed Management Plan.

These three major watersheds in the City have each been monitored for several years. Monitoring has been done in Cabin Creek since 2002, Shoal Creek since 2001, and Potato Creek since 2000. Water quality data is stored in a Water Resource Database (WRDB) that is maintained by the Stormwater Division. Biological data are presented in biological monitoring reports that are prepared after each survey. Long term monitoring plans are in place for these three watersheds, and are detailed in the individual Watershed Protection Plans.

Each Watershed Protection Plan recommends management actions will help the City meet its objectives for the watershed and achieve the overarching goals of the Protection Plan. Recommended measures include structural BMPs, stream restoration, and non-structural BMPs. Structural BMPs and stream

restoration sites were screened and prioritized to identify the most practical, cost effective locations for implementation. An implementation schedule for management actions is proposed for each watershed.

The City of Griffin is proactive in its stormwater planning and management efforts. The progress that the City has made so far in developing their stormwater management program will provide the foundation and resources needed for future projects and planning efforts. Some of the larger programs and projects that the Stormwater Division has instituted are described below.

Flood Management

The City has a Flood Ordinance that protects, maintains, and enhances public health, safety, environment, and general welfare. The ordinance minimizes public and private losses due to flood conditions in flood hazard areas. It also protects the beneficial uses of floodplain areas for water quality protection, streambank and stream corridor protection, wetlands preservation and ecological and environmental protection.

The City developed models for the hydrology and hydraulics of the watersheds for the purposes of estimating the full build-out floodplain and regulating new development on this basis rather than the ever-changing existing condition (Integrated Science and Engineering 2003). As part of the studies, cross-sectional data were collected from the majority of waterways within Griffin. Using the cross-sectional data, the streams and waterways were analyzed under a full range of flow conditions. The City used the model results to map the urbanized 100-Year floodplain for all watersheds within City limits. This floodplain has been incorporated as Zone A in Federal Emergency Management Agency (FEMA) Flood Insurance Rate Maps (FIRMs). There are approximately 100 structures and 1000 parcels inside the floodplain.

In October 2009, Griffin's floodplain management program improved its CRS Class from a CRS-7 to a CRS-6 which allows citizens to acquire flood insurance with a 20% discount. On May 1, 2011 the City again improved their CRS Class from a CRS-6 to a CRS-5. The CRS-5 rating will give citizens a 25% reduction on flood insurance premiums. The City is the first CRS-5 program in the State of Georgia.

Hydrology and Water Quality Modeling

In March 2008, Tetra Tech prepared a *Watershed Hydrology Modeling Report the City of Griffin Watersheds* and a *Watershed Water Quality Report for the City of Griffin Watersheds*. The Watershed Hydrology Modeling Report presents the results for the model calibration and validation of the Cabin Creek (HUC8 No. 03070103, Upper Ocmulgee), Shoal Creek, Potato Creek, Heads Creek, and Honeybee Creek (HUC8 No. 03130005, Upper Flint) Watersheds. The Water Quality Report presents the results of the preliminary water quality calibration and validation of the same watersheds. The Loading Simulation Program C++ (LSPC) watershed model was used to represent the hydrological conditions. The model is capable of representing loading, both flow and water quality, from nonpoint and point sources. It was used to represent the variability of nonpoint source contributions through dynamic representation of hydrology and land practices. The model included all point and nonpoint source contributions.

In 2010, Tetra Tech amended the LSPC watershed model to include data through the December 2009. This model is for the entire City. The 2010 *Watershed Hydrology and Water Quality Modeling Report* is included in Appendix D of the Potato Creek Protection Plan.

Improvements in 2010 include the addition of monitored water quality data and U.S. Geologic Survey (USGS) flow records through December 2009. With this additional data, the model simulation time was extended, thereby improving the diversity of precipitation and response conditions for the modeled watersheds. In addition, the 2008 model represented water quality loading through accumulation and wash-off rates only. In this release, the water quality loading simulations were improved through the inclusion of biochemical processes.

Geomorphology Studies

Geomorphology studies have been conducted in the City's three largest watersheds—Potato Creek, Cabin Creek, and Shoal Creek. These studies identified stream reaches with high erosion activity. A large portion of the sediment load in Griffin's streams is attributed to bank erosion. Therefore, the results of these geomorphic assessments were used in Griffin's Watershed Protection Plans to identify priority areas for flow attenuation and stream restoration projects. Major findings in each of these studies are summarized in the respective Watershed Protection Plans.

Potato Creek

In 2008, the City performed a *Stream Channel Erosion Activity Assessment of the Potato Creek Watershed* to assess the geomorphic state of streams in the Potato Creek watershed from the Southern Spalding County Line (County Line Road) to its headwaters. This assessment was conducted by Tetra Tech during March and April of 2008. A fluvial geomorphologist walked either on the stream bed or along the stream bank while conducting Rapid Geomorphic Assessments (RGAs). Stream reaches were rated in terms of erosion potential and descriptions were provided via a written report, maps, and photographs.

Cabin Creek

The City performed geomorphology studies in the Cabin Creek Watershed in 2004 and 2008. These assessments, conducted by Tetra Tech, included written characterizations of the streams, maps illustrating assessment results in terms of channel erosion activity, and photographs of assessment sites. The 2004 study, *Source Assessment and Data Analysis for the Cabin Creek Watershed* (Tetra Tech 2005), focused on stream reaches where DO monitoring was being conducted.

In the 2008 study, a total of 390 sites were assessed, from the headwaters of Cabin Creek to State Highway 16. The assessment was performed by a fluvial geomorphologist walking either on the stream bed or along the stream bank while conducting RGAs. Impacts from urban, upland, and natural activities were described for each site, as well as suspected sediment source hot spots and other potential influences on the stream channels. The 2008 Cabin Creek Geomorphic Assessment, titled *Stream Channel Erosion Activity Assessment of the Cabin Creek Watershed*, is included as Appendix C of the Cabin Creek Watershed Assessment.

Shoal Creek

In 2004, the City performed geomorphology assessments at approximately 120 sites within the Shoal Creek watershed, above the Griffin Country Club Lake. Impacts from urban, upland, and natural activities were described for each site, as well as suspected sediment source hotspots and other potential influences on the stream channels. This assessment, conducted by Tetra Tech, included written characterizations of the stream, maps illustrating assessment results in terms of channel erosion activity, and photographs of assessment sites. The assessment was carried out by a fluvial geomorphologist walking on the stream bed and conducting RGAs. The 2004 Shoal Creek Geomorphic Assessment, titled *Stream Channel Stability Assessment of the Shoal Creek Watershed* is included as Appendix C of the Shoal Creek Watershed Assessment.

Regional Detention Ponds

North Griffin Regional Detention Pond

The City completed construction of the North Griffin Detention Pond in 1998. It is located within the 180-acre North Griffin Drainage Basin, in the Shoal Creek Watershed. The pond provides detention for the upstream drainage, eliminating downstream flooding while utilizing a natural wetland system to provide water quality enhancement for the sub-basin.

The second phase of the project, completed in 1999, involved construction of a bio-engineered wetland system within the pond, planted with vegetation specifically selected to promote the breakdown of contaminants present in the stormwater runoff. The vegetated pond holds stormwater draining from the basin and releases the water slowly into an established forested wetland downstream. The system has been shown effective in reducing some pollutants by 90 percent.

The Project was constructed using, in part, funds from a Clean Water Act Section 319 Grant. There are four water quality sample locations throughout the system. Sampling and analysis has been conducted since 1999 and includes the following constituents:

- Total Suspended Solids
- Total Dissolved Solids
- Turbidity
- Nitrate Nitrogen
- Nitrite Nitrogen
- Nitrate/Nitrite Nitrogen
- Biochemical Oxygen Demand
- Total Phosphorus
- Total Kjeldahl Nitrogen
- Chemical Oxygen Demand
- Dissolved Oxygen
- pH
- Specific Conductance
- Oil & Grease
- Total Petroleum Hydrocarbons
- Fecal Coliform
- Total Copper
- Total Lead
- Total Zinc

The *Section 319 (h) Nonpoint Source Pollution Control Program Watershed Project Final Report* for this project was completed in 2003 (Paragon 2003).

Oakview Drainage Improvement

The Oakview Drainage Improvement Project consisted of retro-fitting an existing stormwater pond that provided detention for 55 acres of commercial and multi-family residential development in the Shoal Creek Watershed. The previous detention pond was undersized and did not provide the desired level of flood control. The City undertook the task of re-designing the existing pond and downstream drainage network to the appropriate engineering standards. At the same time, the City saw an opportunity to incorporate a water quality enhancement component into the redesigned pond that ultimately resulted in a comprehensive design that addressed both water quality protection and flood control. The project was constructed in 2002. The Oakview Pond is just upstream of sample station HC1.

This Project was constructed using, in part, funds from a Clean Water Act Section 319 Grant. Water quality monitoring is no longer being conducted at the Oakview Pond.

TEA-21 Project

The TEA-21 project is a stormwater quality improvement study to assess stormwater quality in an urban highway corridor, engineer and emplace stormwater quality improvement technologies (best management practices), and re-assess stormwater quality after those technologies have been implemented into the study area. The project was jointly funded through the City Stormwater Utility, and a Georgia State Department of Transportation (DOT) grant. Three BMP devices, including the SMI- Storm Filter, the Baysaver 10k, and the PBM CrystalStream, were installed in a highly developed area of the Potato Creek Watershed along the State Route 16 corridor in Griffin. The *Final Report for TEA-21 Urban BMP Project* (Paragon 2004) details the maintenance needs, pollutant removal efficiencies, and cost effectiveness of each device.

Bacterial Source Tracking

Peter G. Hartel PhD., an associate professor at the University of Georgia, published a report on *Bacterial Source Tracking (BST) in the Potato Creek Watershed* (Hartel 2005). The study found that the Griffin reach was persistently contaminated with high numbers of *E. coli* bacteria during both base and stormflow conditions. The report concluded that human fecal contamination in the Griffin reach during baseflow conditions was unlikely, and the most likely source of fecal contamination was from pets and urban wildlife. The report also states that fecal contamination in the lower branches of Potato Creek is more than likely caused by dairy cattle and a set of dog kennels.

Sand Filter Grant

This project was funded by a Clean Water Act Section 319 grant. The objective of this project is to evaluate the effectiveness of the modified version of the Delaware Sand Filter to address non-point source pollutants present in stormwater runoff using various media readily available in the State of Georgia. The City has been an active participant in evaluating various BMPs to improve the water quality and biologic diversity of streams and rivers in Georgia.

The City will evaluate these modified Delaware Sand Filter systems for use in retrofit situations in urbanized areas by installing a portion of the filters using its own personnel and resources and installing the remaining systems by a contractor selected through competitive bid. This study is being conducted in a select area in the Potato Creek Watershed. Work on this project started on 2008, and the study will be complete in September 2011. The City will use the collected data to conduct a cost benefit analysis of the modified Delaware Sand Filters.

Sub-watershed Delineation

Paragon Consulting Group completed the final phase of a two year engineering project "Sub-watershed delineation" in 2009. This project has defined all the subwatersheds within the City and each subwatershed was reviewed for potential regional stormwater detention and stormwater pollutant mitigation. Numerous sites were identified for potential new stormwater detention facilities, stormwater detention pond retrofit/modification opportunities, and for the installation of proprietary BMP devices for stormwater quality improvements. The results of this study were used to help identify potential project locations for BMPs in the Cabin Creek, Shoal Creek, and Potato Creek Watershed Protection Plans.

8 Existing Conditions

The City's stormwater drainage system is separate from the sanitary sewer system. In cities where stormwater drainage pipes are connected to the sanitary sewer system, stormwater is treated at a wastewater treatment facility before it is discharged into a stream. These combined systems can exceed capacity after periods of heavy rain or snow melt, discharging untreated wastewater, including raw sewage, into the receiving water body. This is termed a combined sewer overflow (CSO) event. When the stormwater system is separate, such as in Griffin, wastewater is routed to a treatment plant while stormwater discharges into a stream without any treatment. Although such systems never have the problem of CSO events, the lack of stormwater treatment can introduce pollutants into the stream, including sediment from bare land, oil and metals from roadways, pet waste, fertilizers, and pesticides.

The City is a developed area with a high percentage of residential development. Most of the remaining land is commercial, industrial, institutional, or forest. A fair amount of agricultural and barren land exists outside of city limits, but within the wastewater service areas. The land uses in and around Griffin have a high percentage of impervious surface cover. The average percent of impervious area that is draining to monitoring stations from within each of the service areas is 23.19 percent for Cabin Creek, 17.25 percent for Shoal Creek, and 16.35 percent for Potato Creek. Impervious surfaces cause stormwater to enter streams very fast, as it is routed directly to waterbodies through storm drains and culverts, and has little opportunity to flow overland through vegetation or infiltrate into the ground. When large volumes of stormwater runoff enter a stream system in a short period of time, flow increases dramatically, velocity increases dramatically, and the stream channel is subject to much greater energy than if the watershed were undeveloped. This results in erosion of the stream banks, incision of the channel, and reduced connectivity with the floodplain. These changes in hydrology and channel morphology are prevalent in the City and are typical of urban watersheds.

Water quality and biological monitoring conducted by the City provide a record of conditions in the city's major watersheds over time. Recent monitoring data is summarized in the Cabin Creek Watershed Assessment (Tetra Tech 2009), the Shoal Creek Watershed Assessment (Tetra Tech 2009), and the Potato Creek Protection Plan (Tetra Tech 2010). Problems and management needs that are specific to each watershed are also detailed in these Management Plan documents. Fecal coliform bacteria are a problem throughout all watersheds. Peter G. Hartel PhD., an associate professor at the University of Georgia, published a report on *Bacterial Source Tracking (BST) in the Potato Creek Watershed*. This report is included as Appendix A of the 2005 Potato Creek Watershed Management Plan (Paragon 2005). The study found that, within Griffin, Potato Creek was persistently contaminated with high numbers of *E. coli* bacteria during both base and stormflow conditions. The report concluded that human fecal contamination in the Griffin reach during baseflow conditions was unlikely, and the most likely source of fecal contamination was from pets and urban wildlife. Nutrient concentrations are also a concern throughout all watersheds. Many monitoring stations have median nutrient concentrations that exceed the lower-bound benchmarks established in the Watershed Management Plans, and individual measurements that exceed the upper bound benchmarks. Other concerns, such as biological, sediment, dissolved oxygen, and hydrologic impairments, are specific to individual subwatersheds.

Some creeks within City limits are listed on the State's Integrated 305(b)/303(d) List as not supporting their designated uses. Potato Creek, from its headwaters to US Highway 333, is on the not supporting list for its designated use of Fishing for violating the criteria of Biota due to sedimentation. Cabin Creek, from its headwaters to the confluence with the Towaliga River, is on the not supporting list for its designated use of fishing. Three criteria were violated: Biota, Toxicity, and Fecal Coliform. Wasp Creek, from its headwaters to the confluence with Little Wasp Creek is listed for not supporting its designated use of fishing for violating the criteria of Biota. TMDLs that have been set for these pollutants are detailed in Section 6.2.

Current stormwater best management practices that have been implemented in the City include numerous stormwater detention ponds that serve individual developments, as well as the regional detention ponds, the TEA-21 BMP devices, and the sand filters discussed in Section 7. Additional non-structural BMPs are also being implemented throughout the city, and are detailed in the City's *MS4 Notice of Intent*.

The stormwater drainage infrastructure in Griffin is aging, and occasionally results in failed culverts and localized flooding. The Stormwater Division keeps track of maintenance requests and repair needs through the Cityworks program, and addresses these identified problems on a priority basis.

9 Protection Plans

Stormwater Protection Plans have been prepared for the Shoal Creek, Cabin Creek, and Potato Creek Watersheds.

9.1 Goals, Objectives, and Indicators

Watershed Goals, Objectives, and Indicators were developed for the Protection Plans based on the Stormwater Utility's existing program and existing conditions in the city's watersheds. The following four overarching goals were proposed:

1) Enhance water quality in the City and the region;
2) Meet or exceed state and federal water quality requirements, including removal of the City streams from the state's list of impaired waters;
3) Implement innovative, cost-effective solutions; and
4) Improve the overall quality of life for citizens in the City.

Tetra Tech recommends eight objectives in support of these goals (see Table 9-1). The individual Protection Plans have some watershed-specific details, but the main objectives are consistent for all watersheds. All eight objectives support multiple goals, and Table 9-1 shows these linkages.

Table 9-2 lists indicators in three categories—watershed impact, source, and programmatic. Watershed impact indicators are environmental measures such as benthic macroinvertebrate community, channel stability, and water quality. Source indicators are measures of potential stressors such as impervious area and deficient riparian area vegetation. Programmatic indicators refer to potential or actual management measures. As shown in Table 9-2, most of the indicators serve as measurable, meaningful surrogates for multiple protection objectives.

Finally, Table 9-3 describes each indicator as well as the proposed assessment tool for measurement. The assessment tools are comprehensive and include monitoring, stream surveys, watershed modeling, GIS analysis, stormwater utility records, CIP program records, and program tracking.

The goals, objectives, and indicators presented in this Plan essentially connect and enhance the tools already being used by the City in its comprehensive watershed management program. They also provide standardized means to assess watersheds and prioritize projects city-wide.

Table 9-1 Objectives Linked to Goals

Watershed Improvement Program Objectives		Goals			
		G1 Enhance Water Quality	G2 Meet Requirements	G3 Be Cost-Effective & Innovative	G4 Improve Quality of Life
A.	Minimize impacts of stormwater runoff and erosion on stream *hydrology* to promote stable stream morphology, protect habitat, and support biota.	■	■		■
B.	Minimize impacts to stream *water quality* from pollutants in stormwater runoff.	■			■
C.	Meet state and federal requirements such as Phase II stormwater, NPDES permit requirements, and TMDL requirements for impaired streams.	■	■		■
D.	Ensure BMPs are properly maintained and functioning.	■	■		■
E.	Minimize impacts of large woody debris to promote stable stream morphology, protect habitat, and support biota.	■			■
F.	Use low impact development (LID), green infrastructure, and innovative regional BMPs, to the extent practicable, to enhance water quality and quality of life in the community.	■		■	■
G.	Actively engage the community in adopting measures to protect and restore streams.	■	■	■	■
H.	Implement cost-effective City programs that provide leadership in watershed stewardship.	■		■	■

Table 9-2 Watershed Impact, Source, and Programmatic Indicators Linked to Objectives

Watershed Impact Indicators	Objectives							
	A	B	C	D	E	F	G	H
Benthic communities	■	■	■	■	■	■	■	■
Aquatic habitat	■	■	■	■	■	■	■	■
Fish communities	■	■	■	■	■	■	■	■
Channel morphology	■		■	■	■	■	■	■
Channel stability	■		■	■	■	■	■	■
Instream sediment	■		■	■	■	■	■	■
Hydrology (frequency, magnitude, and duration of flows)	■	■	■	■	■	■	■	■
Drainage complaints	■				■		■	■
Percent riparian area deficient of vegetation	■	■				■	■	■
Percent connected natural area	■	■				■	■	■
Water quality (modeling of future conditions): relative nutrient, upland sediment, and metals loading.		■	■					■
Water quality (observed/measured): instream total phosphorus (TP), total nitrogen (TN), total suspended solids (TSS), fecal coliform (FC), metals, dissolved oxygen (DO), turbidity		■	■					■

Table 9-2 cont'd Watershed Impact, Source, and Programmatic Indicators Linked to Objectives

SOURCE INDICATORS	OBJECTIVES							
	A	B	C	D	E	F	G	H
Impervious area	■	■	■	■		■	■	■
Stormwater outfalls	■	■						■
Property loss due to erosion	■	■	■	■	■	■	■	■
Percent of development with uncontrolled stormwater	■	■	■	■		■	■	■
Percent highways with uncontrolled stormwater	■	■	■			■		■
Sanitary sewer crossings and sewer spills		■						■
Deficient riparian area vegetation	■	■				■	■	■
TP, TN, TSS, metals loading (modeled)		■						

Table 9-2 cont'd Watershed Impact, Source, and Programmatic Indicators Linked to Objectives

Programmatic Indicators	Objectives							
	A	B	C	D	E	F	G	H
# Cisterns installed	■	■				■	■	■
# Disconnected downspouts		■				■	■	■
# Retrofits of existing flood control structures for water quality/hydrology	■	■		■		■	■	■
Length stream restoration	■	■					■	■
Acres buffer restoration using native vegetation	■	■				■	■	■
Percent development using LID and green infrastructure (since 2009)	■	■		■		■	■	■
# BMPs providing neighborhood or community amenity (e.g. open space, garden, water features)	■	■				■	■	■
# Regional BMPs constructed	■	■		■		■	■	■
Percent development with stormwater BMPs functioning as designed	■	■	■	■		■	■	■
Percent City projects with LID or green infrastructure	■	■				■		■
Percent City projects with stormwater BMPs functioning as designed	■	■		■				■
Mitigation cost-effectiveness ($/load reduced)								■
Leveraged funding sources								■

Table 9-3 Description of Watershed Impact, Source, and Programmatic Indicators

Watershed Impact Indicators	Description	Assessment Tool
Benthic communities	Georgia DNR Standard Operating Procedures for Macroinvertebrate Biological Assessment	Monitoring
Aquatic habitat	Georgia DNR Standard Operating Procedures for Macroinvertebrate Biological Assessment	Stream survey
Fish communities	Standard Operation Procedure for Conducting Biomonitoring on Fish Communities in Wadeable Streams in Georgia (GA DNR, 2005)	Monitoring
Channel morphology	Visual based physical habitat assessment per Georgia DNR Standard Operating Procedures for Macroinvertebrate Biological Assessment; other options include the Incised Channel Evolution Model (ICEM) that defines the stages of channel evolution following land development, urbanization, and restoration	Stream survey
Channel stability	Visual based physical habitat assessment per Georgia DNR Standard Operating Procedures for Macroinvertebrate Biological Assessment; other options include a comparison of specific stream power and velocity to critical threshold values relevant to channel stability	Stream survey Watershed model
Instream sediment	Visual based physical habitat assessment per Georgia DNR Standard Operating Procedures for Macroinvertebrate Biological Assessment.; other options include qualitative or quantitative estimate of sediment load generated by channel erosion (specify load if quantitative)	Qualitative assessment, literature review, or permanent cross section data
Hydrology (frequency, magnitude, and duration of flows)	A measure or index that uses storm event simulations to provide information on hydrologic alteration and potential impacts to stream morphology, habitat, and biota	Monitoring and storm event simulation
Drainage complaints	Records number of drainage complaints per square mile of developed area	Public works records
Percent riparian area deficient of vegetation	Percent of land within the riparian buffer lacking sufficient natural, vegetative cover. (If using the Multi-Resolution Land Characteristics Consortium [MRLC] Landscape Fire and Resource Management [LANDFIRE] 2001 data, <30 percent coverage within any vegetative layer could be used as an indicator of deficiency.)	Stream survey GIS analysis
Percent connected natural area	Percent of land within a subwatershed that supports natural areas with significant connectivity	GIS analysis
Water quality future conditions	Relative nutrient, metals, and upland sediment, loading	Watershed model
Water quality observed/measured	Instream TP, TN, TSS, FC, metals, DO, turbidity	Monitoring

Table 9-3 cont'd Description of Watershed Impact, Source, and Programmatic Indicators

Source Indicators	Description	Assessment Tool
Percent impervious area	Percent of land in subwatershed with impervious surface	GIS analysis of land use/land cover data
Stormwater outfalls	Number and location of stormwater outfalls per mile of stream	Stream surveys and GIS analysis
Property loss due to erosion	Widening of stream channels resulting in property loss	Stream surveys; aerial photographs
Percent of development with uncontrolled stormwater	Areas of development prior to stormwater control requirements	Stormwater utility records
Percent highways with uncontrolled stormwater	Highways built prior to stormwater control requirements	Stormwater utility records
Sanitary sewer crossings and sewer spills	Number of locations where sanitary sewers cross streams per mile of stream; number of sanitary sewer spills or overflows per square mile of subwatershed	Stream surveys; record of spill notices
Percent riparian area deficient of vegetation	Percent of land within the riparian buffer lacking sufficient natural, vegetative cover	Stream surveys and GIS model
TP, TN, TSS, metals loading (modeled)	Estimated and predicted loading of nutrient, upland sediment, metals, and fecal coliform bacteria	Watershed model

Table 9-3 cont'd Description of Watershed Impact, Source, and Programmatic Indicators

Programmatic Indicators	Description	Assessment Tool
# Cisterns installed	Self explanatory	Program tracking
# Disconnected downspouts	Self explanatory	Program tracking
# Retrofits of existing flood control structures for water quality/hydrology	Self explanatory	CIP program records
Length stream restoration	Self explanatory	Program tracking
Acres buffer restoration	Self explanatory	Program tracking
Percent development using LID and green infrastructure (since 2009)	Self explanatory	Land development records
# Regional BMPs constructed	Self explanatory	CIP program records
Percent development with stormwater BMPs functioning as designed	Self explanatory	Inspections records
Percent City projects with LID or green infrastructure	Self explanatory	Program tracking
# BMPs providing neighborhood or community amenity (e.g. open space, garden, water features)	Rain gardens, constructed wetlands, greenways, ponds, tree planters, or BMPs that provide amenities in neighborhoods, parks, streetscapes, city courtyards/plazas, etc.	Program tracking
Percent City projects with stormwater BMPs functioning as designed	Self explanatory	Inspection records
Mitigation cost-effectiveness	Cost per ton of TSS reduced, cost per pound of nutrients and metals reduced, cost per detention volume, etc.	Program tracking; cost analysis
Leveraged funding sources	Grants received, cost-share dollars from other agencies, and in-kind contributions	Program tracking

9.2 Benchmarks

Benchmarks have been developed for select indicators to assess status, help select among management options, and track progress in meeting objectives. To develop the benchmarks, Tetra Tech reviewed the State of Georgia water quality regulations for any relevant standards (State of Georgia, 2010). Benchmarks derived from Georgia numeric water quality criteria are presented and Table 9-4.

Table 9-4 Benchmarks Derived from Georgia Numeric Water Quality Criteria

Parameter	Benchmark[1]	Reference	Typical Nonpoint Sources
pH	Between 6.0 and 8.5	State of Georgia (2010) Standards	Decaying organic matter, groundwater
Dissolved Copper (µg/L)[2]	5 µg/L at 50 mg/L CaCO3 (acute criterion, hardness dependent) 7 µg/L at 50 mg/L CaCO3 (chronic criterion, hardness dependent)	State of Georgia (2010) Standards	Road runoff (brake pads, automotive flaking), parking areas in urban and industrial sites (from vehicular traffic), roofing and storage building materials, copper gutters
Dissolved Zinc (µg/L)	65 µg/L at 50 mg/L hardness (acute and chronic criterion hardness dependent)	State of Georgia (2010) Standards	Road runoff (brake pads, automotive flaking), parking areas in urban and industrial sites (from vehicular traffic), corrugated metal roofing and siding, native soils
Fecal Coliform (# /100 mL)	May – October: 200 # /100mL 30-day geomean November – April: 4000 # /100mL instantaneous; 1000 # /100mL 30-day geomean	State of Georgia (2010) Standards	Wildlife, birds, pets, cattle, malfunctioning septic systems, sewer system leaks and spills, illicit connections
DO (mg/L)	>4 mg/L instantaneous; >5 mg/L daily average	State of Georgia (2010) Standards	Affected by BOD load, groundwater and activity of algae, heterotrophic bacteria and fungi

[1]Note: Acute or instantaneous criteria are applicable benchmarks for both wet and dry weather conditions; chronic, average or geomean criteria are applicable benchmarks for dry weather sampling.

2The copper standard will need to be recalculated based on observed hardness and converted to total copper to compare to monitoring data.

Additional water quality benchmarks were developed specific to each watershed based on literature values for reference conditions within the Georgia piedmont in conjunction with dry weather monitoring data for the individual watersheds. These watershed-specific water quality benchmarks are presented in the individual Watershed Protection Plans.

Where information was available, Tetra Tech developed the following recommended benchmarks for indicators other than the water quality constituents. These benchmarks represent conditions at which the relevant goals and objectives may be met.

- Benthic Communities: Good or excellent rating.
- Aquatic Habitat – A score of 113 or higher (using the 2009 scoring methods), which indicates optimal or suboptimal habitat conditions.
- Impervious Area – Percent imperviousness of 25 or less considered a desirable condition. Above this value, severe degradation is expected to occur and indicators of stream quality consistently shift to a poor condition (CWP 2003). Most stream quality indicators begin to decline at 10 percent impervious, which could be used as a more conservative benchmark.

9.3 Watershed Protection Measures

The City is proactive in its implementation and maintenance of stormwater BMPs. The City's Stormwater Division prides itself on going above and beyond what is expected, continually developing innovative programs and pushing forward with numerous measures aimed at protecting the City's waters from pollutants, and educating its citizens about stormwater issues. The Stormwater Department posts Annual Reports on its website: http://www.cityofgriffin.com/Departments/PublicWorks/Stormwater/Education.aspx.

The City's BMP commitments are described in detail in the City's *MS4 Notice of Intent*, and summarized in Table 9-6, below. This includes an ambitious list of structural and non-structural measures that the City is using to maintain and improve stormwater infrastructure, and water quality in the City's streams.

As an education and outreach measure, the City hosts an annual Erosion & Sedimentation and Stormwater Quality Workshop every October. This has grown into a very large event that includes presentations, vendors, and BMP demonstrations. The workshop is attended by representatives from federal, state, and local government, as well as private firms. With over 200 participants in 2010, the Workshop has become a significant forum for the discussion of stormwater issues and the demonstration of structural BMP measures that are available for use in the region.

The City maintains records of pollutant reductions achieved through non-structural BMPs. Below are recent data on street sweeping and stream clean-up efforts:

- **Street sweeper data (June 2008 to October 2009):**

  The City removed an average of 66 tons of debris from 227 miles of streets per month for a yearly total of 792 tons removed from 2,725 miles of streets.

- **Steam clean-up data (2006 to 2011):**

  The data in Table 9-5 includes all efforts in the City.

Table 9-5 Stream Clean-up Data

Year	Pounds Removed		
	Garbage	Recyclable Metals	Tires
2006	800	Not measured	440
2007	2,800	820	400
2008	2,180	200	1,000
2009	3,000	460	1,000
2010	4,100	380	400
2011	7,480	220	1,100

In addition to the BMP commitments described in the MS4 NOI, the City has implemented additional BMPs related to sewage management, flood control, stormwater management, and public education and outreach. Table 9-6 summarizes the current watershed protection measures for Griffin's watersheds. Measures are organized by codes and regulations, MS4 permit NOI commitments, and additional BMPs.

Each Watershed Protection Plan recommends new protection measures specific to the watershed. The recommended measures include structural BMPs, stream restoration, and non-structural BMPs. Based on an analysis of watershed management needs, Tetra Tech located the highest priority sites for the implementation of stormwater detention facilities, proprietary BMP devices, and stream restoration projects. Site selection involved a desktop analysis and field assessments. BMP modeling and optimization was then conducted to identify the most cost effective set of best management practices for achieving a set of water quality targets. The Protection Plans include a schedule for implementing these new management measures so that the City continues working to meet watershed goals and objectives.

Table 9-6 Summary of Current Watershed Protection Measures

Best Management Practice (BMP)	Comments
CODES AND REGULATIONS	
City of Griffin Ordinances	
Stormwater management ordinance	Establishes a stormwater utility; requires developers to prepare a stormwater management plan and specifies stormwater management plan requirements; addresses post-development stormwater runoff quality and quantity impacts by requiring the use of BMPs
Development ordinance	Regulates new development
Tree preservation ordinance	Protects the existing urban forest by regulating and controlling the planting, conservation, and replacement of trees and shrubbery on public lands within the City
Soil erosion and sediment control ordinance	Regulates land-disturbing activities such as clearing, grading, excavating, or filling of land
Illicit discharges and connections ordinance	Regulates non-stormwater discharges to the municipal separate storm sewer system
Floods ordinance	Protects, maintains, and enhances public health, safety, environment, and general welfare; minimizes public and private losses due to flood conditions in flood hazard areas; protects the beneficial uses of floodplain areas for water quality protection, streambank and stream corridor protection, wetlands preservation and ecological and environmental protection
Litter ordinance	Provides for public health, safety, and general welfare through the regulation and control of litter
Spalding County ordinances	
Illicit discharge and connection ordinance	Regulates non-stormwater discharges to the county separate storm sewer system
Soil erosion and sedimentation control ordinance	Regulates land disturbing activities

Table 9-6 cont'd Summary of Current Watershed Protection Measures

Best Management Practice (BMP)	Comments
MS4 NOTICE OF INTENT (NOI) COMMITMENTS	
Public education and outreach on stormwater impacts	
1. Presentation of stormwater projects at commission meetings	Presented once a year
2A. Water Sourcebook Program	An ongoing WaterWise program
2B. Water education poster	Distributed annually to elementary schools
2C. Classroom education	Stormwater Division staff educates school and civic association children on stormwater, water quality, soil, erosion and sedimentation, and on fats, oils, and grease (FOG) issues
2D. Career day activities	Stormwater Division staff participate in at least one Career Day annually
3. Web site	Maintained regularly (www.cityofgriffin.com)
4. Flyers	Distributed in utility bills annually
5. Annual reports	Published on website and in local newspaper each year
6. Brochures and bookmarks	Distributed at public buildings, events, and festivals
7. Large display stand	Periodically updated with new material and moved to a new public location
8. Ecomasters CD	500 copies distributed annually to 3rd and 4th graders
9. BMP training site and annual training	The City of Griffin hosts an Erosion & Sedimentation Control and Stormwater Quality Workshop each October that includes speakers, vendors, and demonstrations
10. Annual stormwater workshop	A workshop is held each year on different stormwater issues. The workshop is open to the general public, commercial and industrial customers of the City.
Public participation and involvement	

Table 9-6 cont'd Summary of Current Watershed Protection Measures

Best Management Practice (BMP)	Comments
1. Curb marker program	500 markers are installed each year
2. Development of Watershed Advisory Council	Council meetings are held quarterly
3. Consumer satisfaction surveys	Mailed every other year.
4. Stream/lake clean-up event	City of Griffin Stormwater Division hosts an annual stream clean-up event
Illicit discharge detection and elimination	
1. Brochure mailings to restaurants and businesses	At least 100 brochures mailed each year
2. Citizen complaints/reporting of problems	Available through website and Environmental Hotline
3. Storm sewer outfall inspection	20% of City outfalls are inspected each year and the City attempts to identify and eliminate any free flowing illicit discharges.
4. Curb Marker Program	500 markers are installed each year
5. Inspection of road culvert pipes	Level 1&2 culverts inspected annually, level 3 semi-annually, and level 4 quarterly
6. SWPPP Site Inspections	Quarterly visual Inspections and annual site inspections at the five sites owned by the City
Construction site stormwater runoff control	
1. Enforcement of litter ordinance	During site inspections
2. Review of erosion control plans	Ongoing for development that disturbs over 1 acre of land
3. BMP Inspection at construction sites	Ongoing
4. Citizen complaints/reporting of problems	Available through website and Environmental Hotline
5. Pre-construction meetings	Prior to issuance of land disturbing permits for commercial projects
6. BMP training site and annual training	The City hosts an annual Erosion & Sedimentation Control and Stormwater Quality Workshop each October that includes multiple speakers, vendors, and demonstrations

Table 9-6 cont'd Summary of Current Watershed Protection Measures

Best Management Practice (BMP)	Comments
Post construction stormwater management in new development and redevelopment	
1. Inspection of ponds and stormwater facilities	Inspected annually, and deficiencies are corrected
2. Structural BMP evaluation	A structural BMP is evaluated annually
3. Loading Simulation Program C++ (LSPC) model distribution	Annual distribution to Planning Department.
Pollution prevention/good housekeeping for municipal operations	
1. Street Sweeping	The City sweeps a minimum of 700 miles of street every year
2. Vacuum and jet out storm drains	The City cleans a minimum of 2,500 storm drains and jets 10,000 feet of storm drain each year
3. Training program for city workers	Annual training for all Pubic Works departments
4. Review of flood control capital improvement projects	Every new project is evaluated for BMP opportunities
4A. Retrofit of existing structures	Review of one existing project each year
5. Use of City Pollution Prevention Plans	Quarterly visual Inspections and annual site inspections at the five sites owned by the City
6. Maintain a system of benchmarks	All 85 benchmarks are inspected and maintained annually; an inventory is maintained on the website
7. Paperless tracking of storm system operation and maintenance (O&M)	Storm system O&M activities are tracked using CityWorks
8. Tree inventory	Tree planting and removal is tracked through CityWorks
9. Basin assessment	One basin will be assessed each year for potential stormwater quality ponds

Table 9-6 cont'd Summary of Current Watershed Protection Measures

Best Management Practice (BMP)	Comments
ADDITIONAL BMPS	
Sewage management	
Sewage collection and treatment system	The City of Griffin maintains an extensive sewage collection and treatment system. The City has a preventative maintenance program for the collection system that includes the use of sewer jets and vacuum trucks and clearing of rights-of-way. Crews TV the lines on a regular basis to check for cracks or breaks. Responses to manhole overflows, broken sewer lines, and clogged lines include cleaning of the line and using hay and lime for absorption and odor control after a spill.
Flood control and stormwater management	
GIS mapping/inventory collection	The City of Griffin has compiled a GIS database inventory of all stormwater drainage structures/features (both natural and manmade attributes) within the City limits; this database continues to be updated/maintained
Stormwater Design Manual	The City Stormwater Design Manual addresses the need to control and minimize the impacts of urban development and stormwater runoff on the environment. It is available on the Stormwater Department website: http://www.cityofgriffin.com/Departments/PublicWorks/Stormwater.aspx
Floodplain mapping	The City of Griffin mapped the urbanized 100-Year floodplain within all its major streams. This floodplain has been incorporated as Zone A in FEMA FIRMs.
Impervious surface limitations	Impervious surface limitations have been incorporated into zoning regulations of the City's Municipal Code
Public education and outreach programs	
Road signage program	In 2000, the City posted signs at named tributary crossings identifying the name of the creek to promote public awareness and understanding of the need to protect the City's water resources
"Only Rain in the Drain" – illicit discharge video	Distributed at events and available on the Public Works and utilities website
Recycling program	The Solid Waste Division has a recycling program that includes curbside recycling pick up, and provides recycling containers to schools to encourage environmental stewardship

Table 9-6 cont'd Summary of Current Watershed Protection Measures

Best Management Practice (BMP)	Comments
Classroom education	Spalding County has established a learning trail and outdoor classroom. A Watershed Assistant has been provided for the Griffin/Spalding school system (funded jointly by the City, County, and UGA Extension Office). The Watershed Assistant presents watershed, water quality, water conservation and stormwater issues to the 4H Cloverleaf students, which includes all 5th grade students in the Griffin-Spalding County School System, private schools within the County, and home school groups. EnviroScape nonpoint source models are used by the City of Griffin to teach students how water can become polluted, as well as the effect their actions can have on water quality.

10 Asset Management

The City maintains a *Municipal Separate Storm Sewer System (MS4) Operations & Maintenance Standard Operating Procedure (SOP)* document that specifies responsibilities and procedures for inspecting and cleaning of the City's drainage conveyance system. The goal of this SOP is to ensure the drainage conveyance system is accurately mapped in ESRI GIS format, new stormwater facilities are entered into the existing GIS inventory and inspection and maintenance procedures are documented for stormwater facilities and anthropogenic and natural drainage systems.

Starting in 2003 the City had the entire storm sewer system located with field global position system equipment. All inlet structures (catch basins, drop inlets and hooded grates), outlet structures (headwalls and outfalls), stormwater structures (retention and detention ponds and proprietary BMPs) and stormwater conveyance (storm sewer pipeline and ditches) were mapped. As with any inventory study some structures are going to be missed. As existing structures are identified that are not currently in the GIS database, the structures are added. When the stormwater assets were identified and mapped in 2003, attempts were made to make connections from storm sewer inlets to outlets. In some cases it was not possible to identify the connectivity of the system and only pipe flow direction could be identified. The Stormwater Division will utilize Wastewater staff whenever necessary or when the schedule permits to video camera unknown pipe connectivity to reduce the amount of pipe direction in the GIS database. Another method for connecting inlet structures is to visit drinking water distribution main repairs. By starting at the inlet to the storm sewer, flow can be tracked by looking into or listening to adjacent stormwater structures until an outlet is identified. This information is passed along to GIS staff and the appropriate changes are made to the GIS database.

The City's GIS inventory is a key resource in managing and tracking stormwater infrastructure and maintenance needs. Details about stormwater infrastructure can be mapped along with other data, such as aerial photographs or the City floodplain map to identify problem areas or plan improvement projects. Figure 10-1 illustrates some of the features included in the GIS inventory.

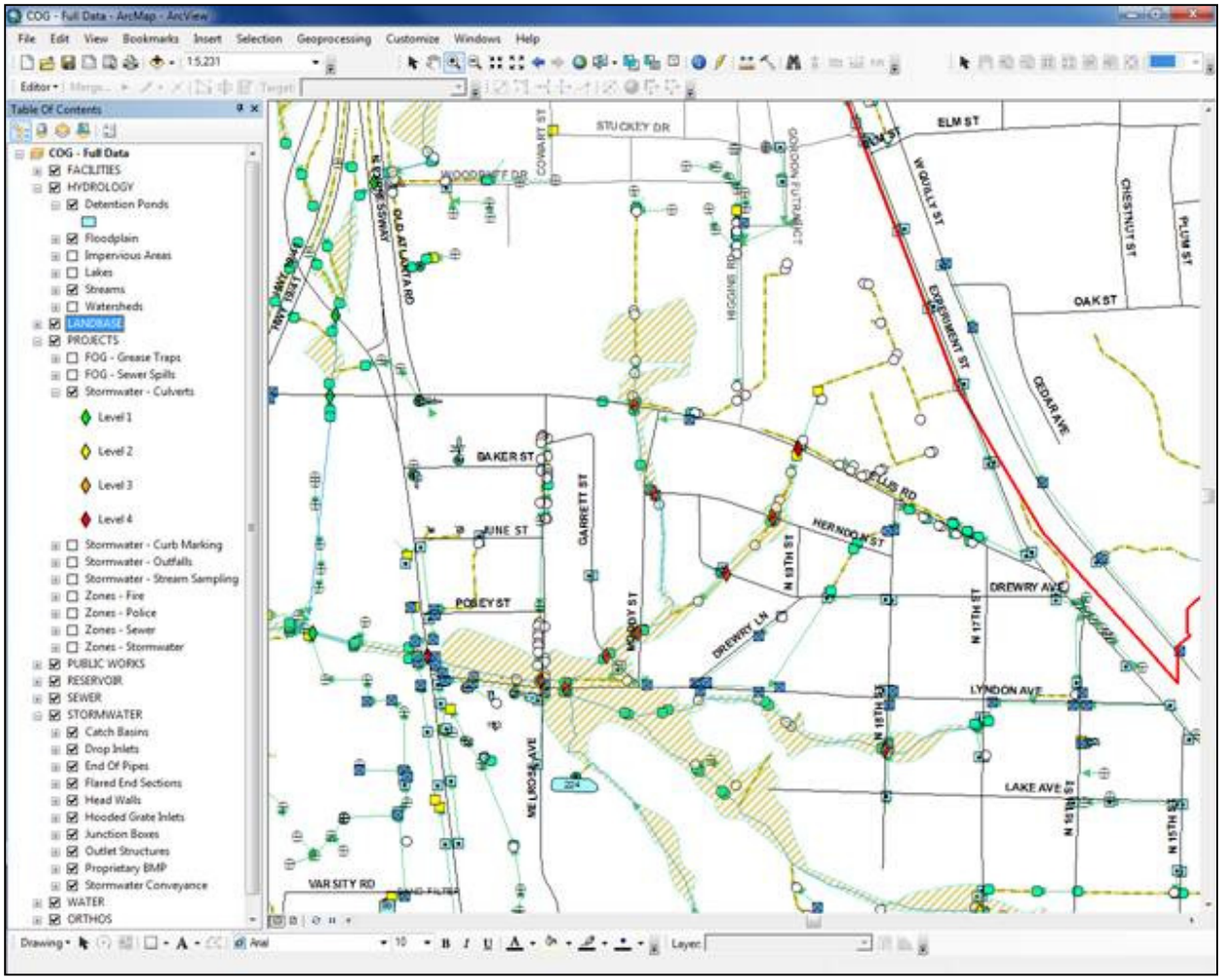

Figure 10-1 Example of Features in GIS Inventory

The *Stormwater Design Manual* specifies the design criteria for stormwater facilities. Depending on the facility that is being designed or analyzed, different design frequencies will be required. In addition to the design frequency, the operations of all major drainage facilities (i.e. culverts, bridges) shall be checked using the 100-year frequency storm to ensure that there are no unexpected flood hazards. Thus, the operation of major drainage structures shall be checked for their design frequency and the 100-year storm.

10.1 Operation and Maintenance Procedures

The City manages all stormwater related issues that are part of the MS4. This excludes industrial facilities which are permitted separately. The City's Extent of Service Policy, which defines the point in the storm system where the City assumes some level of responsibility, is detailed in the City's *Level of Service Model*.

Griffin's *MS4 Notice of Intent* includes culvert and outfall inspection commitments under the category of Illicit Discharge Detection and Elimination. The Stormwater Division will inspect 20% of the 342 (70 of the 342 outfalls) storm sewer system outfalls located within City limits per year looking for illicit discharges. Outfalls that have been monitored will be plotted in the City's GIS database to ensure that 100% of the outfalls are inspected over five years. The Division will inspect road culvert pipes using the

designated level of service (LOS) for frequency of inspection. A total of 106 culverts will be inspected by the following level of service: level 1 (15) and 2 (2) culverts annually, level 3 (17) culverts every 6 months and level 4 (72) culverts quarterly. Records on culverts that require maintenance and remediation will be kept.

The Stormwater Division also conducts quarterly visual inspections and annual site inspections at municipal sites with Storm Water Pollution Prevention Plans (SWPPP), including the wastewater treatment plants and industrial sites owned by the city.

The *MS4 Operations and Maintenance SOP* document specifies immediate as well as long-term inspection procedures:

A. **Immediate Inspections**
    1. Inlet structures are inspected and cleaned during rain events to minimize street flooding potential.
    2. After each major storm event that could adversely impact the drainage ditches and natural drainage ways.
    3. In response to citizen's complaints.
    4. Video camera inspection by Wastewater Division staff of lines that are not draining correctly during rain events to locate problems or for illicit discharge detection and elimination inspections.

B. **Long-term Inspections**
    1. Visual inspection of all public components of the surface drainage infrastructure on an annual basis including all drainage ditches and natural drainage ways.
    2. Annual inspections of all private stormwater retention and detention facilities.
    3. Annual inspections of publicly owned proprietary stormwater best management practices.

Citizen requests are taken in person at the Stormwater office, through the Environmental Hotline, at 770-229-6625, and through the Reporting Problems form on the City's website (www.cityofgriffin.com). The requests are then entered into the Cityworks work order program. Maintenance requests are handled on a priority basis, with problems that pose a risk to human health and safety (such as sinkholes) addressed before problems that pose minimal risk (such as driveway flooding). The priority process for defining "what gets done first" is detailed in the *Level of Service Model*.

10.2 Prioritization of CIP Projects

Capital improvements projects are necessary to improve stormwater conveyance or repair failed existing pipes. The results from hydrologic and hydraulic studies have been used as a tool to identify flooding problems at streams, culverts and bridges under the existing land use conditions in the City. The types of problems identified include structural flooding, non-structural flooding, areas that could potentially erode, undersized or deteriorated drainage infrastructure, and roadway overtopping by floodwaters. The results of the existing drainage system evaluation are used to develop stormwater management priorities. Capital improvement project locations are identified and prioritized based on the LOS for stream crossings in the watershed. Each vehicle crossing structure has been assigned a Service Rating or LOS based on the return period of the event the structure conveys. The service rating of 10-years means that the 10-year event does not overtop the roadway but the 25-year event does. If a road is overtopped by the 2-year flood event the service rating is 0-years.

After the LOS is determined for vehicle crossings the potential CIP sites are evaluated and prioritized based on their current service rating. The City will work through the CIP list starting with the LOS 0-year projects first as they have the potential to flood every year. Primary consideration for selecting CIP is the ability for emergency service access during floods.

A current list of CIP projects is presented in the *MS4 Operations and Maintenance SOP*. These projects can be dropped on the priority list if a more important project becomes apparent.

11 Capital Improvement Projects

The current list of capital improvement projects, as discussed in Section 10 and detailed in the MS4 *Operation and Maintenance SOP*, is limited to the repair and upgrade of stormwater drainage infrastructure. In order to address stormwater issues in a comprehensive manner, other potential project ideas have been developed for consideration in future planning efforts. Projects that are not approved or carried forward as capital improvement projects may be considered for implementation under other funding sources, such as 319 grants. Below is a brief description of projects that should be considered as funding becomes available.

- **Stream Walks / Geomorphic Assessment**- A Geomorphic Assessment of Shoal Creek was originally done in 2004 for the portion of Shoal Creek upstream of the Griffin Country Club Lake. It is time for the Shoal Creek Geomorphic Assessment to be redone. A geomorphic assessment should also be conducted on all remaining stream segments in the City that have not already been assessed, including Shoal Creek downstream of Griffin Country Club Lake, Heads Creek, and Wasp Creek. Conducting stream walks and characterizing the stability of stream banks helps identify areas of high erosion, areas with excessive sedimentation, and areas where infrastructure is at risk of being compromised (i.e. exposed sewer lines, bank erosion close to fences and parking lots). The identification of specific problem areas is the first step in addressing larger issues, such as getting streams delisted. It provides information about areas that are in need of spot repair, as well as information that is useful for locating new stormwater improvement projects such as detention ponds and stream restoration sites.
- **Preservation Area Study-** Identify riparian areas that are serving to protect stream health, but are in danger of degradation or development. It is much more cost effective to protect intact riparian areas than to restore areas that are degraded. Preservation areas can be an asset to the City, serving as multi-use areas that include passive recreation such as jogging or biking trails.
- **Storm Sampling-** Collect hourly storm data for nutrients and TSS at two or three sample locations. This information will provide the City a better understanding about the characteristics of different constituent loadings from the watershed. This information would also be used to improve the City's watershed hydrology and water quality model.
- **Kudzu control program-** Institute a kudzu control program involving mechanical and herbicide treatment of kudzu along streams. The program should also provide for vegetation enhancement in the areas where Kudzu is removed.
- **Bacterial Identification Study-** Conduct a bacterial identification study to identify sources of fecal coliform bacteria in Shoal and Cabin Creek watersheds. State Water Quality Criteria specify *"for the months of May through October, when water contact recreation activities are expected to occur, fecal coliform is not to exceed a geometric mean of 200 per 100 ml based on at least four samples collected from a given sampling site over a 30-day period at intervals not less than 24 hours. Should water quality and sanitary studies show fecal coliform levels from non-human sources exceed 200/100 ml (geometric mean) occasionally, then the allowable geometric mean fecal coliform shall not exceed 500 per 100 ml in free flowing freshwater streams"*. A formal study on the source of fecal coliform bacteria could allow Cabin Creek and Shoal Creek to meet water quality standards at geometric means up to 500 counts per 100ml from May through October.
- **Community programs**
    - Corporate challenge- Have corporations make financial and in-kind contributions related to invasive species removal, stream clean-ups, preservation, and restoration.

- Riparian Habitat Association- Get garden clubs, 4H groups, boy/girl scouts, high school clubs, or business groups to adopt a plot, work with City to plant a riparian habitat garden, and maintain the site on a regular basis.
- Watershed video- Produce a video (for school kids or community at large) that will make the information from the Watershed Assessments and Protection Plans available to the community in a clear, concise way. Show watershed maps; discuss urban stream syndrome and flashy hydrology; illustrate active in-stream and upland sediment sources; discuss water quality and biological monitoring; identify some of the species that live in the streams; discuss water quality concerns identified in the Watershed Assessments and Protection Plans; discuss ways that the City is protecting the watershed and list actions that individuals can do to help.
- LEED challenge- Create a challenge or incentive for the first LEED building in Griffin - particularly one that addresses stormwater quality and quantity.
- Demonstration projects- Construct demonstration projects at schools or City buildings that include bioswales, rain gardens, cisterns, or porous pavement. Install a floating wetland island in the Country Club Lake or City golf course lake.

- **Asset Management Plan-** Develop more comprehensive planning strategies for forecasting operation and maintenance needs related to drainage infrastructure, and preparing cost estimates for the next twenty years. Conduct a risk assessment to identify potential problem areas/potential points of failure. A template Asset Management Plan for local governments is provided in the Metropolitan North Georgia Water Planning District's Watershed Management Plan (MNGWPD 2009).
- **Stormwater Capital Cost Recovery Pan-** Develop a plan that would include either a cost per pound or cost per acre to buy-in to regional BMPs, detention, or mitigation facilities. This plan would utilize the City's watershed model and BMP optimization model.

12 The Path Forward

The City Stormwater Division will operate according to the principles and guidelines set forth in this Stormwater Master Plan. The Division will strive to fulfill the following obligations in accordance with Program Priorities identified in Section 2.1:

- Serve as a leader in the stormwater community and an example for other municipalities.
- Stay engaged and active in regional issues (i.e. Flint River Advisory Committee).
- Administer the stormwater programs and oversee/regulate stormwater matters in an appropriate and efficient manner.
- Maintain a well-functioning stormwater drainage system that minimizes risk to human health and safety.
- Obtain funding for continued operation, maintenance, and development of stormwater programs.
- Proactively develop new projects and programs as well as oversee and further develop existing projects.
- Comply with MS4 permit obligations.
- Comply with TMDLs for impaired waters.
- Educate citizens through school programs, community events, stream clean ups, mailers, annual reports, and the City's website.
- Assess the condition of the City's streams though water quality and biological monitoring as specified in the Long Term Monitoring Plan.
- Protect the City's watersheds through implementation of the Shoal Creek, Cabin Creek, and Potato Creek Protection Plans.

In support of the general objectives listed in Table 9-1, the Division will focus its efforts on the following priorities:

- Get streams delisted.
- Upgrade aging infrastructure- particularly aging and undersized drainage pipes.
- Mitigate flooding concerns.
- Continue maintenance of the MS4.
- Improve water quality/aquatic habitat.

13 References

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