# *Stormwater Management*
# FOUNDATION DOCUMENT

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# *Stormwater Management*

## 8-1 INTRODUCTION

The purpose of the Santa Rosa County Stormwater Management Element is to describe the existing stormwater systems and drainage problems and to set forth the basic policies to ensure that the County will be able to meet the existing and anticipated stormwater management needs. The analysis of the existing conditions and future needs serves as a basis for formulating suitable recommendations concerning the Stormwater Management needs in addition to formulating the Goals, Objectives, and Policies (GOP's).

### A. Organization of the Element

This element is divided into four main headings, the Introduction, Terms and Concepts, Existing Regulatory Framework, and Data and Analysis. The Terms and Concepts define the terms utilized throughout most of this document. The Existing Regulatory Framework describes the current federal, state, regional and county regulations. The Data and Analysis section identifies the current stormwater management conditions of the County. This section describes several factors that influence the stormwater management practices employed within the County. The Implementation subsection discusses funding sources and future actions to assist in the planning, design and implementation of actions required to meet the future Stormwater Management needs of Santa Rosa County.

### B. Relationship to Other Elements of the Comprehensive Plan

There are several key linkages between the Stormwater Management Sub-Element and other Elements of the Comprehensive Plan which include the following:

The *Future Land Use Element* is an overall blueprint for managing growth in the County, it defines the direction and intensity of future growth and development. The future land use types and intensities will have a direct impact on the Stormwater Management quantity and quality in different areas of the County.

The *Conservation/Coastal Management Elements* identifies all of the County's natural resources (i.e., geology, topography, minerals, soils, surface water quality and groundwater quality and quantity; floodplains, natural vegetative communities, wildlife habitats, fisheries, air quality, hazardous waste in addition; to coastal management issues beach and dune preservation, beach access, archaeological and historic sites, natural disaster planning, coastal high hazard areas and evacuation planning) and discusses various preservation techniques (i.e., preservation ordinances, conservation easements, financial incentives and land acquisition) as well as various land management techniques which will help to eliminate various land use conflicts.

The *Intergovernmental Coordination Element* provides opportunities to improve County collaboration and coordination with other agencies, such as, the Florida Department of Environmental Protection and the U.S. Environmental Protection Agency (EPA) to develop the best Stormwater Management tools to meet the needs of Santa Rosa County.

The *Capital Improvements Element* will reflect the County's strategy for delivery of infrastructure and other public services, and will serve a primary role in growth management and help shape future stormwater

management. In addition, the Capital Improvements Element will reflect the five-year budget plan for capital plan for capital outlay, which should support the Goals, Objectives, and Policies of this Element.

The *Infrastructure Element* consists of five sub-elements, which include Potable Water, Sanitary Sewer, Stormwater Management, Solid Waste and Natural Aquifer Groundwater Recharge. Together, these sub-elements will impact the development patterns within Santa Rosa County into the next planning horizon. This in turn will influence the Stormwater Management practices within this area.

## 8-2 TERMS AND CONCEPTS

*Best Management Practices (BMPs):* Practices used to achieve satisfactory water quality at a minimum cost. Structural BMPs emphasize preservation and/or simulation of natural drainage features to promote infiltration, filtration, and reduced peak discharges. Examples include: retention/detention ponds, infiltration trenches/basins and grassed swales. Examples of non-structural BMPs include: watershed management, facilities maintenance, land use planning and public education.

*Capacity Analysis:* A determination of a stormwater management facility's ability to provide a given level of service.

*Capital Improvement Plan:* A projected schedule of capital projects based on estimated costs and expected funding.

*Conveyance:* Transport of stormwater via pipe and/or open channel system(s).

*Design Capacity:* The amount of flow a storm sewer system is designed to manage, usually expressed in cubic feet per second for flow and cubic feet or acre feet for storage.

*Design Storm Event:* A measure of capacity for which drainage facilities are designed. The design storm event is calculated by the intensity, duration, and frequency of the storm.

*Flood Zones:* Areas that have been designated as "special flood hazard areas" have been delineated by the FEMA's National Flood Insurance (NFIP) as "A" zones or "V" zones on Flood Insurance Rate maps (FIRMs). Designated flood zones as defined by the FEMA are listed below:

Zone "A" Base flood elevations have not been determined.
Zone "AE" Base flood elevations determined.
Zone "AH" Base flood elevations determined; flood depths of 1 to 3 feet (usually areas of ponding).
Zone "AO" Average depths determined; flood depths of 1 to 3 feet.
Zone "D" Areas in which flood hazards are undetermined.
Zone "V" Coastal flood area with velocity hazard (wave action); no base flood elevations determined.
Zone "VE" Coastal flood area with velocity hazard (wave action); base flood elevations determined.
Zone "X" 1) Areas outside of 500 year flood;
Zone "C" 2) Areas of 500 year flood (outside 100 year flood); or
3) Areas of 100 year flood with average depths less than 1 foot, with drainage areas less than 1 square mile, or areas protected by levees from a 100-year flood.

*COBRA Zone:* Flood insurance not available for new or substantially improved structures after a specific deadline on designated coastal barrier islands.

*Flow Rate:* Area X Velocity = Quantity per unit of time, or discharge rate. AxV=Q is the formula for determining the capacity of drainage facilities. "A" represents the area of the cross section of the drainage

facility and is expressed in square feet. "V" represents the velocity speed and duration of the water and is expressed as a rate in feet per second (ft/s). The product "A" and "V" equals "Q" the quantity of water per unit of time. "Q" is expressed in cubic feet per second (cfs).

*Impervious Surface:* A substance or surface, such as roads, parking lots, buildings, which will not allow percolation of water or other liquids (impermeability) into the ground.

*Models:* Approximations of the hydraulics and hydrology or a drainage basin based upon mathematical derivations of quantifiable relationships between various factors. These factors usually include, but are not limited to, area, slope, drainage system characteristics, rainfall and land use.

*Outfall:* The location where stormwater flows out of a given system. The ultimate outfall of a system is usually a "receiving water".

*Percolation:* The ability of water to pass through a porous medium. In most cases, this medium is the underlying soil.

*One Hundred (100) Year Storm Event:* The eschewed probability of a storm capable of producing a specific amount of rainfall in a specific period of time which has a one (1) percent chance of being equaled or exceeded in a given year.

*Pre-development Conditions:* The conditions (relief, land cover, and the rate, volume and direction of stormwater runoff) which are present at a site prior to the commencement of land disturbing activities.

*Post-development Conditions:* The conditions (relief, land cover, and the rate, volume and direction of stormwater runoff) which are present at a site following the completion of land disturbing activities.

*Stormwater Treatment Facility:* A structural "best management practice" (BMP) designed to reduce pollutant loading on a receiving water by either reducing the volume of flow; biological uptake of pollutants, the limiting the loading of pollutants or by allowing pollutants to settle out of stormwater flow. Structural BMPs include but are not limited to detention basins, retention basins, open bottom inlets, undercut ditches, exfiltration trenches and swales.

*Swale:* A stabilized and/or grassed trench with side slopes less than three (3) feet horizontal to one (1) foot vertical. A properly functioning swale should convey stormwater runoff while providing some water quality treatment, and requiring minimal maintenance.

*Ten (10) Year Storm Event:* The eschewed probability of a storm capable of producing a specific amount of rainfall in a specific period of time which has a ten (10) percent chance of equaled or exceeded in a given year.

*Twenty-five (25) Year Storm Event:* The eschewed probability of a storm capable of producing a specific amount of rainfall in a specific period of time which has a four (4) percent chance of being equaled or exceeded in a given year.

### *Stormwater Management*

Stormwater management is a term used to describe all aspects used to control stormwater runoff in areas affected by development. Typical measures of management include storm sewers, culverts, swales, and retention and detention basins. Storm sewers and culverts help convey stormwater from one point to another. In addition, detention and retention basins reduce and eliminate the peak rate of flow respectively. These facilities, in turn, affect both the quantity and quality of stormwater runoff. Therefore, these facilities have become the central point of focus of stormwater management.

*Detention Facilities*

The primary task of detention facilities is to temporarily store water during a storm and to slowly release it so that the net effect is the reduction of the rate of flow of the runoff. This reduction is known as attenuation of the flow. In these facilities, water is stored in a pond or reservoir, which is typically an open cut in the ground or a series of underground pipes or chambers. An outlet structure or spillway employing an orifice, weir or a combination of flow controlling devices then accomplishes the slow release of water.

Water quality improvement of stormwater runoff is an important consideration in the selection of a detention basin design. However, to be effective, the basin must provide a permanent pool with sufficient storage time to allow for the physical, chemical and biological removal of pollutants. The Department of Environmental Protection has strict requirements for the design and implementation of these types of stormwater management facilities. This criteria will vary depending on individual site characteristics.

*Retention Facilities*

Similar to detention facilities, the primary task of retention-type stormwater management facilities is to capture the runoff during a storm event. However, retention facilities do not have an outlet structure. The runoff is simply routed into these basins, where the water will be stored. The runoff leaves this type of facility through either evaporation or percolation. Therefore, primary consideration must be given to the underlying soil type and depth to water table before it is determined that this type of facility is to be used. Although these facilities, if used correctly, can play an important role in providing areas of recharge to the underlying groundwater sources, if they are not used in the proper circumstances, they can cause more problems than benefits.

In cases where the underlying soil types have adequate permeability, retention ponds are a very effective method of improving the quality of the stormwater runoff entering the groundwater aquifer. Recent research indicates that most of the pollutants carried by stormwater runoff is contained in the first one inch or so. Diverting this first flush of runoff into a retention basin allows for their elimination. However, in a similar fashion to the practices that must be employed with detention-type systems, the gradual accumulation of these sediments and pollutants must be removed in order to maintain the performance of this type of basin.

Basins can, and in many cases do, employ detention and retention components. Runoff that is routed to these facilities will be retained until the retention volume is exceeded. At that point, excess runoff will be detained with the use of outflow structures as previously described.

## 8-3 EXISTING REGULATORY FRAMEWORK

### A. Federal

The three primary agencies responsible for regulation of stormwater management in the United States are the U.S. Environmental Protection Agency (EPA), the Federal Emergency Management Agency (FEMA) and the U.S. Army Corps of Engineers (USACE). EPA regulatory framework includes the implementation of the Clean Water Act of 1987 and Section 208 of the Federal Water Pollution Control Act.

*U.S. Environmental Protection Agency*

The Federal Water Pollution Control Act and The Clean Water Act of 1987 are the primary regulations governing stormwater management on the federal level. In relation to the Federal Water Pollution Control Act, the U.S. Environmental Protection Agency (EPA) has identified several pollutants carried in stormwater

runoff as a major source of water contamination. To achieve the goals set forth by this Act, the EPA has provided assistance to state and local agencies for the development of area wide Water Quality Management Plans, or "208" Plans. These plans are intended to study a broad range of potential water pollution sources, including stormwater, and focus on identifying pollutant and abatement needs as well as to develop regulatory programs to ensure implementation.

In relation to the regulation of stormwater discharge quality, the Clean Water Act, and its respective amendments in 1987 required EPA to develop a permit system for this area. The intent of this system was to reduce the pollutant loadings of the subsequent runoff for these areas. Under this Act, the National Pollutant Discharge Elimination System (NPDES) was implemented, requiring all facilities with conveyances in place to direct wastewater or stormwater to waters of the United States to submit an application for municipal separate storm sewer system (MS4) discharges.

In addition, under the Clean Water Act, EPA is responsible for issuing and reviewing all dredge and fill permits with the assistance of the U.S. Army Corps of Engineers (USACE), the Department of Environmental Protection (DEP) and the Northwest Florida Water Management District (SJRWMD). The pertinent regulations and the department responsible for the jurisdiction of these activities vary with the type and quantity of the dredge and fill activities performed. In 1995, a combination of the dredge and fill permit issued by DEP and the former Storage and Management of Surface Waters (MSSW) permit issued by the Water Management Districts were used to form what became known as Environmental Resource Permits (ERPs). This Program was initiated to ensure that any new type of development will not cause flooding by adversely affecting the natural flow and/or the storage of water while preventing stormwater pollution in nearby lakes and streams and to protect the wetland environments. The Northwest Florida Water Management District does not implement Florida's Environmental Resource Permit (ERP) program. Section 373.4145, Florida Statutes, exempts the District from the implementation of this program due to its limited financial resources. The Florida Department of Environmental Protection is responsible for all non-agricultural wetland related permits.

### *Federal Emergency Management Agency*

The Federal Emergency Management Agency (FEMA) is indirectly responsible for the regulation of stormwater management and flood protection in Santa Rosa County. These practices are carried out through the Agency's establishment of regulations for the National Flood Insurance Program (NFIP).

FEMA completed the Flood Insurance Study (FIS) for the unincorporated areas of Santa Rosa County (Community Number 120274), on November 1, 1985. Since that time, the FEMA maps for the southern portion of the County were revised in January 2000 to take into account changes caused by Hurricanes Erin and Opal in 1995. The study includes peak discharges, floodway, and base flood elevations for the applicable floodplain areas within the County. The study also includes elevations for the 10-year, 100-year, and 500-year return frequency floods. These elevations are used to carry out the floodplain management objectives of the NFIP that will be used to determine the appropriate flood insurance premium rates for buildings and their contents.

### *U.S. Army Corps of Engineers*

The primary responsibilities of the Corps of Engineers is to regulate the wetlands and regulate major dredge and fill activities within the United States. Under Section 9 of the Rivers and Harbors Act and Section 404 of the Clean Water Act, the USACE works in cooperation with the EPA in the regulation of activities within jurisdictional wetlands. Also, as previously discussed the Corps works in cooperation with the Environmental Protection Agency in the issuance of dredge and fill permits within Santa Rosa County.

## B. State

At the state level, there are two primary agencies responsible for Stormwater Management within Santa Rosa County. These agencies include the Florida Department of Environmental Protection (DEP) and the Florida Department of Transportation (FDOT).

### *Florida Department of Environmental Protection*

The Florida Department of Environmental Protection (DEP) is responsible for the implementation of appropriate rules for the design and construction of stormwater management facilities under Chapter 62-25, F.A.C. This section of regulation provides the Department with design standards and permitting requirements for new stormwater facilities within Santa Rosa County, as well as throughout the state of Florida.

In addition, DEP is responsible for the review and permitting of stormwater discharges into waters of the State under Chapter 62-3 of the F.A.C to ensure that state water quality standards are not compromised. Chapter 62-302.530 contains a table for the acceptable standards for the water quality permitted for stormwater discharges.

### *Florida Department of Transportation*

The Florida Department of Transportation (FDOT), under the authority of Chapter 353-02, F.S., owns and maintains several drainage facilities, which serve major arterial roads within Santa Rosa County. Many outfall ditches, canals and stormwater structures, for example, drain the I-10, U.S. Highway 90 and U.S. Highway 98 corridors. In addition, the FDOT permits connections to stormwater management facilities (SWMF) within FDOT right-of-ways.

## C. Regional

There are two agencies responsible for establishing the regional Stormwater Management policies within Santa Rosa County. However, only one of these regional agencies is responsible for regulating Stormwater Management criteria. These agencies include the Northwest Florida Water Management District (NWFWMD) and the West Florida Regional Planning Council (WFRPC).

### *Northwest Florida Water Management District*

The Northwest Florida Water Management District (NWFWMD) encompasses an area of approximately 11,305 square miles, which includes all of Santa Rosa County. Other duties of the NWFWMD include regulation of the management and storage of surface waters within the district boundary under the authority of Chapter 40C-42, F.A.C. In addition, the 1987 Surface Water Improvement Management (SWIM) Act directed the NWFWMD to develop a SWIM Plan for the Pensacola Bay System. The SWIM Plan for the Pensacola Bay System Watershed, which encompasses the area of Santa Rosa County, was developed in 1996. Within this Plan, four principal issues were addressed. These issues include:

- Water and sediment quality;
- Habitat quality;
- Administration, planning and coordination; and,
- Public education and awareness.

The SWIM Plan further addressed these issues by identifying respective goals, sub-programs, objectives, strategies and projects directing the organization of the watershed's surface water resource restoration and protection. Throughout this sub-element the SWIM Plan will be discussed further.

*West Florida Regional Planning Council*

Stormwater management regulation on the regional level also falls under the responsibility of the West Florida Regional Planning Council (WFRPC). The WFRPC encompasses approximately 6,026 square miles, which include seven counties and thirty-five incorporated municipalities. In 1996, the Council adopted the West Florida Strategic Regional Policy Plan (SRPP). Several key components of this Plan are applicable to the Stormwater Management Sub-Element, including the Emergency Preparedness and Natural Resources of Regional Significance Elements.

### D. Local

Article 4, General Provisions, of the County's Land Development Code sets minimum design and construction standards for public and private roadways and drainage as a condition prior to obtaining a building permit for construction projects within the unincorporated areas of Santa Rosa County. Article 12, Coastal Management /Conservation, of the County's Land Development Code specifies the requirements for compliance with the National Flood Insurance Act of 1968, as amended.

## 8-4 DATA AND ANALYSIS

The Pensacola Bay system (also, PBS or "system") includes five interconnected estuarine embayments, including Escambia Bay, Pensacola Bay, Blackwater Bay, East Bay, and Santa Rosa Sound, and three major river systems: the Escambia, Blackwater, and Yellow rivers. The system also includes smaller tributaries of these embayments and rivers, as well as its entire watershed. The watershed covers nearly 7,000 square miles, about one-third of which is in Florida. This includes the majority of Escambia, Santa Rosa and Okaloosa counties, the northwest quadrant of Walton County, and a substantial portion of southern Alabama. The entire system discharges into the Gulf of Mexico, primarily through a narrow pass at the mouth of Pensacola Bay. Map 8-1 in the Conservation Element illustrates the watershed as a whole.

Basin boundaries, or watershed basin divides, can be easily located in hilly areas, but not in flat areas. These features are more obscure and are easily altered by human and natural impacts. As a result, drainage divides are not distinct and are low enough to be inundated during floods. Similarly, artificial structures such as roads, levees and railroads are more likely to influence the natural drainage patterns.

There are no regional stormwater management facilities located in Santa Rosa County. Stormwater facilities are site specific and are approved through the County's Development Review Process to ensure compliance with County regulations.

### A. Stormwater Management

Climate, soils, geology, topography, vegetative cover and land use all have an effect on stormwater runoff and drainage. Land use impacts the natural hydrology in four interrelated, but separable ways as stated further below:

1. changes in peak flow,
2. changes in total runoff,

3. changes in water quality, and
4. changes in hydrologic amenities or the appearance of a river, stream or bay.

Land use urbanization has the most significant impact affecting the hydrology of an area. The majority of pollution problems arise from the associated land uses such as residential, commercial, industrial and agricultural.

In undeveloped areas, stormwater runoff is managed by nature through the hydrologic cycle. As rainfall accommodates on the ground or in standing water bodies, the water either returns to the atmosphere through evaporation or it can percolate into the ground to be assimilated by trees and vegetation, eventually to be returned to the atmosphere by transpiration. Percolation water that is not used by vegetation is percolated deep into soils increasing groundwater supply. In the presence of saturated ground conditions the remainder of rainfall collects into rivulets, increasing the speed and quantity as it flows to the receiving body of water. Then the cycle begins again through evaporation.

Nature's inability to accommodate severe rainfalls without damage is apparent even in undeveloped areas. Nature's stormwater management designs are constantly changing. Streams change course and meander, banks erode, and lakes lose volume as they are filled with sediment.

Historically, urbanization has resulted in new or highly modified drainage systems which dealt with only the quantitative effects of runoff. Today, stormwater management is more comprehensive. An effective program involves the development of methods to control water while providing surface drainage, flood control, a reduction in erosion and sedimentation and a reduction in pollutants. Stormwater management applies to both rural and urban areas.

To accomplish an effective stormwater management system, it is necessary to ensure that volume, rate, timing and pollutant load runoff is similar to what occurred before development. The approach used in this comprehensive plan is to minimize the adverse impacts through a coordinated system of source controls. Source controls emphasize the prevention and reduction of non-point source pollution and excess stormwater flow before it reaches a collection system or receiving water.

### *Stormwater Management Studies*

Since the Stormwater Management Element was adopted, the Federal Emergency Management Agency (FEMA) revised the FIRM floodplain maps for the southern portion of the County in January 2000 to take into account changes caused by Hurricanes Erin and Opal in 1995.

## A.1 Stormwater Management Problems

Stormwater management practices within Santa Rosa County must deal with two problems. The first problem is drainage and flooding. The second problem is the water quality of the stormwater runoff. Recent studies conducted nationwide have indicated that environmental impacts are caused by pollutants carried in stormwater. These pollutants include bacteria, fertilizers, heavy metals, and pesticides as indicated in previous sections of this sub-element. Stormwater management must provide provisions to settle or filter out these pollutants in order to preserve the quality of the groundwater and surface water into which the stormwater is to be discharged. Chapter 62-25, F.A.C., provides the guidelines that are relevant to stormwater management facilities and the practices that are to be employed to help ensure adequate treatment and protection to protect the citizens within the County.

### A.1(a) Flooding Problems

The major sources of flooding within Santa Rosa County are storm surge generated by a tropical storm or hurricane and riverine flooding. Storm surge can be expected along the Gulf of Mexico, Santa Rosa Sound, Escambia Bay, East Bay and Blackwater Bay. The wave action associated with the storm surge can be more damaging than the actual high water. The second major source of flooding is riverine flooding where heavy rainfall occurs on many water courses including the Escambia River, Blackwater River, Yellow River, East River, Pond Creek, Big Juniper Creek, Sweetwater Creek, Big Coldwater Creek and East Fork. Not all storms passing close to the County produce high storm surge or flooding conditions. Similarly, storms that produce flooding in one area of the County may not necessarily flood another part of the County. Presently, the County's drainage problems fall into six categories:

1. traffic hazards from standing water,
2. damaging sheet flow of rural roads,
3. potential flooding from hurricanes,
4. long term water quality problems due to runoff,
5. resource destruction from over drainage (during dry periods), and
6. drainage affected by existing County, State and Federal systems.

Although drainage problems exist throughout the County, flooding is most evident along coastal areas and in and around the Floridatown area where a heavy rainfall can slow traffic and close streets. These areas were developed prior to modern Stormwater Management standards.

### A.1(b) Water Quality

Different types of land use affect the water quality in an area. For example, in an undeveloped area, many biological, physical and chemical processes interact to recycle most of the materials that are found in stormwater runoff. As land use in these areas intensifies, this process is disrupted. Increased activities add materials to the land surface such as fertilizers, pesticides, oils, grease, heavy metals and animal wastes, which are then washed off by the rainfall and runoff. In turn, this runoff then increases the pollutant loading which is carried to a nearby surface water body. A list of the ranges of characteristics of different types of pollution sources are indicated in *Table 8-1*, on the following page. It can be seen that the levels of some of these pollution sources have the potential to threaten the nearby water quality when they reach their maximum level.

Surface water bodies are classified by the Florida Department of Environmental Protection (DEP) based upon the intended uses of these bodies. Escambia Bay, East Bay, Blackwater Bay, and Santa Rosa Sound are classified as Class II waters. Class II waters are suitable for shellfish harvesting. The Escambia River, the Yellow River, the Blackwater River, Big Coldwater Creek and East Fork are classified as Class III waters suitable for recreation and fish and wildlife maintenance and propagation.

Maintaining and improving water quality in Class II waters, Outstanding Florida Waters (OFW) and estuaries is an issue facing Santa Rosa County. The Yellow River Marsh is an Aquatic Preserve that has OFW classification. In addition, waters inside the Blackwater River, the Blackwater River State Park and Santa Rosa Sound through the Gulf Islands National Seashore are also designated as Outstanding Florida Waters.

Table 8-1
Characteristics of Different Pollution Sources

| *Parameter (1)* | *Urban Stormwater* | *Rural Stormwater* | *Untreated Wastewater* | *Secondary Treated Wastewater* |
|---|---|---|---|---|
| $BOD_5$ | 1-400 | 1-200 | 100-350 | 10-30 |
| SS | 2-7340 | 3-726 | 100-350 | 10-30 |
| TN | 1-49 | 3.7-15.5 | 35-100 | 15-35 |
| TP | 0.1-16.0 | .5-12.5 | 10-50 | 3-10 |
| OP | 0.1-10.0 | 0.1-10.0 | 6-35 | 0.5-10.0 |
| TOC | 3-384 | 1-100 | 100-300 | 10-120 |
| COD | 5-3100 | 2-150 | 250-1000 | 25-150 |
| LEAD | 0.1-10.0 | 0.01-2.0 | 0.05-1.27 | 0.0005-0.20 |
| ZINC | 0.1-4.6 | 0.01-1.5 | 0.03-8.31 | 0.047-0.02 |
| CADMIUM | 0-0.10 | 0-0.05 | 0.004-0.14 | 0.0002-0.02 |
| OILS/GREASE | 0-110 | 0-50 | 50-100 | 5-15 |
| FECAL COLIFORM | $55\text{-}112 \times 10^6$ | $55\text{-}112 \times 10^6$ | $10^7\text{-}10^9$ | 200 |
| TOTAL COLIFORM | $200\text{-}146 \times 10^6$ | $200\text{-}146 \times 10^6$ | $10^9\text{-}10^{11}$ | 1000 |

(1) All parameters expressed in Mg/L, except coliform, which are expressed as the number of organisms/100m.

Source: The Florida Development Manual: A Guide to Sound Land and Water Management (Department of Environmental Protection, 1988).

The DEP undertakes water quality assessments of water bodies in response to Section 305 (b) of the Federal Clean Water Act. There are eight DEP water quality monitoring sites within Santa Rosa County monitored on a weekly basis along with fourteen water quality monitoring sites monitored quarterly by the Bream Fisherman Association.

The water quality of the estuarine portion of the Pensacola Bay system has been the subject over the years of a number of studies and monitoring efforts. Some were required by point source permits, some were initiated because of a recognition that out-of-state pollution sources may impact Florida waters, and some were initiated as academic research and routine state and federal monitoring efforts. Reidenauer and Shambaugh (1986) described a problem associated with using the results of multiple, unrelated assessments: "The interpretation and compilation of available water quality data was hampered in many instances by difficulties encountered with different sampling techniques and analyses used by various investigators in addition to unrecorded physical conditions at the time of sampling and sampling stations not in the same location in many cases, contributing to additional variability in the results."

Characterizing water quality within the riverine component of the system is also difficult, not primarily due to multiple, inconsistent methods, but rather due to a general lack of information. Few complete assessments have been completed, particularly for the Yellow River system.

While some areas of the system remain relatively pristine (perhaps portions of the Blackwater and Yellow river systems), others (Escambia Bay) exhibit consistently degraded water quality as a result of nonpoint and point source discharges, and others (Bayou Chico in Escambia County) have been degraded to such an extent for such a long period of time that they are in need of significant

restoration. Other waterbodies, such as East Bay and Santa Rosa Sound appear vulnerable to increased degradation due to increasing development and non-point source pollution.

## B. Stormwater Management Analysis and Needs

As previously stated, several geographic properties play a significant role in stormwater management. These properties include climate, soil type, geology, topography, vegetative cover and land use. The most significant property is land use, as urbanized areas contribute the most runoff. As the land use of an area changes, aspects such as the peak flow, total runoff, water quality and hydrologic amenities, as well as the appearance of a receiving water body are also affected.

Pollution problems exist in the Pensacola Bay System; however, only a few of these problems have been investigated by the Department of Environmental Protection (DEP). The passing of the SWIM Act prompted more investigative activities to occur over the last planning timeframe. Many water quality and quantity issues still remain to be addressed. The majority of these problems arise from the associated land use in the watershed. Residential, commercial, industrial and agricultural land uses all pose problems to water quality.

As an area becomes urbanized, the peak flow and the rate of runoff increases and runoff is concentrated in peak flows that are shorter duration and higher flow rates than those produced under natural conditions. These effects are caused by a reduction in infiltration, evaporation, transpiration and depressional storage; an increase in impervious surface; and a modification of surface drainage, including the development of artificial drainage facilities.

The volume of stormwater runoff is governed primarily by infiltration characteristics and is related to the land uses, soil types, topography and vegetative cover. Runoff is therefore, related to the percentage of the area covered by roofs, streets and other impervious surfaces. Water intercepted by vegetation, evaporated, and transpired, is lost from runoff. Water infiltrated into the soil and groundwater is delivered as delayed flow to the receiving water body and does not directly contribute to peak stormwater runoff. Impervious surfaces normally convert almost all of the total rainfall immediately to the stormwater runoff.

All forms of land use affect water quality. In an undeveloped area many ongoing physical, chemical and biological processes interact to recycle most of the materials in runoff. As the land use intensifies, these processes are disrupted. Pesticides, fertilizers, animal wastes, oil, grease and heavy metals are pollutants that can be present in runoff. When these pollutants are washed into receiving water bodies, the pollutant load of the water is increased. The amenity value of the surface water environment is primarily affected by three factors:

- The stability of the stream channel;
- The accumulation of trash; and
- The disruption of the stream channel.

A channel that is gradually enlarged because of flooding caused by urbanization tends to have unstable, unvegetated banks, muddy channel beds and high content of sediment and debris. These problems, combined with an unnatural balance of the waters' biota resulting from the addition of nutrients, organics and sediments, can reduce the attractiveness of the water. Additional nutrients stimulate algae and plant growth, increase turbidity and lower oxygen content. When this occurs, desirable fish, game and plant species can be replaced with undesireable species. Progression toward a more intensive land use tends to disrupt and degrade the ongoing natural process that protects and preserves the water quality. As development occurs, efforts should be made to manage water resources.

### Cultural Influence

Principal areas of floodplain encroachment have occurred along the Gulf of Mexico, Santa Rosa Sound, the Escambia River, and the Blackwater River and their associated tributaries. Encroachment has taken the form of urban development in and adjacent to floodplains. Substantial residential and commercial development has also occurred in Coastal High Hazard Areas. Previous floodplain encroachment has caused increased public expenditures to protect or repair property, and for additional stormwater and flood protection systems. In some cases, encroachment into the floodplain has led to water quality problems.

## C. Implementation

County-wide stormwater management, although imperative, is quite costly. Capital improvements, operating and maintenance, renewal and replacement of existing structures, water quality monitoring and administrative services are only a few examples of the many stormwater management issues that face Santa Rosa County every year.

### C.1 Funding Sources

In this section the funding sources that are available to financially support these activities will be discussed. These funding sources include federal grants, state grants, and state and local tax assessments, as well as additional federal bond and grant programs, that can be used as stand-alone monetary sources or can be used together to help provide the monetary support needed for some of the larger projects. A summary of these funding sources, which are described in detail in the following paragraphs, along with the stormwater management functions that can be addressed by each alternative, is included in *Table 8-2*.

Table 8-2
Summary of Alternative Funding Methods For
Stormwater Management Activities

| *Funding Alternative* | *Stormwater Management Administration and Design* | *Capital Improvements Program* | *Operation and Maintenance* | *Water Quality Monitoring* |
|---|---|---|---|---|
| General Fund | X | X | X | X |
| Special Taxing District | | X | X | |
| Gas Taxes | X | X | | |
| Homeowners Association | | X | X | X |
| Stormwater Utility | X | X | X | X |
| Fees/Permits | X | | | |
| Penalties/Fines | X | X | | X |
| Bonds | | X | X | |
| Pay-as-you-go Sinking Fund | | X | | X |
| Subdivision Exactions | | X | | |
| Fee-in-lieu-of | | X | | |
| Availability Charge | | X | | |
| Developer Incentives | | X | | |
| Betterment Charge | | X | | |

*General Funds*

Stormwater management funds are traditionally provided from the General Fund. This source can best be considered as a bank retaining revenues which will fund county stormwater programs in the future. The source of funds for this alternative includes ad-valorem income, as well as other taxes. Other income which can be placed into the General Fund includes revenue sharing income and county-wide ad-valorem taxes (for activities completed for the citizens of the county). This revenue source can provide funding for administration, renewal/replacement, construction, maintenance, and water quality monitoring.

The principal advantage associated with utilizing the General Fund is that the accounting process is understood. The major disadvantage with using the General Fund is that many governmental services, except the utilities, are funded by the general fund. For this reason, competition for the funds is intense and historically, stormwater management programs have had a low priority. From a point of equitability, ad-valorem taxes are based on property values which are not always related to the property's impact on stormwater. For these reasons, many governmental entities are looking for another source of funding for stormwater.

*Special Taxing Districts*

Areas that are designated as "special", for whatever reason, can pay an additional tax or have an increased assessment, for future area improvements related to stormwater. If a particular stormwater management facility is constructed or designed to benefit a particular sub-basin within the County, this alternative funding mechanism could be an option. The area benefiting from the project would be designated a special taxing district. In this district, an additional tax levy would be assigned to the properties benefiting from the project to pay for the necessary improvements and maintenance activities.

Capital improvement projects, Operation/Maintenance (O&M) activities, and water quality monitoring generally benefit the most from this alternative. The advantage of this funding source is the funding for facilities or O & M is generated and used in the area where the money is collected. The amount of money collected in the area is based upon assessment of property values, lot front-footage, or lot size, and is limited to the specific area and project value.

*Gas Taxes*

These funds may be implemented for capital projects related to roads and can be used to fund road repair or construction. Santa Rosa County is responsible for a number of county-maintained roadways. As some stormwater management improvements can be integrated into road improvements or maintenance projects, the stormwater facilities can be indirectly funded or subsidized by the expenditure of gas tax funds. These funds, however, are generally intended to be limited to the capital improvement appropriations, project administration, design and construction. These funds should not be used to fund annual operation and maintenance activities (i.e. water quality monitoring programs).

*Homeowners Association*

Homeowners association revenue is similar to the revenue generated in a special assessment district in that it is an additional assessment for capital improvements and maintenance. A homeowners association fee is a reasonable alternative in cases where special districts cannot be established, or where the maintenance of a stormwater facility is managed privately. This type of assessment is generally applicable only for residential parcels and generally cannot include commercial property. Assessments are specific depending on the needs and desires of each association. Naturally, the level of service and the amount of the assessment varies depending on how much an association wants to spend on drainage. This results in

an inconsistency of protection and inequity of assessment. Capital improvements, operation/maintenance, and water quality monitoring for the residential development can be funded by this method.

*Stormwater Utility*

Utilizing revenues from a user charge system to fund stormwater management programs has been successful in Florida. The concept was developed in the western U.S. and has been used for a number of years. The first city in Florida to implement such a program was Tallahassee in October, 1986. Since this time, a number of other cities and counties have adopted ordinances to implement a stormwater utility.

A stormwater utility includes a fee structure whereby the customer pays a fee consistent with the contribution to the need for the stormwater service. Stormwater utilities in Florida use impervious area to measure each customers contribution: the greater the impervious area, the greater the fee. The merits of the stormwater utility are that there is a direct connection between the fee and the need for service, and the fee provides a long-term, dedicated funding source.

The stormwater utility can be used to fund administration, operation and maintenance, renewal/replacement, capital improvements, and water quality monitoring. The income can also be used to pay the debt service for a stormwater capital improvement program, thereby leveraging the utility's annual revenue into a major program. Advantages of the program include:

- A stable funding source for all stormwater activities.
- Dedicated funding for the County's stormwater management program, (i.e., operation/maintenance, planning/design;
- The potential to associate the stormwater utility fee with the other utilities administered by the county; and
- A fee schedule based on contribution rather than property valuation (i.e., user fee);

*Fees/Permits*

Funding from this source is generally limited to inspection of construction and the cost of permit review. Permit fees are reasonable when associated with other funds since the amount of income is generally small. The permit fees should be sufficient to cover the costs of the services provided.

*Penalty/Fines*

Similar to permit fees, penalties and fines are limited in scope. Such income, if generated, should be used to correct the violation or subsequent ones. This type of income can be associated with the other types of stormwater funding including the stormwater utility.

*Bonds*

Bonds used by governmental agencies, which include general obligation, revenue, or special assessment bonds, are normally used to cover the costs of large capital improvement programs. In turn, the operation and maintenance cost of the resulting facilities can be capitalized and included in the bond request. These bonds are normally repaid through the general fund (i.e. ad-valorem tax income). However, special assessment district income, as well as stormwater utility revenues, can also be used to pay the debt service.

The principal advantage associated with selling bonds is that a large-scale capital improvement program can be initiated when the facilities are needed rather than waiting until the funds are accumulated. The disadvantage is the long-term debt incurred by the entity.

*Pay-As-You-Go Sinking Fund*

As an alternative to revenue bond financing, this type of stormwater funding is most common. Essentially, a fund is formed similar to a separate account. The fund receives revenues from numerous sources such as ad-valorem taxes or stormwater utility income. The fund accumulates revenues until sufficient money is available for an identified project whereupon the total project amount is removed from the fund and the growth stage starts over. No money is borrowed so it is "pay-as-you-go"; and since it periodically is depleted, it is referred to as a sinking fund.

This method is generally used for capital improvement programs and is normally used with other revenue systems, such as the stormwater utility. The major advantage is that no long-term debt service is created. On the other hand, capital projects must wait until the fund is of a sufficient amount to pay for the entire project.

*Subdivision Exactions*

A local government can require the developer of a subdivision, or large parcel, to dedicate the stormwater management facilities to the County upon completion. In addition, developers could be required to donate drainage easements or other types of partial rights to the County for stormwater management purposes. In turn, the local government (County) would assume responsibility of the operation and maintenance of the facilities. Thus, the developer would be responsible for funding the construction of such facilities while the local government would be responsible for funding the operation and maintenance practices. The advantage of this type of program is the transfer of the capital burden away from the government. The disadvantages are that it is entirely possible that the Stormwater facility, once obtained, has not been properly maintained or the system may not provide adequate drainage for the subdivision. In addition, the County may later find out that the discharge may cause downstream flooding. Provisions for this type of developer contributions should not be considered until the County has a dedicated and stable source of revenue to appropriately fund operation and maintenance functions; and the County has in place a set of design standards and criteria, and a comprehensive design review and construction inspection process. The consequences of inheriting inadequate or poorly constructed and maintained facilities are significant.

*Fee-in-Lieu-Of*

As an alternative to requiring developers to construct stormwater management facilities, the County may require them to pay a front-end charge for the capital improvements needed to service their development. This fee would be figured by the contribution that the proposed development would have on the nearby watershed. The term is derived from the case in which a developer is required to construct infrastructure including stormwater systems. Since small-scale systems are not always advisable, particularly because of the problems associated with the acceptance of the operation and maintenance costs, the better choice is a fee paid to the County to construct a larger system. The fee would be representative of the developer's share of the regional facility.

There are two general areas where a fee-in-lieu-of is appropriate. First, a fee-in-lieu-of is appropriate where there is a large marginal cost of constructing additional facilities. For example, a developer may be charged the cost related to the average cost of pumping an additional unit of water rather than pay for a whole new water system. Likewise, a developer may pay for a portion of the construction of a large regional detention facility in-lieu-of-the construction of a detention facility for an individual development. In the same manner, if the addition of a development to the stormwater infrastructure causes a large increment of cost, then the developer should pay an alternative fee to support a larger (regional) facility.

The second area is when the introduction of a sizable development precipitates the need for a new type of stormwater management system. For example, the stormwater problem may be adequately controlled within a watershed with the use of drainage ditches and swales. With the introduction of a new development, a detention (or retention) facility may be required. In this case, the developer should pay a fee-in-lieu-of for the construction of the facility.

The major advantage of the fee-in-lieu is that regional systems are promoted rather than the small-scale individual systems. The larger stormwater facility is easier to maintain and can address large-scale problems. The disadvantage is that the developer must wait until sufficient funding is available for the regional system and until the County can construct the system. In developed portions of the County, there would be fewer new developments to contribute to the construction of larger regional facilities. Nevertheless, the fee-in-lieu-of process can reasonably be associated with a stormwater utility in the undeveloped portions of the County for augmenting capital improvement funds.

*Availability Charge*

An availability charge is assessed to a developer of a parcel or a resident to recover the cost of the previously constructed regional facilities. In the case where a structure had been designed for an ultimate capacity scenario, it is appropriate to charge new residents for their respective contribution to this capacity. The original cost of the structure can be paid either by bond, pay-as-you-go sinking fund, or stormwater utility. In theory, the revenue generated by an availability charge should be returned to the long-time residents who have been supporting the debt service utility cost. This can be accomplished by allocating receipts to the operating funds to potentially decrease rates. The receipts could also be allocated to a sinking fund for future capital needs in the area. The availability charge concept is similar to impact fees collected to repay the cost of provided capacity in regional systems.

*Developer Incentives*

Through applicable zoning ordinances, incentives may be offered to induce developers to use proper stormwater management planning techniques. Such incentives, for example, could allow higher density development to occur if land is dedicated to the County for stormwater management purposes. This method would still require the construction of the stormwater facility by the County. However, the land costs for the stormwater management facility would be reduced. Two disadvantages of this alternative include: 1) it is in direct conflict with the goals and objectives of zoning regulations; and 2) it increases the problem of non-point source pollution from the higher level of development.

*Betterment Charges*

This alternative involves the construction of a stormwater management facility to resolve a problem in a nearby community. In turn, the property within this community will increase in value. For example, if a drainage system is installed along a street where no stormwater management system had previously existed, then the control of flooding has increased the value of property next to the road. The capital cost for such improvements could therefore be appointed to the property owner. The advantage is that the benefactors of the stormwater management system would fund the program. However, it is very difficult to estimate the increase in property value, and even when this estimate is accurate, it is often difficult to convince the property owner of the respective benefits from these improvements. Also, another disadvantage to this alternative includes the fact that these “beneficial” funds, once they are obtained, are often not large enough to cover the cost of construction.

## C.2 Analysis of Funding Alternatives

After reviewing the benefits and deficiencies associated with each financial alternative, General Fund and a Stormwater Utility are the only two funding sources capable of addressing a comprehensive stormwater management program on a county-wide basis. The major distinction between the two alternatives is the method of allocating the costs for stormwater management. The General Fund is made up of revenues generated from ad-valorem taxes – income based on property value which does not correlate with the runoff contribution of the property nor to the benefits received from the stormwater management system. Competition for General Fund revenues from other governmental programs often results in less than adequate funding for the stormwater management program. Funds generated through the implementation of a stormwater utility are dedicated entirely to the stormwater management program similar to other enterprise funds. The costs are allocated to customers of the utility based on the quantity and quality of the stormwater, which is likely to be generated by each property using the correlation between the amount of impervious area and the stormwater runoff quality/quantity. Considering the high level of competition for limited General Fund revenues, and the ability to dedicate revenues from a stormwater utility, the County should consider the implementation of a stormwater utility as a dedicated source of revenues to fund the stormwater management program and capital improvements.