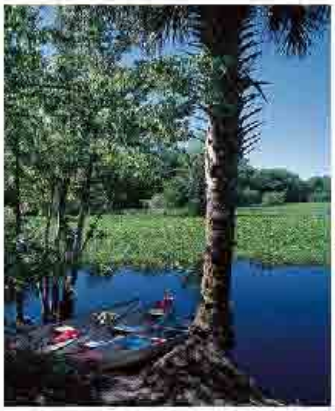
CDM

NOTE: This is only Part 3 of 4 of this document (includes Sections 3 through 8 of 8). The other 3 parts are, also, located on the Lake County Water Atlas under the same title, *Wekiva Parkway and Protection Act: Master Stormwater Management Plan Support*, only with a different part designation at the end of the main title.

# Wekiva Parkway and Protection Act
## Master Stormwater Management Plan Support

# FINAL REPORT



Prepared for:

**St. Johns River Water Management District**

**LAKE COUNTY**
City of Eustis
City of Mount Dora

**SEMINOLE COUNTY**
City of Altamonte Springs
City of Lake Mary
City of Longwood

**ORANGE COUNTY**
City of Apopka
Town of Eatonville
Town of Oakland
City of Ocoee
City of Orlando
City of Winter Garden

Final Report - November 2005
Updated - March 2006

# Contents

# Figures

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# Acronyms

| | |
|---|---|
| AP | Apopka Basin |
| AS | Alexander Springs Basin |
| BFE | Base Flood Elevation |
| BLS | Below Land Surface |
| BMAP | Basin Management Action Plan |
| BMP | best management practice |
| BOD | Biochemical Oxygen Demand |
| BW | Big Wekiva River Basin |
| BWC | Black Water Creek Basin |
| CIP | Capital Improvement Project |
| CRA | Community Redevelopment Agency |
| CSO | Combined Sewer Overflow |
| CUP | Consumptive Use Permit |
| CWA | Clean Water Act |
| CWP | Center for Watershed Protection |
| DCA | Department of Community Affairs |
| DCIA | Directly Connected Impervious Area |
| DO | Dissolved Oxygen |
| DOH | Department of Health |
| DOQQ | Digital Orthophoto Quarter Quadrangle |
| DU | Dwelling Units |
| ECFRPC | East Central Florida Regional Planning Council |
| EDB | Ethylene Dibromide |
| EDU | Equivalent Drainage Unit |
| EPA | Environmental Protection Agency |
| ERP | Environmental Resource permitting |
| ERU | Equivalent Residential Unit |
| ESM | Engineering Standards Manual |
| F.A.C. | Florida Administrative Code |
| FAVA | Florida Aquifer Vulnerability Assessment |
| FDEP | Florida Department of Environmental Protection |
| FDOT | Florida Department of Transportation |
| FEMA | Federal Emergency Management Agency |
| FGS | Florida Geologic Survey |
| FIRM | Flood Insurance Rate Maps |
| FLUCCS | Florida Land Use/Land Cover and Forms Classification System |
| F.S. | Florida Statutes |
| FTE | Full Time Equivalency |
| FY | Fiscal Year |

| | |
|---|---|
| GIS | Geographical Information System |
| GT | Golden Triangle Basin |
| HGL | Hydraulic Grade Line |
| HSPF | Hydrologic Simulation Program Fortran® |
| ICPR | Interconnected Channel and Pond Routing |
| IWR | Impaired Waters Rule |
| LA | Load Allocation |
| LCWA | Lake County Water Authority |
| LE | Lake Eustis Basin |
| LID | Low Impact Development |
| LiDAR | Light Detection and Ranging |
| LOS | Level Of Service |
| LOWESS | Locally Weighted Scatterplot Smoothing |
| LW | Little Wekiva River Basin |
| MA | Maintenance Areas |
| MFL | Minimum Flows And Levels |
| MGD | Million Gallons Per Day |
| MON | Monroe Basin |
| MOS | Margin Of Safety |
| MS4 | Municipal Separate Storm Sewer System |
| MSBU | Municipal Service Benefit Unit |
| MSJRB | Middle St. John's River Basin |
| MSMP | Master Stormwater Management Plan |
| MSTU | Municipal Service Taxing Unit |
| NAD | North American Datum |
| NAVD | North American Vertical Datum |
| NGVD | National Geodetic Vertical Datum |
| NOAA | National Oceanic & Atmospheric Administration |
| NPDES | National Pollutant Discharge Elimination System |
| NPS | Nonpoint Source |
| NRCS | Natural Resource Conservation Service |
| NWRC | Northwest Recreation Center |
| O&M | Operations And Maintenance |
| OAWP | Office of Agricultural Water Policy |
| OCEPD | Orange County Environmental Protection Division |
| OFW | Outstanding Florida Water |
| OSTDS | Onsite Sewage Treatment And Disposal Systems |
| OUSWMM | Orlando Urban Stormwater Management Manual |
| PEC | Professional Engineering Consultants, Inc. |
| PET | potential evapotranspiration |
| PLRG | Pollution Load Reduction Goal |

| | |
|---|---|
| PMP | Probable maximum precipitation |
| PWRCA | Priority water resource caution area |
| REV | Rate-Efficiency-Volume |
| RIB | Rapid Infiltration Basin |
| SB | Senate Bill |
| SET | Stormwater Education Toolkit |
| SFWMD | South Florida Water Management District |
| SIB | Stormwater Infiltration Basins |
| SJRWMD | St. Johns River Water Management District |
| SOL | Soldiers Creek Basin |
| STORET | Storage and Retrieval |
| SWIM | Surface Water Improvement and Management |
| TMDL | Total Maximum Daily Load |
| TSD | Treatment, Storage and Disposal |
| TSI | Trophic State Index |
| TV | Temporal Variability |
| USDA | United States Department of Agriculture |
| USEPA | United States Environmental Protection Agency |
| USGS | United States Geological Survey |
| WAVA | Wekiva Aquifer Vulnerability Assessment |
| WBID | Water Body Identification |
| WLA | Wasteload Allocation |
| WMD | Water Management District |
| WMM | Watershed Management Model |
| WPA | Wekiva River Protection Act |
| WPPA | Wekiva Parkway and Protection Act |
| WSA | Wekiva Study Area |
| WWTP | Wastewater Treatment Plant |
| YL | Yankee Lake Basin |

# Section 3
# Stakeholder Stormwater Management Policies

## 3.1 Introduction

This section summarizes the Stakeholders' current policies as they relate to stormwater management. CDM reviewed comprehensive plans, code of ordinances, land development codes and permits, and obtained feedback from the Stakeholders in order to provide a summary of each individual Stakeholder's policies. In this section, information is provided for each Stakeholder on adopted level of service (LOS), National Pollutant Discharge Elimination System (NPDES) permitting, stormwater system inspection and maintenance, redevelopment control measures (as they relate to water quantity and quality) and current water resources funding mechanisms. Level of service is generally defined as: an indicator of the extent or degree of service provided by (or proposed to be provided by) a public facility based on, and related to, the operational characteristics of the public facility.

## 3.2 Lake County

Unincorporated Lake County occupies approximately 146 square miles or 31 percent of the WSA. The portion of Lake County in the WSA is largely undeveloped and its predominant land uses are forest, agriculture, wetlands and open lands. Black Water Creek, Big Wekiva River, Golden Triangle, Lake Eustis and Alexander Springs watersheds are all within unincorporated Lake County.

### 3.2.1 Level of Service

Section 9.06.00 of the Lake County Code of Ordinances specifies the current requirements for stormwater management. Performance criteria for stormwater management systems (Section 9.06.05(k)) state that stormwater facilities be designed to perform as follows:

1. Bridges - Hydraulic profile should be below the top cord of the bridge for the 50-year, 24-hour storm.

2. Stormwater detention and retention ponds which are contributory to land-locked areas with no positive outlet, should be designed for the 25-year, 96-hour storm.

3. Canals, ditches, or culverts external to the development, and stormwater detention or retention basins which are part of a project that is not contributory to a land-locked areas with no positive outlet, should be designed for the 25-year, 24-hour storm.

4. Stormwater flooding for all arterial and collector roads should not exceed one-half (1/2) of the roadway width. For all local roads, stormwater flooding should not exceed the crown of the road for the 10-year, 24-hour storm.

5. Storm sewers and roadside swales should be designed such that the hydraulic gradient is 1.0 foot below the gutter line or edge of pavement for arterial roadways; and 0.5 feet below the gutter line or edge of the pavement for collector and local roadways for the 10-year, 24-hour storm.

### 3.2.2 NPDES MS4 Permit

Lake County is regulated under the NPDES Phase II program which regulates small municipal separate storm sewer systems (MS4). The County was issued a generic permit for discharge of stormwater (Permit No. FLR04E106) from FDEP in September 2004. Under this permit, the County must implement a comprehensive stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges to the MS4. This is a 5-year permit that requires the County to comply with six (6) defined minimum control measures:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-construction Stormwater Management in New Development and Redevelopment
- Municipal Operation Pollution Prevention and Good Housekeeping

Under each of these minimum control measures, the County has committed to implement various BMPs throughout the life of the permit in order to achieve compliance.

### 3.2.3 Stormwater System Inspection and Maintenance

The County also has a section of its Code of Ordinances (Section 9.06.08) devoted to stormwater maintenance. The County's code requires that installed stormwater systems be maintained by the legal entity responsible for maintenance and that all stormwater management permit applications should contain documentation sufficient to demonstrate that the operation and maintenance entity is the legal entity empowered and obligated to perpetually maintain the stormwater management facilities. The County also requires an approved written operation and maintenance plan which should contain the following minimum criteria:

- Demonstration of the ability of an entity to provide adequate maintenance;
- Written agreement of acceptance of an entity to maintain the facilities;
- Specific maintenance activities to be performed;
- Frequency of maintenance activity; and,
- Measurable objective of maintenance activity.

The County recognizes the following entities as acceptable to operate and maintain stormwater management facilities:

- Local governmental units including the County, municipalities, or municipal service taxing units or municipal benefit taxing units;
- Active water control districts or drainage districts, community development districts or special assessment districts; and,
- Non-profit corporations including homeowners associations, property owners associations, condominium owners associations, or master associations under certain conditions which ensure that the corporation has the financial, legal, and administrative capability to provide for the long-term operation and maintenance of the facilities.

Lake County is divided into three Maintenance Areas (MA) within the Road Operations Division. Combined, the three MAs total 71 staff and 123 pieces of equipment. County owned equipment include trucks, tractors, compactor/rollers, loaders/backhoes, dump trucks, flatbeds, water trucks and irrigation pumps. Currently, maintenance frequency and structure inspections are complaint driven. However, the County is moving toward scheduled maintenance and inspection activities with the mapping of the drainage infrastructure.

In addition to County staff and County-owned equipment, the Road Operations Division maintains a contract with an outside contractor for ditch cleaning services (Gradall®) which is funded to 0.75 full time equivalency (FTE). The Road Operations Division also contracts for pipe cleaning.

## 3.2.4 Redevelopment Control Measures

The County's Code of Ordinances was reviewed for stormwater management requirements related to redevelopment. Under Chapter V, Concurrency Management addresses the requirements for development. Section 5.01.02 identifies exemptions for development with negligible impacts. This is considered development that will cause negligible impacts in public facilities and services, and are exempt from the County's concurrency management review. Such development includes:

1. Interior renovations or alterations and exterior maintenance to existing structures which do not involve a change in use;
2. Demolitions, except in conjunction with the replacement of an existing structure;
3. Replacement of a single family residence with a single family residence;
4. Electrical, plumbing and mechanical activities;
5. Signage, fences and pools;
6. Screen patio and screen pool enclosures, and wooden (non-roofed) decks;
7. Improvements to an existing single family residence such as room additions and screened enclosures;
8. Accessory structures to a single family residence;
9. Temporary construction trailer placements;
10. Wells and septic tank placements;
11. Utilities such as telephone switching stations, and electrical power substations;
12. Radio and other communication towers; and,
13. Accessory facilities for agricultural uses.

Section 5.01.04 of the County's code of ordinances also identifies special exemptions for redevelopment after demolition or termination of existing use. This requirement states that "in the case of demolition of an existing structure or termination of an existing use in conjunction with plans for redevelopment, the concurrency management evaluation for future development shall be based upon the new or proposed land use as compared to the land use existing at the time of such demolition or termination. Credit shall only be given for the density/intensity of the site proposed for demolition/termination. Proposed redevelopment that increases the density/intensity of the site shall be reviewed based upon the net increase in density/intensity."

The Lake County Comprehensive Plan (as amended through 2002) was also reviewed for this element. One of the policies in the stormwater sub-element (Chapter VI-C) of the County's Comprehensive Plan addresses redevelopment and stormwater management. Policy 6C-2.7 (Provide Effective Stormwater Treatment) of the stormwater sub-element states that Lake County requires that plans for expansion, modifications, and replacement of existing development, excluding phased development, meet the adopted level of service, where such stormwater treatment is currently inadequate.

### 3.2.5 Current Water Resources Funding Mechanisms

Ordinance 1990-25 establishes a municipal service taxing unit (MSTU) for the unincorporated area of Lake County for the provision of stormwater management in addition to other various services provided by the County. Under this ordinance, the Board of County Commissioners is authorized to levy a millage (tax paid for each $1,000 of assessed value of property), up to five (5) mills on the dollar on the assessed value of the taxable real property and tangible personal property within the Lake County MSTU for unincorporated Lake County, in order to fund the provision of stormwater management and other essential facilities and municipal services.

## 3.3 City of Eustis

The City of Eustis has jurisdiction over approximately 3,327 acres or 5.2 square miles in the WSA. The City of Eustis is located along the northwestern edge of the WSA and portions of the City are within the Lake Eustis and Golden Triangle watersheds. Predominant land uses within the City of Eustis based on SJRWMD's 2000 Land Use and Land Cover data include medium density residential (39 percent), open land (14 percent), forest (8 percent) and commercial (8 percent).

### 3.3.1 Level of Service

Section 115-5 (Stormwater Management) of the City's Code of Ordinances defines the level of service for stormwater facilities as follows:

- Bridges – The hydraulic profile shall be below the top cord of the bridge for the 50-year, 24-hour storm event.

- Canals - Canals, ditches, or culverts external to the development, and stormwater detention or retention basins which are not part of a project that is contributory to land-locked areas with no positive outlet, shall be designed for the 25-year, 24-hour storm event.

- Roadway - Stormwater flooding for arterial and collector roadways shall not exceed one-half of the roadway width. For local roads, stormwater flooding shall not exceed the crown of the road for the 10-year, 24-hour storm event.

Additionally the design for drainage basins should be based on the following requirements:

- The 100-year 24-hour storm event shall be used for land locked (without positive drainage outfall) areas which are low-lying with a history of flooding problems, have a high water table, or contain impervious soils.

- The 50-year, 24-hour storm event for land locked areas which have a low ground water table or pervious soils.

- The 25-year, 24-hour storm event shall be used for areas having positive drainage outfall to an existing storm sewer or drainage ditch which leads to the surface waters of a lake or a canal. Drainage outfall onto adjacent property by sheet flow is prohibited.

## 3.3.2 NPDES MS4 Permit

The City of Eustis is regulated under the NPDES Phase II program which regulates small MS4s. The City was issued a generic permit for discharge of stormwater (Permit No. FLR04E100) from FDEP in February 2004. Under this permit, the City must implement a comprehensive stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges to the MS4. This is a 5-year permit that requires the City to comply with six (6) defined minimum control measures which include:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-construction Stormwater Management in New Development and Redevelopment
- Municipal Operation Pollution Prevention and Good Housekeeping

Under each of these minimum control measures the City has committed to implement various BMPs throughout the life of the permit in order to achieve compliance.

## 3.3.3 Stormwater System Inspection and Maintenance

The City of Eustis currently has 5 staff members devoted to stormwater maintenance. Maintenance activities include mowing, debris removal, pipe and inlet cleaning and street sweeping. The frequency of maintenance is defined as follows:

- Mowing of pond areas and debris removal - weekly in the summer, less as season dictates;
- Inlet and pipe cleaning - as needed; and,
- Street sweeping – residential (monthly); commercial and main roads (monthly); industrial areas (bimonthly); downtown core (weekly).

The City collects approximately 1600 cubic yards of material from 1110 miles of sweeping. The City also has backhoes for larger work needs.

### 3.3.4 Redevelopment Control Measures

Section 106-2 of the City's Code of Ordinances requires that the level of service standards for stormwater (i.e., rate of discharge, volume of discharge and retention/detention) are met prior to the issuance of any final permit for land development activity issued by the City, with the following exceptions:

- Any addition to a single family dwelling;
- Any addition, expansion, or improvement to any other structure or use where such addition, expansion, or improvement can be shown to have no net increase in the demand for infrastructure;
- Any replacement of a structure or use by a similar structure or use where such replacement can be shown to have no net increase in the demand for infrastructure;
- Any change of use which reduces demand for all infrastructure facilities, even if the infrastructure serving the former use or activity was over capacity;
- Any low- or moderate-income housing development;
- Any public infrastructure or public facility; or
- Any vested project.

### 3.3.5 Current Water Resources Funding Mechanisms

Section 94-177 of the City's Code of Ordinances establishes a stormwater utility in order to "acquire, own, construct, equip, operate and maintain open drainage ways, underground storm drains, equipment and appurtenances necessary, useful or convenient for a complete stormwater control system; and also including maintenance, extension and reconstruction of the stormwater control system of the city; to minimize by suitable means the system's contribution to flooding; to minimize by suitable means the system's adverse effect on the water quality of streams and lakes; and to seek the cooperation of the state department of transportation, the county and other municipalities in minimizing the effects of all such systems and other sources of accelerated runoff to flooding and water quality, water conservation, replenishment and enhancement of groundwater." All stormwater drainage utility fees are collected by the City into a stormwater utility management fund. This fund is used for paying the costs of stormwater drainage facilities to be constructed in the various storm drainage basins and paying the cost of operation, administration and maintenance of the stormwater drainage facilities of the City. For residential units, the stormwater utility rate is currently $3.00, and for commercial units it is $6.00.

# 3.4 City of Mount Dora

The City of Mount Dora occupies approximately 3,150 acres or 4.9 square miles in the WSA. Located immediately to the southeast of the City of Eustis, it also lies along the northwestern edge of the WSA and portions of the City are also within the Lake Eustis and Golden Triangle watersheds. Predominant land uses within the city limits in the WSA include medium density residential (33 percent), water bodies (17 percent), high density residential (9 percent) and forest (8 percent).

## 3.4.1 Level of Service

Under Section 6.2.2 of the Land Development Code, the City's LOS is defined and requires that stormwater facilities be designed to accommodate the 25-year/24-hour storm design event for all new development and redevelopment, and meet the following water quality and quantity standards:

- Water quantity - Peak post-development runoff shall not exceed peak predevelopment runoff rates.

- Water quality - Treatment of stormwater runoff shall be required of all development and redevelopment areas. The stormwater treatment system or systems can be project specific, serve subareas within the city or be a system to serve the entire city. Regardless of the area served, the stormwater treatment systems must provide a level of treatment which meets the requirements of Chapter 40C-42, in particular Section 40C-42.025, Florida Administrative Code (FAC) to ensure that the receiving water quality standards of Chapter 62-302, FAC are met and to ensure that the receiving water bodies and their water quality are not degraded below the minimum conditions necessary to maintain their classification as established in Chapter 62-302, FAC.

Additionally, section 6.2.9 of the Land Development Code identifies the design criteria that must be met and are summarized in **Table 3-1**.

**Table 3-1**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**City of Mount Dora LOS Stormwater Standards**

| Facility | Frequency (Year) | Duration (Hours) |
|---|---|---|
| Bridges | 50 | 24 |
| Principal arterial bridges and evacuation routes | 100 | 24 |
| Canals, ditches, swales or culverts for drainage external to the development | 25 | 24 |
| Canals, ditches, swales or culverts for drainage internal to the development | 10 | 24 |
| Detention and retention basins contributory to land-locked areas with no positive outlet | 25 | 96 |
| Major detention/retention structures with a positive outlet. The probable maximum precipitation (PMP) as required by the SJRWMD shall be evaluated PMP | | 24 |
| Minor detention/retention structures with a positive outlet | 25 | 24 |
| Houses/buildings first floor elevation must be 18" or above the 100-year flood elevation | 100 | 24 |

## 3.4.2 NPDES MS4 Permit

Like Lake County and the City of Eustis, the City of Mt. Dora is also regulated under the NPDES Phase II program which regulates small MS4s. The City was issued a generic permit for discharge of stormwater (Permit No. FLRD4E121) from FDEP in August 2004. Under this permit, the City must implement a comprehensive stormwater management program to reduce the contamination of stormwater runoff and prohibit illicit discharges to the MS4. This is a 5-year permit that requires the City to comply with six (6) defined minimum control measures. The City has committed to a number of various activities throughout the life of the permit to satisfy the 6 minimum control measures in order to achieve compliance. The 6 minimum control measures include:

- Public Education and Outreach
- Public Participation/Involvement
- Illicit Discharge Detection and Elimination
- Construction Site Stormwater Runoff Control
- Post-construction Stormwater Management in New Development and Redevelopment
- Municipal Operation Pollution Prevention and Good Housekeeping

### 3.4.3 Stormwater System Inspection and Maintenance

The City of Mount Dora currently has 3 staff members dedicated to stormwater maintenance and inspections including a street-sweeper operator. For storm events, the City assigns 12 persons to cleaning ditches and inspecting damage, 3 assigned to each quadrant of the City.

All of the stormwater inspection and maintenance work is done internally. The only contracted services are for waste/trash disposal (litter like cans, debris) and tree-stump grinding, if the City needs to remove trees in the drainage paths. The City has a site for other miscellaneous debris stockpiling.

The City performs street sweeping daily. The street sweeper rotates around the entire city and visually inspects for major problems like collapsed inlets or for major system plugs. Maintenance activities are largely complaint driven and also driven by inspections. The City assigns repairs on a priority basis depending on the severity of the problem. Stormwater structures/outfalls are inspected approximately twice per year. The vac-truck issued to jet out severely plugged lines. Mowing is done on a weekly rotating schedule. Ditch cleaning is done approximately once per month, on a rotating basis. This includes about 2 to 3 miles of major ditches. Most of the minor ditch cleaning is complaint driven and the City also gets assistance from the homeowners as the problems are on private property much of the time.

The City owns riding mowers, a bush hog, a vac-truck, a one-ton flatbed truck, and minor equipment like weed-eaters, chain saws, hedge trimmers, etc.

The City maintains approximately 56 miles of paved roads, excluding privately owned subdivision roads. There are no public dirt roads within the City limits. The City Public Works department has a curbing and sidewalk program to add new and to replace damaged infrastructure.

The City is expanding rapidly and acquiring new subdivisions through annexation. The City's utility service district extends well beyond the current city limits. The City is considering the possibility of expanding the stormwater regulations and MS4 permit requirements to the entire utility service district area, which may help with future growth issues.

### 3.4.4 Redevelopment Control Measures

The City has a community redevelopment agency that was established under Chapter 38 of its Code of Ordinances. Section 6.2 of the City's Land Development Code requires all new development and redevelopment to adhere to the City's adopted level of service for drainage. This includes requirements for water quantity (i.e., peak post-development runoff should not exceed peak predevelopment runoff) and water quality (i.e., treatment of stormwater runoff is required and that treatment systems must provide a level of treatment which meets the requirements of Section 40C-42.025, F.A.C.). Some areas in the downtown exempt district are exempt from the SJRWMD permitting requirements.

### 3.4.5 Current Water Resources Funding Mechanisms

Part IV of Chapter 86 of the City's Code of Ordinances establishes a stormwater drainage utility in order to fund the operation and maintenance of stormwater conveyance systems. All stormwater drainage utility fees are collected by the City are paid into a stormwater utility management fund. This fund is used for paying the costs of stormwater drainage facilities to be constructed in the various storm drainage basins and paying the cost of operation, administration and maintenance of the stormwater drainage facilities of the City. For residential units, the stormwater utility rate is currently $3.00.

## 3.5 Orange County

Of all Stakeholders, Unincorporated Orange County occupies the largest land area in the WSA. Approximately 253 square miles or 39 percent of the WSA are within unincorporated Orange County. The County has jurisdiction within the Lake Apopka, Big Wekiva River, and Little Wekiva River watersheds. Dominating land uses in the County are water bodies (26 percent), wetlands (11 percent), forest (11 percent) and medium density residential (10 percent).

### 3.5.1 Level of Service

Orange County currently defines its LOS standard for stormwater in Chapter 30 (Planning and Development) of its Code of Ordinances. Section 30-520(5) (Performance Standards) states that the LOS standard for stormwater is based on the following stormwater quantity and quality criteria:

1. Stormwater facilities should accommodate the design storm events, based on a 24-hour minimum, shown below in **Table 3-2**.

2. Stormwater management systems are required to retain or detain with filtration the first one-half (1/2) inch of rainfall on the site, or the runoff generated from the first inch of rainfall on developed sites, whichever is greater.

3. Require a retention/detention system which limits peak discharge of a developed site, to the discharge from the site in an undeveloped condition during a 24-hour/25-year frequency storm event.

4. Prior to development approval, require projects to receive appropriate permits from state agencies to comply with the rules and regulations for stormwater facility design, performance and discharge.

5. Discharged stormwater runoff shall not degrade receiving surface water bodies below the minimum conditions established by state water quality standards (F.A.C. §§ 62-302 and 62-40.420).

**Table 3-2**
**Wekiva Parkway & Protection Act Support**
**Master Stormwater Management Plan**
**Orange County LOS Stormwater Standards**

| Facility | Design Storm |
|---|---|
| Bridges | 50-year |
| Canals, ditches, or culverts for drainage external to the development | 25-year |
| Cross drains, storm sewers | 10-year |
| Roadside swales for drainage internal to the development | 10-year |
| Detention basins | 25-year |
| Retention basins (no positive outfall) | 100-year |

Additionally, Orange County requires that the freeboard for open drainage ways and ponds should be a minimum of one (1) foot above the design high water elevation. Section 34-266 of the County's code also requires that a stormwater management system be designed and contain features to provide for:

(1) Pollution abatement- Pollution abatement will be accomplished by retention, or detention with filtration, of one-half (1/2) inch of runoff from the developed site or the runoff generated from the first one (1) inch of rainfall on the developed site, whichever is greater. The depth of runoff generated from the first inch of rainfall is estimated by multiplying the Rational Method Runoff Coefficient (C) for the developed site by one (1) inch of rainfall.

(2) Recharge where possible- Recharge in designated areas where the soils are compatible (Hydrologic Soil Group Type "A" soils as indicated on the soils survey map for the county prepared by the U.S.D.A. Soil Conservation Service) will be accomplished by providing for retention of the total runoff generated by a 25-year frequency, 24-hour duration storm event from the developed site. Where a positive outfall is not available, design the site to retain the 100-year frequency/24-hour duration storm on-site.

(3) Protection from flooding.

## 3.5.2 NPDES MS4 Permit

Orange County is currently regulated under the Phase I NPDES program for large MS4s. The County, along with its co-permittees (City of Apopka, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Garden, City of Winter Park, Florida Department of Transportation (FDOT) District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4

Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the County and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the County to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the County is required to implement the specified stormwater management program (SWMP) specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to County requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Continuation of basin studies;
- Inspections, monitoring and maintenance of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

### 3.5.3 Stormwater System Inspection and Maintenance

Stormwater maintenance and operation information was obtained from the *Overview of the Drainage Section Maintenance and Operation Program* (Orange County Roads and Drainage, 2002). The County has a Drainage Section of the Roads and Drainage Division whose primary responsibilities include the design, construction, maintenance and operation of stormwater control facilities. The County's stormwater management system consists of pump stations, open channels, canals, closed pipe systems, control structures, drainage wells, retention/detention ponds, and drainage ditches. The County performs the following in terms of maintenance and inspection:

- Primary Canals – Two canal crews perform routine maintenance activities on a 4- to 5-week cycle which include mowing, litter/debris removal, trimming and inspections. Non-routine maintenance includes removal of sediment, erosion repairs, replace/repair erosion control and prevention measures, and re-establishment of canal banks and slopes. Herbicides treatment is also performed bi-annually. Major repairs such as profiling or realignment are conducted as capital improvement projects (CIP).

- Non-MSTU Retention Ponds – A pond crew performs routine maintenance activities on a 4-to 5-week cycle which include mowing, litter/debris removal, trimming and inspections. Non-routine maintenance includes removal of sediment, erosion repairs, replace/repair erosion control and prevention measures, and re-establishment of flood bank and slope. Herbicides treatment is also performed bi-annually. The in-house crew maintains approximately 27 ponds and the remainder of the pond maintenance activities are outsourced.

- MSTU Ponds – The pond crew is divided into 4 geographic sectors with a total of 34 people. An inspection and mowing crew in each sector mows on a 4-week cycle and inspects control structures, fence conditions and berms for erosion. Necessary maintenance or repairs are ordered immediately, including removal of sediment, erosion repairs, replace/repair of erosion control and prevention measures, re-establishment of flood bank and slope, or use of heavy equipment. Heavy equipment is only used on an average of 8-12 years. Every two months 1 spray crew for sprays ponds in the entire county for aquatic vegetation.

- Pump Stations, Drainage Wells and Control Structures - Routine maintenance activities are conducted on a bi-weekly basis and include structural repair, litter/debris removal, trimming and inspections. Drainage wells are inspected daily during heavy rainfall periods. A two-person maintenance crew is assigned to routine maintenance of pump stations. Non-routine maintenance includes removal of sediment, erosion repairs, replace/repair erosion control and prevention measures (e.g., major cleaning of drainage wells). Herbicide treatments to control or remove brush and broadleaf weeds growing along and around the pump house, near control structures, curb inlets, inlet throats and gutters are performed on a bi-monthly basis.

The County also has a Heavy Equipment Section which is composed of two groups, Drainage and Roads. The section is comprised of a foreman, thirteen equipment operators and one MSTU equipment operator. These individuals operate a variety of machinery and equipment which ranges from ten wheel dump trucks, transport tractor/trailers, loaders, backhoes, trackhoes, bulldozers, draglines, long booms, snort booms and mobile cranes. The County has a contract for street sweeping which is performed once per month. Only those roads with curbs are swept which account for approximately 2,900 miles. The County requires a minimum of eight sweepers to be in operation.

## 3.5.4 Redevelopment Control Measures

Article XVII of Chapter 38 of the County's Code of Ordinances establishes zoning standards which are designed to facilitate the redevelopment of historic and/or established communities in the County. These communities fall under the designation of neighborhood center, neighborhood activity corridor, and neighborhood residential. The provisions of the article, including stormwater management, apply to all lands that have one of these designations. Section 38-1734 (4) addresses stormwater management for these areas. In general, it states the following:

- The design and construction of stormwater management systems within redevelopment areas should be in accordance with Chapter 34 of the Code of Ordinances (Subdivision Regulations). The stormwater management system should be consistent with applicable master plans or special area studies and designed as an amenity where feasible.

- The County encourages property owners to prepare stormwater master plans for multiple properties containing at least one acre and/or provide shared retention. In addition, individual property owners are encouraged to aggregate multiple properties into building sites containing a minimum of one acre for the purpose of providing stormwater management for the entire site.

- A minimum of one (1) tree and five (5) shrubs is required for each one hundred (100) linear feet of stormwater management area edge.

- A stormwater management system counts towards the overall amount of required open space if it is designed as an amenity with approved additional plantings over the minimum requirements specified above.

## 3.5.5 Current Water Resources Funding Mechanisms

The County's Stormwater Management Division and CIPs are financed through the general fund. This also includes some of the Orange County Environmental Protection Division's (EPD) programs as well. EPD programs include water quality sampling and monitoring, watershed management studies, data management, natural resources permitting, management of several MSTU/benefit unit (BU) lakes, lake water quality improvement projects, and citizen outreach and education. Projects and programs can also be supplemented through grants from the SJRWMD and the South Florida Water Management District (SFWMD). The Orange County Roads and Drainage Division receives funding sources from several sources including ad valorem taxes, local option gas tax and the constitutional gas tax.

# 3.6 City of Apopka

The City of Apopka is entirely within the WSA and is comprised of approximately 29.4 square miles or 6 percent of the WSA. The City has jurisdiction within the Lake Apopka and Big Wekiva River watersheds. Dominating land uses in the City are agriculture (22 percent), forest (21 percent) and open land (15 percent).

## 3.6.1 Level of Service

Section 6.05.00 in the City's Code of Ordinances established the guidelines for stormwater management within the City. Although the City does not define specific design storm events for various stormwater facilities (i.e., bridges, canals, etc.), it requires that all subdivisions, multifamily, and nonresidential projects must provide for retention and/or detention of stormwater runoff using the following guidelines:

- The post-development peak rate of discharge must not exceed the predevelopment peak rate of discharge for the 25-year, 24-hour storm.
- Pollution abatement volume should be in accordance with SJRWMD criteria.
- Construct finished floor slab elevations of all habitable structures at an elevation no less than 20 inches above the 100-year storm elevation, unless approved by the building division; in no instance, however, may the finished floor slab elevation be less than one foot above the 100-year storm elevation.
- Design all drainage discharge structures and bleed-down devices pursuant to SJRWMD criteria.
- All ponds should have a minimum one foot of freeboard to the design water resulting from the design storm.
- Approval of final engineering plans for any development will not be granted until the City is in receipt of a copy of the SJRWMD permit.
- The 24-hour rainfall amount of 8.6 inches should be used in runoff calculations.
- All retention ponds and detention ponds should be designed as dry bottom ponds unless otherwise approved by City Council.

Where a positive outfall is not available the following design criteria will apply:

- The on-site pond should be designed to retain the 100-year storm event. The pond should be designed to evacuate a daily volume equivalent to one inch of runoff from the total area contributing to the pond. The pond should be dry within 11 days following the storm event.
- When the project discharges to landlocked lakes that have no positive outfall which are adjacent to properties of one ownership, on-site detention ponds should be

designed to accommodate the pollution abatement volume as required by the SJRWMD from the developed site prior to discharge.

- When the project discharges to landlocked lakes that have no positive outfall which are adjacent to properties of more than one ownership, on-site detention ponds should be designed to accommodate the 25-year, 96-hour storm. Post-development runoff rate and runoff volume should not exceed predevelopment runoff rate and volume.

## 3.6.2 NPDES MS4 Permit

Similar to Orange County, the City of Apopka is currently regulated under the Phase I NPDES program for large MS4s. The City, along with its co-permittees (unincorporated Orange County, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Garden, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the City and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of the floodplain management regulations within the Land Development Code that require future flood management projects to assess and minimize the impacts of the water quality of the receiving water;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,

- Construction site runoff permitting, inspections, enforcements and operator training.

## 3.6.3 Stormwater System Inspection and Maintenance

Stormwater structures (i.e. storm sewer system, drainage wells, weirs, channel control structures, pump stations, inlets and catchbasins) within the City of Apopka are inspected and maintained twice a year. Storm sewer system maintenance includes TV inspections, vacuum truck operation, and repairs as needed. Stormwater treatment ponds (dry and wet detention, dry retention), ditches/swales, exfiltration trenches and wetlands have an inspection/maintenance schedule with an average of 18 times per year. Natural lakes are inspected/maintained once per week while roadways are on an ongoing schedule. Roadway maintenance includes street sweeping, resurfacing and repair, and curb edging. Ponds and ditches are scheduled to be mowed 8 times a year. Other maintenance activities include weed eating, litter and debris removal. The stormwater facilities are maintained by eight city employees and eight Orange County inmates. Inmate forces are used for maintaining the grass areas. For the majority of the year, the equipment used is lawn mowers (15) and other grass maintaining tools. However, in the event major work is required, the City has two backhoes which can be used for this task. Additional equipment owned by the City includes two street sweepers, two bush hogs, one vacuum truck, one dump truck, four transport trailers, 20 weed eaters, two pumps and numerous hand tools.

Chapter 12.02.00 (Procedure for Review of Development Plans) of the City's Code of Ordinances also has provisions for maintenance of private facilities. Section 12.02.07 specifically requires that "whenever a proposed development provides for the creation of facilities or improvements which are not proposed for dedication to the city a legal entity shall be created to be responsible for the ownership and maintenance of such facilities and/or improvements."

## 3.6.4 Redevelopment Control Measures

Section 11.06.00 of the City's Code of Ordinances establishes the City's Community Redevelopment Agency (CRA), which administers the redevelopment of the CRA district (one square mile area in downtown Apopka), through the use of local initiatives. Section 6.05.00 of the City's Code of Ordinances states that "no subdivision shall be platted nor shall construction commence for any multifamily, commercial, industrial or institutional project until the drainage design for such project has been approved by the city engineering division. The design shall equal or exceed design standards set forth hereinafter and the policies and procedures established by SJRWMD, and Department of Environmental Regulation [Protection], the Florida Department of Transportation and the design criteria contained therein." Additionally the code states that "all subdivisions, multifamily, and nonresidential projects must provide for retention and/or detention of stormwater runoff."

### 3.6.5 Current Water Resources Funding Mechanisms

Article III of Chapter 82 of the City's Code of Ordinances establishes a stormwater management utility. All stormwater management utility fees are collected by the City into a proprietary fund known as the Stormwater Management Fund. The fund is used exclusively to pay for the costs of the stormwater management program, including but not limited to, the costs to plan, construct, operate and maintain stormwater management facilities and to administer the stormwater management program as described in Article III. The stormwater management program is defined in the Code of Ordinances as the system by which the City manages and controls stormwater within its jurisdictional boundaries. The system includes management services such as designing, permitting, planning and reviewing stormwater-related infrastructure, and the operation, maintenance, repair and replacement and improvement of such infrastructure consistent with the capital improvement and stormwater management element of the City's comprehensive plan. The current annual fees are $15.00 for vacant lands with no building, $25 for single family residence property with building, and $46.25 for commercial property with building.

## 3.7 Town of Eatonville

The Town of Eatonville occupies approximately 0.7 square miles or 0.1 percent of the WSA. Located immediately to the southeast of the City of Maitland, it lies along the southwestern edge of the WSA and is in the Little Wekiva River watershed. Predominant land uses within the city limits within the WSA include water bodies (22 percent), commercial (14 percent) and forest (14 percent).

### 3.7.1 Level of Service

Although a defined LOS was not included in the Town's Land Development Code, Chapter 7, Article 3 of the Code establishes design standards and requires pre- and post-development or redevelopment peak flows to be similar but not exceed 10 percent for a 25-yr storm. In addition, the first inch of rainfall must be retained on-site, and natural vegetation should be used as a component of drainage design. Best management practices are required for stormwater runoff prior to discharge to natural or artificial drainage systems.

### 3.7.2 NPDES MS4 Permit

The Town of Eatonville is currently regulated under the Phase I NPDES program for large MS4s. The Town, along with its co-permittees (unincorporated Orange County, City of Apopka, City of Belle Isle, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Garden, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the Town and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the Town to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the Town is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Ensuring flood control projects consider water quality impacts;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage; and,
- Development of a construction inspection program, site runoff permitting, inspections, enforcements and operator training.

## 3.7.3 Stormwater System Inspection and Maintenance

Article 5 of the Town's Land Development Code outlines the inspection and maintenance requirements for stormwater in the Town of Eatonville. The Town maintains off-site systems that provide general public benefits. On-site retention and detention systems are required to be maintained by the owner; however the Town is permitted to conduct inspections and take corrective action at the cost to the owner.

The Town performs maintenance on a routine basis which includes mowing, street sweeping, cleaning retention ponds, and cleaning manholes. Monthly inspections of stormwater facilities are also performed and include inspections of weather outfall skimmers and using a televisions camera to inspect stormwater lines for leaks.

Resources used for maintenance includes, but is not limited to equipment, man-hours and contractual services. Equipment used includes a television camera (when needed), lawn mower, a front-end loader, and Vactron vacuum.

## 3.7.4 Redevelopment Control Measures

Redevelopment must meet the level of service as described in subsection 3.7.1, with the following exceptions: single-family and duplex residences and accessory structures, alterations or improvements to existing structures that do not change or affect the rate or volume of runoff; and construction that is on or parallel to the ground, less than or equal to 1,000 square ft of impervious area.

### 3.7.5 Current Water Resources Funding Mechanisms

The Town of Eatonville has established a separate stormwater utility fund for stormwater activities. This fund is generated by revenues from user fees of $4.95 charged on their monthly utility bill.

## 3.8 Town of Oakland

The Town of Oakland occupies approximately 1.7 square miles or 0.4 percent of the WSA. Located along the south shore of Lake Apopka, it is within the southwestern portion of the WSA in the Lake Apopka watershed. Predominant land uses within the town limits in the WSA include forest (28 percent), open land (16 percent), wetlands (14 percent) and medium density residential (12 percent).

### 3.8.1 Level of Service

The Town of Oakland has adopted the following stormwater LOS as shown in Infrastructure Policy 4.1.1:

a. Stormwater management of the mean annual (2.3 year ), 10 year and 25 year frequency, 24-hour duration storm,

b. Require that discharge from the stormwater management facilities does not degrade receiving surface water bodies below the minimum conditions as established by the State water quality standards, and

c. That developments provide pollution abatement by requiring stormwater management systems to meet one of the following options:

   i. Retain off-line the first one-half inch of run-off from developed sites or 1.25 inches of run-off from the impervious area, whichever is greater; or on-line retention of an additional one-half inch of run-off over that volume previously specified;

   ii. Wet detention of the first inch of run-off or 2.5 inches of run-off from the impervious area, whichever is greater;

   iii. Dry detention of the first inch of run-off or 2.5 inches or run-off from the impervious area, whichever is greater;

   iv. Swale systems that percolate 80 percent of the run-off from the 3 year, 1 hour storm; or

   v. Wetland stormwater systems that meet the criteria of Section 40C-42.0265, F.A.C.; and that the stormwater management facility shall limit peak discharge of a developed site to the discharge from the site in an undeveloped condition during the mean annual (2.3 year), 10 year, and 25 year, 24-hour frequency storm events.

Under Article II (Wetlands) of Chapter 78 (Waterways), the Town "acknowledges and endorses the management and storage of surface waters permitting program established by F.S. ch. 373 and F.A.C. chs. 40C-4 (Management and Storage of Surface Waters), 40C-40 (General Surface Water Management Permits), 40C-41 (Surface Water Management Basin Criteria), 40C-42 (Regulation of Stormwater Management Systems), 40C-43 (General Silvicultural Surface Water Management Permits After Notice), and 40C-44 (Regulation of Agricultural Surface Water Management Systems); and jurisdictional wetlands shall be designated conservation areas."

Additionally, Section 34-110(d) (6) of the Town's Code provides design guidelines to encourage proper design, location, and use of open space. Stormwater management ponds can be used to obtain credits for open space if the performance standards are met.

## 3.8.2 NPDES MS4 Permit

As of the 2000 U.S. Census, the Town of Oakland had a population of 936 which is below the minimum population criteria of 1,000 residents which would require coverage under the NPDES MS4 Phase II program. The Town may be required to seek coverage after the next Census.

## 3.8.3 Stormwater System Inspection and Maintenance

The Town provides maintenance for the Tubb St. and Bailey St. areas as well as the old town plat. Residential area and subdivision ponds are privately maintained by homeowner's associations.

## 3.8.4 Redevelopment Control Measures

In 1994, the Town formally adopted the Orange County subdivision regulations for development and SJRWMD rules for stormwater management. Any development within the Town must also meet the LOS previously described. The threshold for redevelopment to meet all current standards is if the taxable value of the property increases by 25 percent or the constructed square footage increases by 20 percent. Redevelopment in the Town of Oakland thus far has been limited to a few older single family homes.

## 3.8.5 Current Water Resources Funding Mechanisms

Chapter 66, Article V of the Town's Code of Ordinances outlines the Special Assessment Improvement Fund which provides for the construction or repair of streets, sidewalks, storm sewers and sanitary sewers, or for any other construction, repairs or improvements. The property especially benefited by the improvement is assessed all or a portion of the cost of the improvement, which then becomes part of the fund. The Town also appropriates other revenues into the fund.

# 3.9 City of Ocoee

The City of Ocoee occupies approximately 13.3 square miles or 2.8 percent of the WSA. The City of Ocoee is located in the south central portion of the WSA to the east of Lake Apopka and has jurisdiction within the Lake Apopka and Big Wekiva River watersheds. Predominant land uses within the city limits in the WSA include medium density residential (21 percent), forest (17 percent), and roads (14 percent).

## 3.9.1 Level of Service

Section 6-7 of the City's Land Development Code defines the requirements for surface water management. The City's defined LOS is shown in **Table 3-3**.

**Table 3-3**
**Wekiva Parkway & Protection Act Support**
**Master Stormwater Management Plan**
**City of Ocoee LOS Stormwater Standards**

| Facility | Design Storm |
|---|---|
| Bridges | 50-year |
| Canals, ditches, or culverts for drainage external to the development | 25-year |
| Cross drains, storm sewers | 10-year |
| Roadside swales for drainage internal to the development | 10-year |
| Detention basins | 25-year |
| Retention basins (no positive outfall) | 100-year |

## 3.9.2 NPDES MS4 Permit

Similar to Orange County, the City of Ocoee is currently regulated under the Phase I NPDES program for large MS4s. The City, along with its co-permittees (unincorporated Orange County, City of Apopka, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Winter Garden, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES Municipal MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the City and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of the floodplain management regulations within the Land Development Code that require future flood management projects to assess and minimize the impacts of the water quality of the receiving water;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

## 3.9.3 Stormwater System Inspection and Maintenance

The City follows the maintenance and inspection activities outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of its NPDES MS4 permit, which is included in **Appendix C**. The City has 5 full-time staff members dedicated to stormwater operations and maintenance. For stormwater management purposes, the City currently owns one sweeping truck, one vacuum truck, one backhoe (for cleaning ditches), and one climbing excavator (for cleaning canals and ditches). Contracted services include mowing only.

## 3.9.4 Redevelopment Control Measures

Section 6-7 of the City's Land Development Code requires that a stormwater management system designed and installed for development contain features to provide for: (1) pollution abatement, (2) recharge where possible, and (3) protection from flooding. The code states that "all development will be required to pretreat the runoff generated from the first inch of rainfall from the developed site for pollution abatement purposes."

## 3.9.5 Current Water Resources Funding Mechanisms

The City of Ocoee currently has a stormwater utility which is responsible for funding the operation, construction and maintenance of stormwater management devices, for stormwater system planning, and lake management. A stormwater utility generates

its revenue through user fees and the current monthly fee is $5.00 per ERU. Residential properties are billed a flat fee based upon one ERU per individual dwelling unit. Non-residential properties are billed for the number of ERUs calculated based on impervious area.

# 3.10 City of Orlando

Approximately 9.2 square miles of the southeastern portion of the WSA are occupied by the City of Orlando which accounts for approximately 1.9 percent of the study area. The City is located within the Little Wekiva River Basin within the WSA. Urban land uses are dominant within the City and include medium density residential (23 percent), roads (14 percent) and industrial (11 percent).

## 3.10.1 Level of Service

The City of Orlando defines the LOS standards for stormwater in the Engineering Standards Manual (ESM) which was approved by the City Council in 2003, replacing the Orlando Urban Stormwater Management Manual (OUSWMM). Chapter 7 Stormwater Management outlines the criteria for the design, rehabilitation and review of existing and/or proposed stormwater management systems within the limits of the City as shown in **Table 3-4**. Other agencies and governmental entities also have jurisdiction within the City, and have established design criteria for stormwater management. Where overlapping jurisdictions occur, the most stringent regulations govern. The following entities have jurisdiction in the City of Orlando:

- South Florida Water Management District
- St. Johns River Water Management District
- Florida Department of Transportation
- Florida Department of Environmental Protection
- Orange County Environmental Protection Department
- Orange County Public Works Department
- U.S. Army Corps of Engineers

**Table 3-4**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**City of Orlando LOS Stormwater Standards**

| Facility | LOS |
|---|---|
| City Primary | Design Storm: 25-year/24-hour.<br>Max. Flood Stage: 100-year/3-day below flood elevation. Storm sewer system along roadway: Max. Hydraulic Grade Line (HGL): 25-year, 6-hour at gutter elevation. |
| City Secondary | Design Storm: 10-year/6-hour.<br>Max. 10-year HGL: 1' below gutter elevation. |
| | Check Storm: 25-year/6-hour.<br>Max. Hydraulic Grade Line (HGL): at gutter elevation. |
| City Tertiary | Design Storm: 10-year/6-hour.<br>Max. 10-year HGL: 1' below gutter elevation. |
| | Check Storm: 25-year/6-hour.<br>Max. HGL: at gutter elevation. |
| Arterial Streets | Roadway and Inlet Design: 10-year occurrence or 10-year/6-hour storm. |
| Collector Streets | Roadway and Inlet Design: 5-year occurrence or 5-year/6-hour storm. |
| Minor Streets | Roadway and Inlet Design: 3 year occurrence or 3-year/6-hour storm. |
| Travel Lane Spread | 12 feet for all roads; roads with parking lane, width measured from face of curb to centerline of the outermost travel lane; clearance between design water surface and top of curb: 1". |
| Maximum Run Distance | 400 Feet to first Inlet. |
| Retention Ponds | Retain the greater of: first 1/2 inch of runoff or the first 1 inch of rainfall; separate from detention system. |
| Detention Ponds | Design Storm: 25-year/6-hour. Detain the volume necessary to restrict post-development peak runoff to pre-development peak runoff. |
| Detention Ponds (landlocked basins) | Same as above plus volume storage on-site for the 100-year/24-hour storm. |
| Flood Prone Areas | Development allowed in 100-year floodplain with compensatory storage. Floor elevation at least 1' above 100-year/24-hour or max. stage for 100-year/ 3-day event. |

Private stormwater systems are governed by the requirements of the water management districts in which they are located. The following exceptions apply:

*St. Johns River Water Management District*

- Flow attenuation for the 25-year, 24-hour storm will be required on projects for which SJRWMD requires a permit, but does not require this evaluation.
- For wet detention facilities, littoral zone requirements will not be waived in lieu of providing additional permanent pool volume.

*South Florida Water Management District*

- No exemption from pollution abatement requirements will be provided for rooftops, non-vehicular impervious surfaces, or water management areas or water features having permanent water surfaces.
- Dry detention is not allowed. Wet detention should be constructed in accordance with the requirements of SJRWMD, with the exception that littoral zone requirements will not be waived in lieu of providing additional permanent pool volume.

The following is a list of exemptions to the LOS for the City of Orlando for proposed projects:

1) Single lot for a single family dwelling unit which is not part of a multi-lot plat;

2) Single lot for a duplex family dwelling unit which is not part of a multi-lot plat;

3) Residential modifications to an existing single family dwelling which do not require a zoning change;

4) Lots, parcels, units, etc., which are part of a larger tract which has an approved drainage plan in conformity with this chapter;

5) Consists only of landscaping or resurfacing elements that do not alter surface drainage patterns.

*Redevelopment Projects*
Stormwater treatment by retrofitting to provide retention volume for pollution abatement will still be required where:

1) The increase in runoff volume (during a 25-year, 24-hour storm) caused by development is less than the volume required for pollution abatement; and

2) Project is not located in a natural water body, floodplain or any other area of critical environmental concern; and

3) Project consists entirely of redevelopment of existing impervious surfaces.

For redevelopment projects on all contiguous properties under a single ownership (to the extent that surface drainage is altered), stormwater management facilities for pollution abatement must be provided. Alterations of surface drainage (with the exception of resurfacing and landscaping elements only) is defined as: changing the flow patterns within the redevelopment area; changing the mode of transport from overland flow or open channel to a closed conduit, etc.; changing an impervious surface's character (from building to parking, wet bottom pond or a new building or vice versa); changing the character of a parking surface (from shell base to asphalt, etc.); or remodeling of an existing building which changes its footprint or number of floors.

## 3.10.2 NPDES MS4 Permit

The City of Orlando is currently regulated under the Phase I NPDES program for large MS4s. The City was issued an individual Phase I NPDES Municipal MS4 Permit (Permit No. FLS000014) on February 6, 2003. This is a 5-year permit that will expire in 2008. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Development planning procedures;
- Roadway maintenance, litter control and street sweeping;
- Flood management;
- Inspections, monitoring and maintenance of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

## 3.10.3 Stormwater System Inspection and Maintenance

Section 7.03 Monitoring and Maintenance of the ESM states that: "All new stormwater retention/detention facilities will be evaluated by the City Engineer for the system's ability to prevent degradation of receiving waters. If deemed necessary by the City Engineer, a water quality monitoring program may be required." A monitoring program may be required for example, if drainage system pollution abatement practices are not functioning properly or there is evidence of water quality degradation in spite of the pollutant removal efficiency. The program will be in effect until the problem is alleviated.

If a monitoring program is required, the ESM states following regarding a sampling program: "Although specifics may vary from project to project, samples will normally be collected at discharge locations. A typical sampling schedule will consist of samples collected once per month during the wet season; however this may vary among projects. Some permittees may be required to collect samples during storm events in addition to monthly sampling. Rate of discharge at the time of sample collection and total monthly discharge each month for the duration of the permit may also be required. Parameters of interest will normally include those listed in Chapter 62-3, Florida Administrative Code, plus the nutrients nitrogen and phosphorus."

The City currently has 47 employees whose responsibilities include stormwater maintenance and/or inspection. For stormwater inspection and maintenance, the City follows the activities outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of their NPDES MS4 permit, as closely as possible. This table, provided in Appendix C**,** also identifies frequencies of inspection and maintenance of stormwater facilities. In addition to the items listed in the maintenance schedule, the City also performs street sweeping which is done on a 14-day cycle.

Major equipment owned and/or operated by the City include: 2 vactor trucks, 12 dump trucks, 8 street sweepers, 2 long reach track backhoes, a bulldozer, a mini excavator and skid loader, and 2 Gradall® excavators.

The City also has a maintenance contract for mowing, litter removal and inspection of open stormwater systems for an annual cost of $660,000.

## 3.10.4 Redevelopment Control Measures

Redevelopment requirements were discussed in Section 3.10.1. Additionally, the Stormwater and Aquifer Recharge Element of the City's Growth Management Plan, which was adopted in 1991 and subsequently amended in 2000, contains the goals, objectives and policies which will direct future development in Orlando. Policy 1.1.6 of the Stormwater and Aquifer Recharge Element specifically states that "the City shall meet State water quality standards in Chapters 62-302 and 62-520, F.A.C., as applied by FDEP and the Water Management Districts through compliance with OUSWMM [ESM] for all development and redevelopment without exception for size or type of development."

### 3.10.5 Current Water Resources Funding Mechanisms

The City of Orlando currently has a stormwater utility which is responsible for funding the operation, construction and maintenance of stormwater management devices for stormwater system planning and lake management. The stormwater utility generates its revenue through user fees. The fee is based on the amount of stormwater a particular parcel passes to the stormwater system. The more runoff a parcel contributes, the greater the fee. The City's stormwater utility Policies & Procedures Manual is specified in Chapter 31 of the City's code of ordinances.

A stormwater utility fee is imposed on each parcel of land within the City. Properties that have existing stormwater management facilities in accordance with the ESM, or those planning such facilities, may have their fee reduced or pro-rated as determined by the Utility Division Chief. The annual utility fee for developed property is based on the Equivalent Residential Unit (ERU). For a residential parcel of 1 ERU, the annual utility fee for the 2004 billing cycle was $82.56. The Utility maintains a database and assigns a billing class code to each parcel, for which each is charged a reasonable and equitable fee, according to assigned ERU equivalence and site mitigation factors.

Developed properties which meet ESM criteria will have their fee discounted. Those properties with on-site mitigation which does not fully meet ESM criteria may receive a partial discount as determined by the Division Chief. The stormwater utility fee is billed annually as a non-ad valorem charge.

## 3.11 City of Winter Garden

The City of Winter Garden is located entirely within the WSA and is comprised of 14 square miles or 3 percent of the WSA. It is situated directly to the southeast of Lake Apopka and located entirely within the Lake Apopka Basin. Dominant land uses in the City consist of agriculture (25 percent), wetlands (15 percent), open land (14 percent) and medium density residential (12 percent).

### 3.11.1 Level of Service

Chapter 86 (Concurrency Management System) of the City's Code of Ordinances defines the LOS for various public facilities within the City. Section 86-8(4) establishes the evaluation criteria for drainage where the impact of any proposed project is measured against the adopted LOS standards contained in the comprehensive plan. Policy 2.1 of the Capital Improvement Element of the City's Comprehensive Plan defines the drainage LOS as the following:

- For on-site retention, retain the first 0.5-inch of runoff for the 25-year/24-hour storm event.
- Post-development stormwater runoff flow rates, quantities, peaks and velocities should be equal or less than the pre-development runoff.
- State water quality standards as set forth in the State Water Policy Chapter 62-40, F.A.C. must be met.

## 3.11.2 NPDES MS4 Permit

The City of Winter Garden is currently regulated under the Phase I NPDES program for large MS4s. The City, along with its co-permittees (unincorporated Orange County, City of Apopka, City of Belle Isle, Town of Eatonville, City of Edgewater, City of Maitland, City of Ocoee, City of Winter Park, FDOT District 5 and the Valencia Water Control District), was issued a Phase I NPDES MS4 Permit (Permit No. FLS000001) on July 29, 2002. This is a 5-year permit that will expire in 2007. Prior to this date, the City and its co-permittees will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for control of discharge and water quality treatment from areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of the floodplain management regulations within the Land Development Code that require future flood management projects to assess and minimize the impacts of the water quality of the receiving water;
- Inspections, monitoring and maintenance of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

### 3.11.3 Stormwater System Inspection and Maintenance

For stormwater inspections and maintenance, the City follows the maintenance and inspection schedule outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of its NPDES MS4 permit, which is included in Appendix C. The City has 4 full-time staff members dedicated to stormwater operations and maintenance including a stormwater engineer and three operators. Major equipment owned and operated by the City includes one backhoe, two street sweepers, one dump truck, one Menzi Muck®, one 1-ton truck. The City currently contracts out storm sewer lining.

Section 106-9 of the City's Code of Ordinances states that prior to the issuance of a building permit, a written maintenance plan be submitted to the City which contains documentation to demonstrate that the maintenance agency is the legal entity empowered and obligated to perpetually maintain the stormwater management facilities. The document should define its authority and responsibility for maintenance of the stormwater management system, define how the maintenance is to be performed, and provide a legal mechanism ensuring the perpetuation of the maintenance. Maintenance of stormwater facilities include the performance of the system as originally designed and permitted by the City and if inspection reveals that the legal entity is not maintaining the system in accordance with the requirements, the City will give the legal entity written notice of the corrective actions required to be taken. If the legal entity fails to complete such corrective action within 30 days after notification, the City may enter upon the property and take the necessary corrective action and the owner will be liable to the City for any costs or expenses incurred by the City in taking the necessary corrective action plus 20 percent for an administrative fee.

### 3.11.4 Redevelopment Control Measures

Article V of Chapter 98 of the City's Code of Ordinances establishes the Community Redevelopment Agency and adopts the City's Community Redevelopment Plan (Draft Report, 2004) which provides recommendations for the sound development and redevelopment of properties in the redevelopment area.

Chapter 106 of the City's Code of Ordinances establishes the requirements for Stormwater Management. In this chapter, the definition of development or development activity includes "the modification or redevelopment of a site." New development or redevelopment shall adhere to the stormwater management requirements described in Section 106-7 of the Code of Ordinances which generally include the following:

- New development or redevelopment will be set to grades which will preclude flooding or any part or portion thereof due to excessive rainfall.
- All runoff be first diverted to retention/detention facilities which meet the requirements as prescribed by the SJRWMD.

- All retention/detention facilities incorporate designs which will provide for percolation, recovery, and other pertinent factors, as required by the SJRWMD.

- In addition to meeting the retention/detention requirements as required by the SJRWMD, the project should have detention capacity sufficient to ensure that post-development runoff flow rates, quantities, peaks, and velocities are equal to or less than predevelopment runoff for the 25-year, 24-hour storm event, and the quality of the runoff conforms to the minimum standards set forth in the State Water Policy, Chapter 62-40 F.A.C.

- In all cases, outfall from retention/detention facilities must be connected by approved means to the city storm drainage system.

- An exfiltration or porous pavement system may be designed in lieu of a retention/detention system.

- Final stormwater storage locations should not impound water against roadway or building structural sections.

- Floodways and floodplains, level of flood flows or velocities of adjacent streams, impoundments, or other watercourses must not be altered so as to adversely impact the off-site storage or conveyance capacities of the water resources.

- Use erosion and sediment control best management practices during construction to retain sediment on site.

- Water reuse and conservation should, to the maximum extent practicable, be achieved by incorporating the stormwater management system into irrigation systems serving the development.

## 3.11.5 Current Water Resources Funding Mechanisms

Article VI of Chapter 78 of the City's Code of Ordinances established the stormwater management utility. Section 78-208 establishes the stormwater management utility operating fund where all stormwater management utility fees and charges are collected by the City. This fund is used for the purpose of paying for stormwater management drainage facilities and the cost of operation, administration and maintenance of the stormwater system of the City. The charge per equivalent drainage unit (EDU) is $3.13 per month and consists of a base fee of $0.88 per EDU applicable to all properties, plus a contribution fee of $2.25 per EDU, applicable to all properties. All nonresidential property with site mitigation facilities may be entitled to a reduction in the contribution fee of up to 40 percent. Additionally, nonresidential property that does not directly or indirectly drain to any city-maintained or city-owned stormwater management system and that does not have frontage on a city-owned or city-maintained right-of-way, easement, or stormwater management system may be entitled to a reduction in the contribution fee of up to 100 percent.

# 3.12 Seminole County

Approximately 54 square miles of the western edge of Seminole County are within the WSA and account for approximately 11 percent of the study area. Seminole County has jurisdiction in the Big Wekiva, Little Wekiva, Monroe Basin, Soldiers Creek and Yankee Lake watersheds within the WSA. With the exception of the Wekiva Preserve, the portion of the County within the WSA is highly urbanized and is dominated by suburban and low density residential land uses.

## 3.12.1 Level of Service

For new development, design criteria for stormwater facilities have been adopted by Seminole County as described in its 2004 Vision 2020 Comprehensive Plan. These design criteria are presented in **Table 3-5**. In addition to these criteria, new development must meet all other applicable local, state, and federal design criteria (e.g., SJRWMD).

**Table 3-5**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Seminole County Design Storm Criteria**

| Facility Type | Design Storm |
|---|---|
| Retention/Detention Basins (with positive outfall)<br>■ sites<br>■ subdivisions | 25-year/24-hour<br>25-year/24-hour |
| Retention/Detention Basins (land locked) | 100-year/24-hour<br>Total Retention |
| Retention/Detention Basins (adjacent to public right-of-way with no positive outfall) | 25-year/24-hour<br>Total Retention |
| Closed Drainage System (internal to development) | 10-year/3-hour |
| Roadside Swales | 10-year/3-hour |
| Arterial and Collector Streets | 10-year, hydraulic grade line 1.0 ft. below gutter line |
| Local Streets | 10-year, hydraulic grade line 0.5 ft. below gutter line |
| Canals | 25-year |
| Bridges | 100-year |

Source: 1991 Comprehensive Plan Update

In addition to design criteria, Seminole County adopted the following LOS definitions:

### LOS A: Flow Contained within Systems

No flooding of major roadways, minor roadways, yards or buildings. The hydraulic grade line (free water surface) is generally at or below the inlet throats of storm sewer systems and/or within the top of bank in channels.

### LOS B: Water Contained within Right-of-Way

Flooding of major roadways is limited to the outer lane but does not prevent travel. Flooding of minor street crowns is of limited duration. Flooding of yards is generally limited to the right-of-way but no flooding of buildings occurs. The hydraulic grade line is at or slightly above the inlet throat and/or encroaches on top of curb but does not breach the top of bank in channels.

### LOS C: Water Contained within the Property

Flooding of major roadways precludes the use of the outer lanes and travel in inner lanes is possible but difficult. Prolonged flooding of minor streets precludes travel. Flooding of property up to the front face of building occurs, but no flooding of the building. The hydraulic grade line is significantly above the inlet, beyond road rights-of-way and beyond the normal channel in the floodplain.

### LOS D: Structure Flooding

Extensive flooding of streets, yards and buildings for prolonged periods (24 hours or longer).

According to the drainage element of the County's Comprehensive Plan, the following facility based standards should be used as a guide for deficiency correction:

1. A 100-year/24-hour design storm standard will be assigned to bridges with spans greater than 20-feet and to any modeled stormwater structure intended to keep evacuation routes and emergency service buildings operational.

2. A 50-year/24-hour design storm standard will be assigned to all cross drains and bridges with spans less than 20-feet intended to keep operational evacuation routes and emergency services buildings operational.

3. A 25-year/24-hour design storm standard will be assigned to the primary stormwater management system and retention/detention facilities included in the stormwater model that are not subject to the criteria listed above.

4. A 10-year/24-hour design storm standard will be assigned to closed pipe conveyance systems and roadside swales included in the stormwater model that are not subject to the criteria listed above.

## 3.12.2 NPDES MS4 Permit

Seminole County along with its co-permittees (City of Altamonte Springs, City of Casselberry, City of Lake Mary, City of Longwood, City of Oviedo, City of Sanford, City of Winter Springs, FDOT District 5 and FDOT Turnpike District), was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. Phase I indicates that Seminole County is a large MS4. The County's permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the County will go through the renewal process.

This NPDES MS4 permit authorizes the County to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the County is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to County requirements for areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Implementation of CIPs;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

## 3.12.3 Stormwater System Inspection and Maintenance

According to the Vision 2020 Comprehensive Plan, Seminole County's maintenance of stormwater facilities has historically focused primarily on improvements associated with the development, expansion and maintenance of County roadways. With the correction of deficiencies and establishment of standards based upon a facility performance, the County developed an ongoing maintenance program to ensure that facility standards are maintained. Given the current growth rate and the continuing natural deterioration of existing drainage systems, ongoing maintenance and

structural improvements are issues of increasing importance. Seminole County should increase current stormwater facility maintenance practices and upgrade its maintenance program.

***Privately Owned Systems***

Issue DRG 5 outlines Seminole County's responsibilities for private facilities and retrofitting:

> "Seminole County is responsible for the development and operation of publicly owned stormwater facilities. There are a significant number of private systems that are inadequate and/or not maintained posing the potential for local flooding. Two general categories of private stormwater facilities need attention: (1) improperly maintained and deteriorating structures and (2) older systems, which are inadequate and not consistent with existing design regulations…
>
> Maintenance of systems associated with private developments is typically the responsibility of homeowner associations. Where improvements and facility replacement are necessary, Seminole County makes private property owners aware of alternative options for facility correction to include the establishment of Special Assessment Districts which permit the County to correct deficiencies and maintain facilities [The County has also initiated a program to acquire and/or secure legal access to drainage rights-of-way since improvements and maintenance of these ditches and canals is becoming a critical component to the overall stormwater program] …
>
> Today, there are many older developments that cannot adequately handle the volume of stormwater runoff generated onsite, and are without provisions for treatment to ensure water quality. Seminole County now regulates the expansion and/or redevelopment of all sites to require that stormwater facilities meet or exceed existing regulations."

***Underdrains***

Issue DRG 3 of the comprehensive plan addresses the use of underdrain facilities which the County plans to tackle in the future:

> "Underdrains are perforated pipe systems placed under or around ponds and roadways to aid in drawdown and recovery of stormwater. They are typically used in areas where natural storage retention systems do not provide sufficient percolation or used where there is insufficient land for retention ponds. Historically, these systems have required an extensive and expensive amount of maintenance to keep them free of debris and organic accumulation… Inadequate facility maintenance poses serious water quality impacts to local communities. Since the SJRWMD has revised its rules regarding underdrains, they are being used less often. Seminole County currently has plans to review the regulations and discontinue use of underdrains."

***Current Maintenance & Inspection Program***
For stormwater inspection and maintenance, the County follows the activities outlined in Table II.A.1.a (Inspections and Maintenance Schedule for Structural Controls) of its NPDES MS4 permit (see Appendix C). This table defines frequencies of inspection and maintenance activities of various stormwater facilities.

The County's stormwater field operation consists of twenty (20) full time employees divided into four crews; one for pond maintenance, one for ditch and canal maintenance, one all-purpose crew which performs a variety of maintenance activities without heavy equipment, and a fourth crew to flush and clean pipes and structures. County-owned equipment for stormwater maintenance includes one long-reach tracked excavator and one skid-steer loader used for pond maintenance; one wheeled excavator and one crawling excavator used for canal and ditch maintenance; and two vacuum trucks for flushing and cleaning pipe structures.

Contracted services include monthly mowing of county-owned ponds, monthly mowing of flat-ground areas along county ditches and canals, and slope mowing of ditches and canals every three months.

## 3.12.4 Redevelopment Control Measures

In the County's Vision 2020 Comprehensive Plan, redevelopment is defined as the "substantial renovation, re-construction or demolition of an existing building or buildings. As shopping centers, apartment buildings, and warehouses become old, economically obsolete or structurally substandard, the property they occupy becomes more valuable than the building. The buildings are usually removed and the newly vacant property is redeveloped for a contemporary use. Redevelopment is the economic response to this growing situation. As development opportunities on vacant lands diminish, as viable commercial sites are rediscovered under marginal buildings, as land becomes more valuable, redevelopment opportunities will increase in Seminole County." Objective DRG5 of the County's Vision 2020 Comprehensive Plan Drainage Element, requires that: 1) all new development and redevelopment meet the design criteria set forth in the County's level of service standards; 2) all new development and redevelopment meet the stormwater quality and quantity criteria implemented within the Land Development Code; and 3) the County regulate development and redevelopment consistent with, and meeting the minimum requirements of the SJRWMD Rule 40C-42, F. A. C., Regulation of Stormwater Discharge and Rule 40C-4, F. A. C., Management and Storage of Surface Waters, and the Stormwater Discharge Rule; Ch. 62-25, Ch. 62-3, F. A.C.

Part 9 of Chapter 270 of the County's Code of Ordinances addresses storm sewer discharges. Section 270.394 prohibits stormwater discharges to the MS4 from new development or sites of significant redevelopment unless the appropriate local, state or federal permits are obtained prior to discharging to the MS4 or to waters of the United States within the County. Section 4 of Appendix B (Surface Water Management Standards) of the County's Land Development Code (2004) requires that

redevelopments which have no increase or a net decrease in impervious area yet lack evidence of a functioning retention/detention facility may be required to retrofit the site to current County standards.

### 3.12.5 Current Water Resources Funding Mechanisms

Overall funding for the County's stormwater program is currently provided mostly through the general fund, with additional monies from sales tax (for CIPs) and the rest from grants.

According to the County's Vision 2020 Comprehensive Plan, funding continues to be one of the most important issues of the County's current stormwater management program. The cost of correcting unfunded deficiencies has grown steadily in recent years. The County sees an effective Stormwater Program as a program that will ensure public safety, minimize flooding, ensure sufficient treatment of runoff and meet or exceed regulatory requirements, continue implementation of the specific basin master plans, correct existing deficiencies and ongoing system maintenance, and acquire rights-of-way. The magnitude of costs associated with meeting these needs is beyond the means of the County's currently applied revenue sources.

Seminole County will continue to pursue development of funding strategies, which generate the required funds while being equitable to County residents. In order to assess the magnitude of existing drainage deficiencies, Seminole County undertook a planning study of stormwater needs, entitled the Stormwater Management Study. As recommended in this study, the County is continuing to evaluate funding mechanisms to alleviate these deficiencies; possibilities are a stormwater utility fee or other financing alternatives to be used in conjunction with the utility included, bonding and special improvement assessment districts. These alternatives and others may be considered by Seminole County for funding of specific drainage improvement needs to supplement a stormwater utility or similar program.

## 3.13 City of Altamonte Springs

The City of Altamonte Springs occupies approximately 8.3 square miles or 1.8 percent of the WSA. The City is located on the eastern side of the WSA and is within the Little Wekiva River watershed. Predominant land uses within the city limits include medium density residential (21 percent), high density residential (21 percent), commercial (17 percent) and roads (16 percent).

### 3.13.1 Level of Service

The City of Altamonte Springs defines its LOS for stormwater facilities under Policy 6-4.1.3 in its Comprehensive Plan, adopted in 2002. The City establishes the following LOS standards for stormwater quantity and quality which apply to all development and redevelopment:

1. The lowest floor elevation of a habitable structure must be at least one foot above the 100-year base flood elevation (BFE) floodplain as set by the Federal Emergency Management Agency (FEMA).

2. Sites shall conform to the following design standards shown in **Table 3-6**.

3. Limit flooding of major arterial roadways to one half of the outer travel lane width using a peak intensity for the 10-year storm.

4. Limit flooding of local streets from exceeding one inch above the crown of the road.

5. Local streets shall not flood to such an extent that they become impassable to emergency vehicles.

6. Any existing structure with a first floor elevation below the 100-year floor elevation will be treated as a nonconforming use.

7. Any new development will be built in such a manner that the development will not exceed the downstream capacity for rate and volume of runoff for the storm events listed above.

8. Discharge to natural water bodies shall be consistent with state standards as stated in Rule 62.302.560, F.A.C., and the NPDES Stormwater Standards.

**Table 3-6**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**City of Altamonte Springs Stormwater LOS**

| Development Type | Standard |
|---|---|
| **Landlocked drainage basin-primary system design standard:** | |
| New Development | Retain the difference in pre-development versus post-development run-off volume during the 100-year, 24-hour storm event and the St. John's River Water Management District (SJRWMD) criteria for water quality treatment, independent of project size. |
| Redevelopment | Retain the difference in pre-development versus post-development run-off volume during the 100-year, 24-hour storm event and the St. John's River Water Management District (SJRWMD) criteria for water quality treatment, independent of project size. |
| Infill Development | Retain the difference in pre-development versus post-development run-off volume during the 25-year, 6-hour storm event and the St. John's River Water Management District (SJRWMD) criteria for water quality treatment, independent of project size. |
| **Positive Outfall (Riverine) drainage basis-primary system design standard**: | |
| New Development | Detain the difference in pre-development versus post-development run-off volume and rate of the 10-year, 3-hour storm event and the SJRWMD criteria for water quantity and quality, independent of project size. |
| Redevelopment | Detain the difference in pre-development versus post-development run-off volume and rate of the 10-year, 3-hour storm event and the SJRWMD criteria for water quantity and quality, independent of project size. |
| Infill Development | Detain the difference in pre-development versus post-development run-off volume and rate of the 10-year, 3-hour storm event and the SJRWMD criteria for water quantity and quality, independent of project size. |
| **For secondary system such as roads and storm sewer systems, the design storm will be the 10-year storm event, using the "Rational method."** | |

## 3.13.2 NPDES MS4 Permit

Similar to Seminole County, the City of Altamonte Springs (along with its co-permittees) was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. The permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Flood control projects;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

## 3.13.3 Stormwater System Inspection and Maintenance

Inspection and maintenance requirements as outlined in the Land Development Code and Chapter 26, Article VI: Stormwater Management of the Code of Ordinances require the property owner to maintain all primary and secondary drainage facilities on-site to ensure the integrity of the system and its proper functioning at design capacity. No owner or successor should remove, destroy, modify, subvert or render inoperable any part of a stormwater system unless approved by the City Engineer in writing in advance of any alteration. These facilities will be inspected for maintenance annually by City Inspectors and before the issuance of a certificate of occupancy.

### 3.13.4 Redevelopment Control Measures

Redevelopment requirements for stormwater management were previously defined in subsection 3.13.1.

### 3.13.5 Current Water Resources Funding Mechanisms

The City of Altamonte Springs established a Stormwater Management Fund described in Chapter 26, Article VI: Stormwater Management of the Code of Ordinances. The fund is used to pay the cost of construction, operation, administration and maintenance of stormwater management facilities. This fund is supplied by a Stormwater Utility Fee imposed on all property within the city, in order to minimize the system's adverse effect on the water quality of lakes, ponds and basins within the city, to seek and to maintain the levels of lakes, ponds and basins within the city, and to facilitate the maintenance of retention areas. Equivalent drainage units (EDU) are calculated for both residential and non-residential properties, and fees are based on $5.75/month/EDU effective April 1, 2005.

## 3.14 City of Lake Mary

The City of Lake Mary occupies less than 0.5 square miles of the WSA. This portion of the City is located along the eastern edge of the WSA within the Soldiers Creek watershed. Based on the SJRWMD's land use and land cover GIS layer, of the City's 290 acres in the WSA, 36 percent is commercial, 26 percent are roads and 20 percent is open land.

### 3.14.1 Level of Service

Chapter 155: Subdivision Regulations, Appendix C: Stormwater Management Regulations outlines the LOS for stormwater facilities required in the City of Lake Mary. The City follows SJRWMD criteria for pollution abatement, flood protection and recharge. **Table 3-7** details the LOS for structures.

**Table 3-7**
**Wekiva Parkway & Protection Act Support**
**Master Stormwater Management Plan**
**City of Lake Mary LOS Stormwater Standards**

| Facility | Design Storm Critical Duration* |
|---|---|
| Bridges | 50-year |
| Canals, ditches, or culverts for drainage external to the development | 25-year |
| Cross drains, storm sewers | 10-year |
| Roadside swales for drainage internal to the development | 10-year |
| Detention basins | 25-year, 24-hour |
| Retention basins (no positive outfall) | 25-year, 24-hour or 100-year, 24-hour |

*Note: Critical duration is that storm event which generates the peak discharge rate for the post-development conditions. Use the Florida Department of Transportation methods to determine this event.

Dry bottom retention/detention facilities must include infiltration and filtration respectively, and be dry 72 hours after a storm. Ponds not designed for the 25-year, 24-hour post-development volume or the 25-year, 96-hour or the 100-year, 24-hour storm events are required to have an outfall structure with an oil skimmer. These outfall structures must discharge to appropriate drainage facilities. Wet retention/detention facilities must be designed to meet the SJRWMD's criteria as a minimum.

## 3.14.2 NPDES MS4 Permit

The City of Lake Mary (along with its co-permittees) was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. The permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for areas of new development and significant redevelopment;
- Roadway litter control and street sweeping;
- Flood control projects;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and
- Construction site runoff permitting, inspections, enforcements and operator training.

## 3.14.3 Stormwater System Inspection and Maintenance

There is one full-time staff member dedicated to stormwater in the City but there is an 8-person maintenance crew in the City's public works department that can be used for stormwater maintenance. The City's inspection and maintenance program is mostly complaint driven; however, the City does visit each system and inspect it monthly on average. Major systems tend to get more regular monthly inspections than some of the smaller ones. Street sweeping occurs twice per year, but the City currently participates in a lease program where they will purchase their own sweeper and can then sweep more frequently. The public works department has mowers, backhoes, a front end loader, pumps, and a vacuum machine. A Gradall® is contracted when needed.

## 3.14.4 Redevelopment Control Measures

Section 154.67 of the City's Code of Ordinances establishes a Downtown Centre Zoning District in order to identify and provide the geographic areas within the designated Downtown Area that are appropriate for development and maintenance of office, retail, and residential uses; and establish development standards for such development within the District. The Downtown Centre standards govern all development and redevelopment in the zoning district to the extent that the development standards for the Downtown Centre Zoning District expressly conflict with the existing land development regulations. These standards were reviewed and there were no provisions for stormwater management identified.

The stormwater management requirements in Appendix C of the City's Subdivision Regulations (Chapter 155 of the City's Code of Ordinances) apply to "the division of a parcel of land into two or more lots or parcels of land for the purpose, whether immediate or future, of transfer of ownership or building development…" . Stormwater management systems are to be designed and installed for all land development projects that will contain features to provide for pollution abatement, recharge where possible, and protection from flooding.

## 3.14.5 Current Water Resources Funding Mechanisms

In order to protect the water quality of its lakes and streams, and mitigate flooding, Section 7 of Appendix C of the City's Subdivision Regulations (Chapter 155 of the City's Code of Ordinances) establishes a stormwater management utility to provide capital for new stormwater projects and maintenance and operation of existing facilities. The stormwater utility fee is imposed on all lots within the city based on EDU. The charge per EDU is $3.00 per month and consists of a base fee of $1.45 per EDU, plus a contribution fee of $1.55 per EDU. Non-residential property with site mitigation facilities will not pay the contribution fee.

# 3.15 City of Longwood

The City of Longwood occupies a little less than 1 square mile of the WSA. Located immediately to the south of the City of Lake Mary, only the western portion of the City is located within the eastern edge of the WSA. Portions of the City are within the Soldiers Creek and Little Wekiva River watersheds. Predominant land uses within the city limits in the WSA include medium density residential (44 percent), water bodies (19 percent) and roads (15 percent).

## 3.15.1 Level of Service

In Chapter 7 (Stormwater Technical Requirements) of the *Manual of Standards for City Streets, Stormwater Systems and Subdivisions* outlines the LOS standards for stormwater facilities as shown in **Table 3-8**.

**Table 3-8**
**Wekiva Parkway & Protection Act Support**
**Master Stormwater Management Plan**
**City of Longwood LOS Stormwater Standards**

| Facility Type | Design Storm |
|---|---|
| Cross drains, storm sewers | 10-year/24-hour |
| Roadside swales for drainage internal to the development | 10-year/24-hour |
| Detention Basins | 25-year/24-hour |
| Retention Basins (no positive outfall) | 100-year/24-hour |

## 3.15.2 NPDES MS4 Permit

The City of Longwood (along with its co-permittees) was issued a Phase I NPDES MS4 Permit (Permit No. FLS000038) on October 1, 1998. The permit was subsequently renewed and was reissued on May 27, 2004. This is a 5-year permit that will expire in 2009. Prior to this date, the City will go through the renewal process.

This NPDES MS4 permit authorizes the City to discharge from existing or new stormwater point sources to waters of the state from those portions of the MS4 that are owned or operated by the permittee. Under the permit, the City is required to implement the SWMP specified in the permit in order to achieve compliance. Elements of the SWMP include:

- Maintenance and inspection of structural controls and stormwater collection systems operation;
- Adhering to City requirements for areas of new development and significant redevelopment;

- Roadway litter control and street sweeping;
- Flood control projects;
- Inspections of municipal waste TSD facilities not covered by an NPDES permit;
- Training and certification of pesticide and herbicide applicators as well as public outreach and education on the proper use of pesticides, herbicides and fertilizers;
- Illicit discharge detection and elimination, spill prevention and response, public reporting, proper disposal of household hazardous waste and limitation of sanitary sewer seepage;
- High risk industrial facility inspection and monitoring; and,
- Construction site runoff permitting, inspections, enforcements and operator training.

## 3.15.3 Stormwater System Inspection and Maintenance

Chapter 24: Stormwater Management, Article II: Regulation of Stormwater Management System of the City's Code of Ordinances outlines the inspection and maintenance procedures for the stormwater systems in the City of Longwood. Structural controls, BMPs, or other elements of the stormwater management system must be operated and maintained by the property owner in accordance with permitted design and performance criteria, and in compliance with federal, state and local permit conditions and regulations. City personnel inspect facilities discharging or suspected of discharging to the City's MS4 or waters of the United States in order to investigate potential violations.

The City's maintenance schedule complies with the requirements set forth in the NPDES permit (see Appendix C). There are 2 full-time staff members specifically dedicated to stormwater maintenance. The City had a consultant under contract for NPDES services. The City does not own/operate any major equipment. Regular maintenance (e.g. cleaning out drains, right-of-way mowing) is done in-house, but major maintenance (cleaning out retention areas, lining pipes) is contracted out. During periods of heavy rain there can be up to 10 people dedicated to stormwater activities.

## 3.15.4 Redevelopment Control Measures

Article III (Design Standards) of the City's Land Development Code addresses stormwater management. All new development and redevelopment, except single-family and duplex structures, must comply with the regulations for stormwater management in the City of Longwood. All stormwater management facilities must meet the level of service requirements of the Longwood Comprehensive Plan; comply with the Stormwater Technical Requirements of the City of Longwood, the Department of Public Works Design Standards and the water management district regulations. Retention/detention requirements outlined in the LOS must also be met.

## 3.15.5 Current Water Resources Funding Mechanisms

The City of Longwood has developed a stormwater utility fee to fund stormwater management projects and services. This fee applies to all property within the City and may be used to fund the following activities:

1. Preparation of plans for improvements and betterments to the stormwater management system.

2. Construction of improvements and betterments to the stormwater management system.

3. The promulgation of regulations for the use of the stormwater management system including provisions for the enforcement of said regulations.

4. Review and approval of all new development permits within the city for compliance with stormwater management regulations included in the present City Code or amendments later adopted.

5. Performance of routine maintenance and minor improvement to the stormwater management system.

6. Recommendation of charges for connection to and use of the stormwater management system.

7. Evaluation of water quality concerns for discharges to the stormwater management system.

8. Performance of all normal utility functions relating to construction, operation, and maintenance of the City's stormwater management system.

9. Stormwater management systems inspection fee. The City charges a fee of fifty dollars ($50.00) for each inspection of completed stormwater management systems which were approved for construction by the City.

**Table 3-9** details the specific fees applied to each type of property in the City of Longwood.

**Table 3-9**
**Wekiva Parkway & Protection Act Support**
**Master Stormwater Management Plan**
**City of Longwood Stormwater Utility Fees**

| Property Type | Stormwater utility fees |
|---|---|
| Single family property per month per unit | $3.00 |
| Multifamily property per month per unit | $3.00 |
| Nonresidential/commercial property:<br>Per EDU per month (if property has mitigation)<br>Minimum charge per month | <br>$1.00<br>$1.00 |
| Nonresidential/commercial property:<br>Per EDU month (if property has no mitigation)<br>Minimum charge per month | <br>$3.29<br>$3.29 |
| Vacant residential platted property | $1.05/month or $6.30 semiannually per lot |
| All other vacant property | $l.05/month or $6.30/ semiannually for every 8,500 sq. ft. or fraction thereof |

# Section 4
# Existing Deficiencies & Prioritization

## 4.1 Introduction

As required by Section 369.319, F.S. of the WPPA, the MSMP must assess existing problems and deficiencies in the community as well as establish priorities to address existing deficiencies. This section describes the methodology used to identify, assess and prioritize existing deficiencies.

## 4.2 Existing Deficiencies

In order to identify existing deficiencies, CDM obtained existing stormwater master plans and drainage studies from the Stakeholders. Some problem areas were also identified through correspondence with Stakeholders as they were not part of an existing study. The available studies were then reviewed and the problems identified were tabulated and mapped using GIS ArcMap® Version 9.0, with a unique Id based on their major watershed location. Where evaluations of alternatives and recommendations for improvements were included in a study, these were noted as well. A large percentage of the WSA has already been studied in detail by the Stakeholders. Stakeholders who have performed detailed studies in the past within their jurisdictions include:

- City of Eustis
- City of Mount Dora
- Orange County
- City of Apopka
- City of Ocoee
- City of Orlando
- City of Winter Garden
- Seminole County
- City of Altamonte Springs

**Table 4-1** lists an inventory of the available studies that were reviewed and summarizes the types of information that were included in each study. As a large number of studies have already been performed within the WSA, CDM attempted to limit the inventory to more recent studies as these would be more up-to-date in identifying existing problems. The areas that have been previously studied or are in the process of being studied are shown in **Figure 4-1**.

**Table 4-1**
**Wekiva Parkway & Protection Act Master Stormwater Management Plan Support**
**Inventory of Stormwater Master Plan/Drainage Studies**

| Study | *Stormwater Structure Inventory* | *Water Quality Data Review* | *Pollutant Load Analysis* | *Water Quality Model* | *Subbasin Delineation* | *Hydrologic Unit Delineation* | *Model Schematic* | *Hydrologic Model* | *Hydraulic Surface Water Model* | *Long-Term Continuous Simulation Model* | *Model Attribute Data* | *Water Quantity Problems* | *Water Quality Problems* | *Other Problem Areas* | *Alternatives Evaluation* | *Estimated Capital Improvement Project Costs* | *Floodplain Mapping* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1. Lake Apopka Basin SWMMP (CDM, 2002) – Orange County | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| 2. Big Wekiva Basin SWMMP (PEC, 2001) – Orange County | ✓ | ✓ | | | ✓ | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | | |
| 3. Little Wekiva River SWMMP (CDM, 2004) – Orange County, Seminole County, City of Orlando, City of Altamonte Springs | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 4. Big Wekiva Engineering Study and Drainage Inventory (DRMP, 2003) – Seminole County | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | | ✓ | ✓ | |
| 5. Lakes McCoy, Coroni and Prevatt Drainage Basin Study (PEC, 1996) – City of Apopka, Orange County | ✓ | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 6. Starke Lake/Lake Olympia Drainage Basin Study (PEC, 1996) – City of Ocoee | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 7. Lake Lotta Drainage Basin Study (PEC, 1998) – City of Ocoee | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 8. Lake Meadow and Prairie Lake Drainage Basin Study (PEC, 1998) – City of Ocoee | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 9. Northwest Ditch Drainage Basin Study (PEC, 1996) – City of Ocoee | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 10. Spring Lake/Lake Johio - Drainage Basin Study (PEC, 1996) – City of Ocoee | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 11. Mt. Dora master Drainage Plan (Bowyer-Singleton, 1991) – City of Mount Dora | ✓ | | | | ✓ | | | | ✓ | | ✓ | ✓ | | | ✓ | | |
| 12. Final Engineering Report on Hydrologic and Hydraulic Design Evaluation Proposed Lulu Creek Check Dams (Ardaman & Associates, 2002)– City of Winter Garden | | | | | ✓ | | | ✓ | ✓ | | ✓ | ✓ | | | | | |
| 13. Altamonte Springs Stormwater Management Master Plan (PEC, 1996) – City of Altamonte Springs | | | | | | | | | | | | ✓ | ✓ | | ✓ | ✓ | |
| 14. Sawmill Pond/Crooked Lake Interconnection Study (SAI, 1999) – Orange County | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | | |
| 15. Land Locked Drainage Basin Study for Orange County: Lakes Julia, Alpharetta, Long and Pleasant(DRMP, 1996) – Orange County | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 16. Johns Lake SWMP (Miller-Sellen, 2003) | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| 17. Stormwater Outfall Master Drainage Plan for Jones Avenue (DRMP, 2002) – Orange County | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 18. City of Eustis SWMP (CPH, 2002) | ✓ | ✓ | | | ✓ | ✓ | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 19. Sweetwater Cove Tributary Surface Phase1A: Short Term Evaluation Water Restoration Project (ERD, 2002) – Seminole County | ✓ | ✓ | | | | | | | | | | ✓ | ✓ | | ✓ | ✓ | |

**Table 4-1**
**Wekiva Parkway & Protection Act Master Stormwater Management Plan Support**
**Inventory of Stormwater Master Plan/Drainage Studies**

| Study | *Stormwater Structure Inventory* | *Water Quality Data Review* | *Pollutant Load Analysis* | *Water Quality Model* | *Subbasin Delineation* | *Hydrologic Unit Delineation* | *Model Schematic* | *Hydrologic Model* | *Hydraulic Surface Water Model* | *Long-Term Continuous Simulation Model* | *Model Attribute Data* | *Water Quantity Problems* | *Water Quality Problems* | *Other Problem Areas* | *Alternatives Evaluation* | *Estimated Capital Improvement Project Costs* | *Floodplain Mapping* |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 20. Sweetwater Cove Tributary Surface Water Restoration Project Phase 1B Hydrologic and Nutrient Budget (ERD, 2003)- Seminole County | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | | |
| 21. West College Park Drainage Evaluation, City of Orlando (ERD, 2000) | | | | | ✓ | ✓ | | ✓ | ✓ | | | ✓ | | | ✓ | ✓ | |
| 22. Pleasant Oaks Drainage Basin, Orange County, Florida (BJM Associates, 1993) | | | | | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 23. Bear Lake Drainage Basin Hydrology Study, Seminole County, Florida (T.E. Knowles & Associates, 1993) | ✓ | ✓ | | | ✓ | ✓ | | ✓ | | | ✓ | | ✓ | | ✓ | | |
| 24. Little Wekiva River Basin Tributary C Flooding Investigation, Seminole County, Florida (DRMP, Inc., 1997) | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | ✓ |
| 25. Little Wekiva River Drainage Basin Drainage Inventory Engineering Study, Tributary "C" Retrofit, Seminole County, Florida (DRMP, Inc., 1995) | | | | | | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | | |
| 26. Drainage Basin Study for Woodsmere Stormwater Pumping Station, Orange County, Florida (PEC, 1999) | | ✓ | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ |
| 27. Orange County Stormwater Needs Assessment Update (Parsons Engineering Science, Inc. 2002) | | | | | | | | | | | | ✓ | ✓ | ✓ | ✓ | ✓ | |
| 28. Final Drainage Investigation Report Londonderry Hills Subdivision, Orange County, Florida (Parsons Engineering Science, Inc. 2001) | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | |
| 29. Nob Hill Drainage Investigation, Orange County, Florida (PEC, 2001) | | | | | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | |
| 30. Engineering Report/Drainage Calculations for the Sunset Lakes Subdivision Drainage Investigation (PEC, December 1998) | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | |
| 31. Water Street Stormwater Outfall Master Drainage Plan (Gee & Jenson, September 1997) | | | | | ✓ | ✓ | ✓ | ✓ | | | ✓ | ✓ | | | ✓ | ✓ | |
| 32. Stormwater Master Plan for the Beggs Road/Overland Road Area, Orange County, Florida (PEC, 1998) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 33. Engineering Study for the Retrofit and Restoration of Lulu Creek (Webb & Associates, Inc., 1999) | | ✓ | ✓ | | ✓ | | | | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| 34. Draft Final Report Sweetwater Cove Tributary Surface Water Restoration Project Phase 2 Restoration Plan (ERD, 2005) | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | |
| 35. Monroe Basin Engineering Study and Drainage Inventory Update Final Report, Seminole County (CDM, October 2001) | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ | | ✓ | ✓ | ✓ |
| 36. Soldiers Creek Basin Engineering Study and Drainage Inventory, Seminole County (Singhofen & Associates, Inc., December, 1996) | ✓ | | | | ✓ | ✓ | ✓ | ✓ | ✓ | | ✓ | ✓ | | | ✓ | ✓ | |

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7/11/05

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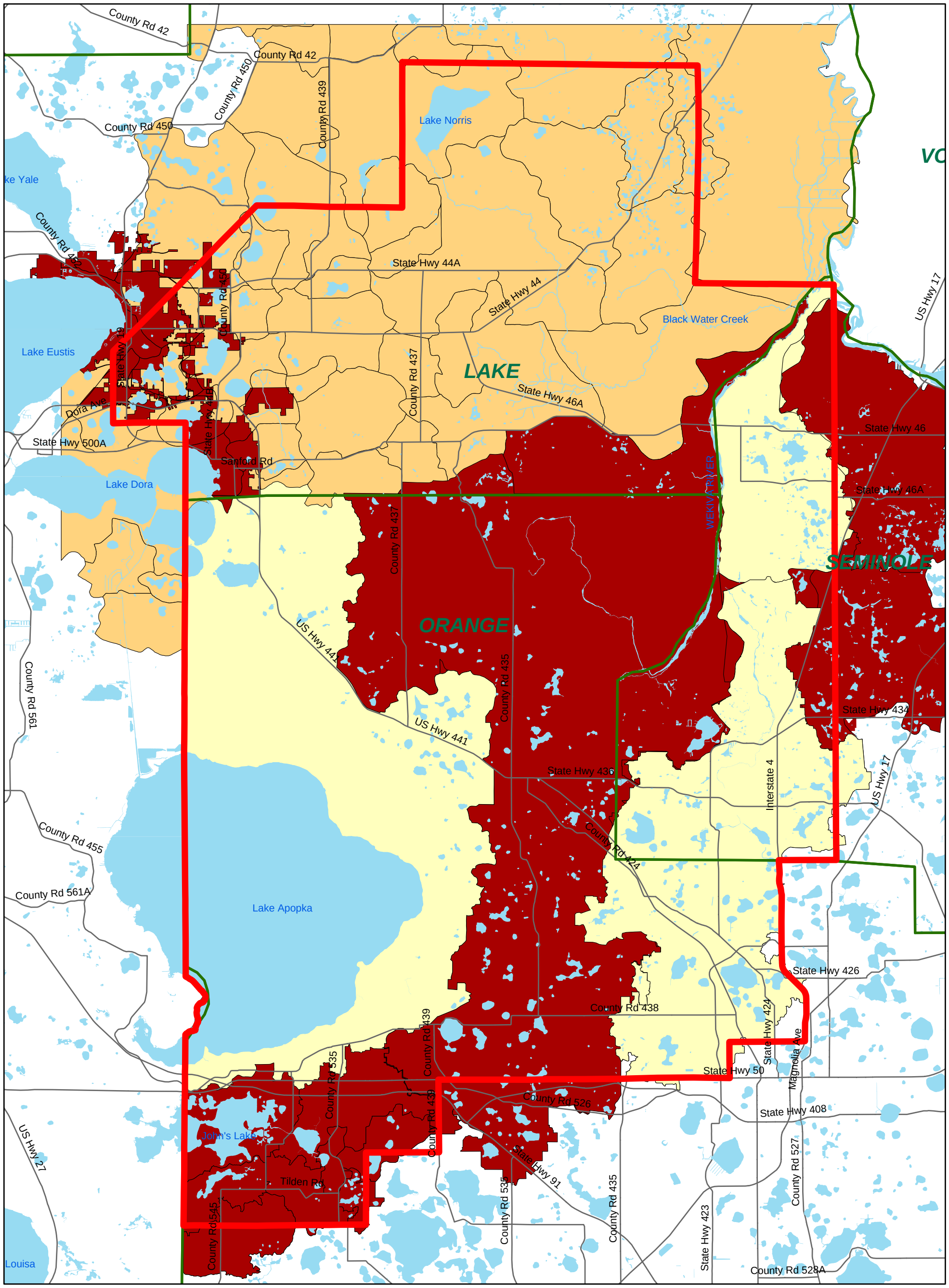


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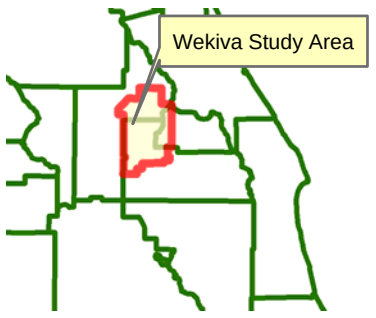
**LOCATION MAP**




**LEGEND**

- Wekiva Study Area
- County Line
- Water Bodies
- Major Roads
- Study Completed
- Study in Progress
- Study Not Completed

Wekiva Parkway & Protection Act
Master Stormwater Management Plan Support

CDM

Figure 4-1
Areas Studied

Due to the large range of types of problems, CDM assigned them to the following categories:

- Aquifer Recharge
- Erosion/Sedimentation
- Finished Floor
- House/Structure Flooding
- Landlocked
- Maintenance
- Property Flooding
- Right-of-Way
- Street Flooding
- Water Quality

Once CDM had summarized, categorized and mapped these problems, they were submitted to the Stakeholders for review and comment. As some of the problems may have already been addressed or no longer exist, CDM took these comments and incorporated them into the master table. The resulting table of problem areas as well as maps showing their locations is provided in **Appendix D**.

## 4.3 Prioritization & Ranking

CDM developed a methodology to prioritize and rank the identified problems. As the final number of problem areas was in excess of 300, it was necessary to develop a methodology that would make prioritization of these problem areas more manageable. As this MSMP addresses surface water, a watershed approach was used to group and manage the problem areas. Section 2.6 of this MSMP identifies the major watershed boundaries within the WSA. In addition, the Stakeholders previously delineated the majority of these watersheds into sub-watersheds, more commonly referred to as subbasins. Based on the available delineations, 102 subbasins were identified (previously shown in Figure 2-11). Using ArcMap® Version 9.0, the problems were further divided by subbasin; the subbasin was then used as a unit of measure to rank and prioritize existing deficiencies.

CDM developed a list of criteria to evaluate and prioritize the subbasins with identified problem areas within the WSA. The problem areas were assigned scores, ranked, and prioritized according to the criteria proposed by CDM. These criteria were also submitted to the Stakeholders for review and comments, which were taken

into account in the final ranking matrix. A description of each of the criterions and how they were used to assess identified problems is provided below:

- Water Quality and Tributary to Impaired Water Body – Subbasins were evaluated based on the presence of water quality problems, and being tributary to an impaired water body, for which FDEP has determined a TMDL will be developed. More importance was placed on those subbasins that met both criteria.

- Landlocked Subbasin with no outfall – Section 2.6.1 (Subbasins) of this MSMP identified those subbasins that are either landlocked, have limited discharge capacity or have a free outfall to a surface water conveyance system. Since the majority of the problem areas in the WSA are flooding related, more importance was placed on landlocked subbasins as it relates to problem areas, as surface water can only be recharged to the aquifer. Most of these subbasins are located in high recharge areas especially along the Mount Dora Ridge through the central portion of the WSA. Subbasins that discharge intermittently or have drainage wells were categorized as limited discharge. Subbasins where surface water discharge can be readily lost (i.e., flow out of the system) were categorized as free outfall subbasins.

- Flooding Related Problems- All flooding problems (i.e. street, property, and house) were evaluated on the severity of impact based on duration, access, correlation with evacuation routes, and threat to structures. Flooding situations that impacted structures, blocked evacuation routes and were of lengthy duration were given more importance.

- Erosion/Sedimentation Problems- Areas with chronic erosion and sedimentation problems impacting the primary conveyance systems were given more priority over nuisance problems affecting secondary conveyance systems.

- Maintenance Problems- Subbasins were evaluated on the number of overall maintenance problems within their boundaries. More emphasis was given to those subbasins with more maintenance problems, which could indicate older stormwater systems or the need for a revised maintenance schedule.

- Number of Problems- The number of problem areas identified in each subbasin was also considered in prioritization. Subbasins with more problems were given more weight to assess the overall condition of that subbasin, and the possibility of combining projects and improvements to serve several areas.

An overall score for each subbasin was calculated, and the results of this process are summarized in a ranking matrix shown in **Table 4-2**. Based on the ranking, the top five subbasins are:

**Table 4-2**
**Wekiva Parkway Protection Act Master**
**Stormwater Management Plan Support**
**Existing Deficiencies**
**Prioritzation and Ranking**

| ***Ranking Matrix*** | | | | Tributary to Impaired Water Body | Landlocked Subbasin with no outfall | No. of Problems | Flooding Related | Erosion / Sedimentation | Maintenance Related | TOTALS | RANKING |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | # of Problems | Weight: | 24.0% | 10.0% | 26.0% | 20.0% | 11.0% | 9.0% | 100.0% | # |
| AP-002 | 8237 | 43 | | 10 | 0 | 10 | 5 | 10 | 10 | 8 | 1 |
| AP-001 | 15876 | 34 | | 5 | 5 | 8 | 7 | 5 | 2 | 6 | 2 |
| LW-008 | 3980 | 13 | | 10 | 5 | 3 | 5 | 10 | 0 | 6 | 2 |
| LW-003 | 11113 | 24 | | 10 | 0 | 6 | 5 | 8 | 2 | 6 | 2 |
| BW-010 | 905 | 9 | | 10 | 5 | 2 | 5 | 10 | 0 | 6 | 2 |
| SOL-001 | 1286 | 4 | | 10 | 10 | 1 | 5 | 0 | 0 | 5 | 3 |
| BW-014 | 668 | 4 | | 10 | 10 | 1 | 4 | 0 | 0 | 4 | 4 |
| BW-011 | 460 | 9 | | 5 | 5 | 2 | 5 | 10 | 2 | 4 | 4 |
| LW-002 | 3549 | 18 | | 10 | 0 | 4 | 4 | 0 | 1 | 4 | 4 |
| LE-004 | 1277 | 1 | | 10 | 10 | 0 | 4 | 0 | 0 | 4 | 4 |
| LW-011 | 585 | 4 | | 10 | 0 | 1 | 8 | 0 | 0 | 4 | 4 |
| BW-002 | 1988 | 16 | | 10 | 0 | 4 | 4 | 0 | 0 | 4 | 4 |
| GT-006 | 1088 | 6 | | 5 | 10 | 1 | 8 | 0 | 1 | 4 | 4 |
| BW-007 | 742 | 7 | | 10 | 5 | 2 | 3 | 0 | 2 | 4 | 4 |
| BW-030 | 1155 | 17 | | 5 | 0 | 4 | 6 | 0 | 7 | 4 | 4 |
| BW-021 | 3683 | 5 | | 5 | 0 | 1 | 6 | 10 | 0 | 4 | 4 |
| BW-012 | 228 | 4 | | 5 | 5 | 1 | 4 | 10 | 0 | 4 | 4 |
| GT-001 | 1551 | 1 | | 10 | 0 | 0 | 0 | 10 | 0 | 4 | 4 |
| SOL-005 | 76 | 1 | | 10 | 0 | 0 | 0 | 10 | 0 | 4 | 4 |
| LW-010 | 1893 | 5 | | 10 | 0 | 1 | 4 | 0 | 0 | 4 | 4 |
| LW-012 | 629 | 3 | | 10 | 0 | 1 | 5 | 0 | 1 | 4 | 4 |
| LE-003 | 420 | 2 | | 10 | 0 | 0 | 5 | 0 | 0 | 4 | 4 |
| AP-006 | 1186 | 1 | | 10 | 0 | 0 | 5 | 0 | 0 | 3 | 5 |
| MON-002 | 655 | 1 | | 10 | 0 | 0 | 5 | 0 | 0 | 3 | 5 |

**Table 4-2**
**Wekiva Parkway Protection Act Master**
**Stormwater Management Plan Support**
**Existing Deficiencies**
**Prioritzation and Ranking**

| ***Ranking Matrix*** | | | | Tributary to Impaired Water Body | Landlocked Subbasin with no outfall | No. of Problems | Flooding Related | Erosion / Sedimentation | Maintenance Related | TOTALS | RANKING |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | # of Problems | Weight: | 24.0% | 10.0% | 26.0% | 20.0% | 11.0% | 9.0% | 100.0% | # |
| BW-013 | 1142 | 5 | | 5 | 10 | 1 | 5 | 0 | 0 | 3 | 5 |
| LW-001 | 2664 | 3 | | 10 | 0 | 1 | 4 | 0 | 0 | 3 | 5 |
| LE-002 | 1216 | 6 | | 5 | 10 | 1 | 4 | 0 | 0 | 3 | 5 |
| BW-009 | 433 | 2 | | 5 | 10 | 0 | 5 | 0 | 0 | 3 | 5 |
| LW-007 | 1279 | 2 | | 10 | 0 | 0 | 4 | 0 | 0 | 3 | 5 |
| MON-001 | 1697 | 2 | | 10 | 0 | 0 | 4 | 0 | 0 | 3 | 5 |
| LW-005 | 1784 | 3 | | 10 | 0 | 1 | 4 | 0 | 0 | 3 | 5 |
| LW-009 | 1717 | 3 | | 10 | 0 | 1 | 3 | 0 | 0 | 3 | 5 |
| GT-007 | 1272 | 4 | | 5 | 10 | 1 | 0 | 7 | 0 | 3 | 5 |
| AP-007 | 10494 | 2 | | 10 | 0 | 0 | 3 | 0 | 0 | 3 | 5 |
| LW-006 | 1160 | 2 | | 10 | 0 | 0 | 0 | 0 | 0 | 3 | 5 |
| BW-006 | 2892 | 4 | | 0 | 10 | 1 | 6 | 0 | 0 | 2 | 6 |
| GT-002 | 592 | 1 | | 5 | 10 | 0 | 0 | 0 | 0 | 2 | 6 |
| LE-006 | 1010 | 1 | | 0 | 10 | 0 | 0 | 10 | 0 | 2 | 6 |
| BW-022 | 15409 | 2 | | 0 | 10 | 0 | 5 | 0 | 0 | 2 | 6 |
| BW-025 | 190 | 1 | | 5 | 0 | 0 | 4 | 0 | 0 | 2 | 6 |
| BWC-007 | 1092 | 1 | | 0 | 10 | 0 | 5 | 0 | 0 | 2 | 6 |
| BW-018 | 7866 | 4 | | 0 | 10 | 1 | 4 | 0 | 0 | 2 | 6 |
| BW-017 | 2741 | 10 | | 0 | 5 | 2 | 4 | 0 | 0 | 2 | 6 |
| BW-032 | 185 | 2 | | 0 | 5 | 0 | 7 | 0 | 0 | 2 | 6 |
| BWC-021 | 3330 | 1 | | 0 | 10 | 0 | 4 | 0 | 0 | 2 | 6 |
| BW-008 | 1415 | 1 | | 5 | 5 | 0 | 0 | 0 | 0 | 2 | 6 |
| BW-028 | 512 | 2 | | 0 | 5 | 0 | 5 | 0 | 1 | 2 | 6 |
| BW-029 | 1021 | 2 | | 0 | 5 | 0 | 4 | 0 | 0 | 1 | 7 |

**Table 4-2**
**Wekiva Parkway Protection Act Master Stormwater Management Plan Support**
**Existing Deficiencies**
**Prioritzation and Ranking**

| ***Ranking Matrix*** | | | | **Tributary to Impaired Water Body** | **Landlocked Subbasin with no outfall** | **No. of Problems** | **Flooding Related** | **Erosion / Sedimentation** | **Maintenance Related** | **TOTALS** | **RANKING** |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | # of Problems | Weight: | 24.0% | 10.0% | 26.0% | 20.0% | 11.0% | 9.0% | 100.0% | # |
| BW-023 | 26783 | 1 | | 5 | 0 | 0 | 0 | 0 | 0 | 1 | 7 |
| BW-031 | 426 | 3 | | 0 | 0 | 1 | 4 | 0 | 2 | 1 | 7 |
| BW-033 | 412 | 1 | | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 7 |
| BW-004 | 210 | 1 | | 0 | 0 | 0 | 5 | 0 | 0 | 1 | 7 |
| BWC-017 | 9526 | 1 | | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 7 |
| YL-001 | 9861 | 1 | | 0 | 0 | 0 | 4 | 0 | 0 | 1 | 7 |
| BW-020 | 1774 | 1 | | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 7 |

***Criteria Explanation:***

| | | |
|---|---|---|
| 1 Tributary to Impaired Water Body | 10 | within the subbasin associated with an impaired water body |
| | 5 | water quality problem have been identified but not related to TMDL |
| | 0 | no water quality problems have been identified |
| 2 Landlocked Subbasin | 10 | landlocked subbasin with no outfall |
| | 5 | landlocked basin with limited discharge |
| | 0 | subbasin with a positive outfall |
| 3 Number of Problems | 10 | Most # of problems |
| | 0 | No problem areas |
| 4 Flood Severity | 10 | structure flooding (e.g., house) |
| | 8 | flooding of evacuation routes but no structure flooding |
| | 5 | impassable local road flooding but no structure or evacuation route flooding |
| | 4 | property flooding |
| | 3 | short-term local road flooding only |
| | 0 | no flooding |
| 5 Erosion/Sedimentation | 10 | chronic erosion/sedimentation occurring in primary conveyance systems |
| | 5 | nuisance erosion/sedimentation associated with maintenance/secondary systems |
| | 0 | no erosion/sedimentation problems |
| 6 Maintenance Related | 10 | the most number of problems related to maintenance |
| | 0 | no maintenance problems |

1. Subbasin AP-002 – This approximately 8,200 acre subbasin is located in the Lake Apopka Basin adjacent to the southeastern shore of Lake Apopka, and encompasses portions of the Town of Oakland, the City of Ocoee, the City of Winter Garden and unincorporated Orange County. Important issues in this subbasin are the number of problem areas identified (43) and it is tributary to an impaired water body (i.e. Lake Apopka).

2. Subbasin AP-001- Located just south of subbasin AP-002, AP-001 is within the Town of Oakland, the City of Ocoee, the City of Winter Garden and unincorporated Orange County. This subbasin is a limited discharge basin, as Johns Lake intermittently discharges to Lake Apopka.

3. Subbasin LW-008 - This 3,980 acre subbasin within the Little Wekiva River Basin, is located on the eastern edge of the WSA and is within the City of Altamonte Springs and unincorporated Seminole County. It is a limited discharge subbasin with 13 problem areas, and is tributary to 4 impaired water bodies: Lake Florida, Lake Orienta, Lake Adelaide and the Little Wekiva River.

4. Subbasin LW-003- This subbasin, also located in the Little Wekiva River Basin, encompasses the main stem of the Little Wekiva River from its headwaters in Orange County to its confluence with the Wekiva River in Seminole County. There were 24 problem areas identified in this subbasin which is tributary to two impaired water bodies: the Little Wekiva Canal (Orange County) and the Little Wekiva River (Seminole County).

5. Subbasin BW-010- This is a limited discharge subbasin in the Big Wekiva Basin and is within the City of Ocoee and unincorporated Orange County. This is a limited discharge basin comprised of approximately 900 acres and is tributary to Starke Lake which is an impaired water body.

## 4.4 Recommendations

The intent of this section was to inventory and prioritize existing deficiencies within the WSA. These problems range widely in the type of problem as well as the severity. Problems associated with both primary and secondary systems were included in this analysis. It is important to re-emphasize that the subbasins listed in Table 4-2 have been identified because they already have detailed studies associated with them. The affected Stakeholders that have jurisdiction in areas shown in Figure 4-1 that have not been studied yet should consider performing detailed studies for these areas, especially as development continues and problems may be more prevalent in the future. Those Stakeholders who have completed a stormwater master plan, but it is somewhat dated (prior to the mid-1990s) should consider updating their existing plans to reflect existing conditions as well as the special needs of the WSA. The results of this matrix were also used to aid in developing management strategy prioritization and ranking, and project selection, furthered detailed in Section 5.

# Section 5
# Wekiva Study Area Management Strategies

## 5.1 Introduction

In addition to the other provisions that the MSMP must contain, as required by Section 369.319 F.S., the MSMP is also required to identify projects to meet long-term needs. The intent of this section of the MSMP is to address this specific objective of the WPPA. This section describes the methodology developed by CDM, with input from the Stakeholders, as well as the long-term management strategies for surface water resources and identified projects. Using this methodology, CDM applied these management strategies and identified 10 projects to address the problems, deficiencies, and long range needs in the WSA based upon the goals of the WPPA. A conceptual planning level capital cost estimate was developed, where practicable, for each of the ten projects and is presented in Section 5. 5. Although there was a limit of 10 projects identified as per the scope of services, the intent of this task is to provide a model on how the strategic planning process can be applied throughout the WSA for water resources management and water conservation.

## 5.2 Methodology

CDM developed a methodology with input from the Stakeholders in order to establish long-term management strategies within the WSA, as well as to identify important issues that are critical to the improvement and sustainability of surface water resources within the WSA.

### 5.2.1 Subbasin Prioritization & Ranking

In order to prioritize the subbasins within the WSA, CDM developed an approach to assess the WSA based on the characteristics of each watershed similar to the methodology described in Section 5. Within each watershed, subbasin boundaries had previously been delineated by the Stakeholders. CDM used the subbasin boundaries as the unit of measure for assessment and prioritization as these are smaller than the larger watersheds and are more manageable from a size standpoint. Subbasins within the same watershed can also vary greatly due to their individual characteristics. CDM developed a list of criteria important to the management of surface waters within the WSA. This list was also presented to the Stakeholders for review and comment. A description of each of the criterions and how they were used to assess each subbasin is provided below:

- Water Quality and Tributary to Impaired Water Body – Water quality problems were identified throughout the WSA as part of the effort described in Section 5 (Existing Deficiencies and Prioritization), as well as those subbasins that are tributary to an impaired water body and FDEP has determined a TMDL will be developed. More importance was placed on those subbasins tributary to the impaired water bodies.

- Magnitude of Estimated Pollutant Loads – This refers to the pollutant loadings resulting from the WMM analysis where both the presence of BMPs and the impact of septic tank failure are taken in to account. For the purpose of prioritization, the pollutant load per year per acre was calculated for each subbasin to determine where the pollutant loads are more concentrated. More importance, in terms of the ranking, was placed on those subbasins with a higher concentrated pollutant load. A detailed description of the pollutant load analysis methodology and results is provided in **Appendix E**.

- Spring Protection - The WAVA developed as part of FDEP's 2004 study, *A Strategy for Water Quality Protection: Wastewater Treatment in the Wekiva Study Area* and the *Report of Investigation No. 104, Wekiva Aquifer Vulnerability Assessment* (FGS, 2005), was used as a basis for this criterion. The More Vulnerable, Vulnerable and Less Vulnerable Zones identified from this study were used to identify which subbasins had more of a direct influence on the resulting water quality and quantity of the springs. As subbasins may encompass portions of different zones, a weighted average of the area for each zone was calculated to determine the ranking. More importance was given to those areas within the WAVA More Vulnerable Zone.

- Subbasins with a Free Outfall – Section 2.6.1 (Subbasins) of this MSMP identified those subbasins that are either landlocked, have limited discharge capacity or have a free outfall to a surface water conveyance system. As water conservation is an important issue within the WSA, more importance was placed on those subbasins with a free outfall as surface water discharge can be readily lost (i.e., flow out of the system) due to increased runoff and loss of pervious areas as a result of urbanization. This is not so much a factor in landlocked subbasins, as the majority of these are located in high recharge areas, especially along the Mount Dora Ridge through the central portion of the WSA. Subbasins that discharge intermittently or have drainage wells were categorized as limited discharge.

- Rate of Growth – This criterion was based on population changes identified from the 1990 and 2000 census data. As population projections are beyond the scope of this MSMP, population changes between 1990 and 2000 were used as an indicator for growth patterns within the WSA. Those subbasins with the greater percent increase in population were assigned a higher priority.

- Problems Identified – The methodology described in Section 5 (Existing Deficiencies and Prioritization) was used to prioritize and rank those subbasins with identified problems. The resulting score for each of those subbasins (which were assessed with a different set of criteria) was factored in to help with prioritizing subbasins from a long-term management standpoint. Subbasins with a higher total score from the problem matrix were given more importance under this category.

- Benefit Area - The size of the subbasin was also taken into consideration, as capital improvement projects and long-term management strategies that are implemented to serve larger areas have an overall greater benefit to surface water resources for both water quality and water quantity.

## 5.2.2 Management Strategies

CDM was required to develop two long-term management strategies that the Stakeholders can consider for future surface water resources planning as per the scope of services of the MSMP. These water resources strategies identify the types of basin management activities that can be pursued by local governments to mitigate existing problems (quality and quantity), promote groundwater protection and water conservation, and provide for long-term flood control and water quality benefits. A series of BMPs that would help meet the intent of each planning strategy were identified and defined. BMP definitions were mostly obtained from the *Stormwater Education Toolkit (SET), Volume II: Business/Industry & Government* (2003) available from the University of Central Florida's Stormwater Management Academy.

The intent of the WPPA legislation was revisited to help in identifying and developing the two management strategies. In general the goals of the WPPA legislation are as follows:

- Restore and protect springs from further impact (i.e., water quantity and quality)
- Protect surface water and groundwater resources
- Land use planning (to be addressed by comprehensive plan amendments, Section 369.321 of the WPPA, not part of this MSMP)

The development of the management strategies focused on the first two goals listed above and the resulting management strategies are:

1) Surface Water Conservation, Groundwater Protection and Reuse; and

2) Surface Water Treatment and Flood Control.

Each management strategy was then examined to determine which types of BMPs (structural and non-structural) would be appropriate to achieve the long-term goal of that strategy. The selected BMPs and their definitions under each strategy are described in the following sub-sections. As can be seen from this list for each strategy, there are some BMPs that if implemented, help meet the long-term goal under both management strategies, and are therefore repeated.

### 5.2.2.1 Strategy No. 1 – Surface Water Conservation, Groundwater Protection & Reuse

- Stormwater Reuse (Localized and System Network) - Small scale stormwater reuse for irrigation in communities and regional stormwater reuse facilities.
- Reservoirs/Ponds- Natural or constructed basin (e.g. abandoned borrow or gravel pit) or high flow/high level pond or lake where water is collected and stored for stormwater reuse and volume control.
- No Net Floodplain Loss- Create compensating storage so that there is no net loss of the 100-year floodplain.
- Stormwater Infiltration Basins (SIBs) - Water impoundment constructed over highly permeable soils to temporarily store surface runoff and allow it to infiltrate through the bottom and sides. Removes many pollutants, provides ground water recharge, reduces the volume of runoff and reduces peak discharges. These may not be appropriate for industrial sites or locations where spills may occur and some pre-treatment may be required if there are large sediment loads.
- Buffers- A BMP consisting of preservation and/or creation of natural areas and wetlands, strips of grass or other erosion-resisting vegetation between disturbed areas and a water body.
- Green Development/Low Impact Development (LID) - Green development is a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for communities and people. LID is a cost effective, alternative form of development that considers resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.
- Recharge Rule – Continuation of the SJRWMD recharge requirement for development.

### 5.2.2.2 Strategy No. 2 – Surface Water Treatment and Flood Control

- Source Controls- Infrastructure and treatment at problem site.
- No Net Floodplain Loss- Create compensating storage so that there is no net loss of the 100-year floodplain.
- Retention- Water impoundment constructed over permeable soils to temporarily store surface runoff and allow it to infiltrate through the bottom and sides of the basin. Removes many pollutants, provides groundwater recharge, reduces the volume of runoff and reduces peak discharges. These BMPs are very effective for removing fine sediment and pollutants such as trace metals, nutrients, bacteria, and oxygen-demanding substances.

- Detention - Temporary storage area for runoff to be held for short periods of time until it is gradually released to a watercourse at a rate no greater than pre-development peak discharge rate. Detention reduces downstream flooding problems, costs of stormwater conveyance facilities, pollution of receiving streams, and enhances aesthetics within a development area. A detention basin consists of a permanent water pool, an overlying zone (where runoff increases the depth while stored and then released at allowable discharge rate), and a shallow littoral zone where wetland plants biologically remove stormwater pollutants such as metals and nutrients. In this manner the water in the permanent pool is "treated" so when stormwater runoff displaces it, the clean water is discharged or, in the case of a severe storm, the polluted runoff will at least be diluted. A detention basin should have a maximum depth of six feet, which will minimize recycling of pollutants stored in the bottom mud.

- Buffers- A BMP consisting of preservation and/or creation of natural areas and wetlands, strips of grass or other erosion-resisting vegetation between disturbed areas and a water body.

- Swales- A shallow vegetated area that is designed to convey stormwater, allow it to soak into the ground, and filter pollutants. Swales can be further classified as the following:

    - Landscape Swales- Landscape retention areas are landscaping features adapted to treat on-site stormwater runoff. Commonly they replace traditional "parking lot islands" with a depressed landscaped area specifically designed to receive runoff and filter it through the vegetation and soil matrix in the planted space. Treats first flush of runoff by reducing velocity, promoting settling, and removing pollutants.
    - Grassed swales- Broad shallow channels with dense stand of established vegetation. Uses low velocities and vegetative cover to settle pollutants and provide infiltration. Can also result in reduced volumes of runoff and peak discharges.

- End-of-Pipe Treatments (e.g., baffle boxes). A baffle box is simply a rectangular chamber connected to the storm drain with partitions dividing the box into sections. Stormwater flows into the first section of the box and allows pollutants to settle out of the water. As water rises above the next partition, it overflows into the second section to allow further reduction of pollutants. Later, as the cleaner water rises, it exits the baffle box to its final discharge point.

- Alum/ Chemical Treatment – An alternative form of stormwater treatment where the addition of alum or some other equivalent chemical promotes the precipitation of pollutants from the water column through adsorption. It is typically used for the removal of suspended solids, phosphorus, heavy metals, algae and bacteria. This technology is typically used where conditions do not allow for the construction of

traditional stormwater BMPs. The system is generally used in conjunction with existing stormwater pipes discharging into water bodies but may also be designed in conjunction with creating a new holding pond or with offline floc settling ponds and automatic floc disposal systems.

- Drainage Well/Recharge Well & Treatment System- Wells that are used to inject surface water directly into an aquifer, or shallow ground water directly into a deeper aquifer, primarily by gravity. Drainage wells in Central Florida are typically used for flood control purposes where stormwater runoff enters the well and recharges the aquifer.

- Agricultural Nonpoint Source Pollution Management – State water quality assessments have shown that agriculture is the most wide-spread source of pollution for assessed rivers and lakes, and the primary agricultural non-point source pollutants are nutrients, sediment, animal wastes, salts, and pesticides (USEPA, 2003). Detailed guidance on the appropriate types of BMPs to use for specific pollutants can be found in the technical guidance and reference document entitled *National Management Measures to Control Nonpoint Source Pollution from Agriculture* (USEPA, 2003). Additionally, the Office of Agricultural Water Policy (OAWP) was established in 1995 by the Florida Legislature to facilitate communications among federal, state, local agencies, and the agricultural industry on water quantity and water quality issues involving agriculture. The OAWP is directly involved with statewide programs to implement the Federal Clean Water Act's TMDL requirements for agriculture. An extensive listing of adopted BMPs and BMP manuals under development can be found on the OAWP's website (http://www.floridaagwaterpolicy.com/BestManagementPractices.html).

- Green Roofs- Attractive building additions which reduce energy use, stormwater runoff, and increase habitat conservation.

- Water Wise Landscaping and Reduced Turf Area- A systematic concept for saving water in landscaped areas, creative landscaping for water and energy efficiency and lower maintenance. The seven water wise landscaping principles are: good planning and design; practical lawn areas; efficient irrigation; soil improvement; use of mulches; low water demand plants; and good maintenance (www.qcwater.com/Glossary.asp).

- Pervious Pavement- Pervious pavement can be classified as the following:

    - Porous- Pavement specially formulated mixture of concrete with a high percentage of void space. Reduces runoff volume and peak flow rates via percolation of liquid through the pavement.

    - Concrete grid and modular - Pavement sections of strong enough materials to accommodate vehicles with regularly interspersed void areas filled with sod, gravel, sand, etc. Reduces runoff volume, peak flow rate and concentration of pollutants in low-volume traffic areas.

- Green Development/LID - Green development is a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for communities and people. LID is a cost effective, alternative form of development that considers resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.

- Public Outreach/Education for Proper Management and Use of Fertilizers– Most of the Stakeholders are currently required to do this under their NPDES MS4 permit, however, this is a global recommendation that all Stakeholders should continue to implement a public education program to emphasize to citizens the importance of proper fertilizer management and application. This can encourage the reduction of use of these products, which will help minimize runoff of nutrients into waterways and infiltration into the ground.

### 5.2.3 Overall Ranking

Since the two management strategies establish different objectives, it was necessary to rank the subbasins under each strategy (i.e. have two separate rankings for each strategy). The reason for this is that although the same ranking criteria (described in subsection 5.2.1) apply, some ranking criteria may be more critical when trying to achieve the objective of one management strategy versus achieving the objectives of the other. Therefore the weighting of the ranking criteria were adjusted to reflect the objectives to be achieved by each strategy. The following weighting was used for each management strategy:

| Criteria | Management Strategy No. 1 | Management Strategy No. 2 |
|---|---|---|
| Water Quality and Tributary to Impaired Water Body | 15% | 19% |
| Magnitude of Estimated Pollutant Loads | 7% | 23% |
| Spring Protection | 25% | 17% |
| Subbasins with a Free Outfall | 25% | 10% |
| Rate of Growth | 15% | 10% |
| Problems Identified | 7% | 15% |
| Benefit Area | 6% | 6% |

As an example, the spring protection ranking criteria would be somewhat of a more critical factor (i.e., those subbasins that are within the "More Vulnerable" and "Vulnerable" WAVA zones) when evaluating the subbasins under Management Strategy No. 1 (Surface Water Conservation, Groundwater Protection and Reuse) versus evaluating the same subbasins under Management Strategy No. 2 (Surface Water Treatment and Flood Control). Therefore, weighting for this criteria assigned under Management Strategy No. 1 (25 percent) was slightly higher than that assigned under Management Strategy No. 2 (17 percent). The resulting rankings under Management Strategy No. 1 and 2 are provided in **Tables 5-1** and **5-2**, respectively. The subbasins with their assigned rankings for each management strategy are also provided in **Figures 5-1** and **5-2**, which shows where the higher priority subbasins, according to the management strategies, are located throughout the WSA.

### 5.2.4 Applying Management Strategies

As mentioned previously, the number of projects (10) to be identified in the WSA was limited as per the scope of services. Therefore, the intent of this task is not only to identify 10 projects, but to also provide a model on how the strategic planning process can be applied throughout the WSA for water resources management and water conservation. In the following section, each management strategy was applied to five example subbasins, for a total of 10 projects. As a number of subbasins received the same ranking based on the results shown in Tables 5-1 and 5-2, an example from each (or as many as the limit of 10 projects would allow) was used to apply the management strategies. To aid the Stakeholders in this process, flowcharts of how to apply each of the management strategy for the remainder of the subbasins throughout the WSA were developed. These diagrams are provided in **Figures 5-3** and **5-4** and can be used as a tool to walk the user through the thought process of applying the management strategies to individual subbasins.

## 5.3 Identified Projects – Management Strategy No. 1 (Conservation, Groundwater Protection and Reuse)

Table 5-1 shows the ranking of the 102 subbasins according to the criteria previously described. As can be seen in the table, several subbasins may have received the same rank. Therefore, a candidate subbasin for the top five ranked subbasins was selected as an example to show how the management strategy can be applied. In most cases the top scoring subbasin (i.e., greatest number of points) within each rank was selected. However after reviewing these, there were some subbasins that were not feasible to apply management strategies to and make recommendations. An example would be subbasin AP-005. This subbasin is within the SJRWMD's jurisdiction for the restoration of Lake Apopka. As this land will be under the ownership and management of the SJRWMD, it was not selected as a candidate subbasin. Additionally, some of the selected candidate subbasins were chosen so that as much as possible, the majority of the Stakeholders were represented. Based on the prioritization shown in Table 5-1 and the reasons previously discussed, the following

**Table 5-1**
**Wekiva Parkway Protection Act**
**Master Stormwater Management Plan Support**
**Subbasin Ranking Matrix - Management Strategy # 1- Conservation, Groundwater Protection Reuse**

| ***Ranking Matrix*** | | | Benefit Area | Tributary to Impaired Water Body | Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr) | Spring Protection (WAVA Zones) | Subbasins with free outfall | Rate of Growth (based on change in population from 1990 - 2000) | Problems Identified | TOTALS | REVISED RANKING | Jurisdiction Affected | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | Weight: | 6.0% | 15.0% | 7.0% | 25.0% | 25.0% | 15.0% | 7.0% | 100% | # | Lake County | Eustis | Mount Dora | Orange County | Apopka | Eatonville | Oakland | Ocoee | Orlando | Winter Garden | Seminole County | Altamonte Springs | Longwood | Lake Mary |
| MON-003 | 25.7 | | 0 | 10 | 5 | 10 | 10 | 9 | 0 | 8 | 1 | | | | | | | | | | | √ | | | |
| BW-002 | 1988.5 | | 1 | 10 | 7 | 6 | 10 | 6 | 4 | 7 | 2 | | | | √ | | | | √ | | √ | | | | |
| LW-005 | 1783.7 | | 1 | 10 | 7 | 6 | 10 | 5 | 4 | 7 | 2 | | | | √ | | √ | | | | | | | | |
| LW-009 | 1716.7 | | 1 | 10 | 6 | 6 | 10 | 4 | 4 | 7 | 2 | | | | √ | √ | | | | | | √ | √ | | |
| LW-004 | 240.0 | | 0 | 10 | 8 | 8 | 10 | 3 | 0 | 7 | 2 | | | | √ | | | | | √ | | | | | |
| LW-007 | 1279.0 | | 0 | 10 | 7 | 6 | 10 | 4 | 4 | 7 | 2 | | | | √ | | | | | | | √ | √ | | |
| LW-003 | 11113.4 | | 4 | 10 | 7 | 5 | 10 | 4 | 6 | 7 | 2 | | | | √ | | | | | √ | | √ | √ | √ | |
| LE-003 | 420.5 | | 0 | 10 | 7 | 7 | 10 | 1 | 4 | 7 | 2 | √ | √ | | | | | | | | | | | | |
| LW-010 | 1893.1 | | 1 | 10 | 7 | 6 | 10 | 2 | 4 | 7 | 2 | | | | | | | | | | | √ | √ | | |
| MON-001 | 1696.8 | | 1 | 10 | 3 | 3 | 10 | 9 | 4 | 7 | 2 | | | | | | | | | | | √ | | | |
| SOL-005 | 75.5 | | 0 | 10 | 6 | 8 | 10 | 0 | 4 | 7 | 2 | | | | | | | | | | | √ | | | |
| LW-001 | 2663.8 | | 1 | 10 | 7 | 7 | 10 | 0 | 4 | 7 | 2 | | | | √ | | | | | √ | | | | | |
| LW-002 | 3549.3 | | 1 | 10 | 8 | 5 | 10 | 1 | 4 | 6 | 3 | | | | √ | | | | | √ | | | | | |
| AP-007 | 10493.9 | | 4 | 10 | 3 | 7 | 10 | 0 | 4 | 6 | 3 | √ | | √ | √ | | | | | | | | | | |
| MON-002 | 654.9 | | 0 | 10 | 4 | 2 | 10 | 9 | 4 | 6 | 3 | | | | | | | | | | | √ | | | |
| LW-006 | 1159.7 | | 0 | 10 | 7 | 5 | 10 | 1 | 3 | 6 | 3 | | | | √ | | | | | | | √ | √ | | |
| BW-010 | 905.0 | | 0 | 10 | 6 | 6 | 5 | 6 | 6 | 6 | 3 | | | | √ | | | | √ | | | | | | |
| BW-021 | 3682.7 | | 1 | 5 | 6 | 6 | 10 | 4 | 4 | 6 | 3 | | | | √ | √ | | | | | | | | | |
| AP-002 | 8237.2 | | 3 | 10 | 4 | 4 | 10 | 0 | 8 | 6 | 3 | | | | √ | √ | | √ | √ | | √ | | | | |
| LW-011 | 585.0 | | 0 | 10 | 8 | 4 | 10 | 0 | 4 | 6 | 3 | | | | | | | | | | | √ | √ | | |
| AP-003 | 25010.9 | | 9 | 10 | 3 | 5 | 10 | 1 | 0 | 6 | 3 | √ | | | √ | √ | | √ | √ | | √ | | | | |
| LW-012 | 629.2 | | 0 | 10 | 6 | 5 | 10 | 1 | 4 | 6 | 3 | | | | | | | | | | | √ | | | |
| SOL-004 | 122.6 | | 0 | 0 | 8 | 9 | 10 | 4 | 0 | 6 | 3 | | | | | | | | | | | | | | √ |
| AP-006 | 1185.9 | | 0 | 10 | 4 | 6 | 10 | 0 | 4 | 6 | 3 | | | | √ | | | | | | | | | | |
| GT-001 | 1550.7 | | 1 | 10 | 5 | 4 | 10 | 2 | 4 | 6 | 3 | √ | | √ | √ | | | | | | | | | | |
| BW-007 | 742.0 | | 0 | 10 | 10 | 6 | 5 | 3 | 5 | 6 | 3 | | | | √ | | | | | √ | | | | | |
| LW-008 | 3980.0 | | 1 | 10 | 9 | 6 | 5 | 1 | 6 | 6 | 3 | | | | | | | | | | | √ | √ | √ | |
| YL-001 | 9860.9 | | 4 | 0 | 3 | 5 | 10 | 9 | 0 | 6 | 3 | √ | | | √ | | | | | | | √ | | | √ |
| AP-001 | 15876.0 | | 6 | 5 | 4 | 4 | 5 | 10 | 6 | 6 | 3 | | | | √ | | | √ | √ | | √ | | | | |
| AP-005 | 13107.1 | | 5 | 10 | 2 | 4 | 10 | 0 | 0 | 5 | 4 | | | | √ | √ | | | | | | | | | |
| BW-011 | 460.2 | | 0 | 5 | 6 | 7 | 5 | 4 | 5 | 5 | 4 | | | | √ | | | | √ | | | | | | |
| BW-014 | 667.8 | | 0 | 10 | 4 | 9 | 0 | 4 | 5 | 5 | 4 | | | | √ | | | | √ | | | | | | |
| BW-023 | 26782.8 | | 10 | 5 | 3 | 1 | 10 | 3 | 2 | 5 | 4 | √ | | | √ | | | | | | | √ | | | |
| BW-012 | 228.3 | | 0 | 5 | 4 | 6 | 5 | 4 | 4 | 5 | 4 | | | | √ | | | | √ | | | | | | |
| BW-025 | 190.0 | | 0 | 0 | 0 | 9 | 10 | 0 | 1 | 5 | 4 | | | | | | | | | | | | √ | | |
| SOL-001 | 1285.6 | | 0 | 10 | 7 | 8 | 0 | 2 | 5 | 5 | 4 | | | | | | | | | | | √ | | √ | |
| BW-008 | 1415.3 | | 1 | 5 | 5 | 6 | 5 | 5 | 2 | 5 | 4 | | | | √ | | | | √ | | | | | | |
| YL-002 | 1226.7 | | 0 | 0 | 4 | 7 | 5 | 9 | 0 | 5 | 4 | | | | | | | | | | | √ | | | |
| BW-020 | 1774.0 | | 1 | 0 | 7 | 7 | 5 | 7 | 1 | 5 | 4 | | | | √ | | | | | | | √ | | | |
| BW-033 | 411.6 | | 0 | 0 | 0 | 8 | 10 | 0 | 1 | 5 | 4 | | | | | | | | | | | √ | | | |
| BW-031 | 425.5 | | 0 | 5 | 0 | 4 | 10 | 1 | 1 | 4 | 5 | | | | | | | | | | | √ | | | |
| BW-030 | 1154.7 | | 0 | 0 | 1 | 6 | 10 | 0 | 4 | 4 | 5 | | | | | | | | | | | √ | | | |
| BW-009 | 433.4 | | 0 | 5 | 5 | 8 | 0 | 6 | 4 | 4 | 5 | | | | √ | | | | √ | | | | | | |
| BW-017 | 2740.7 | | 1 | 0 | 8 | 6 | 5 | 5 | 2 | 4 | 5 | | | | √ | | | | √ | | | √ | | | |
| LE-004 | 1276.9 | | 0 | 10 | 5 | 6 | 0 | 3 | 5 | 4 | 5 | √ | √ | | | | | | | | | | | | |
| BW-016 | 1012.2 | | 0 | 0 | 7 | 7 | 5 | 2 | 0 | 4 | 5 | | | | √ | | | | √ | | | | | | |
| BW-013 | 1142.5 | | 0 | 5 | 4 | 8 | 0 | 4 | 4 | 4 | 5 | | | | √ | | | | √ | | | | | | |
| LE-008 | 891.1 | | 0 | 10 | 2 | 3 | 0 | 8 | 5 | 4 | 5 | √ | √ | | | | | | | | | | | | |
| LE-002 | 1215.7 | | 0 | 5 | 4 | 6 | 0 | 7 | 4 | 4 | 5 | √ | √ | | | | | | | | | | | | |
| AP-004 | 9716.3 | | 4 | 10 | 4 | 6 | 0 | 2 | 0 | 4 | 5 | | | | √ | √ | | | √ | | | | | | |
| SOL-003 | 681.5 | | 0 | 0 | 6 | 8 | 0 | 9 | 0 | 4 | 5 | | | | | | | | | | | √ | | | √ |
| BWC-016 | 7724.3 | | 3 | 0 | 3 | 2 | 10 | 3 | 0 | 4 | 5 | √ | | | | | | | | | | | | | |
| BWC-019 | 4577.8 | | 2 | 0 | 2 | 2 | 10 | 2 | 0 | 4 | 5 | √ | | | | | | | | | | | | | |
| BWC-015 | 1944.2 | | 1 | 0 | 2 | 2 | 10 | 3 | 0 | 4 | 5 | √ | | | | | | | | | | | | | |
| BW-003 | 343.9 | | 0 | 0 | 5 | 5 | 5 | 5 | 0 | 4 | 5 | | | | √ | | | | √ | | | | | | |
| BW-032 | 184.5 | | 0 | 0 | 0 | 9 | 5 | 0 | 2 | 4 | 5 | | | | | | | | | | | √ | | | |

**Table 5-1**
**Wekiva Parkway Protection Act**
**Master Stormwater Management Plan Support**
**Subbasin Ranking Matrix - Management Strategy # 1- Conservation, Groundwater Protection Reuse**

| ***Ranking Matrix*** | | | Benefit Area | Tributary to Impaired Water Body | Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr) | Spring Protection (WAVA Zones) | Subbasins with free outfall | Rate of Growth (based on change in population from 1990 - 2000) | Problems Identified | TOTALS | REVISED RANKING | Lake County | Eustis | Mount Dora | Orange County | Apopka | Eatonville | Oakland | Ocoee | Orlando | Winter Garden | Seminole County | Altamonte Springs | Longwood | Lake Mary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | Weight: | 6.0% | 15.0% | 7.0% | 25.0% | 25.0% | 15.0% | 7.0% | 100% | # | | | | | | | | | | | | | | | |
| BWC-013 | 6767.9 | | 3 | 0 | 2 | 1 | 10 | 2 | 0 | 4 | 5 | √ | | | | | | | | | | | | | |
| BWC-010 | 5133.8 | | 2 | 0 | 2 | 1 | 10 | 2 | 0 | 3 | 6 | √ | | | | | | | | | | | | | |
| BWC-018 | 2879.5 | | 1 | 0 | 2 | 1 | 10 | 2 | 0 | 3 | 6 | √ | | | | | | | | | | | | | |
| BWC-017 | 9526.4 | | 4 | 0 | 2 | 0 | 10 | 3 | 0 | 3 | 6 | √ | | | | | | | | | | √ | | | |
| BW-001 | 62.6 | | 0 | 0 | 4 | 9 | 0 | 6 | 0 | 3 | 6 | | | | √ | | | √ | | | | | | | |
| AS-001 | 771.9 | | 0 | 0 | 2 | 1 | 10 | 2 | 0 | 3 | 6 | √ | | | | | | | | | | √ | | | |
| GT-002 | 592.3 | | 0 | 5 | 6 | 6 | 0 | 2 | 3 | 3 | 6 | √ | | √ | √ | | | | | | | | | | |
| BW-024 | 330.5 | | 0 | 0 | 5 | 10 | 0 | 3 | 0 | 3 | 6 | | | | √ | √ | | | | | | | | | |
| GT-006 | 1088.3 | | 0 | 5 | 7 | 6 | 0 | 1 | 4 | 3 | 6 | √ | √ | √ | | | | | | | | | | | |
| SOL-002 | 682.2 | | 0 | 0 | 7 | 8 | 0 | 4 | 0 | 3 | 6 | | | | | | | | | | | √ | | √ | √ |
| BW-022 | 15408.7 | | 6 | 0 | 3 | 8 | 0 | 3 | 2 | 3 | 6 | √ | | | √ | √ | | | | | | | | | |
| BW-027 | 84.4 | | 0 | 0 | 10 | 9 | 0 | 0 | 0 | 3 | 6 | | | | | | | | | | | √ | | | |
| LE-006 | 1009.7 | | 0 | 0 | 2 | 6 | 0 | 8 | 3 | 3 | 6 | √ | √ | | | | | | | | | | | | |
| BW-028 | 511.7 | | 0 | 0 | 0 | 6 | 5 | 1 | 2 | 3 | 6 | | | | | | | | | | | √ | | | |
| GT-007 | 1272.2 | | 0 | 5 | 4 | 6 | 0 | 2 | 4 | 3 | 6 | √ | √ | | | | | | | | | | | | |
| BW-029 | 1020.5 | | 0 | 0 | 1 | 6 | 5 | 0 | 1 | 3 | 6 | | | | | | | | | | | √ | √ | | |
| LE-005 | 777.6 | | 0 | 0 | 3 | 5 | 0 | 8 | 2 | 3 | 6 | √ | √ | | | | | | | | | | | | |
| BW-004 | 210.4 | | 0 | 0 | 5 | 5 | 0 | 6 | 2 | 3 | 4 | | | | √ | | | | √ | | | | | | |
| BW-006 | 2892.2 | | 1 | 0 | 8 | 6 | 0 | 3 | 2 | 3 | 6 | | | | √ | | | | | | | | | | |
| LE-007 | 1254.6 | | 0 | 0 | 2 | 6 | 0 | 7 | 2 | 3 | 6 | √ | | | | | | | | | | | | | |
| BW-018 | 7866.0 | | 3 | 0 | 7 | 5 | 0 | 4 | 2 | 3 | 6 | | | | √ | √ | | | √ | | | | | | |
| LE-001 | 1232.1 | | 0 | 0 | 1 | 5 | 0 | 8 | 0 | 3 | 6 | √ | √ | √ | | | | | | | | | | | |
| BW-026 | 913.2 | | 0 | 0 | 2 | 10 | 0 | 0 | 0 | 3 | 6 | | | | √ | √ | | | | | | | | | |
| GT-004 | 1474.7 | | 1 | 0 | 3 | 5 | 0 | 6 | 0 | 3 | 6 | √ | | √ | | | | | | | | | | | |
| BW-015 | 1588.7 | | 1 | 0 | 5 | 6 | 0 | 4 | 0 | 3 | 6 | | | | √ | | | | √ | | | | | | |
| BWC-004 | 575.9 | | 0 | 0 | 2 | 7 | 0 | 3 | 0 | 2 | 7 | √ | | √ | | | | | | | | | | | |
| BWC-001 | 2462.9 | | 1 | 0 | 2 | 7 | 0 | 2 | 0 | 2 | 7 | √ | | | √ | | | | | | | | | | |
| BWC-007 | 1091.9 | | 0 | 0 | 2 | 7 | 0 | 2 | 2 | 2 | 7 | √ | | | | | | | | | | | | | |
| GT-003 | 1450.6 | | 1 | 0 | 4 | 7 | 0 | 2 | 0 | 2 | 7 | √ | | √ | | | | | | | | | | | |
| BWC-023 | 672.6 | | 0 | 0 | 2 | 7 | 0 | 2 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| BWC-022 | 755.3 | | 0 | 0 | 3 | 6 | 0 | 2 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| BWC-006 | 3838.8 | | 1 | 0 | 2 | 6 | 0 | 3 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| BWC-014 | 2397.2 | | 1 | 0 | 2 | 7 | 0 | 2 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| GT-005 | 1222.1 | | 0 | 0 | 5 | 5 | 0 | 2 | 0 | 2 | 7 | √ | | √ | | | | | | | | | | | |
| BWC-003 | 3630.8 | | 1 | 0 | 2 | 5 | 0 | 3 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| BWC-009 | 1042.7 | | 0 | 0 | 2 | 5 | 0 | 2 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| BWC-021 | 3330.0 | | 1 | 0 | 2 | 4 | 0 | 2 | 2 | 2 | 7 | √ | | | | | | | | | | | | | |
| BWC-008 | 1700.4 | | 1 | 0 | 2 | 5 | 0 | 2 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| BW-019 | 2939.4 | | 1 | 0 | 3 | 5 | 0 | 1 | 2 | 2 | 7 | | | | √ | √ | | | √ | | | | | | |
| BWC-012 | 1075.1 | | 0 | 0 | 2 | 6 | 0 | 0 | 0 | 2 | 7 | √ | | | | | | | | | | | | | |
| BWC-002 | 1415.7 | | 1 | 0 | 3 | 3 | 0 | 3 | 0 | 1 | 8 | √ | | | | | | | | | | | | | |
| BWC-011 | 1646.9 | | 1 | 0 | 2 | 2 | 0 | 4 | 0 | 1 | 8 | √ | | | | | | | | | | | | | |
| BWC-005 | 1458.6 | | 1 | 0 | 1 | 3 | 0 | 3 | 0 | 1 | 8 | √ | | | | | | | | | | | | | |
| BWC-020 | 5536.6 | | 2 | 0 | 2 | 2 | 0 | 2 | 0 | 1 | 8 | √ | | | | | | | | | | | | | |
| BWC-024 | 3241.5 | | 1 | 0 | 3 | 2 | 0 | 2 | 0 | 1 | 8 | √ | | | | | | | | | | | | | |
| BWC-025 | 210.0 | | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 1 | 8 | √ | | | | | | | | | | | | | |

***Criteria Explanation:***

| | | | |
|---|---|---|---|
| 1 | Benefit Area | 10 | largest benefit area based on size |
| | | 0 | least benefit area based on size |
| 2 | Tributary to Impaired Water B | 10 | within a subbasin associated with an impaired water body |
| | | 5 | water quality problem have been identified but not related to TMDL |
| | | 0 | no water quality problems have been identified |
| 2 | Magnitude of Pollutant Load | 10 | areas with the highest concentration of pollutant load (lbs/acre/yr) |
| | | 0 | areas with the lowest concentration of pollutant load (lbs/acre/yr) |
| 3 | Spring Protection | 10 | within the primary protection WAVA zone |
| | | 5 | within the secondary WAVA protection zone |
| | | 0 | within the tertiary WAVA protection zone |
| 4 | Subbasin with free outfall | 10 | subbasin with a positive outfall |
| | | 5 | landlocked basin with limited discharge |
| | | 0 | landlocked subbasin with no outfall |
| 5 | Rate of Growth | 10 | highest rate of growth (in terms of population) |
| | | 0 | little to no population growth |
| 6 | Problems Identified | 10 | problems identified in the subbasin with the highest score |
| | | 0 | no identified problems |

**Table 5-2**
**Wekiva Parkway Protection Act**
**Master Stormwater Management Plan Support**
**Subbasin Ranking Matrix - Management Strategy # 2- Surface Water Treatment Flood Control**

| *Ranking Matrix* | | | Benefit Area | Tributary to Impaired Water Body | Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr) | Spring Protection (WAVA Zones) | Subbasins with free outfall | Rate of Growth (based on change in population from 1990 - 2000) | Problems Identified | TOTALS | REVISED RANKING | Jurisdiction Affected: Lake County | Eustis | Mount Dora | Orange County | Apopka | Eatonville | Oakland | Ocoee | Orlando | Winter Garden | Seminole County | Altamonte Springs | Longwood | Lake Mary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | Weight: | 6.0% | 19.0% | 23.0% | 17.0% | 10.0% | 10.0% | 15.0% | 100% | # | | | | | | | | | | | | | | |
| LW-003 | 11113.4 | | 4 | 10 | 7 | 5 | 10 | 4 | 6 | 7 | 1 | | | | √ | | | | √ | | √ | √ | √ | |
| LW-008 | 3980.0 | | 1 | 10 | 9 | 6 | 5 | 1 | 6 | 7 | 1 | | | | | | | | | | √ | √ | √ | |
| BW-002 | 1988.5 | | 1 | 10 | 7 | 6 | 10 | 6 | 4 | 7 | 1 | | | | √ | | | √ | | √ | | | | |
| MON-003 | 25.7 | | 0 | 10 | 5 | 10 | 10 | 9 | 0 | 7 | 1 | | | | | | | | | | √ | | | |
| LW-007 | 1279.0 | | 0 | 10 | 7 | 6 | 10 | 4 | 3 | 7 | 1 | | | | √ | | | | | | √ | √ | | |
| BW-007 | 742.0 | | 0 | 10 | 10 | 6 | 5 | 3 | 4 | 6 | 2 | | | | √ | | | | √ | | | | | |
| LW-002 | 3549.3 | | 1 | 10 | 8 | 5 | 10 | 1 | 4 | 6 | 2 | | | | √ | | | | √ | | | | | |
| LW-005 | 1783.7 | | 1 | 10 | 7 | 6 | 10 | 5 | 3 | 6 | 2 | | | | √ | | √ | | | | | | | |
| LE-003 | 420.5 | | 0 | 10 | 7 | 7 | 10 | 1 | 4 | 6 | 2 | √ | √ | | | | | | | | | | | |
| LW-010 | 1893.1 | | 1 | 10 | 7 | 6 | 10 | 2 | 4 | 6 | 2 | | | | | | | | | | √ | √ | | |
| BW-010 | 905.0 | | 0 | 10 | 6 | 6 | 5 | 6 | 6 | 6 | 2 | | | | √ | | | | √ | | | | | |
| LW-009 | 1716.7 | | 1 | 10 | 6 | 6 | 10 | 4 | 3 | 6 | 2 | | | | √ | √ | | | | | √ | √ | | |
| LW-004 | 240.0 | | 0 | 10 | 8 | 8 | 10 | 3 | 0 | 6 | 2 | | | | √ | | | | | √ | | | | |
| LW-001 | 2663.8 | | 1 | 10 | 7 | 7 | 10 | 0 | 3 | 6 | 2 | | | | √ | | | | | √ | | | | |
| LW-011 | 585.0 | | 0 | 10 | 8 | 4 | 10 | 0 | 4 | 6 | 2 | | | | | | | | | | √ | √ | | |
| SOL-005 | 75.5 | | 0 | 10 | 6 | 8 | 10 | 0 | 4 | 6 | 2 | | | | | | | | | | √ | | | |
| LW-006 | 1159.7 | | 0 | 10 | 7 | 5 | 10 | 1 | 3 | 6 | 2 | | | | √ | | | | | | √ | √ | | |
| AP-002 | 8237.2 | | 3 | 10 | 4 | 4 | 10 | 0 | 8 | 6 | 2 | | | | √ | √ | | √ | √ | | | | | |
| SOL-001 | 1285.6 | | 0 | 10 | 7 | 8 | 0 | 2 | 5 | 6 | 2 | | | | | | | | | | √ | | √ | |
| LW-012 | 629.2 | | 0 | 10 | 6 | 5 | 10 | 1 | 4 | 6 | 2 | | | | | | | | | | √ | | | |
| MON-001 | 1696.8 | | 1 | 10 | 3 | 3 | 10 | 9 | 3 | 6 | 2 | | | | | | | | | | √ | | | |
| MON-002 | 654.9 | | 0 | 10 | 4 | 2 | 10 | 9 | 3 | 6 | 2 | | | | | | | | | | √ | | | |
| AP-007 | 10493.9 | | 4 | 10 | 3 | 7 | 10 | 0 | 3 | 5 | 3 | √ | | √ | √ | | | | | | | | | |
| GT-001 | 1550.7 | | 1 | 10 | 5 | 4 | 10 | 2 | 4 | 5 | 3 | √ | | √ | √ | | | | | | | | | |
| BW-021 | 3682.7 | | 1 | 5 | 6 | 6 | 10 | 4 | 4 | 5 | 3 | | | | √ | √ | | | | | | | | |
| AP-001 | 15876.0 | | 6 | 5 | 4 | 4 | 5 | 10 | 6 | 5 | 3 | | | | √ | | | √ | √ | | √ | | | |
| BW-014 | 667.8 | | 0 | 10 | 4 | 9 | 0 | 4 | 4 | 5 | 3 | | | | √ | | | | √ | | | | | |
| AP-006 | 1185.9 | | 0 | 10 | 4 | 6 | 10 | 0 | 3 | 5 | 3 | | | | √ | | | | | | | | | |
| BW-011 | 460.2 | | 0 | 5 | 6 | 7 | 5 | 4 | 4 | 5 | 3 | | | | √ | | | | √ | | | | | |
| LE-004 | 1276.9 | | 0 | 10 | 5 | 6 | 0 | 3 | 4 | 5 | 3 | √ | √ | | | | | | | | | | | |
| AP-003* | 25010.9 | | 9 | 10 | 3 | 5 | 10 | 1 | 0 | 5 | 3 | √ | | | √ | √ | | √ | √ | | √ | | | |
| SOL-004 | 122.6 | | 0 | 0 | 8 | 9 | 10 | 4 | 0 | 5 | 3 | | | | | | | | | | | | | √ |
| BW-009 | 433.4 | | 0 | 5 | 5 | 8 | 0 | 6 | 3 | 4 | 4 | | | | √ | | | | √ | | | | | |
| BW-012 | 228.3 | | 0 | 5 | 4 | 6 | 5 | 4 | 4 | 4 | 4 | | | | √ | | | | √ | | | | | |
| GT-006 | 1088.3 | | 0 | 5 | 7 | 6 | 0 | 1 | 4 | 4 | 4 | √ | √ | √ | | | | | | | | | | |
| BW-008 | 1415.3 | | 1 | 5 | 5 | 6 | 5 | 5 | 2 | 4 | 4 | | | | √ | | | | √ | | | | | |
| AP-005 | 13107.1 | | 5 | 10 | 2 | 4 | 10 | 0 | 0 | 4 | 4 | | | | √ | √ | | | | | | | | |
| LE-008 | 891.1 | | 0 | 10 | 2 | 3 | 0 | 8 | 3 | 4 | 4 | √ | √ | | | | | | | | | | | |
| AP-004 | 9716.3 | | 4 | 10 | 4 | 6 | 0 | 2 | 0 | 4 | 4 | | | | √ | √ | | | √ | | | | | |

**Table 5-2**
**Wekiva Parkway Protection Act**
**Master Stormwater Management Plan Support**
**Subbasin Ranking Matrix - Management Strategy # 2- Surface Water Treatment Flood Control**

| ***Ranking Matrix*** | | | Benefit Area | Tributary to Impaired Water Body | Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr) | Spring Protection (WAVA Zones) | Subbasins with free outfall | Rate of Growth (based on change in population from 1990 - 2000) | Problems Identified | TOTALS | REVISED RANKING | Lake County | Eustis | Mount Dora | Orange County | Apopka | Eatonville | Oakland | Ocoee | Orlando | Winter Garden | Seminole County | Altamonte Springs | Longwood | Lake Mary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | Weight: | 6.0% | 19.0% | 23.0% | 17.0% | 10.0% | 10.0% | 15.0% | 100% | # | | | | | | | | | | | | | | |
| BW-013 | 1142.5 | | 0 | 5 | 4 | 8 | 0 | 4 | 3 | 4 | 4 | | | | √ | | | | √ | | | | | | |
| BW-020 | 1774.0 | | 1 | 0 | 7 | 7 | 5 | 7 | 1 | 4 | 4 | | | | √ | | | | | | | √ | | | |
| BW-017 | 2740.7 | | 1 | 0 | 8 | 6 | 5 | 5 | 2 | 4 | 4 | | | | √ | | | | √ | | | √ | | | |
| LE-002 | 1215.7 | | 0 | 5 | 4 | 6 | 0 | 7 | 3 | 4 | 4 | √ | √ | | | | | | | | | | | | |
| GT-002 | 592.3 | | 0 | 5 | 6 | 6 | 0 | 2 | 2 | 4 | 4 | √ | | √ | √ | | | | | | | | | | |
| BW-027 | 84.4 | | 0 | 0 | 10 | 9 | 0 | 0 | 0 | 4 | 4 | | | | | | | | | | | √ | | | |
| YL-001 | 9860.9 | | 4 | 0 | 3 | 5 | 10 | 9 | 1 | 4 | 4 | √ | | | √ | | | | | | | √ | | | √ |
| BW-023 | 26782.8 | | 10 | 5 | 3 | 1 | 10 | 3 | 1 | 4 | 4 | √ | | | √ | | | | | | | √ | | | |
| BW-016 | 1012.2 | | 0 | 0 | 7 | 7 | 5 | 2 | 0 | 4 | 4 | | | | √ | | | | √ | | | | | | |
| BW-006 | 2892.2 | | 1 | 0 | 8 | 6 | 0 | 3 | 2 | 4 | 4 | | | | √ | | | | | | | | | | |
| SOL-003 | 681.5 | | 0 | 0 | 6 | 8 | 0 | 9 | 0 | 4 | 4 | | | | | | | | | | | √ | | | √ |
| GT-007 | 1272.2 | | 0 | 5 | 4 | 6 | 0 | 2 | 3 | 3 | 5 | √ | √ | | | | | | | | | | | | |
| YL-002 | 1226.7 | | 0 | 0 | 4 | 7 | 5 | 9 | 0 | 3 | 5 | | | | | | | | | | | √ | | | |
| SOL-002 | 682.2 | | 0 | 0 | 7 | 8 | 0 | 4 | 0 | 3 | 5 | | | | | | | | | | | √ | | √ | √ |
| BW-018 | 7866.0 | | 3 | 0 | 7 | 5 | 0 | 4 | 2 | 3 | 5 | | | | √ | √ | | | √ | | | | | | |
| BW-024 | 330.5 | | 0 | 0 | 5 | 10 | 0 | 3 | 0 | 3 | 5 | | | | √ | √ | | | | | | | | | |
| BW-003 | 343.9 | | 0 | 0 | 5 | 5 | 5 | 5 | 0 | 3 | 5 | | | | √ | | | | √ | | | | | | |
| BW-004 | 210.4 | | 0 | 0 | 5 | 5 | 0 | 6 | 2 | 3 | 5 | | | | √ | | | | √ | | | | | | |
| BW-022 | 15408.7 | | 6 | 0 | 3 | 8 | 0 | 3 | 2 | 3 | 5 | √ | | | √ | √ | | | | | | | | | |
| BW-031 | 425.5 | | 0 | 5 | 0 | 4 | 10 | 1 | 1 | 3 | 5 | | | | | | | | | | | √ | | | |
| BW-001 | 62.6 | | 0 | 0 | 4 | 9 | 0 | 6 | 0 | 3 | 5 | | | | √ | | | | | | | | | | |
| BW-025 | 190.0 | | 0 | 0 | 0 | 9 | 10 | 0 | 2 | 3 | 5 | | | | | | | | | | | | √ | | |
| BW-030 | 1154.7 | | 0 | 0 | 1 | 6 | 10 | 0 | 4 | 3 | 5 | | | | | | | | | | | √ | | | |
| LE-006 | 1009.7 | | 0 | 0 | 2 | 6 | 0 | 8 | 2 | 3 | 5 | √ | √ | | | | | | | | | | | | |
| BW-015 | 1588.7 | | 1 | 0 | 5 | 6 | 0 | 4 | 0 | 3 | 5 | | | | √ | | | | √ | | | | | | |
| BW-033 | 411.6 | | 0 | 0 | 0 | 8 | 10 | 0 | 1 | 3 | 5 | | | | | | | | | | | √ | | | |
| LE-005 | 777.6 | | 0 | 0 | 3 | 5 | 0 | 8 | 1 | 2 | 6 | √ | √ | | | | | | | | | | | | |
| LE-007 | 1254.6 | | 0 | 0 | 2 | 6 | 0 | 7 | 1 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-016 | 7724.3 | | 3 | 0 | 3 | 2 | 10 | 3 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| GT-003 | 1450.6 | | 1 | 0 | 4 | 7 | 0 | 2 | 0 | 2 | 6 | √ | | √ | | | | | | | | | | | |
| BW-032 | 184.5 | | 0 | 0 | 0 | 9 | 5 | 0 | 2 | 2 | 6 | | | | | | | | | | | √ | | | |
| GT-004 | 1474.7 | | 1 | 0 | 3 | 5 | 0 | 6 | 0 | 2 | 6 | √ | | √ | | | | | | | | | | | |
| BWC-017 | 9526.4 | | 4 | 0 | 2 | 0 | 10 | 3 | 1 | 2 | 6 | √ | | | | | | | | | | √ | | | |
| BWC-019 | 4577.8 | | 2 | 0 | 2 | 2 | 10 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-013 | 6767.9 | | 3 | 0 | 2 | 1 | 10 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| GT-005 | 1222.1 | | 0 | 0 | 5 | 5 | 0 | 2 | 0 | 2 | 6 | √ | | √ | | | | | | | | | | | |
| BWC-015 | 1944.2 | | 1 | 0 | 2 | 2 | 10 | 3 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-022 | 755.3 | | 0 | 0 | 3 | 6 | 0 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-007 | 1091.9 | | 0 | 0 | 2 | 7 | 0 | 2 | 2 | 2 | 6 | √ | | | | | | | | | | | | | |

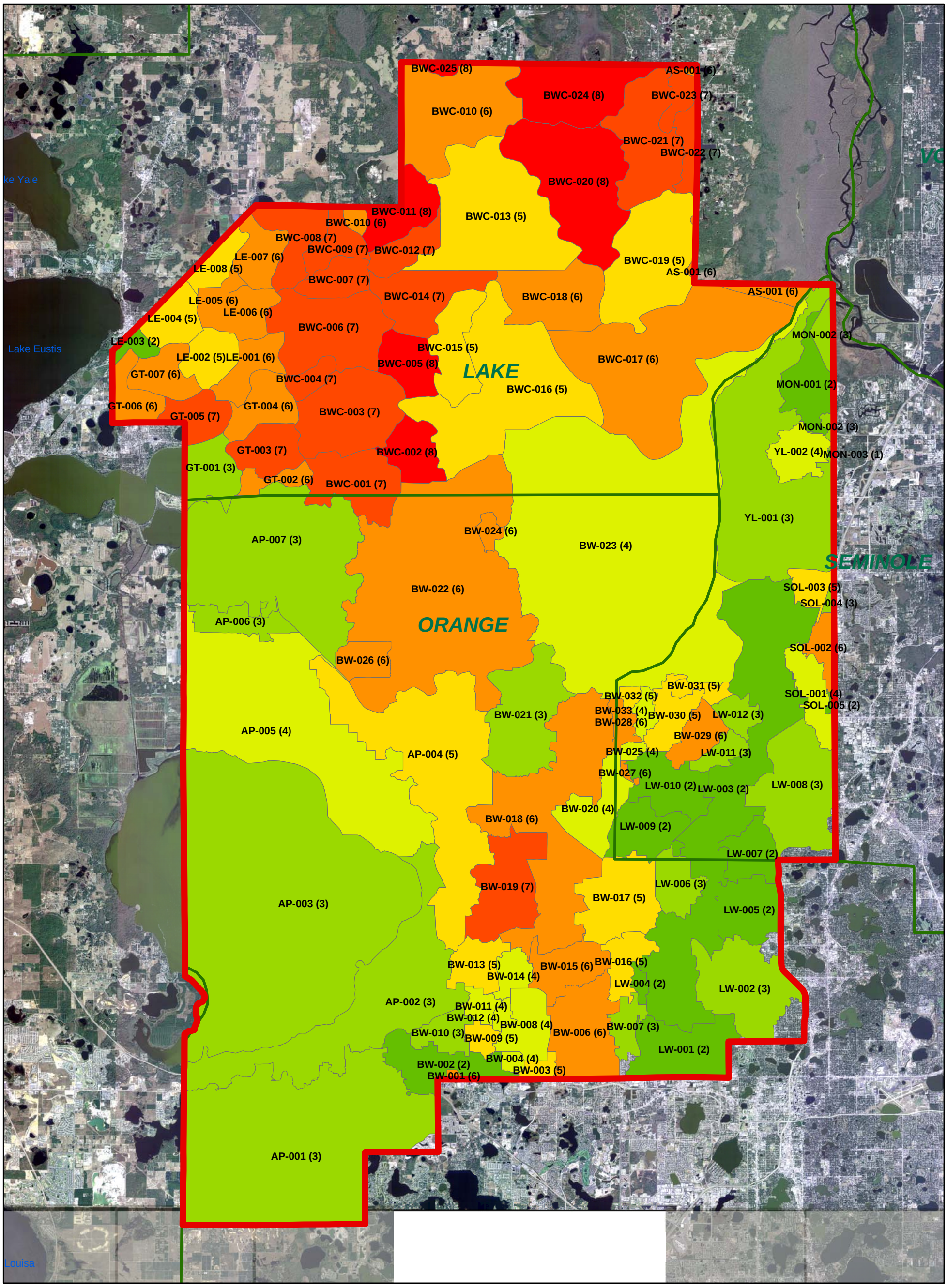
**Table 5-2**
**Wekiva Parkway Protection Act**
**Master Stormwater Management Plan Support**
**Subbasin Ranking Matrix - Management Strategy # 2- Surface Water Treatment Flood Control**

| ***Ranking Matrix*** | | | Benefit Area | Tributary to Impaired Water Body | Magnitude of Pollutant Load (includes BMP & septic tank impacts) (lbs/ac/yr) | Spring Protection (WAVA Zones) | Subbasins with free outfall | Rate of Growth (based on change in population from 1990 - 2000) | Problems Identified | TOTALS | REVISED RANKING | Lake County | Eustis | Mount Dora | Orange County | Apopka | Eatonville | Oakland | Ocoee | Orlando | Winter Garden | Seminole County | Altamonte Springs | Longwood | Lake Mary |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Subbasin | Acres | Weight: | 6.0% | 19.0% | 23.0% | 17.0% | 10.0% | 10.0% | 15.0% | 100% | # | | | | | | | | | | | | | | |
| LE-001 | 1232.1 | | 0 | 0 | 1 | 5 | 0 | 8 | 0 | 2 | 6 | √ | √ | √ | | | | | | | | | | | |
| BWC-010 | 5133.8 | | 2 | 0 | 2 | 1 | 10 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BW-026 | 913.2 | | 0 | 0 | 2 | 10 | 0 | 0 | 0 | 2 | 6 | | | | √ | √ | | | | | | | | | |
| BWC-001 | 2462.9 | | 1 | 0 | 2 | 7 | 0 | 2 | 0 | 2 | 6 | √ | | | √ | | | | | | | | | | |
| BWC-018 | 2879.5 | | 1 | 0 | 2 | 1 | 10 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-023 | 672.6 | | 0 | 0 | 2 | 7 | 0 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| AS-001 | 771.9 | | 0 | 0 | 2 | 1 | 10 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | √ | | | |
| BW-028 | 511.7 | | 0 | 0 | 0 | 6 | 5 | 1 | 2 | 2 | 6 | | | | | | | | | | | √ | | | |
| BW-029 | 1020.5 | | 0 | 0 | 1 | 6 | 5 | 0 | 1 | 2 | 6 | | | | | | | | | | | √ | √ | | |
| BWC-004 | 575.9 | | 0 | 0 | 2 | 7 | 0 | 3 | 0 | 2 | 6 | √ | | √ | | | | | | | | | | | |
| BW-019 | 2939.4 | | 1 | 0 | 3 | 5 | 0 | 1 | 1 | 2 | 6 | | | | √ | √ | | | √ | | | | | | |
| BWC-014 | 2397.2 | | 1 | 0 | 2 | 7 | 0 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-021 | 3330.0 | | 1 | 0 | 2 | 4 | 0 | 2 | 2 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-006 | 3838.8 | | 1 | 0 | 2 | 6 | 0 | 3 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-003 | 3630.8 | | 1 | 0 | 2 | 5 | 0 | 3 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-009 | 1042.7 | | 0 | 0 | 2 | 5 | 0 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-008 | 1700.4 | | 1 | 0 | 2 | 5 | 0 | 2 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-002 | 1415.7 | | 1 | 0 | 3 | 3 | 0 | 3 | 0 | 2 | 6 | √ | | | | | | | | | | | | | |
| BWC-012 | 1075.1 | | 0 | 0 | 2 | 6 | 0 | 0 | 0 | 1 | 7 | √ | | | | | | | | | | | | | |
| BWC-011 | 1646.9 | | 1 | 0 | 2 | 2 | 0 | 4 | 0 | 1 | 7 | √ | | | | | | | | | | | | | |
| BWC-020 | 5536.6 | | 2 | 0 | 2 | 2 | 0 | 2 | 0 | 1 | 7 | √ | | | | | | | | | | | | | |
| BWC-024 | 3241.5 | | 1 | 0 | 3 | 2 | 0 | 2 | 0 | 1 | 7 | √ | | | | | | | | | | | | | |
| BWC-005 | 1458.6 | | 1 | 0 | 1 | 3 | 0 | 3 | 0 | 1 | 7 | √ | | | | | | | | | | | | | |
| BWC-025 | 210.0 | | 0 | 0 | 2 | 0 | 0 | 2 | 0 | 1 | 7 | √ | | | | | | | | | | | | | |

***Criteria Explanation:***

| | | |
|---|---|---|
| Benefit Area | 10 | largest benefit area based on size |
| | 0 | least benefit area based on size |
| Tributary to Impaired Water Bod | 10 | within a subbasin associated with an impaired water body |
| | 5 | water quality problem have been identified but not related to TMDL |
| | 0 | no water quality problems have been identified |
| Magnitude of Pollutant Load | 10 | areas with the highest concentration of pollutant load (lbs/acre/yr) |
| | 0 | areas with the lowest concentration of pollutant load (lbs/acre/yr) |
| Spring Protection | 10 | within the primary protection WAVA zone |
| | 5 | within the secondary WAVA protection zone |
| | 0 | within the tertiary WAVA protection zone |
| Subbasin with free outfall | 10 | subbasin with a positive outfall |
| | 5 | landlocked basin with limited discharge |
| | 0 | landlocked subbasin with no outfall |
| Rate of Growth | 10 | highest rate of growth (in terms of population) |
| | 0 | little to no population growth |
| Problems Identified | 10 | problems identified in the subbasin with the highest score |
| | 0 | no identified problems |

* The delineation for Subasin AP-003 includes just Lake Apopka itself. Therefore, jurisdictions affected should not be concerned with evaluating this particular subasin.

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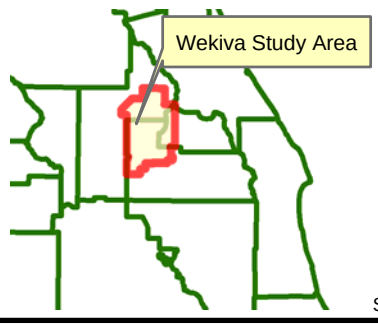
0 3,400 6,800 13,600 20,400 Feet

**LOCATION MAP**




**LEGEND**

- Wekiva Study Area
- County Line

**Subbasin Boundaries**

**Management Strategy No. 1 Ranking**

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

*This reflects the overall ranking for Management Strategy No.1. Subbasins highlighted in the draker green represent the highest priority subbasins.

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Figure 5-1
Management Strategy No. 1 - Assigned Ranking

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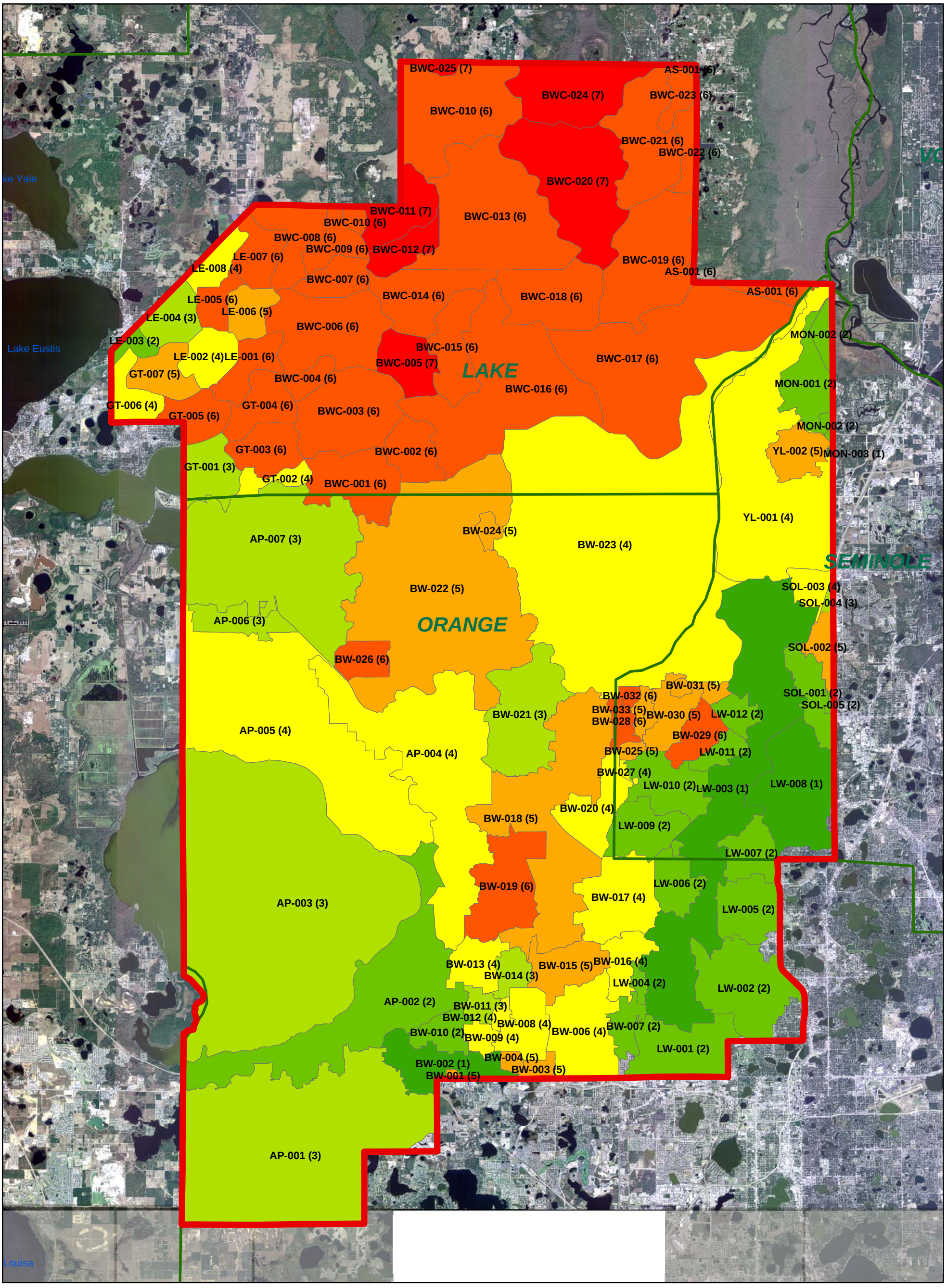


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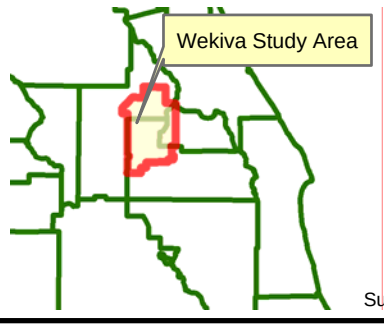
0 3,400 6,800 13,600 Feet

**LOCATION MAP**




**LEGEND**

Wekiva Study Area
County Line

**Management Strategy No. 2 Ranking**

7
6
5
4
3
2
1

*This reflects the overall ranking for Management Strategy No.2. Subbasins highlighted in the draker green represent the highest priority subbasins.

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Figure 5-2
Management Strategy No. 2 - Assigned Ranking

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**Figure 5-3**
**Management Strategy No. 1**
**Conservation, Groundwater Protection and Reuse**
**Decision Making Flow Diagram**

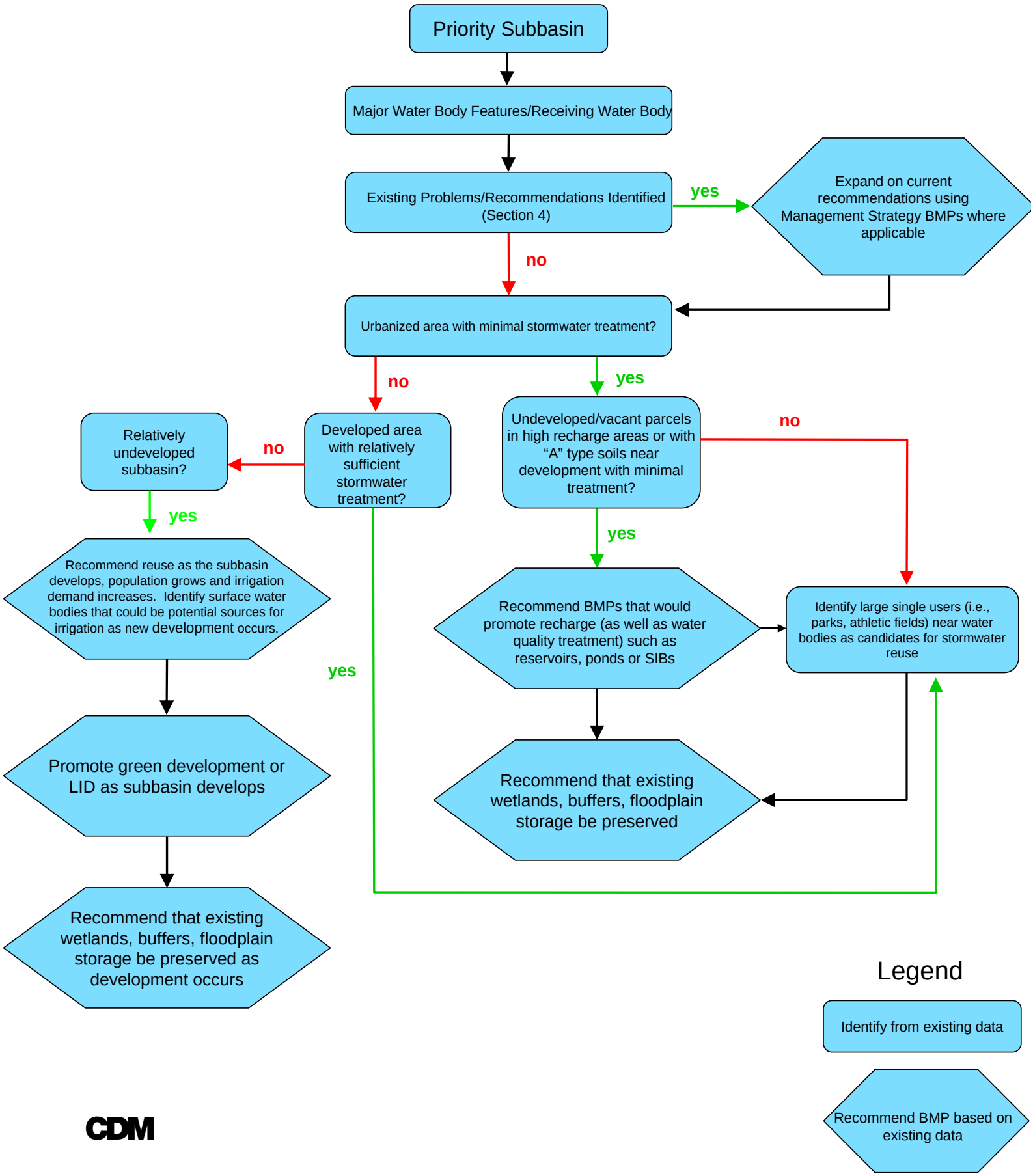


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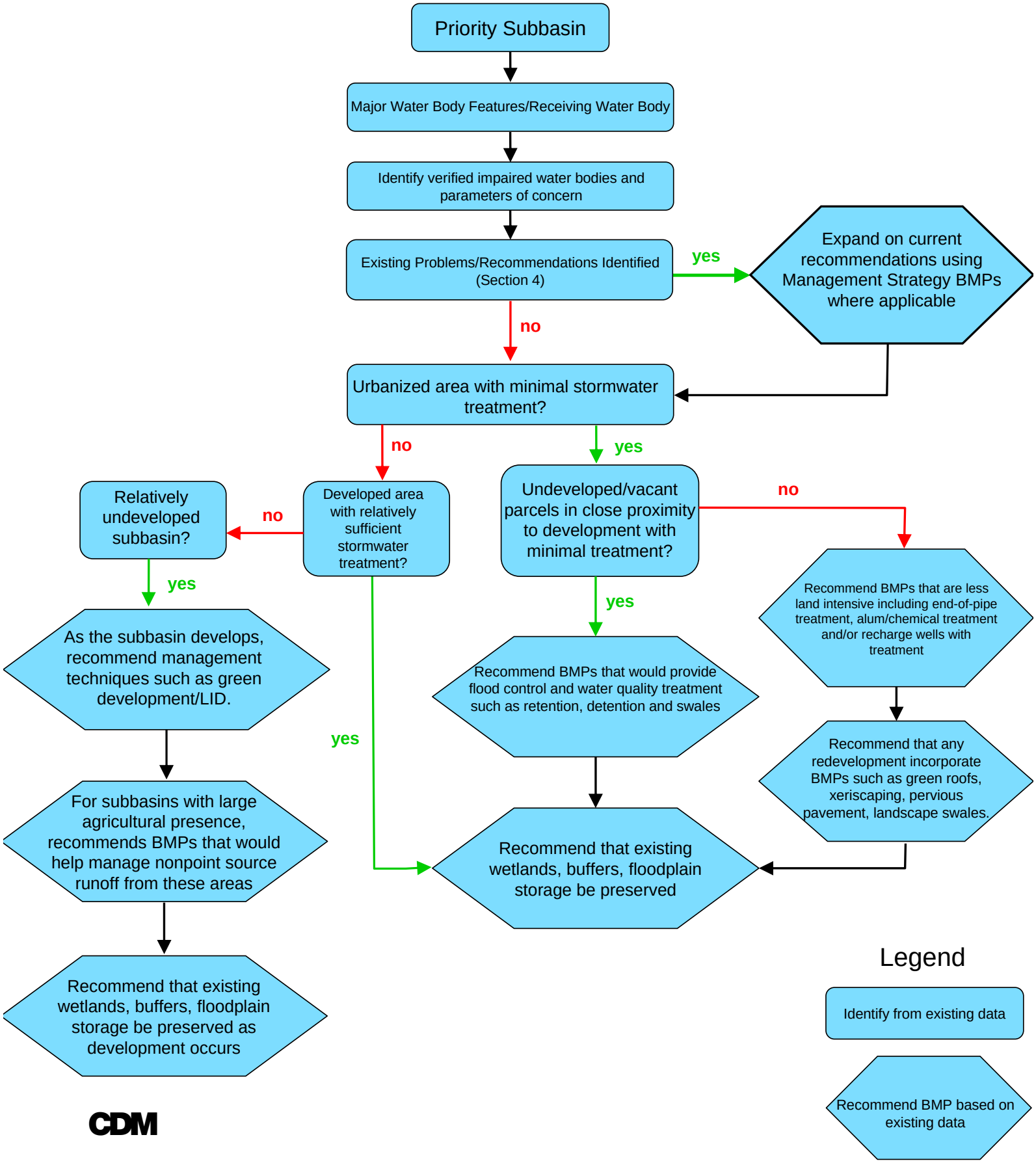
**Figure 5-4**
**Management Strategy No. 2**
**Surface Water Treatment & Flood Control**
**Decision Making Flow Diagram**

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subbasins were selected as candidate subbasins to apply Management Strategy No. 1 (Surface Water Conservation, Groundwater Protection and Reuse):

- BW-002 (Rank 2; Subbasin MON-003 received a rank of "1" under this management strategy, however this subbasin is very small (26 acres) relative to the WSA, and it was thought the effort in identifying projects for Subbasin BW-002 would have more of an overall benefit to the WSA)
- LW-002 (Rank 3)
- BW-008 (Rank 4)
- BW-031 (Rank 5)
- BWC-010 (Rank 6)

The locations of these subbasins are shown in **Figure 5-5** along with the jurisdictional boundaries.

## 5.3.1 Subbasin BW-002

BW-002 received an overall rank of "2" under Management Strategy No. 1, Surface Water Conservation, Groundwater Protection and Reuse. Subbasin BW-002 is located in the Big Wekiva River Basin in the south central portion of the WSA and is approximately 1,989 acres. It is primarily located within the City of Ocoee (1,492 acres or 75 percent), but there are also small portions of unincorporated Orange County (313 acres of 16 percent) and the City of Winter Garden (181 acres or 9 percent) within the subbasin. Surface water in this subbasin is conveyed to the southeast to Lake Lotta where it eventually flows south out of the WSA. Lake Lotta is impaired for nutrients (TSI) and is scheduled to have a TMDL developed by 2008. Problems identified in Section 5 of this MSMP for this subbasin consist primarily of street and some property flooding and are shown in **Figure 5-6**. This subbasin was previously studied in detail by the City of Ocoee and is documented in a report entitled the *Lake Lotta Drainage Basin Study, Ocoee Florida* (PEC, 1998). For this particular subbasin, the PEC study emphasized that the depressional areas along the main conveyance system "attenuate peak flood flows from contributing drainage areas upstream…and reduces the amount of flood flows released to downstream drainage elements.'' The study recommends that "the City [of Ocoee] continue to strictly regulate development adjacent to flood hazard areas, such as this depressional area…and the regulation of development in such flood hazard areas will be in accordance with the policies established by the City's Comprehensive Plan."

In addition to the recommendations made in the Lake Lotta study, the affected jurisdictions should consider implementing the following BMPs under Management Strategy No. 1:

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BWC-010

BWC-010

GT-007

GT-001

AP-002

BW-008

BW-002

BW-020

LW-008

LW-002

LAKE

ORANGE

SEMINOLE

Lake Yale

Lake Eustis

Lake Apopka

John's Louisa

Black Water Creek

WEKIVA RIVER

County Rd 42

County Rd 19

State Hwy 44A

State Hwy 19

Sanford Ave

State Hwy 46

County Rd 437

State Hwy 441

Interstate 4

State Hwy 429

State Hwy 424

State Hwy 50

State Hwy 423

County Rd 439

County Rd 535

State Hwy 435

County Rd 528A

0 3,400 6,800 13,600 20,400 Feet

N W E S

LOCATION MAP

Wekiva Study Area

LEGEND

County Line

Wekiva Study Area

Candidate Subbasins

Water Bodies

Major Roads

Incorporated Areas

Altamonte Springs

Apopka

Eatonville

Eustis

Lake Mary

Longwood

Maitland

Mount Dora

Oakland

Ocoee

Orlando

Winter Garden

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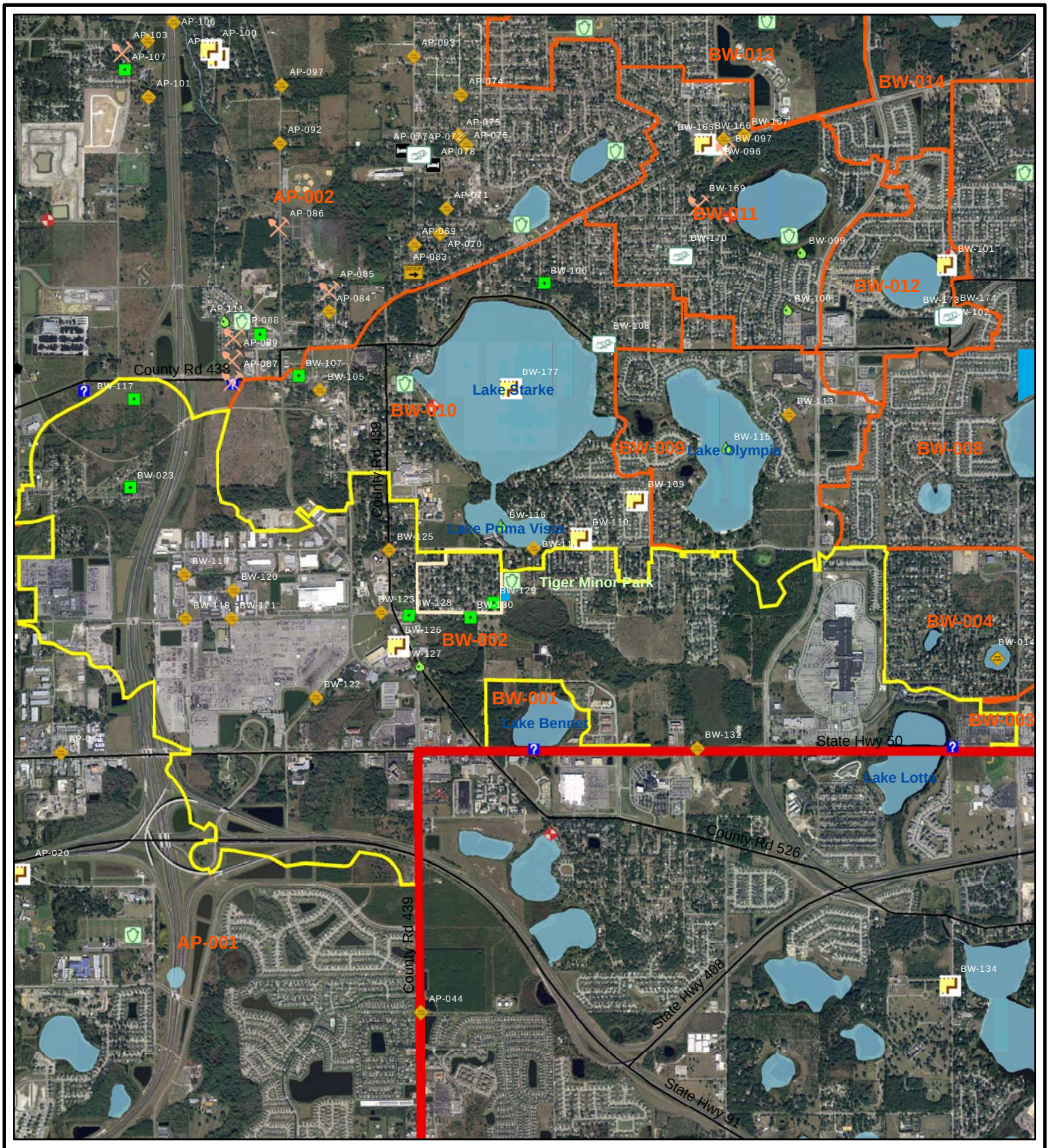
Figure 5-5
Example Subbasins for Applying Management Strategies





0 2,900 5,800 Feet

LOCATION MAP


LEGEND

- Potential Pond Site
- Problem Areas
  - Erosion/Sedimentation
  - House Flooding
  - Maintenance
  - Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality
- Drainage Wells
  - Abandoned
  - Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed
- Parks
- Wekiva Study Area
- Subbasin Boundary
- Major Roads
- Water Bodies
- Primavista Subdivision

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Figure 5-6
Subbasin BW-002

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- The natural wetlands that act as floodplains through this area should be preserved, or if development near these areas is permitted, floodplain ordinances requiring compensating storage should be strictly enforced.

- Add retention/detention to retrofit untreated areas such as subdivisions, for water quality/quantity. A large majority of the subdivisions are equipped with stormwater treatment. An example of an untreated subdivision would be the Primavista Subdivision located to the south of East Orlando Avenue. This subdivision is currently within the City of Ocoee. Adjacent to the subdivision are lands owned by the City that are dominated by "A" type soils and may be suitable for a detention or retention facility. A facility located here would not only provide water quality treatment, flood control benefits, and promote aquifer recharge, but could also be used as a source of irrigation water for stormwater reuse.

- There may be some local opportunities for stormwater reuse for irrigation. One park, Tiger Minor Park, is owned by the City of Ocoee and may be a candidate for providing stormwater reuse from the above mention proposed pond or nearby Lake Primavista for irrigation purposes.

- Preserve and/or add buffers surrounding existing wetland floodplain areas. This would provide additional protection to the floodplain areas noted previously.

- Continue the SJRWMD 3-inch recharge rule for new development as this subbasin is predominately within the WAVA Vulnerable Zone.

- Provide aeration for Lake Lotta to improve water quality and sediment removal.

- A recharge well at Lake Lotta would provide treatment and promote recharge, although this will require discharge to the well to meet federal primary and state primary and secondary drinking water standards. This alternative would need further evaluation, most likely as part of the BMAP process after a TMDL has been developed and adopted for this water body.

- When implementing the recommendations proposed in the Lake Lotta Drainage Basin Study, the affected jurisdictions should also use site-specific water quality treatment options such as rehabilitation of existing swales and/or landscape swales where there are "A" type soils and where this type of retrofit would be deemed practicable.

## 5.3.2 Subbasin LW-002

Subbasin LW-002 received an overall rank of "3" in the decision matrix for Management Strategy No. 1, Surface Water Conservation, Groundwater Protection and Reuse. Subbasin LW-002 is located in the Little Wekiva River Basin in the southeast portion of the WSA and is approximately 3,549 acres in size. It is located within both the City of Orlando (1,684 acres or 47 percent) and unincorporated Orange County (1,845 acres or 52 percent). A very small portion, approximately 14 acres is within the City of Winter Park. The major water body features are Little Lake

Fairview and Lake Fairview. Overflow from Lake Fairview is discharged into the Little Wekiva River. This is a highly urbanized subbasin that is almost entirely built-out. Much of the development is older and was constructed prior to the SJRWMD's requirements for stormwater management and treatment.

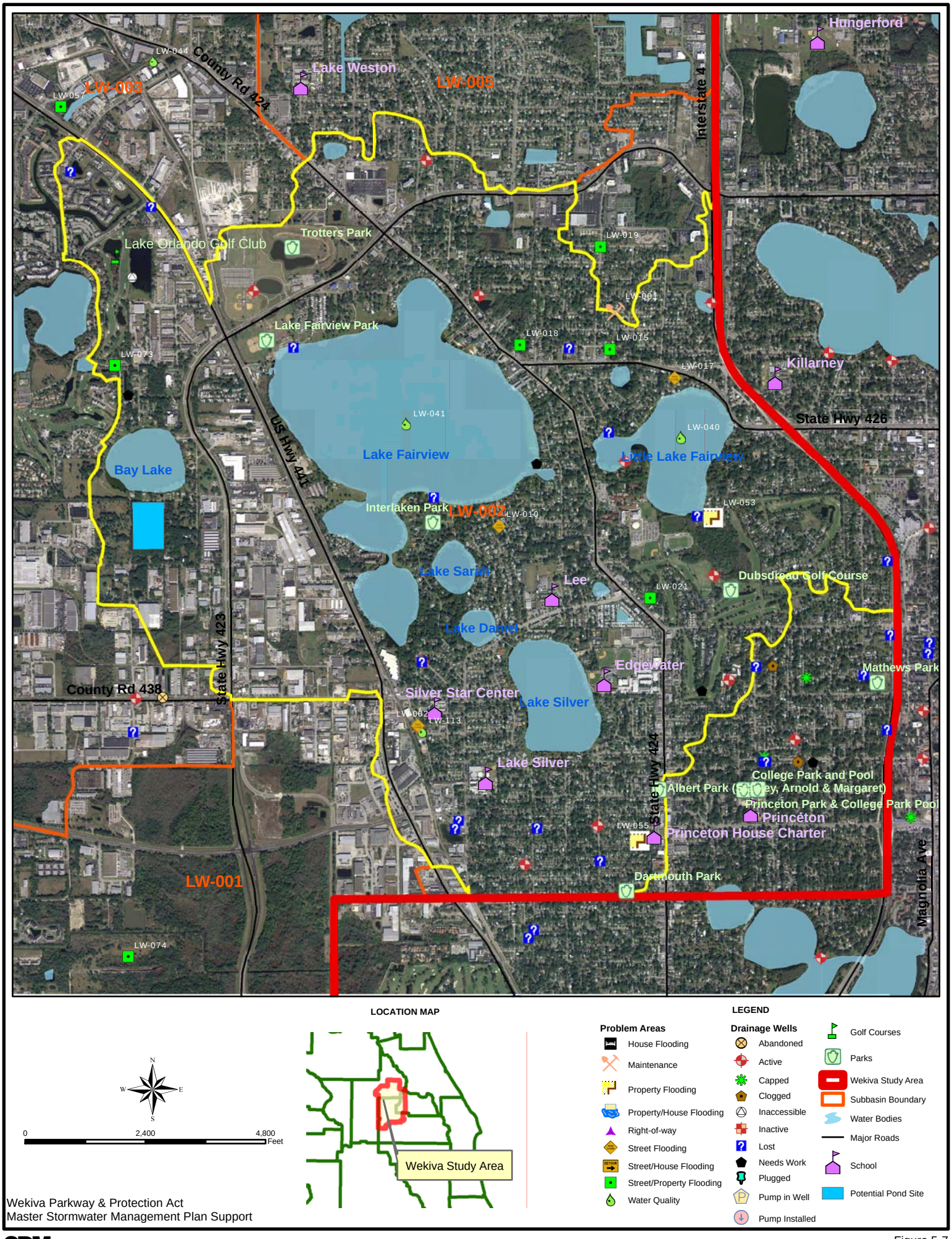
Existing problems identified for this subbasin consist of a combination of property flooding, street flooding and water quality. There are also three impaired water bodies in this subbasin: Lake Silver (nutrients (TSI)), Bay Lake (nutrients (TSI)) and the Little Wekiva Canal (BOD, DO, nutrients- chlorophyll a, and fecal coliform bacteria). The subbasin, along with the location of these problem areas, is shown in **Figure 5-7**. A detailed study of the Little Wekiva River watershed is currently underway as a separate effort by CDM. In this study, CDM identified existing problems, performed a pollutant load analysis, and updated the existing ICPR hydrologic and hydraulic model. The project is currently in its last and final phase where alternatives are being developed to address flooding problems within the primary surface water conveyance system and water quality issues in the watershed.

In addition to the recommendations that will be made in the final phase of the Little Wekiva River Watershed Management Plan, the affected jurisdictions should consider implementing the following BMPs to improve surface water conservation and groundwater protection:

- There are several parks within this subbasin and some are in the vicinity of surface water bodies. Some of these locations may be candidates for supplying stormwater reuse. These include Trotter's Park, Lake Fairview Park and Interlaken Park. Additionally, Edgewater High School, Lee Middle School and Lake Silver Elementary are also located within close proximity to Lake Silver, and have sports fields and recreational areas where there could be opportunities for stormwater reuse.

- The Little Lake Fairview Restoration project, which is a joint effort between Orange County, the City of Orlando and the SJRWMD, involves the design of a retrofit stormwater treatment facility to treat stormwater runoff that is currently conveyed in ditches bordering Minnesota Avenue and Edgewater Drive to Little Lake Fairview. The stormwater treatment facility will include a conveyance system and wet detention ponds to provide water quality benefits to the lake. Wetlands southeast of the lake will be restored and the existing adjacent borrow pond will be refurbished. Additionally, consideration is currently being given to providing the Dubsdread Golf Course with a stormwater reuse alternative for irrigation in an effort to minimize consumptive use of potable water.

- There is a large undeveloped area to the south of Bay Lake which is also an area of high recharge (i.e., 12-20 in/yr) and has "A" type soils. This site could possibly serve as a stormwater infiltration basin where overflow from Bay Lake or the Lake Fairview system could be routed to this area, as discharge from these systems go directly to the Little Wekiva River. This basin would temporarily store surface




LOCATION MAP




LEGEND

**Problem Areas**
- House Flooding
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

**Drainage Wells**
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed

- Golf Courses
- Parks
- Wekiva Study Area
- Subbasin Boundary
- Water Bodies
- Major Roads
- School
- Potential Pond Site

N W E S

0 2,400 4,800 Feet

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Figure 5-7
Subbasin LW-002

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runoff and allow it to infiltrate through the bottom and sides. It would remove many pollutants, provide ground water recharge, and reduce the volume of runoff and peak discharges to the Little Wekiva River, which is a tributary to the Wekiva River.

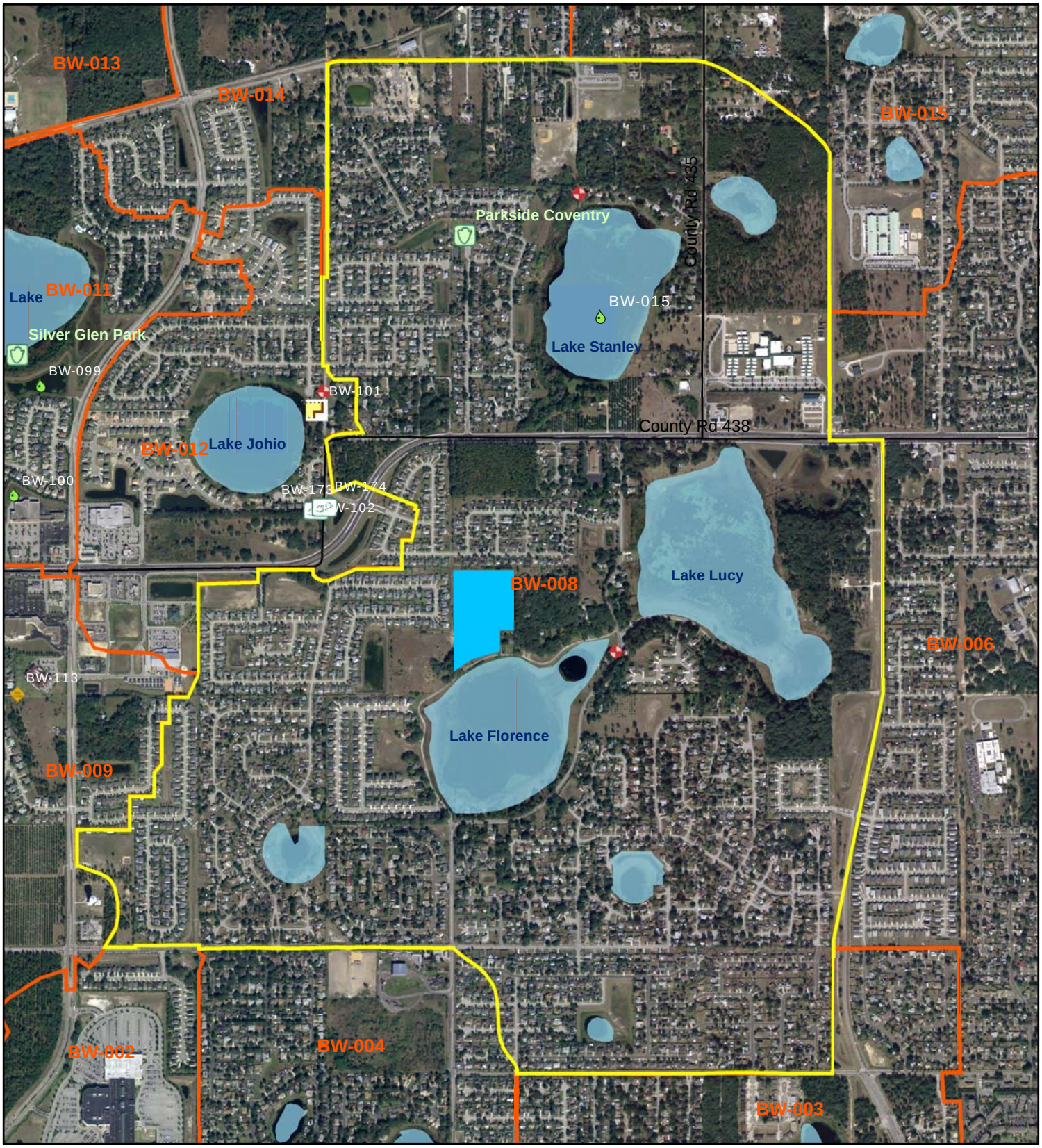
- The Lake Orlando Golf Club is northwest of Bay Lake. There could be an opportunity to provide irrigation to this golf course in the form of stormwater reuse, using Bay Lake as a source. This would promote aquifer recharge and reduce consumptive use as well. Recharge in the vicinity of the golf course is estimated to be 8 to 12 in/yr. The previously mentioned proposed facility could also serve as storage for reuse irrigation.

### 5.3.3 Subbasin BW-008

Subbasin BW-004 received a rank of "4" under Management Strategy No. 1. It is comprised of approximately 1,415 acres and is primarily located within unincorporated Orange County (1,094 acres or 77 percent), with some of its area within the City of Ocoee (321 acres or 22 percent). This subbasin is within the larger Big Wekiva River Basin and is located in the south central portion of the WSA (see **Figure 5-8**). The subbasin is highly urbanized but the majority of the development appears to have stormwater management systems in place. Its main water body features are Lake Stanley, Lake Lucy and Lake Florence. This is considered a limited discharge subbasin as it has drainage wells associated with Lake Stanley and Lake Florence that recharge the Floridan aquifer with surface water. According to the Central Florida Drainage Well Inventory (Hartman & Associates, Inc., 2003), both of these drainage wells are considered to be active. This lake system was previously studied by Orange County in the *Big Wekiva River Basin Stormwater Management Master Plan* (PEC, 2001). There was one existing water quality problem identified associated with high bacteriological counts within Lake Stanley. The Orange County Environmental Protection Division (OCEPD) did some studies on the lake using DNA testing and determined the source of bacteria was due to animals.

Lake Stanley has an active drainage well but is also connected to Lake Lucy via a culvert crossing. Lake Lucy is connected to Lake Florence via a culvert under Good Homes Road that is obstructed and may in the long term reduce the amount of source water that could be recharged into the aquifer through the Lake Florence drainage well (PEC, 2001). The affected jurisdictions should consider implementing the following BMPs in this subbasin in order to meet the long-term goals of Management Strategy No. 1.

- The *Big Wekiva River Basin SWMMP* (PEC, 2001) stated that although no documented flooding problems have been identified, Lake Florence is vulnerable to flooding from extreme rainfall events because its lake level is controlled by a single drainage well. In addition to maintaining this drainage well, an emergency overflow surface water infiltration basin could be constructed in this subbasin, where surface water is collected and stored for volume control and infiltration.

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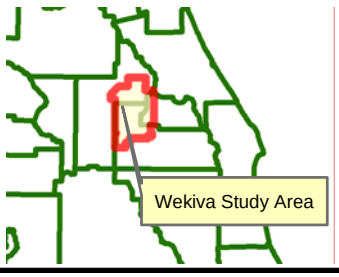
LOCATION MAP




LEGEND

Problem Areas
- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Land-locked
- Maintenance

- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

Drainage Wells
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed

- Golf Courses
- Parks
- Streets
- Wekiva Study Area
- Subbasin Boundary
- Water Bodies
- Potential Pond Site

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Figure 5-8
Subbasin BW-008

This facility would temporarily store surface runoff and allow it to infiltrate through the bottom and sides of the pond. Such a facility would remove pollutants, provide ground water recharge, and reduce peak stages in the lake. There are several large undeveloped parcels that have "A" soils and are in high recharge areas in this subbasin that would be good candidates for this type of facility.

- It would be important to maintain the natural floodplain areas around Lake Lucy and Lake Florence that have not yet been developed. If development were to occur, both the County and the City should strictly enforce their requirements to provide compensating storage.

- There are still some large undeveloped forested/wetland areas surrounding Lake Stanley and Lake Lucy. It is recommended that these be preserved as buffers, as these areas are dominated by "A" type soils and in high recharge areas. Additionally, these areas are predominately within the WAVA Vulnerable Zone.

- For any new development that occurs within this subbasin, the SJRWMD 3-inch recharge requirement should continue to be enforced, as there are high recharge areas within this subbasin.

### 5.3.4 Subbasin BW-031

Subbasin BW-031 received a rank of "5" under Management Strategy No. 1, Surface Water Conservation, Groundwater Protection and Reuse. This subbasin is located in the Big Wekiva Subbasin in Seminole County and is just south of the Wekiva Springs State Park. Subbasin BW-031 is approximately 426 acres in size and is located entirely within unincorporated Seminole County. There are no major water features in this subbasin and stormwater runoff is conveyed to the north to the Big Wekiva wetland. As can be seen in **Figure 5-9**, this subbasin is highly urbanized and problem types reported in this area are a combination of secondary system nuisance flooding, water quality and maintenance related issues. A detailed study was undertaken by Seminole County and is entitled the *Big Wekiva Basin Engineering Study and Drainage Inventory Phase II* (DRMP, 2003). In addition to the recommendations presented in the 2003 DRMP study, the County should consider implementation of the following to promote surface water conservation and aquifer recharge in the Subbasin BW-031:

- Approximately 50 percent of the subbasin is equipped with stormwater treatment. Due to the built-out nature of this subbasin there is limited opportunity to incorporate BMPs that promote conservation and aquifer recharge. Most of the neighborhoods in this area also have curb and gutter systems and would provide little opportunity for retrofitting with BMPs such as landscaped swales.

- Subbasins BW-030 and BW-033, which are adjacent to this area, also received approximately the same rank as subbasin BW-031. Lake Brantley which is within the vicinity of the subbasins, is a minimum flows and levels (MFL) water body and is monitored by the SJRWMD to ensure it is meeting its regulated lake levels.


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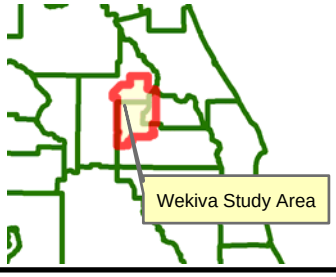
LOCATION MAP




LEGEND

WWTF Effluent Sites
Reuse Type
- Closed Stormwater Management System
- RIBs
- RIBs/Public Access Reuse Irrigation System
- RIBs/SPRAYFIELD
- Public Access Reuse Irrigation System

Problem Areas
- Erosion/Sedimentation
- House Flooding
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality
- Parks

- Streets
- Golf Courses
- Wekiva Study Area
- Subbasin Boundary
- Water Bodies

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Figure 5-9
Subbasin BW-031

Therefore, surface water conservation in this area is important in helping to maintain these lake levels. DRMP's 2003 study cites that most of the subbasin tributary to Lake Brantley was developed prior to inclusion of rules for stormwater treatment. The Wekiva Hunt Club Wastewater Treatment Plant (WWTP) is located in this area and uses public access reuse irrigation system, rapid infiltration basins (RIBs) and surface water discharge as its disposal system. The public access system provides for public access irrigation of the Wekiva Hunt Club Community, two (2) golf courses (Trophy Club Golf Course [a.k.a. Sabal Point Golf Course] and Wekiva Golf Course), parks, playgrounds, landscaped areas, plant nursery (Lake Brantley Plant Corp.), road medians and right of ways. There may be some opportunity to augment the reclaimed water supply at the WWTP with excess surface water from Lake Brantley. A separate evaluation would need to be conducted to determine if there is a need for this additional supply as well as to determine the amount that could be withdrawn from Lake Brantley so that its MFLs are not violated. It is also important to mention that this WWTP is located in the WAVA Vulnerable Zone, and it will have new reclaimed water limits for existing RIBs (6 mg/l total nitrogen) and reuse irrigation systems (10 mg/l total nitrogen).

### 5.3.5 Subbasin BWC-010

Subbasin BWC-010, which is part of the Black Water Creek watershed, received a rank of "6" under Management Strategy No. 1. This 5,133 acre subbasin is located in the northwest corner of the WSA and is entirely within unincorporated Lake County. Lake Norris, which is the headwaters for Blackwater Creek, is the major water body feature in the subbasin. This water body is also regulated under the SJRWMD's MFL program. As can be seen in **Figure 5-10**, this subbasin is currently largely undeveloped and dominated by wetlands and open land. There are some agricultural and residential areas in the subbasin. There were no problem areas reported in this subbasin. The County should consider implementing the following BMPs to enhance surface water conservation and groundwater protection as this subbasin begins to develop over time:

- Reuse would be desirable in this subbasin as the population grows and along with it, irrigation demand increases. Surface water from Lake Norris, in addition to some of the local depressional lakes, could be potential sources for irrigation as new development occurs. Decreasing the projected consumptive use in this subbasin will also help Lake Norris maintain its regulated lake levels as dictated by the MFL program.

- As this subbasin is dominated by wetland areas both surrounding Lake Norris as well as Blackwater Creek, it is important to maintain these natural floodplains as development occurs over time. The County should strictly enforce their floodplain management requirements, and if development is allowed to occur in this area, compensating storage must be provided. It is important to note the area to the west of Lake Norris is a conservation area owned by the SJRWMD.

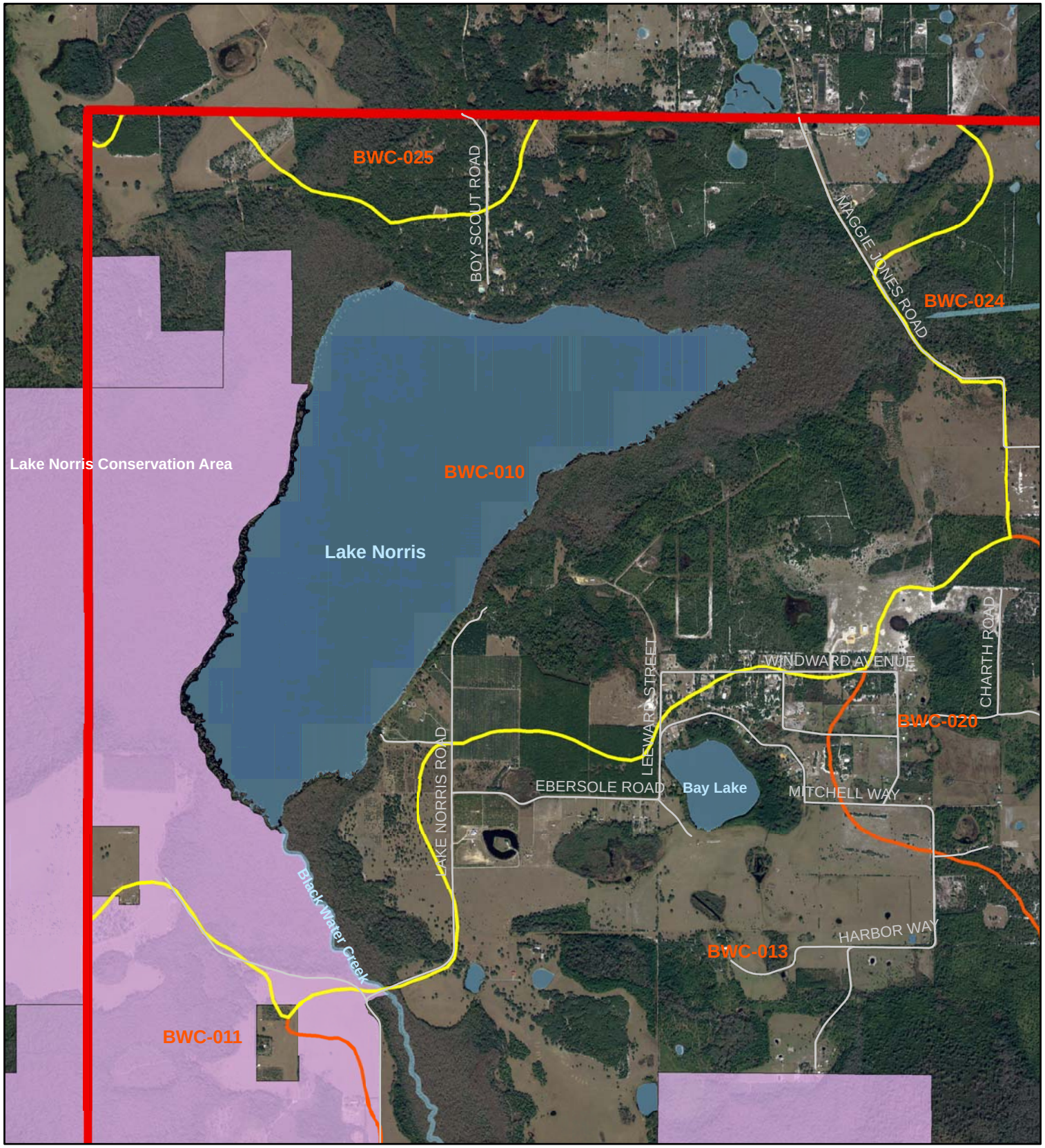


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Figure 5-10
Subbasin BWC-010

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- The County should also continue to enforce the use of buffers surrounding these wetland areas as stated in Chapter VI (Resource Protection Standards) of its Code of Ordinances. These buffers could consist of preservation and/or creation of natural areas and wetlands, strips of grass or other erosion-resisting vegetation between disturbed areas and a water body.

- As this subbasin is largely undeveloped, it would be an ideal candidate for promoting green development or low impact development. Green development is a strategically planned and managed network of wilderness, parks, greenways, conservation easements, and working lands with conservation value that supports native species, maintains natural ecological processes, sustains air and water resources, and contributes to the health and quality of life for communities and people. Low impact development is a cost effective, alternative form of development that considers resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality. Future land use for this subbasin indicates that it will be primarily low density residential (i.e., less than 1 dwelling unit/acre). This land use designation should be adhered to as development occurs in the subbasin.

- Subbasin BWC-010 is primarily within the WAVA Less Vulnerable Zone; however, there are some Vulnerable Zone areas to the east of Lake Norris. The SJRWMD 3-inch recharge rule should continue to be enforced, especially in the More Vulnerable and Vulnerable Zones.

## 5.4 Identified Projects – Management Strategy No. 2 (Surface Water Treatment and Flood Control)

Based on the prioritization shown in Table 5-2, the following subbasins were selected as candidate subbasins to apply Management Strategy No. 2 (Surface Water Treatment and Flood Control):

- LW-008 (Rank 1; although subbasin BW-002 was ranked the highest under this strategy, it was already evaluated under management strategy No. 1, therefore the next highest ranked subbasin was selected for evaluation)

- AP-002 (Rank 2)

- GT-001 (Rank 3)

- BW-020 (Rank 4)

- GT-007 (Rank 5)

The locations of these subbasins are shown in Figure 5-5 along with the jurisdictional boundaries.

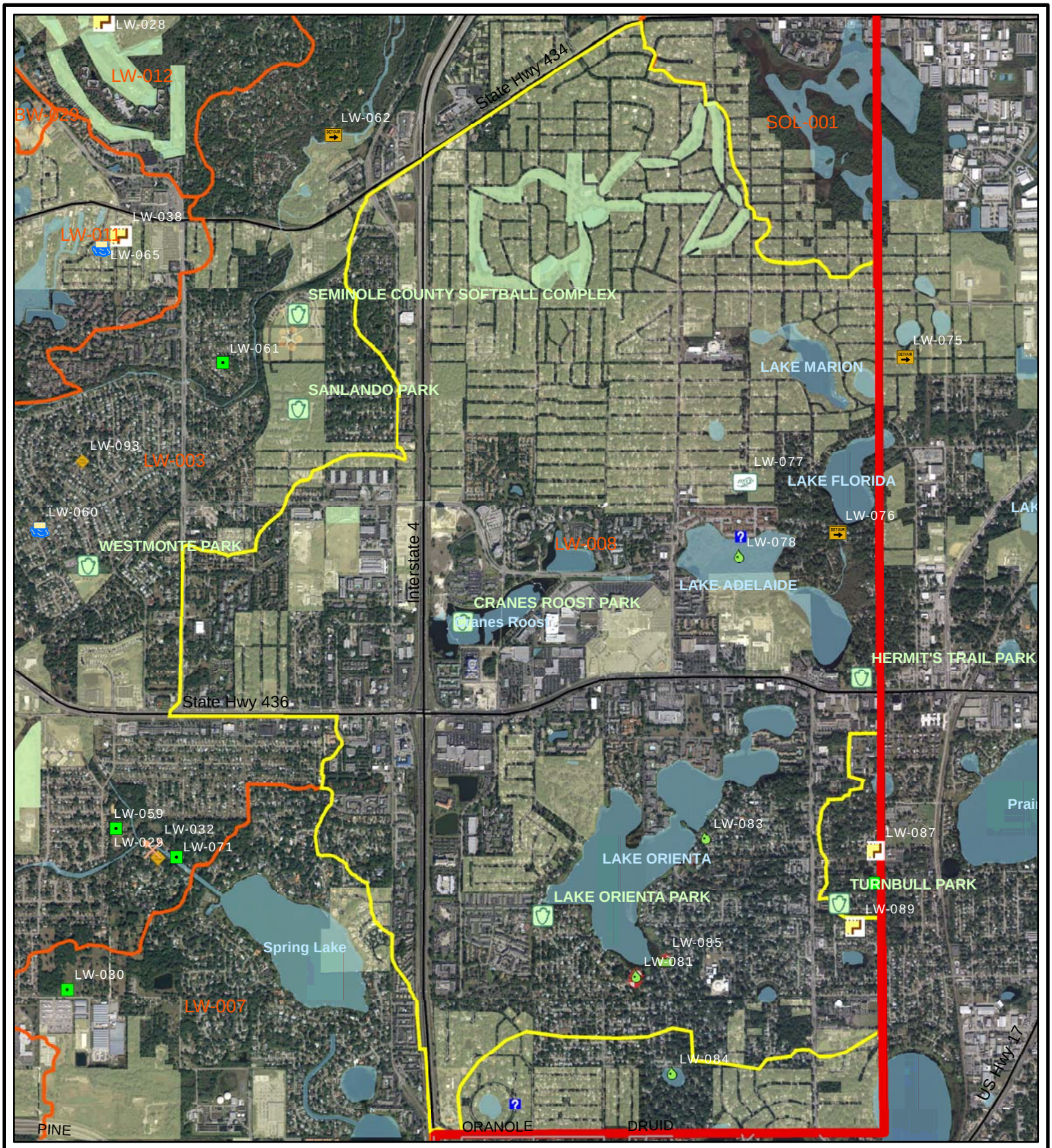
### 5.4.1 Subbasin LW-008

LW-008 was ranked the highest priority subbasin under Management Strategy No. 2. This 3,980 acre subbasin is within the Little Wekiva River Watershed and is partially located in the City of Altamonte Springs (2,335 acres or 59 percent) and unincorporated Seminole County (1,642 acres or 41 percent). Surface water in this subbasin is conveyed through a series of lakes, including Lake Marion, Lake Florida and Lake Adelaide. From Lake Adelaide, surface water can be discharged into Cranes Roost where it is intermittently pumped to the Little Wekiva River. Part of the reason subbasin LW-008 is a high priority subbasin is that it contains three impaired water bodies: Lake Adelaide, Lake Florida and Lake Orienta, all of which are impaired for nutrients (TSI). Lake Orienta is also a landlocked lake with drainage wells. As shown in **Figure 5-11**, this is another very highly urbanized subbasin where much of the development was built prior to the SJRWMD stormwater treatment requirements.

Problems identified in this subbasin consist of flooding, erosion and sedimentation, and water quality. Many of the problems in the subbasin have already been addressed by the City, or the recommendations associated with them have been found not feasible. A detailed study of the Little Wekiva River watershed is currently underway as a separate effort by CDM. In this study, CDM identified existing problems, performed a pollutant load analysis, and updated the existing ICPR hydrologic and hydraulic model. The project is currently in its last and final phase where alternatives are being developed to address flooding problems within the primary surface water conveyance system and water quality issues in the watershed.

In addition to the recommendations that will be made in the final phase of the Little Wekiva River Watershed Management Plan, the affected jurisdictions should consider implementing the following BMPs to provide surface water treatment and flood control:

- This subbasin has a high density of septic tanks, especially to the north of Lake Adelaide and to the south of Lake Orienta. The City of Altamonte Springs has noted that this may be contributing to water quality degradation. The Florida Department of Health (DOH) report entitled the *Wekiva Basin Onsite Sewage Treatment and Disposal System Study* (2004) recommends that the highest priority for sewering should be given to areas with high densities of systems within the WAVA More Vulnerable and Vulnerable Zones. For septic tanks, the Florida DOH recommends the following: 1) a discharge limit of 10 mg/l of total nitrogen for new systems, systems being modified, and for existing systems within the WAVA More Vulnerable and Vulnerable Zones; 2) state and local planning agencies evaluate the economic feasibility of sewering versus nutrient removal upgrades to existing onsite sewage treatment and disposal systems (OSTDSs) (areas with high densities of development will be better suited to central sewering, and lower density areas more suitable for nitrogen-removing OSTDSs); 3) failed or modified systems within the WSA be upgraded to meet new system standards; and 4) new regional

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N
W
E
S

0 600 1,200 2,400 3,600 Feet

LOCATION MAP


LEGEND

Problem Areas
- Erosion/Sedimentation
- Force Main Problem
- House Flooding
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

Drainage Wells
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed
- Parks
- Golf Courses
- Major Roads
- Parcels Served by Septic Tanks
- Water Bodies
- Subbasin Boundary
- Wekiva Study Area

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Figure 5-11
Subbasin LW-008

wastewater management entities be established or that existing ones be modified to oversee the maintenance of all wastewater discharged from OSTDSs in the WSA. Subbasin LW-008 is an example of an area that is highly developed with a high density of septic tanks in the WAVA Vulnerable Zone.

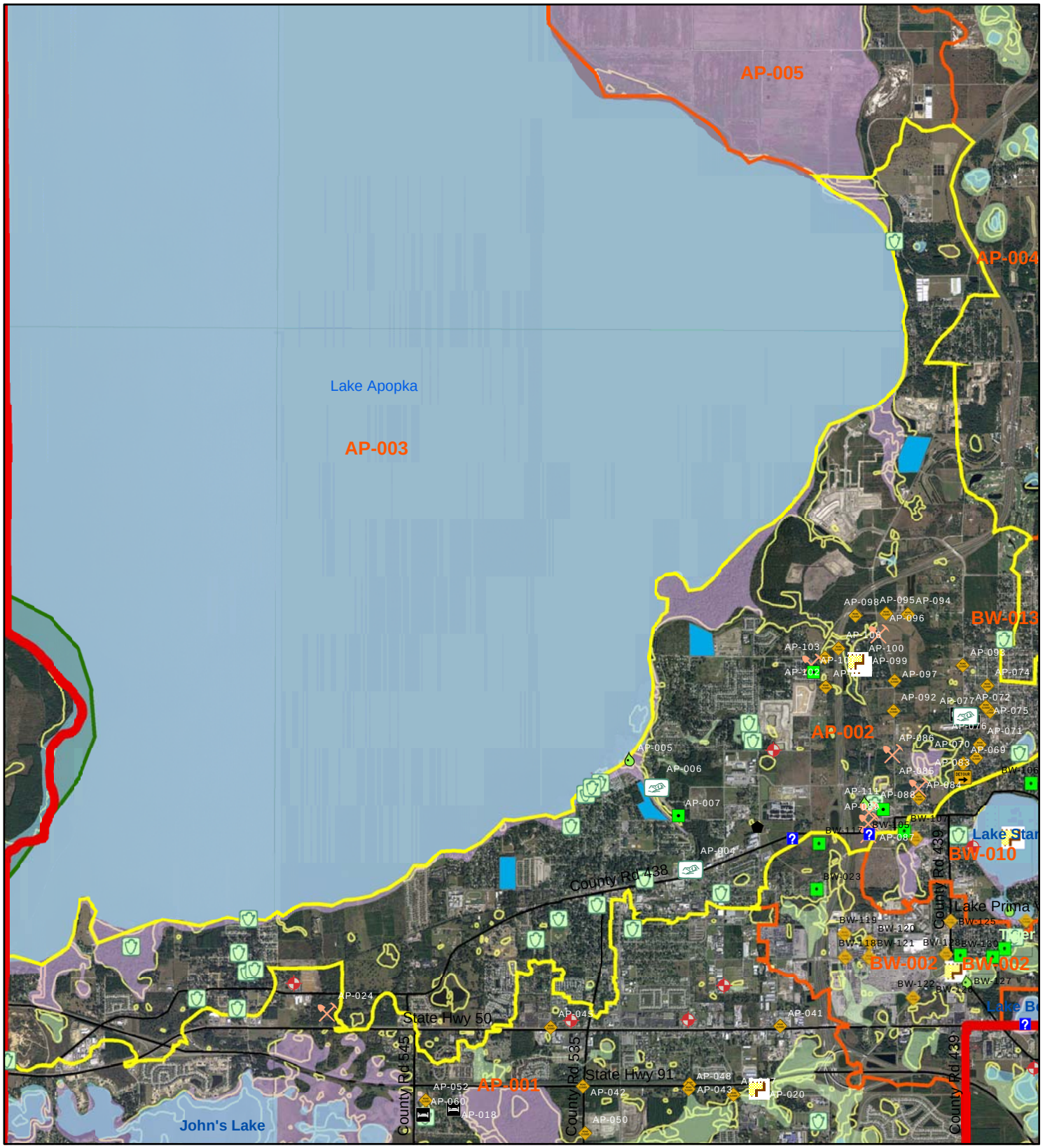
- Subbasin LW-008 was estimated to have some of the highest pollutant loads per acre from nonpoint source runoff based on the WMM results. There is little to no opportunity to construct large-scale regional stormwater treatment facilities due to the degree of urbanization that has taken place. Most of the neighborhoods in this area also have curb and gutter systems which would provide little opportunity for retrofitting with BMPs such as landscaped swales. Although the use of baffle boxes and alum treatment (or equivalent coagulant) has been recommended in this area before, it is an option that may want to be reconsidered to help improve water quality, especially for the impaired water bodies. As part of the NPDES MS4 program, the City feels that their street sweeping activities have been effective in removing solids and sediments that would otherwise be discharge to surface water bodies.

- As much of the development is older in subbasin LW-008, there may be areas that are desirable from a redevelopment standpoint. Therefore, strict enforcement of stormwater management treatment requirements for redevelopment in this subbasin is also very important. BMPs that can be incorporated into redevelopment include detention, retention, landscape swales, xeriscaping or water wise landscaping, green roofs and pervious pavement.

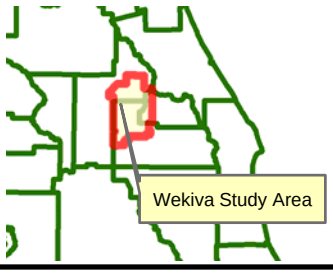
- As there is very limited opportunity in this subbasin for stormwater treatment retrofit and there are three impaired water bodies, the use of recharge wells with treatment would provide both flood control as well as water quality treatment. This BMP would provide a conduit where surface water is able to seep into the ground and refill surficial aquifers with a filter system surrounding the drain inlet. However, a modification to an existing drainage well or installation of a new well would require that surface water discharge to meet federal primary and state primary and secondary drinking water standards. The City of Altamonte Springs recently obtained a Consumptive Use Permit (CUP) from the SJRWMD to augment its reclaimed water supply with surface water from five water bodies, including Lake Orienta and Crane's Roost, which helps maintain the lake stages, reduces flows to the drainage wells and the Little Wekiva River.

## 5.4.2 Subbasin AP-002

Subbasin AP-002 received an overall rank of "2" under Management Strategy No. 2. This subbasin is comprised of approximately 8,237 acres and is located immediately to the east and south of Lake Apopka (see **Figure 5-12**). There are several jurisdictions within this subbasin including the City of Apopka (302 acres or 4 percent), the Town of Oakland (639 acres or 8 percent), the City of Ocoee (2,070 or 25 percent), the City of Winter Garden (2,995 acres or 36 percent) and unincorporated Orange County (2,215




LOCATION MAP




LEGEND

Problem Areas
- Potential Pond Site
- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Land-locked
- Maintenance
- Property Flooding
- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality

Drainage Wells
- Abandoned
- Active
- Capped
- Clogged
- Inaccessible
- Inactive
- Lost
- Needs Work
- Plugged
- Pump in Well
- Pump Installed
- Golf Courses
- Parks
- Wekiva Study Area
- Subbasin Boundary

National Wetlands Inventory
- Lacustrine
- Palustrine
- Riverine
- Major Roads

FEMA Zone
- A
- AE
- AH
- ANI

N
W E
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0 2,600 5,200 Feet

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Figure 5-12
Subbasin AP-002

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acres or 27 percent). The major water body feature in this subbasin is Lake Apopka. There are several streams and tributaries throughout the subbasin that discharge into the lake.

Most of the problem areas within the subbasin have been identified in the Northwest drainage ditch as this is an area that has been studied in detail by the City of Ocoee (PEC, 1996). Additionally, a master stormwater management plan is currently being undertaken by Orange County for the Lake Apopka Basin for the unincorporated areas. Identified problems consist mainly of street and property flooding, water quality and maintenance issues. In addition to the recommendations made in the aforementioned studies, the affected jurisdictions should consider implementing the following BMPs.

- There are several large wetland areas surrounding the tributaries to Lake Apopka that are associated with the floodplain as shown by the Q3 flood data obtained from the SJRWMD, which is derived from the Flood Insurance Rate Maps (FIRMs) published by the Federal Emergency Management Agency (FEMA). Parts of these areas are within the designated 100-year floodplain (i.e., Zone AE, an area inundated by 1 percent annual chance flooding, for which base flood elevations (BFEs) have been determined). These natural floodplains should be maintained and floodplain ordinances should be strictly adhered to in these areas if compensating storage needs to be provided as development occurs. Based on review of the 2004 DOQQs, development has already occurred right up to the edge of some of these wetland areas.

- All new development within the Lake Apopka Basin must meet phosphorus discharge limits pursuant to section 373.461(3)(a), F.S. Subbasin AP-002 is predominately within the WAVA Vulnerable Zone as well as in an area where recharge is estimated to be 4 to 8 inches per year. There are several large undeveloped parcels that may be suitable for a large-scale regional detention facility. The facility would provide water quality treatment and flood control benefits for developed areas that were constructed prior to the SJRWMD's requirements for stormwater treatment and limitations for phosphorus discharge. This type of facility could provide treatment for new development as well. The affected jurisdictions could create a municipal service taxing unit (MSTU) where in lieu of requiring on-site treatment for new development, a special district is established to fund a facility that is operated and maintained by the jurisdiction and benefits a larger area. Depending on the facility's construction, it could enhance aquifer recharge in addition to providing flood control benefits and water quality treatment.

- For the remaining areas along the shoreline of Lake Apopka, buffers should be incorporated to prevent development on the water's edge. Buffers should also be incorporated into development that is adjacent to the natural wetland areas surrounding the tributaries to Lake Apopka.

- For those remaining undeveloped areas in the subbasin, the affected jurisdictions should consider promoting green or LID, or providing incentives to those developers that incorporate resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.

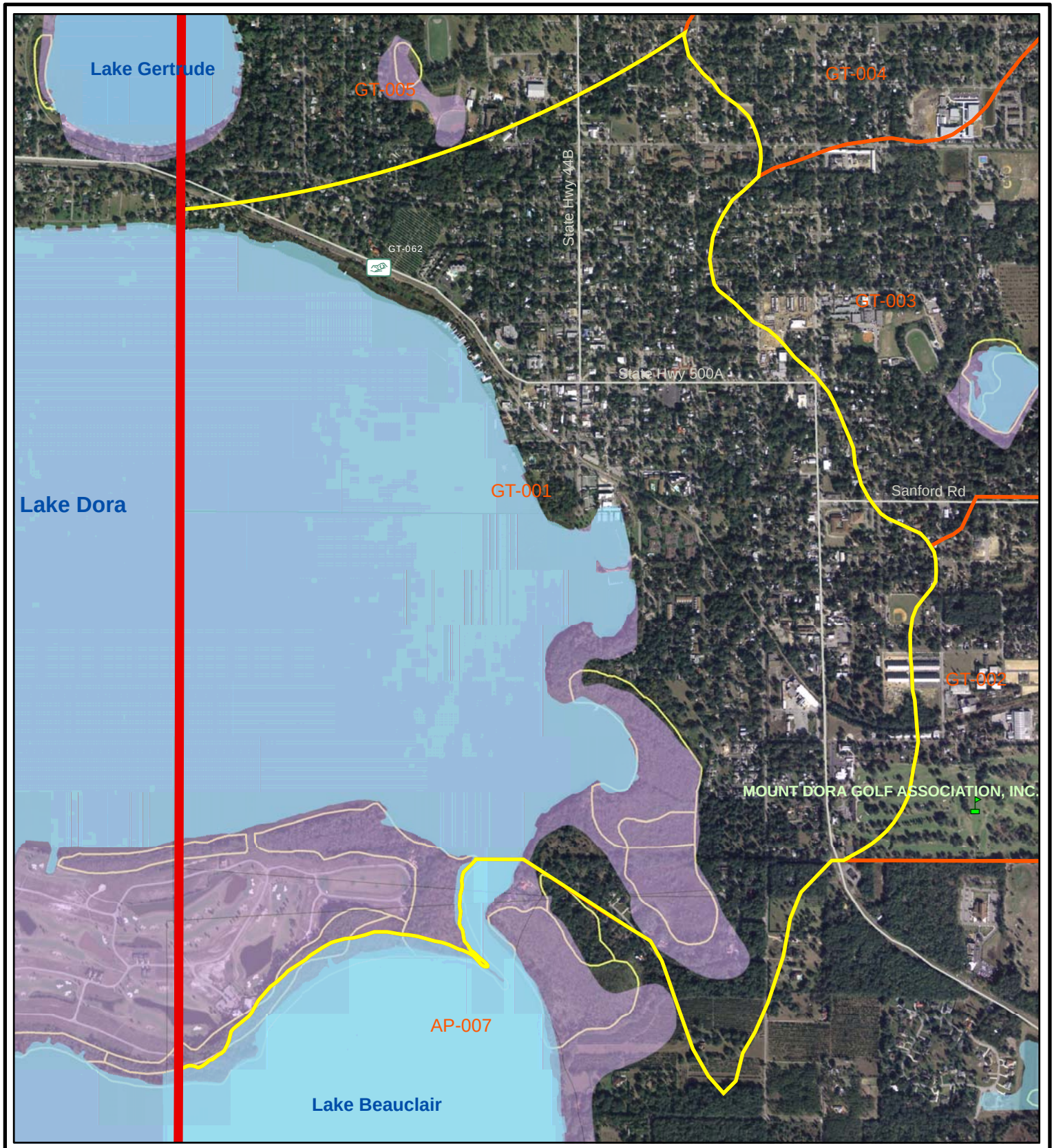
- When implementing the recommendations proposed in the *Northwest Ditch Drainage Basin Study* (PEC, 1996), the affected jurisdictions should also consider implementing site-specific water quality treatment options to coincide with the recommended culvert upgrades.

### 5.4.3 Subbasin GT-001

Subbasin GT-001 received a rank of "3" under Management Strategy No. 2. This subbasin, shown in **Figure 5-13**, is within the larger Golden Triangle Basin and is within the City of Mount Dora (1,152 acre or 74 percent), unincorporated Lake County (286 acres or 18 percent) and unincorporated Orange County (112 acres or 7 percent). Lake Dora is the receiving water body for this subbasin and the lake discharges through the Dora Canal into Lake Eustis. Lake Dora is also an impaired water body for which a TMDL for total phosphorus has already been developed, and FDEP is in the process of developing a BMAP for this water body. As part of the development of the phosphorus PLRG for Lake Dora, Fulton et al. (2003) found that the Lake Beauclair discharge represented more than 90 percent of both the phosphorus and nitrogen annual load to Lake Dora. Further personal communication with the SJRWMD revealed that the 90 percent was an average for 1991-2000. Estimated phosphorus contributions for more recent years are 2001 (54 percent P, 73 percent N), 2002 (55 percent P, 67 percent N), and 2003 (87 percent P, 91 percent N).

A master drainage plan for Mount Dora was completed in 1991 by Bowyer-Singleton & Associates. The master drainage plan states that stormwater conveyance in the City is characterized by pipe networks and ditch systems that discharge directly to Lake Dora, with little provision for stormwater treatment. The study also notes that the 100-year floodplain for Mount Dora is 66-ft NGVD and may exceed the banks of the lake and partially flood residential areas on the northern and eastern banks along Boathouse Road. Based on discussions with City staff, there are currently no deficiencies within the City and the recommendations made in the Bowyer-Singleton master drainage plan have been addressed. One problem due to erosion, was identified by Lake County in this subbasin at old US 441 and the railroad tracks. The affected jurisdictions should consider implementing the following BMPs under Management Strategy No. 2 in order to enhance long-term water quality treatment and flood control.

- Subbasin GT-001 is an urbanized basin, with development occurring up to most of the Lake Dora shoreline. Based on review of the 2004 DOQQs, there still appears to be some wetland areas along the southeast portion of the lake. It is important to maintain these areas in order to preserve what is left of the natural floodplain for

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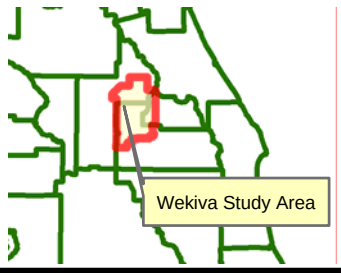
0 1,450 2,900 Feet

LOCATION MAP




LEGEND

Problem Areas
- Erosion/Sedimentation
- Golf Courses
- Parks
- Wekiva Study Area
- Subbasin Boundary

National Wetlands Inventory
Type
- Lacustrine
- Palustrine
- Riverine
- Major Roads
- Water Bodies

FEMA Zone
- A
- AE
- ANI

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Figure 5-13
Subbasin GT-001

Lake Dora. The Q3 flood data obtained from the SJRWMD (derived from the FEMA FIRMs) has this area designated as part of the 100-year floodplain (i.e., Zone AE, an area inundated by 1 percent annual chance flooding, for which BFEs have been determined). If these areas are permitted to be developed, compensating storage requirements should be strictly enforced.

- As this subbasin is fairly built-out, there is little space available for large-scale regional stormwater treatment facilities. The City of Mount Dora has approximately 19 stormwater detention facilities that are currently within their maintenance jurisdiction. In addition to maintaining these ponds so that they effectively treat stormwater, the affected jurisdictions should install baffle boxes and end-of-pipe treatment devices, especially at the outfalls to the lake. For those areas that have no stormwater treatment capabilities, the affected jurisdictions should retrofit with landscaped or grass swales that are designed to convey stormwater, allow it to soak into the ground, and filter pollutants. These would be most effective in areas where there are "A" type soils or where this type of retrofit would be deemed practicable by the affected jurisdiction.

- The affected jurisdictions should also strictly enforce buffer requirements around the remaining wetlands to the southeast of Lake Dora. This will not only help with flood attenuation but also allow the wetlands to continue to provide natural water quality enhancement capabilities for surface runoff before it enters the lake.

### 5.4.4 Subbasin BW-020

BW-020 received an overall rank of "4" in the decision matrix for Management Strategy No. 2, Water Quality Treatment and Flood Control. Subbasin BW-020 is located in the Big Wekiva River Basin in the central portion of the WSA and is approximately 1,774 acres in size. It is located within the City of Apopka (908 acres or 51 percent), unincorporated Orange County (653 acres of 37 percent) and unincorporated Seminole County (213 acres or 12 percent). The major water body features include Border Lake, Lake Cortez, Lake Pleasant, Lake Jackson, Lake Piedmont, Blue Lake, Lake McDade and Lake Page. There are active drainage wells associated with Lake Page and Lake Pleasant that provide lake level control. This area has been previously studied both by Orange and Seminole Counties. Orange County has previously studied this lake system in the *Border Lake Master Plan, Phase I* (Miller-Sellen & Associates, Inc.) as well as the *Big Wekiva River Basin Stormwater Management Master Plan* (PEC, 2001). Similarly, the Border Lake system was modeled as part of the *Big Wekiva Basin Engineering Study and Drainage Inventory Phase II* (DRMP, 2003). The existing problem identified in this subbasin is associated with flood control of Lake Cortez and Border Lake, of which a re-study is currently underway by Orange County to examine and identify potential alternatives for lake level control. The preferred alternative identified in the *Big Wekiva River Basin Stormwater Management Master Plan* (PEC, 2001) entailed lowering existing drainage wells and pumping from or installing a new drainage well on Lake Cortez to help with flood control. The subbasin and the location of this problem area are shown in **Figure 5-14**.

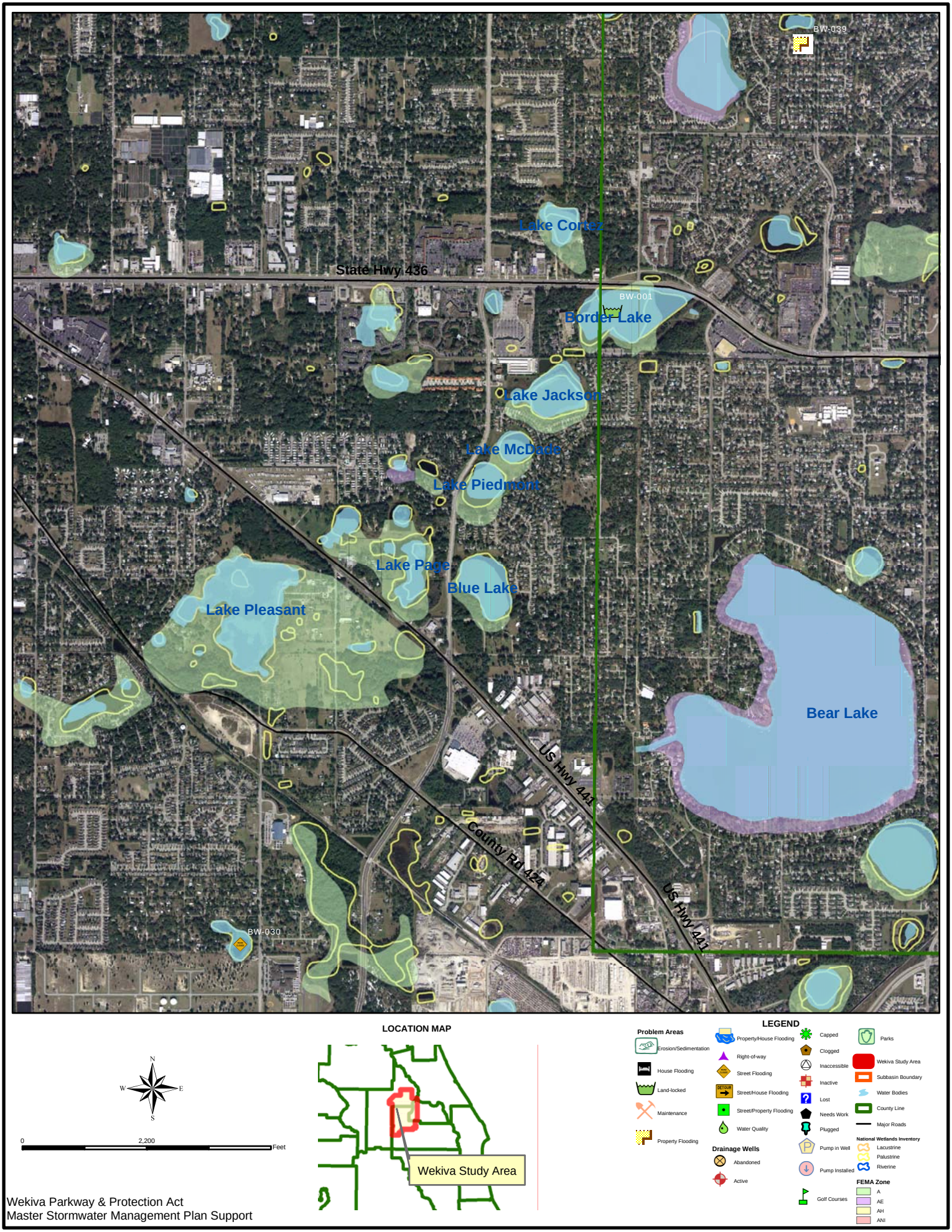


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Figure 5-14
Subbasin BW-020

In addition to addressing existing deficiencies in the subbasin, the affected jurisdictions should consider implementing the following BMPs for long-term water quality treatment and flood control:

- Based on review of the 2004 DOQQs, there still remain some undeveloped/natural areas around several of the lakes including Lake Pleasant, Lake Page and Blue Lake. The Q3 flood data obtained from the SJRWMD that is derived from the FEMA FIRMs show some undeveloped areas within the 100-year floodplain (i.e., Zone A which is defined as an area inundated by 1 percent annual chance flooding, for which no BFEs have been determined). It is important to maintain these areas both for floodplain management as well as buffer systems as they provide water quality benefits. If any further development takes place in these areas, compensating storage must be strictly enforced so that no net loss of floodplain occurs.

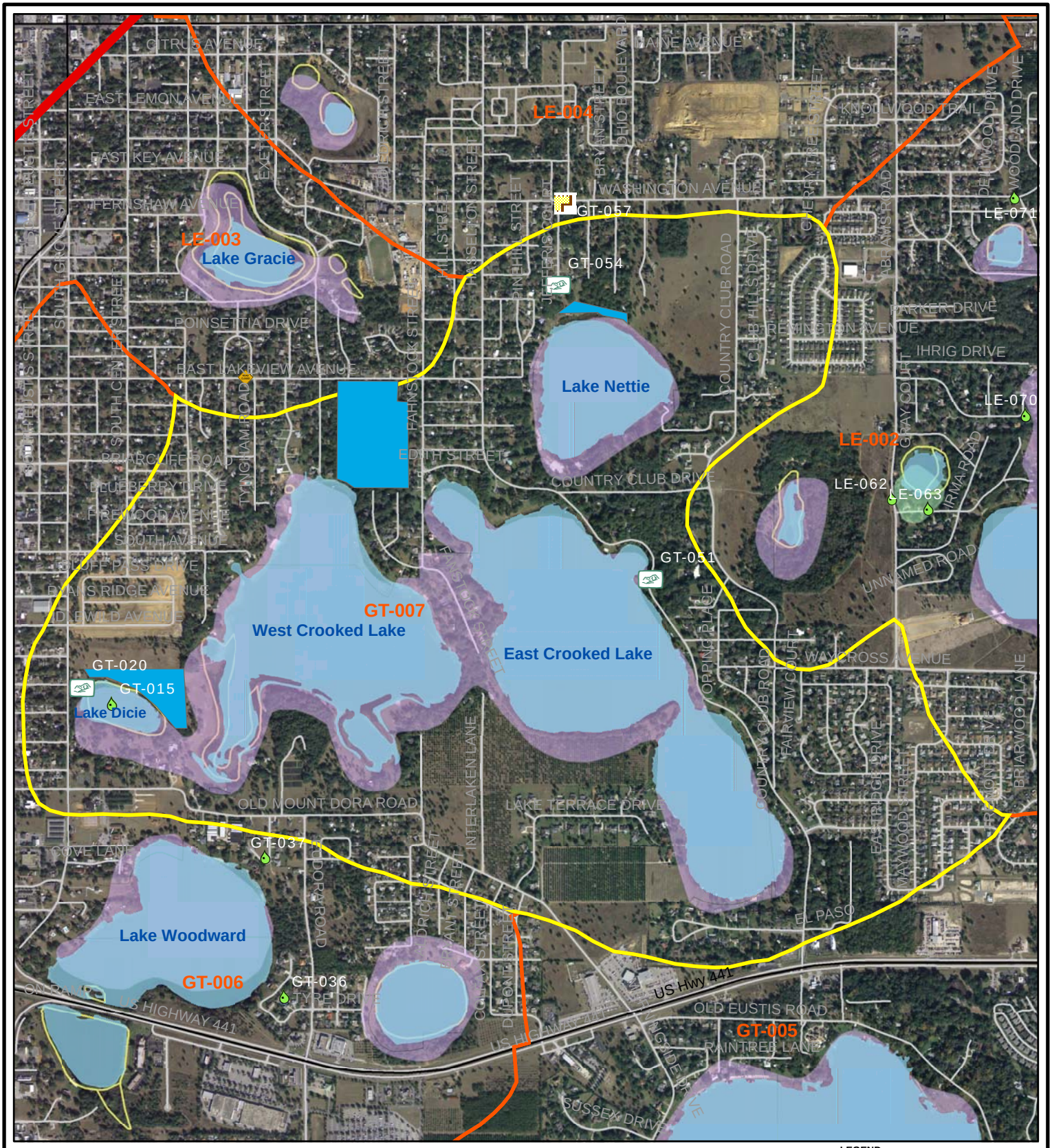
- As new development occurs, especially near the open water bodies within the subbasin, it will be important to incorporate buffers that will either preserve or create natural areas and wetlands between disturbed areas and a water body.

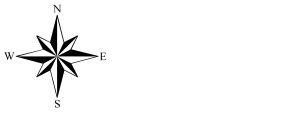
- Based on review of the 2004 DOQQs, a large majority of this subbasin appears to be equipped with stormwater treatment. For the few remaining areas constructed prior to the SJRWMD requirements for stormwater treatment, the affected jurisdictions should consider retrofitting with landscaped or grass swales where there are "A" type soils and where this type of retrofit would be deemed practicable. These BMPs would convey stormwater, allow it to soak into the ground, and filter pollutants.

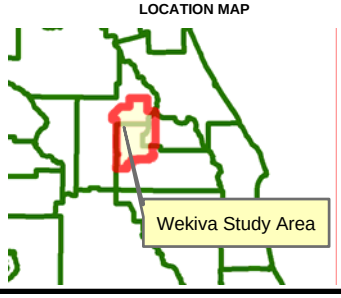
- For older, untreated areas that discharge directly to one of the lake systems, the affected jurisdictions should also consider providing end-of-pipe treatment at the outfalls to the lake.

## 5.4.5 Subbasin GT-007

Subbasin GT-007 received a rank of "5" under Management Strategy No. 2. This subbasin is 1,272 acres in size (shown in **Figure 5-15**) and is within the larger Golden Triangle Basin. It includes portions of the City of Eustis (526 acres or 41 percent) and unincorporated Lake County (746 acres or 59 percent). West Crooked Lake, East Crooked Lake, Lake Dicie and Lake Nettie are the main water body features in this subbasin. This area was previously studied as part of the *City of Eustis Master Stormwater Plan* prepared by CPH Engineers, Inc. in 2002. These are landlocked lake systems where the stormwater conveyance system is comprised of mostly closed secondary sewer systems which discharge directly to the lakes, as well as overland flow.




**LEGEND**

**Problem Areas**
- Erosion/Sedimentation
- House Flooding
- Increase Aquifer Recharge
- Maintenance
- Property Flooding

- Property/House Flooding
- Right-of-way
- Street Flooding
- Street/House Flooding
- Street/Property Flooding
- Water Quality
- Golf Courses
- Parks

- Wekiva Study Area
- Subbasin Boundary

**National Wetlands Inventory**
- Lacustrine
- Palustrine
- Riverine
- Major Roads
- Streets
- Water Bodies

**FEMA Zone**
- A
- AE
- ANI
- Potential Pond Site

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Figure 5-15
Subbasin GT-007

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The problem areas identified in this subbasin consist of erosion and sedimentation and water quality. In addition to the recommendations made in the master plan, the affected jurisdictions should implement the following BMPs under Management Strategy No. 2 in order to enhance long-term water quality treatment and flood control.

- Based on review of the 2004 DOQQs, there are some undeveloped areas around the perimeter of West Crooked Lake, East Crooked Lake, Lake Dicie and Lake Nettie. The Q3 flood data obtained from the SJRWMD (derived from the FEMA FIRMs) show large areas of undeveloped land within the 100-year floodplain (Zone AE, for which a BFE has been established). It is important to maintain these areas both for floodplain management purposes as well as buffer systems, as they provide water quality benefits. If any further development takes place in these areas, compensating storage must be strictly enforced so no net loss of floodplain area occurs.

- Some of the development in the *City of Eustis Master Stormwater Plan* was noted as having stormwater treatment either through detention/retention or swale systems. There still remain several large tracts of either undeveloped or agricultural lands which may be suitable for a regional stormwater treatment facility that could provide both attenuation and water quality benefits, for those areas that are untreated. This type of facility could also serve multiple purposes as it could provide treatment for older development as well as for new development. The affected jurisdictions could create an MSTU where in lieu of requiring on-site treatment for new development, a special district is established to fund a facility that is operated and maintained by the jurisdiction and benefits a larger area. Additionally, depending on where the facility is constructed, it could enhance aquifer recharge in addition to providing flood control benefits and water quality treatment. This type of facility can also have social value as it can be constructed as part of a park or public facility, and provide both educational and aesthetic value.

- For the remaining open spaces around the lakes not encroached by development, it is important to maintain buffers which will not only serve as filters for pollutants in stormwater runoff but also provide flood protection.

- If construction of a regional stormwater treatment facility is not feasible, the affected jurisdictions should consider retrofitting with landscaped or grass swales where there are "A" type soils and where this type of retrofit would be deemed practicable. These BMPs would convey stormwater, allow it to soak into the ground, and filter pollutants. Additionally, the affected jurisdictions should consider retrofit collection systems with end-of-pipe treatment such as baffle boxes to provide water quality treatment prior to surface water discharge.

- There are several large agricultural parcels that are immediately adjacent to West and East Crooked Lakes. The affected jurisdictions should work with the agricultural communities in this area to explore the feasibility of implementing

agricultural BMP practices. An extensive list of agricultural management practices can be found in the technical guidance and reference document entitled *National Management Measures to Control Nonpoint Source Pollution from Agriculture* (USEPA, 2003) as well as on the OAWP's website (http://www.floridaagwaterpolicy.com/BestManagementPractices.html).

- For those remaining undeveloped areas in the subbasin, the affected jurisdictions should consider promoting green or LID or providing incentives to those developers that incorporate resource conservation, hydrological site layout, energy efficient building design, natural watershed hydrology, native landscaping, and water quality.

- For any new development that occurs within this subbasin, the SJRWMD 3-inch recharge requirement should continue to be enforced, as there are high recharge areas within this subbasin.

## 5.5 Conceptual Cost Estimates

Planning level conceptual cost estimates were prepared for each of the previously described alternatives where applicable. This included estimates for subbasins BW-002, LW-002, BW-008, LW-008, AP-002, GT-001, BW-020, and GT-007. As detailed hydrologic and hydraulic modeling was beyond the scope of this MSMP, the recommendations, and therefore the costs, are all conceptual in nature. Some of the recommendations made throughout the MSMP are more policy related and therefore a cost was not associated with those. When developing the conceptual cost estimates for those applicable alternatives, a number of assumptions were made including:

- Planning level costs do not include land acquisition or wetland mitigation costs;

- Unit costs and quantities may vary significantly based on actual site conditions.

- Costs do not include any potential hazardous material remediation or utility adjustment costs;

- The proposed project site has relatively level topography; and

- Gravity flow was assumed where applicable.

A more detailed list of assumptions and clarifications is included with the breakdown of the conceptual cost estimate for each alternative provided in **Appendix F**. The estimated planning level conceptual cost for each subbasin is shown in **Table 5-3**.

**Table 5-3**
**Wekiva Parkway and Protection Act**
**Master Stormwater Management Support**
**Planning Level Conceptual Cost Estimates**

| Subbasin | Alternative Description | Conceptual Cost Estimate |
|---|---|---|
| BW-002 | Detention Pond, Irrigation & Aeration | $464,000 |
| LW-002 | Surface Water Infiltration Basin & Irrigation | $3,365,000 |
| BW-008 | Surface Water Infiltration Basin | $2,188,000 |
| LW-008 | Baffle Boxes | $1,703,000 |
| AP-002 | Detention Pond(s) | Ranges from $2,747,000 to $5,526,000 depending on option |
| GT-001 | Baffle Boxes | $425,000 |
| BW-020 | Baffle Boxes | $211,000 |
| GT-007 | Baffle Boxes | $318,000 |

# Section 6
# Feasibility of Stormwater Reuse

## 6.1 Introduction

Section 369.319 of the WPPA requires that the MSMP evaluates the feasibility of stormwater reuse. As the future of a sustainable water supply in Central Florida becomes more uncertain, water conservation practices and reuse become more attractive. The idea of stormwater reuse as an alternative water supply for irrigation has been suggested as a viable option that would help promote recharge and lower consumptive use of potable water supplies. Included in this section is an analysis of the feasibility of stormwater reuse as well as a summary of work done by others in this area.

## 6.2 Purpose & Methodology

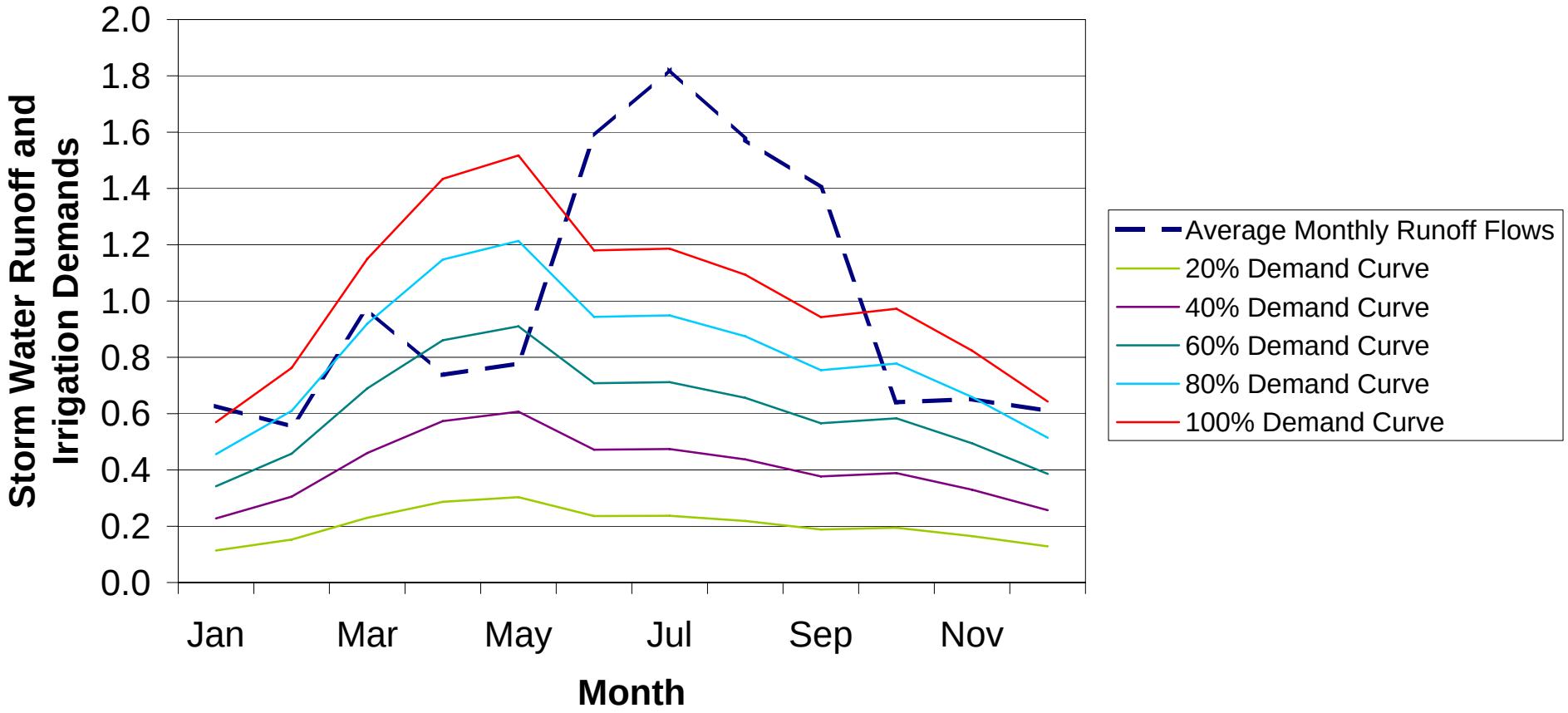
As part of the WPPA MSMP, CDM was tasked with evaluating the feasibility of using stormwater runoff as a source of irrigation water. Stormwater reuse can take several forms. One method is the direct reuse of stormwater runoff in landscape swales; another is to use the required retention basin as a source of irrigation water (the subject of this section). In order to accomplish this task, CDM used long term continuous simulation results for a representative 1-acre parcel in the Wekiva springshed along with long term meteorological records from the Orlando weather station (Station ID 6638). Using this information, the following calculations were developed:

- Stormwater Runoff – Daily runoff volumes were calculated for approximately 11 years (4,019 days) for a hypothetical one acre site using the above referenced weather station information. Stormwater calculations were based on A-type soils with 25 percent DCIA. The infiltration coefficient for type A soil was estimated to be 0.5. The model used to generate the runoff volumes was the Hydrologic Simulation Program Fortran® (HSPF).

- Irrigation Demand - An independent model developed by CDM for the analysis of water reclamation systems was then run to calculate the demand for irrigation expressed as inches of supplemental water required per day corresponding to the time period for the runoff calculations described above. The model uses the Thornthwaite equation (with correction factors for local conditions) to calculate potential evapotranspiration (PET) and includes soil moisture conditions in estimating irrigation demands. A more detailed explanation of calculating irrigation demands and the Thornthwaite equation is provided in **Appendix G**.

As one might expect, the available supply of stormwater runoff is inversely related to the demand for irrigation as shown in **Figure 6-1**. Using predicted demands and available supply (i.e., stormwater runoff) as input, this figure shows the dimensionless average monthly runoff curve for the Orlando area, with a range of irrigation demands expressed as a fraction of the average annual supply. This figure

# Figure 6-1
# Wekiva Parkway & Protection Act
# Master Stormwater Management Plan Support
# Average Monthly Runoff Versus Irrigation Demands



masks shortages and excesses that occur at less than a monthly (30 day) interval, but generally indicates that the average monthly demand for irrigation would be expected to be less than the available supply of runoff in all months, for commitments of less than approximately 50% of the available supply. This is of course, an over-simplification of the potential available moisture content in the root zone at any given time.

These predicted demand and available supply (i.e., stormwater runoff) datasets were then joined together in a water balance model spreadsheet based on the stormwater runoff represented as the only source of water available to satisfy supplemental irrigation requirements which represent a demand on the system. A more detailed description of the water balance model is also provided in Appendix G. Daily runoff and irrigation demands for approximately 11 years (4,019 days) were input into a water balance model. Variables in the daily water balance calculations were as follows:

- Percent of stormwater runoff committed to irrigation – The calculated daily runoff for the hypothetical one acre site was averaged over the period of record (4,019 days). This average value was used as the average volume of water available to meet the need for irrigation. The long term average demand for irrigation was then input into the water balance as a fraction of the total available supply varying from 0 to 100% of the expected supply. For example, the long term average daily runoff from the hypothetical one acre site was calculated to be 0.0012 cfs. If a long term irrigation demand equal to 50% of the available supply was used, the average daily demand for irrigation would be 0.0006 cfs.

- Available Storage – Irrigation commitments varying from 0 to 100% of the average long term supply (in 10%increments) were input into the water balance model spreadsheet. Storage was then varied until all shortages in irrigation demands could be eliminated (i.e., the fluctuations in supply and demand were completely equalized). Shortages occurring in the first year of the water balance calculation were neglected to allow the system to come to equilibrium. **Table 6-1** summarizes the result of the water balance calculations. This information is also presented graphically in **Figure 6-2**.

**Table 6-1**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Storage Requirements as a Function of Irrigation Commitment**

| Irrigation Commitment (1) | Storage Required (Days) (Neglecting Year 1) (2) | Storage Required ($ft^3$/ac) (3) (Neglecting Year 1) |
|---|---|---|
| 0% | 0 | - |
| 10% | 10.5 | 1,089 |
| 20% | 25.3 | 2,623 |
| 30% | 39.3 | 4,075 |
| 40% | 53.2 | 5,516 |
| 50% | 76.6 | 7,942 |
| 60% | 102.5 | 10,627 |
| 70% | 130.4 | 13,520 |
| 80% | 207.8 | 21,545 |
| 90% | 300.2 | 31,125 |
| 100% | | |

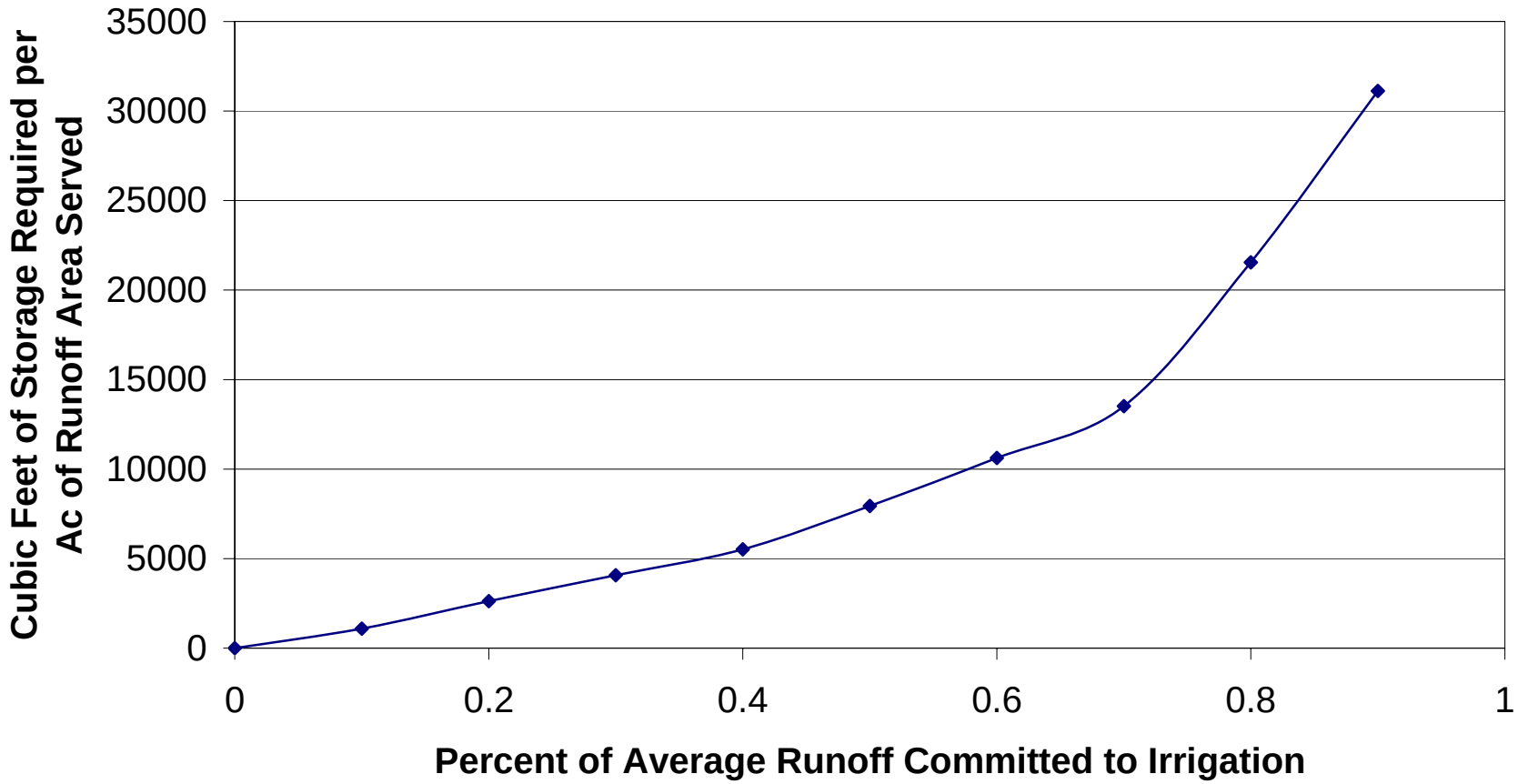
(1) Expressed as a fraction of the long term average runoff of a hypothetical one acre site.
(2) Expressed as days of the long term average runoff of a hypothetical one acre site.
(3) Expressed as cubic feet of storage required per acre of runoff area served given a long term average runoff of 0.0012 cfs

## 6.3 Results

The results of this analysis can be separated into two categories in order to assess or draw conclusions about the feasibility of stormwater reuse. The first category relates to demand and supply. As mentioned above, Figure 6-1 generally indicates that the average monthly demand for irrigation would be expected to be less than the available supply of runoff in all months, for commitments of less than approximately 50 percent of the available supply. Although it may be somewhat of an oversimplification, but from this comparison, it appears that stormwater reuse may be feasible on a continuous basis when demand is 50 percent or less of the available supply.

The second category for assessing the feasibility of stormwater reuse relates to storage. Based on the analysis performed, the volume of storage required to avoid a shortfall in irrigation increases as the fraction of runoff committed to beneficial use increases from 0 to 100 percent of the available supply. For the dataset used for the water balance calculations, it was not possible to provide sufficient storage to completely equalize supplies and demands, based on a desire to reuse 100% of the available runoff. It should be noted that the calculations of storage excluded losses

**Figure 6-2**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Storage Required to Prevent a Shortage of Irrigation Water**



and gains as a result of evaporation and rainfall respectively, as these values will be specific to the geometry of the storage pond. However, these parameters should be incorporated into the water balance calculations once the surface area of the storage pond is known.

The analysis given above suggests that stormwater reuse is feasible but the facilities required for a successful stormwater reuse system will depend on what fraction of the available supply is intended for beneficial use. From Figure 6-2, there is a linear relationship between storage volume required and percent of runoff reused as this percentage varies from 0 to approximately 70 percent of the long term average supply. At commitments beyond 70 percent, the slope of the curve increases and it is unlikely that reuse at these levels would be feasible due to the volume of storage required to equalize seasonal differences in supply (runoff) and demand (irrigation). From this, it can be concluded that stormwater reuse systems that attempt to reuse less than 70 percent of the long term average runoff may be feasible.

## 6.4 Advantages and Disadvantages

Several benefits of stormwater reuse have been identified. The most obvious benefit being increased pollutant removal and groundwater recharge. Reuse ponds are useful when the water table is close to the land surface, minimizing the losses due to groundwater infiltration, which will provide a more constant supply. It is also a relatively inexpensive source of irrigation water when compared to potable water supplies. Wanielista and Yousef (1993) calculated that irrigating a 100-acre 18-hole golf course (2 inches/week) would cost $300,000/year if potable water is used. The annual irrigation cost of pumping stormwater for irrigation was calculated to be $40,000/year for the same facility, seven times less than the cost of using potable water. A report entitled "Stormwater Reuse – A Balanced Assessment" (McAlister, 1999) also identified some additional benefits of stormwater reuse:

- Reduction in potable water usage;
- Reduction of peak flows;
- Reduce the magnitude of peak flows of potable water supplies, thus extending the life of existing water supply infrastructure; and
- Raises the awareness of stormwater management.

Some disadvantages of water reuse ponds are that they require a greater degree of operation than other stormwater practices and require the presence of a nearby customer for irrigation water. The impacts of continued pumping on downstream flows and aquatic life would have to be assessed as well. The report entitled "Stormwater Reuse – A Balanced Assessment" (McAlister, 1999) also identified some additional disadvantages for stormwater reuse:

- Widespread use may negatively impact environmentally sensitive areas;

- Public health;
- Relatively "new" approach;
- Source of supply not always available when needed;
- May require new standards and education practices; and
- Buyer and developer resistance.

An example of a large-scale stormwater reuse project currently underway in the WSA is the City of Apopka's Northwest Storage and Aquifer Recharge Stormwater and Reclaimed Water Project, which is currently under design and located at the City's Northwest Recreation Center (NWRC). The City is currently designing a system what will store stormwater to be used to augment their reclaimed water supply, which is another method of reusing stormwater. Boyle Engineering Corp. performed a feasibility study (2003) and cited the following reasons as to why this site was an ideal candidate for this type of project: 1) it is already under the City's ownership; 2) its topography provides natural depressions for temporary storage of reclaimed water as well as potential sites for concentrated recharge; and 3) the site is well situated relative to planned reclaimed water supply lines. The project includes construction of a storage/recharge pond and disinfection of the blend of reclaimed and stormwater that will be collected in the pond. FDEP is acquiring an additional 92 acres to implement Phases II and III of the project.

## 6.5 Conclusions

Other researchers (e.g., Wanielista) have developed stormwater reuse methodologies. Wanielista simulated a water reuse pond in Florida using 15 years of daily rainfall, runoff, reuse and pond discharge data. The model was then used to construct a series of rate-efficiency-volume (REV) curves which can aid in the design of water reuse ponds. An analysis of these curves suggest that water reuse ponds can provide a reliable source of irrigation water over the long term if a sizeable reuse is provided, which is often in excess of the water quality treatment volume used in designing stormwater treatment facilities.

As suggested by both CDM's analysis and Wanielista's research, stormwater reuse may be feasible up to a certain point, however additional study is needed to address the following concerns when considering this type of system in the WSA:

- The feasibility of stormwater reuse is site-specific and would need to be evaluated on a case by case basis as site conditions can vary greatly throughout the WSA (e.g., soils, recharge capacity, temporal and spatial distribution of rainfall, and local irrigation demand); and
- The relationship of stormwater reuse to the proposed pre-development/post-development match (Section 369.318 (4) of the WPPA) in the WSA would have to be assessed.

# Section 7
# Evaluation of Stormwater Management Programs

## 7.1 Introduction

Section 369.319, F.S. requires that the MSMP establishes measures to address redevelopment; includes requirements for inspection and maintenance of facilities; and identifies a funding source to fund implementation of the plan and maintenance program. Information presented in this section will address each of the aforementioned requirements in addition to establishing a schedule to complete needed improvements.

## 7.2 Redevelopment Measures

In addition to the economic and social benefits that successful redevelopment projects provide, they also afford an opportunity to local stakeholders and communities to incorporate stormwater management techniques and practices, that may have not previously existed or were substandard, which in the long term can provide better overall protection to the watershed. Many of the Stakeholders have established Community Redevelopment Agencies (CRA) through their local ordinances. A brief synopsis of each Stakeholders' policies for redevelopment as it relates to stormwater management and treatment is provided. In addition to this synopsis, this subsection provides examples of stormwater practices that can be used as guidance that when implemented at the local level, will help reduce pollutants in runoff, improve stormwater management and improve the environmental quality of development sites in highly urbanized watersheds.

### 7.2.1 Stakeholder Redevelopment Policies

Each of the Stakeholders' regulations were reviewed to identify current requirements for redevelopment as they relate to stormwater management for water quantity and quality. These were generally summarized in Section 3 - Stakeholder Stormwater Management Policies. In general, many of the Stakeholders already have language in either their code of ordinances, comprehensive plans and/or land development codes that specifically address stormwater management requirements for redevelopment. These Stakeholders include:

- Lake County
- City of Mount Dora
- Orange County
- City of Orlando
- City of Winter Garden

- Seminole County
- City of Longwood

Those Stakeholders where the language in their codes and/or comprehensive plans is somewhat vague and requirements apply to "land development activity", which could be interpreted as new development and/or redevelopment include:

- City of Eustis
- City of Apopka
- Town of Eatonville
- City of Ocoee
- City of Altamonte Springs
- City of Lake Mary

Those Stakeholders where language in their codes and/or comprehensive plans does not specifically or generally require stormwater management for redevelopment include:

- Town of Oakland

The Stakeholders with codes that are more broadly defined or do not have specific requirements for stormwater management and treatment for redevelopment should add to or strengthen the current language where applicable. Additionally, redevelopment practices related to stormwater management such as those described in the following subsection can be used as guidance by Stakeholders when promoting redevelopment in their communities.

#### 7.2.1.1 Redevelopment Stormwater Practices

The Center for Watershed Protection (CWP) convened a Redevelopment Roundtable, which consisted of national and local stakeholders who participated in the process to develop "Smart Site Practices" specifically for redevelopment and infill sites. These practices are documented in the *Redevelopment Roundtable Consensus Agreement, Smart Site Practices for Redevelopment and Infill Projects* (CWP, 2001). When these practices are applied together, they provide benefits for all local stakeholders including developers, local government residents and others who are interested in designing redevelopment so that it better protects the local watershed features such as streams, lakes, wetlands and estuaries. Examples of redevelopment projects include historic preservation, waterfront development, Brownsfields, residential infill, adaptive reuse, downtown business district, multifamily, suburban commercial, mixed use development and roadway expansion. The "Smart Practices" were developed as a tool to be used by

developers, local government and planners and can be utilized to develop better criteria on which to gauge the potential impact of a development site. The practices are generally described below:

- Practice No. 1: Redevelopment and infill planning should include environmental site assessments that protect existing natural resources and identify opportunities for restoration where feasible.

- Practice No. 2: Sites should be designed to utilize impervious cover efficiently and to minimize stormwater runoff. Where possible, the amount of impervious cover should be reduced or kept the same. In situations where impervious cover does increase, sites should be designed to improve the quality of stormwater runoff at the site or in the local watershed.

- Practice No. 3: Plan and design sites to preserve naturally vegetated areas and to encourage revegetation, soil restoration and the utilization of native or non-invasive plants where feasible.

- Practice No. 4: Establish mechanisms to guarantee long-term management and maintenance of all vegetated areas.

- Practice No. 5: Manage rooftop runoff through storage, reuse, and/or redirection to pervious surfaces for stormwater management and other environmental benefits.

- Practice No. 6: Parking lots, especially surface lots, should be minimized and designed to reduce, store and treat stormwater runoff. Where site limitations or other constraints prevent full management of parking lot runoff, designers should target high use areas first.

- Practice No. 7: Utilize a combination of Better Site Design techniques with infill projects to minimize stormwater runoff and maximize vegetated areas. Many single lot or small multi-lot infill projects contribute to "impervious creep," which is defined as the increase in impervious cover seen over time in highly developed areas. On-site improvements, such as house additions, expanded driveways, new housing, and sidewalks all contribute to impervious creep. Better Site Design refers to a design approach that seeks to reduce the amount of impervious cover associated with development, increase the natural lands set aside for conservation, use pervious areas for more effective stormwater treatment, and achieve a marketable, cost-effective product. Better Site Design consists of a series of benchmarks that fall under three categories: parking lot and street design, lot development, and natural areas conservation.

- Practice No. 8: Utilize proper storage, handling and site design techniques to avoid the contact of pollutants with stormwater runoff.

- Practice No. 9: Design the streetscape to minimize, capture and reuse stormwater runoff. Where possible, provide planting spaces to promote the growth of healthy street trees while capturing and treating stormwater runoff. In arid climates, xeriscape or water wise landscaping should be used to achieve similar benefits.

- Practice No. 10: Design courtyards, plazas, and amenity open space to store, filter or treat rainfall.

- Practice No. 11: Design sites to maximize transportation choices in order to reduce pollution and improve air and water quality.

## 7.3 Stormwater Inspection and Maintenance

The benefit of stormwater operations and maintenance (O&M) to a community is realized in three general ways:

- The useful life of the stormwater infrastructure is extended through proper operation and routine maintenance of these assets resulting in a cost savings by delaying the need for major rehabilitation or replacement of these assets.

- Cleaning of catch basins, culverts, and stream channels maintains the hydraulic capacity of these items, thus lessening the likelihood of flooding in the vicinity of these structures as compared to a non-maintained state.

- Regular removal of trash, debris, sediment, and excess vegetation from the stormwater system improves water quality of streams and downstream waterways as well as the aesthetic value of these areas to the community. Regular street sweeping and greenway maintenance achieves similar results.

Information on the current stormwater inspection and maintenance practices was provided by each of the Stakeholders. This information was generally described in Section 3 of this MSMP (Stakeholder Stormwater Management Policies). Based on feedback from the Stakeholders, CDM summarized the maintenance operations, inspections, contracted services and equipment for each Stakeholder in **Tables 7-1** through **7-14**, located at the end of this section. Several of the Stakeholders regulated under the NPDES MS4 Phase I program use the suggested maintenance schedule (Table II.A.1.a in the NPDES permit) that is included in their NPDES permit to define their routine maintenance and inspections. These include the City of Orlando, City of Winter Garden, Seminole County, City of Altamonte Springs and City of Longwood. Other Stakeholders, although while still in compliance with their NPDES permit, have established and developed their own routine maintenance and inspection programs such as Orange County, City of Apopka, City of Ocoee and City of Lake Mary. Those Stakeholders regulated under the NPDES MS4 Phase II program, Lake County, Mount Dora and Eustis, do not have a suggested maintenance schedule. However, as part of the Phase II program, they will be required to establish certain inspection programs for illicit discharges and stormwater controls for construction throughout

the duration of their permit. Those NPDES Phase II permittees that already have established routine inspection and maintenance programs include the City of Eustis and the City of Mount Dora. Currently within Lake County, maintenance frequency and structure inspections are complaint driven. However, the County is moving toward scheduled maintenance and inspection activities with the mapping of their drainage infrastructure.

As O&M programs can vary greatly amongst Stakeholders based on individual needs and constraints (e.g., staffing, equipment, funding), it is recommended that each Stakeholder evaluate improvements to their maintenance programs based on the information presented in this MSMP and their own familiarity with their respective programs. The next sub-section provides some guidance on how individual Stakeholders can evaluate their maintenance programs.

### 7.3.1 Stormwater Operations and Maintenance Evaluation Guidance

The term "level-of-service" (LOS) describes the magnitude of the benefit provided as a result of a stormwater program. A higher LOS will result in more benefit to the community, but will also have a higher cost of implementation. The LOS concept is useful for assessing stormwater O&M programs.

For the purposes of this study, different LOS have been defined and assigned standard letter grades, with "A" being the highest and "D" being the lowest. These standard definitions facilitate the evaluation of the LOS currently being provided by the Stakeholders' stormwater programs and allows for consideration of alternative LOS, with their associated benefits and costs.

Definitions to assist in the understanding the different LOS as they relate to O&M are provided below

- LOS A - Fully Preventative/100% Routine
- LOS B - Mixture of Routine and Inspection Based
- LOS C - Inspection Based Only
- LOS D - Responsive Only

One of the lowest LOS associated with O&M activities is a responsive type of program (also known as complaint-based). Under a responsive program, O&M staff rely on private citizens or other outside sources to report O&M problems. Once a notice or complaint is received, O&M staff investigate the complaint and takes action if determined to be under its responsibility. Unfortunately, under this approach O&M problems are not reported until there is significant failure, which in some cases

causes damage to the infrastructure that may far exceed the cost of routine maintenance. This responsive type of program has been defined as a "D" LOS.

An enhanced LOS for O&M is an inspection based-program. Under this program, O&M staff perform periodic inspections of the existing stormwater system. This staff identify O&M problems before they result in complete failure of elements in the stormwater system. Information gathered during periodic inspections is processed and used to direct O&M activities, ideally before the situation results in a significant failure as under a responsive program. While an inspection-based program is an improvement over a responsive-only program, the approach still allows problems to develop in the system before they are corrected. This inspection-based type of program has been defined as a "C" LOS.

The most desired LOS for O&M is a preventative program. Under this approach, O&M is performed on a routine schedule, which is planned and conducted based upon known historical maintenance requirements of the system. This LOS also requires the owner to have a fairly complete inventory of the system and system components under its responsibility. In this type of program, O&M activities are performed before problems occur, thus providing the highest level of protection for system assets. This LOS can be more cost-effective that a response-based O&M approach once the initial phase of inventory, repairs, and backlog maintenance activities are completed. The challenge lies in transitioning from a responsive or inspection-based program to a fully preventive program. Even once the transition begins, it may be several years before the full benefits of routine maintenance are seen in terms of a reduction in O&M problems and failures. A fully preventive O&M program has been defined as an "A" LOS.

A LOS B is used to define a program that has characteristics of a preventive maintenance program, but also requires continued inspection-based (and possibly some responsive-based) activities. Usually, critical facilities receive routine maintenance and non-critical ones receive maintenance based on inspections.

## 7.4 Funding Mechanisms

Information on current funding mechanisms for the individual stormwater management programs was provided by each of the Stakeholders. This information was generally described in Section 3 of this MSMP (Stakeholder Stormwater Management Policies). A number of the Stakeholders currently have a stormwater utility to fund projects. These Stakeholders include the City of Altamonte Springs, the City of Apopka, the Town of Eatonville, the City of Eustis, the City of Lake Mary, the City of Longwood, the City of Mount Dora, the City of Ocoee, the City of Orlando and the City of Winter Garden.

Provided below is a discussion of funding alternatives for stormwater services. For the purposes of this discussion, stormwater services have been categorized into two elements: operations and capital improvements. Stormwater operations include

management, engineering, planning, enforcement, survey, maintenance, research, permitting, inspection, GIS, and drafting. Capital improvements include significant capital construction projects. The reason for this separation is that some funding alternatives provide revenues only for capital projects while others can provide funding for both components. The discussion that follows is divided into existing and new sources. Existing sources are those that have been historically used and new sources are those alternative funding mechanisms that are becoming increasingly more common.

## 7.4.1 Existing Funding Sources

### Ad Valorem Taxes

Historically the typical source of funding for stormwater services, the general fund is an aggregation of several revenue sources from which many diverse governmental services are funded. As noted above, the major funding contributor to the general fund is ad valorem taxes. The maximum millage (tax paid for each $1,000 of assessed value of property) is by law 10.000 mills. This means that a house valued at $100,000 (after the $25,000 homestead exemption) would pay $100 for the annual ad valorem tax. Ad valorem taxes are unrestricted and can be used for any legitimate governmental program including operating and capital project stormwater costs.

Included in this general category is funding by municipal service taxing unit (MSTU) and benefit unit (MSBU). MSTU revenues can be used for any county service; however, MSBU funds are restricted to properties specifically benefiting from the municipal service. Use of the MSTU funding over multiple years such as to pay a debt service would require a referendum; this would not be required for a MSBU.

The advantage using of ad valorem revenues for stormwater services is that ad valorem tax is an existing source of revenue not requiring additional legislative action other than adoption of the millage rate. The public is currently paying such taxes and revenues are currently being used for stormwater services. The disadvantage is the competition for the use of ad valorem taxes usually means that stormwater services are not adequately funded.

### Proprietary Sources

Proprietary sources identified in the budget are those funds collected for a particular service and ear-marked for such services. Some of these can be used for stormwater services such as Development Review Fees (used for review of site plans for stormwater). Others are for specific utility services such as water and sewer services; revenues from these utilities can be used only for the utility itself. Of course, many communities in Florida have adopted a utility fee for stormwater which will be described under subsection 7.4.2 New Funding Sources.

### Special Assessments

Also referred to as a non-ad valorem assessment or uniform assessment method, special assessments for stormwater services are authorized in Chapter 403.0893, F.S. and the methodology to implement described in Chapter 197.3632 F.S. The basic rules for a legitimate special assessment are: (1) the services provided must be of special benefit to the individual properties; and (2) the assessment must be fairly and reasonably apportioned according to the benefits received. The Florida Supreme Court decision regarding the special assessment for Sarasota County (20 Fla. Law Weekly, S600-S603, January 1990) concludes that a stormwater special assessment can meet both of these criteria. However, the assessment must be set up specifically for stormwater as a new fee (see subsection 7.4.2 New Funding Sources).

### ½ Cent Sales Tax

The ½ Cent Sales Tax, identified as a state source, applies $0.005 to each dollar of sales of products within a county. The ½ Cent Sales Tax was imposed by the state legislature and shared with local governments.

### Impact Fees

Impact fees are restricted in use and must be used for capital construction related to new growth in the area in which they are collected. The advantage of an impact fee is that they can generate funds for specific projects in a benefited area such as for development impacts. This is further described below under Other Funding Sources. The significant disadvantages are based upon the experience of other communities in the application of impact fees to stormwater services, they generally generate too small revenues to pay for the needed capital improvements and they can only be used for new growth. Many of the existing stormwater problem areas are related to existing developments, whereas new development is required to provide stormwater attenuation and treatment.

### Local Option Gas Tax

The Local Option Gas Tax is one of many sources which are related to gas taxes and are placed in a specific fund to account for the construction, reconstruction, and major maintenance of County roads. Arterial and collector roads are funded through Gas Tax Bonds, the Constitutional Gas Tax, and the Six-Cent Local Option Gas Tax. The costs of local or "neighborhood" roads are assessed against the properties deemed to benefit from the improvements.

The advantage of this revenue is that it is an existing funding source which can resolve stormwater problems associated with roads. The disadvantage is that many problems are not associated with roads so this source is not available. Also, stormwater operating expenses can not be funded by this source.

## 7.4.2 New Funding Sources

### Special Assessments or Non-ad Valorem Assessments

As discussed previously, a special or non-ad valorem assessment is a method to charge property owners in any county for services provided by that county. The two major criteria to judge the validity of a special assessment are that the property must receive special benefit from the service and the assessment must be reasonably apportioned according to the benefit. The assessment is billed through the Tax Collector's Office on the annual tax bill. However, to properly collect the assessment, a rigorous protocol must be followed as defined in Chapter 197.3232 F.S. which includes:

- Adoption of a resolution during the prior year stating that the non-ad valorem assessment may be billed in the following year;
- An agreement with the Property Appraiser and Tax Collector to implement the non-ad valorem assessment;
- Development of a non-ad valorem assessment roll, consistent with the Property Appraiser's data for the Tax Collector, and provided to the Tax Collector in September;
- During the first year of the assessment, a first-class mailing to property owners announcing the assessment; and,
- A public hearing in which the non-ad valorem assessment roll is adopted prior to September 15th of the year in which the assessment is billed.

It is clear that the schedule is stringent, the data requirements are specific, and implementation starts during the year prior to billing.

It is important to note that the non-ad valorem assessment is not a tax and is sent to taxed and non-taxed property alike. That is, tax-exempt property, such as homesteaded residential properties valued less than $25,000, governmental (local, state and federal, including schools) and institutional (churches and non-profit agencies) properties, must pay the assessment. As an example, the Sarasota Church of Christ took Sarasota County to the Florida Supreme Court in objection to the County's special assessment for stormwater services. While the details of the case and court decision are extensive, the results of the case were essentially that the property does indeed receive special benefit from stormwater services, especially related to stormwater quality, and that Sarasota County reasonably apportioned its assessment (their assessment was based upon an assessment for developed property only, a rate structure using impervious area alone, a uniform rate for residential properties, and an individual assessment for non-residential properties based upon actual impervious areas). This case was important in the understanding of special assessments in Florida. Since the case concluded, Sarasota County and others have modified their

rate structures to improve the apportionment by including undeveloped properties, pervious as well as impervious areas, and credits and adjustments.

The advantages of a special assessment include:

- Use in counties for lighting, paving and solid waste services;
- A billing mechanism is already in place with the Tax Collector;
- Revenues can pay for all components of the stormwater management program;
- Property owners are given an assessment which is equitably apportioned to them in relation to the benefits they receive;
- Tax-exempt properties pay for the assessment in recognition that they receive special benefits from the stormwater services provided by the County;
- Non-payment is minimal due to the ability to place a tax lien;
- The majority of property owners (residential) will pay the fee from an escrow account from which they normally pay property taxes; and,
- The method has been adjudicated up to the Florida Supreme Court where it was upheld.
- The disadvantages of a special assessment include:
- The public perception that it is a tax because it is on the tax bill;
- The cost of starting the assessment is moderate considering the one year advanced notice and stringent guidelines of Chapter 197 F.S.;
- Tax-exempt parcels have objected to the assessment based upon the experience of other municipalities who have adopted, or attempted to adopt, the assessment; and,
- A lien cannot be placed on governmental properties to require payment.

### Stormwater Utility Fee

Governments can charge customers for services they provide for the following reasons: fees in exchange for a services or privilege (e.g., admission fees); fees to fund a regulatory responsibility (e.g., building fees, and inspection fees); and fees for a service for which the customer's own actions or property creates the need for the revenue (e.g., utility fees, impact fees, etc.). For the last two categories, there must be a reasonable connection (nexus) between cost of the service or regulatory activity and the fee charged. Fees such as these are usually charged on a utility bill which may include other fees (e.g., electric, water, sewer, solid waste fees, cable, etc.).

The use of a stormwater utility fee began in Florida in October of 1986 with the $1.00 per month per single family unit equivalent for the City of Tallahassee. In this case and many others in Florida, the user charge is assigned to the fee payer relative to the contribution to the stormwater problem or burden. For the majority of stormwater utilities, the contribution is related to stormwater runoff which, in turn, is related to impervious area (or a combination of pervious and impervious areas). Therefore, for most utilities, the fee is based upon the relative amount of impervious area. Since residential impervious area varies much less than does non-residential imperviousness, almost all stormwater utility fees in Florida are based on a residential equivalent. That is, residential fees are generally uniform equal to or a fraction of the single family unit rate, and non-residential fees depend on the relative amount of impervious area compared to either single family dwelling units or an average of all dwelling unit types. In this manner, the fees charged are connected or related to the service being provided.

The fee structure for a stormwater utility fee and a stormwater special assessment can be very similar. The Supreme Court case supported the apportionment of the special assessment for Sarasota which is very similar to many others in Florida. The biggest difference between the two is the billing method: a stormwater utility fee would be billed monthly with other utilities and the non-ad valorem assessment would be billed on the annual tax bill. It should be noted however, that the Supreme Count case showed that the legal requirements for the non-ad valorem assessment are greater than for the utility fee.

The advantages of a stormwater utility fee include:

- Revenues can pay for all components of the stormwater management program;
- Customers pay a fee which is equitably related to the benefits they receive;
- Tax-exempt properties pay the fee just as they pay for water and sewer services;
- A dedicated and stable funding source;
- Located on a utility bill, the stormwater fee is not perceived as a tax and is generally significantly less than the monthly water/garbage fees;
- Where bills are sent monthly, cash flow is improved over annual bills; and,
- Stormwater utility fees are consistent with and can be associated with other municipal utility fees such as water or sewer.

Disadvantages of the utility fee include:

- The cost of starting the assessment is moderate considering the data analysis necessary to assign each fee payer a correct fee;

- If it is not associated with other utilities, total collection of the stormwater utility fee is difficult; and,

- A stormwater utility fee is generally new to a municipality so there is additional political and public scrutiny and resistance to adopting the fee.

### Local Government Infrastructure Sales Tax

Similar to the ½ Cent Sales Tax discussed above, the local government infrastructure sales tax allows the County to collect up to 1 percent on sales within the county. The revenues can be used for capital improvements for infrastructure, land acquisition, and landfill closures. This sales tax must be approved by voters in a referendum and has the ability to generate significant revenues. A local government infrastructure sales tax could be used for stormwater capital improvements.

An advantage of this method is that it will generate a significant amount of funding for a stormwater capital improvement program. Generally, the sales tax is used for all of the County's capital improvements (government buildings, sports arenas, entertainment halls, etc.) so that the stormwater program is only a part of the overall program. Another advantage is that because it is a sales tax applied to everyone who makes purchases in a county, both citizens and tourists alike pay for the capital improvements. That is, not just citizens pay for the improvements. A disadvantage of the sales tax include that a citizen vote is required: generally, voters are reluctant to vote for a additional tax. Also, the revenues can only be used for capital improvements where the overall stormwater program includes operational expenses as well.

### Public Service Tax

Another major source of new funding would be a public service tax, which can be up to 10 percent of the purchases of electric, gas, water, garbage, telecommunications (only up to 7 percent) and fuel oil (up to 4 cents per gallon). It would be the County's choice as to which utility would be taxed. The tax would include all municipalities in a County. No referendum would be required to adopt a public service tax and the revenues could be used for any county service.

## 7.4.3 Other Funding Sources

Additional sources are available to local governments to pay for a portion of the stormwater management financial needs. These have been separated from the others because they generally do not generate sufficient funds for the entire stormwater program and in many cases are ear-marked to fund specific programs.

### Impact Fees

Water, wastewater and solid waste utilities use impact fees as well as utility fees to support their programs. Impact fees are imposed on new construction because the development causes an impact on the utility service (e.g., increased water or sewer capacity, or increased collections). The concept is that a one-time fee is charged to the

new development to pay for the construction of new facilities which services the fee payer. Once the development has been connected to the utility service, normal monthly fees are imposed to pay for the actual service received. This discussion leads to the four major restrictions on the use of impact fees:

- Impact fees must be used for construction of facilities related to the utility;
- Impact fees must be defined based upon a clear connection between the fee and the construction required;
- Impact fees must be used for facilities, or incremental increases in facilities, required for new growth; and,
- Impact fees must be used in the area of the growth.

Impact fees can only be used for the design and construction of major CIP projects related to new growth. None of the other stormwater management functions can be funded by impact fees. For this reason, impact fees should be considered as a supplemental funding source.

Impact fees represent a method of capital cost recovery for growth-related construction. A new development will increase the runoff volume, timing and peak flow from the property. Stormwater regulations require that the post-development runoff peak flow must be no more than the pre-development runoff peak flow and the first half-inch or inch of runoff must be treated (detention). While the regulations help to maintain pre-development conditions, there are still increased services (in the form of construction of conveyances or storage) required by the municipality as a result of the new development. From this perspective, there are three possible methods to administer impact fees to recover capital costs.

***Fixed Impact Fees***
In this method, a uniform impact fee is imposed on a new development based upon a characteristic of the development. Possible characteristics include total land area, number of homes, etc. The impact fee would be used for the municipality to deal with the increased runoff and would be independent of any regulatory requirement imposed on the development.

***Fee-In-Lieu-Of Charge***
Another method of recovering capital costs is to require developments to pay an up-front charge for the capital improvements needed to service the development in lieu of a developer-built onsite stormwater facility. The charge would be representative of the runoff contribution of the development to the regional facility in the watershed. The concept is that regional stormwater facilities may be less costly than individual systems, and can be better maintained than onsite systems. The advantages for the municipality include capital cost recovery for the regional system and better maintenance. The advantage for the development is more land for development

(since none is required for the onsite stormwater facility). The fee-in-lieu-of charge is paid prior to the construction of the regional facility. The major issue with the fee-in-lieu-of charge is that the regional facility must be built prior to the completion of the development.

There are two general situations when a fee-in-lieu-of charge is appropriate. The first occurs when there is a large incremental cost to be incurred by the municipality to accommodate the new development. The second is when the addition of a sizable development precipitates the need for a new stormwater system, not just an expansion of the existing system.

*Availability Charge*

Similar to the fee-in-lieu-of charge, the availability charge is applied to a development to connect to an existing stormwater management facility. In this case, the regional stormwater facility must be constructed with excess capacity, the excess to be sold to developments based upon need. The original cost of the facility can be funded by whatever mechanism the municipality desires (bonds, pay-as-you-go sinking funds, etc.) and the capital cost to oversize the facility to accommodate growth is recovered through the availability charge. For this method to work, a master plan is required in order to define the amount of excess capacity needed for the future build-out.

Of the three options for capital cost recovery, the fee-in-lieu-of and availability charges are closely related to the particular benefits received. Implementation is on a project-by-project basis. In this way, each project can be categorized as construction for either existing problems, or for growth, so capital recovery charges can be negotiated depending on the development's requirements. These charges are fair, since the development pays only for what it needs (i.e., the charge is related to the service provided in the capital improvement).

## Grants/Cost Sharing

Another method to provide funding for portions of the stormwater management program is through grants (external funding without significant cost to the municipality) and cost sharing (partial external funding). In neither of these cases is there no cost to the municipality. For grants, there are costs related to obtaining the grant (applications, environmental assessments, etc.) and these serve more for capital or regionally important projects. However, for either grants or cost sharing, governments may be able to accomplish the study, design and construction of capital projects for half or less of the total cost. It is important to note that cost sharing funds are not typically for maintenance and operation and local governments need to plan for their own funding of this. Sources of grants and cost sharing funds include the following:

***Water Management District (WMD)***

There are two sources of WMD funding, both of which require cost sharing: cooperative funds and Surface Water Improvement and Management Act (SWIM) funds. Cooperative funds uses SJRWMD ad valorem funds and projects are competitively selected. These funds provide generally 50 percent funding for projects which are mutually beneficial to the municipality and WMD. Cooperative funding can also provide the revenue for capital construction, generally for water quality and ecosystem enhancement projects as well as water supply improvements. SWIM funds refer to the Surface Water Improvement and Management Act which was developed to improve the quality of priority water bodies in Florida. Recently such funding has been limited although there are some funds available. As with cooperative funds, SWIM funds are for cost shared projects.

***State of Florida***

As with the water management district, there are a number of ways to fund projects with the state of Florida (usually through FDEP). First, periodically, the legislature provides FDEP with grant funding for stormwater purposes. The grants are generally small and currently there are no grants available. Second, the legislature allows low interest loan funds to be made available for stormwater management projects. These loans have interest rates less than the Prime Lending Rate. The stormwater loan program is relatively new and the process to obtain the loans can be tedious.

FDEP's Nonpoint Source (NPS) Management Section also administers grant money it receives from USEPA through Section 319(h) of the Federal Clean Water Act. These grant funds can be used to implement projects or programs that will help to reduce nonpoint sources of pollution. Projects or programs must be conducted within the state's NPS priority watersheds, which are the state's SWIM watersheds and National Estuary Program waters. All projects must include at least a 40% nonfederal match. Examples of fundable projects include: demonstration and evaluation of BMPs, nonpoint pollution reduction in priority watersheds, ground water protection from nonpoint sources, public education programs on nonpoint source management, etc.

In the 2005-06 legislative session, Senate Bill (SB) 444 authorized the Water Protection and Sustainability Program which defines funding for alternative water supplies, TMDL implementation and research, SWIM activities and small community grants. $100 million is to be available annually to FDEP for the implementation of an alternative water supply program of which 20 percent is for TMDL activities and 10 percent for SWIM activities. Grants will be distributed based on application and approval by each appropriate WMD. Even so, counties, cities, water management districts and special districts can apply for the grants.

***Federal Government***

In recent years, even though the USEPA has begun requiring stormwater management permits (NPDES MS4 permits), no new funding has been provided from the federal government to the states. Of course the low interest loan program for the

states is seeded by the federal government but direct grant or cost sharing money is not available. There are funds potentially available for water resources projects through the Army Corps of Engineers and sometimes as a direct consequence of federal legislative activity. As above, there are generally some costs to obtain these funds and the funds are usually restricted to capital projects which have significant public or statewide benefits.

## 7.4.4 Summary of Funding Sources

Most of the funding sources discussed above apply to cities and counties but are limited in their application to a multi-city and county program. Of course, all of the cities and county participants have revenues from ad valorem taxes collected within the three counties (Lake, Orange and Seminole). Many of the municipalities have stormwater utility fees; but none of the counties do. Thus, the use of an existing funding source to provide revenues for the entire WSA would be difficult to implement. Options to provide new sources are discussed below.

### St. Johns River Water Management District

Currently (FY 04/05) the SJRWMD has set a millage rate of 0.462, of which 0.432 is for the baseline budget and 0.030 is for new projects and initiatives (e.g., local government water resource projects, district building repairs, water conservation media campaign, computer enhancements and restoration of the Apopka-Beauclair Canal). Total revenues are $216.5 million, of which $97.8 million are from ad valorem taxes. This translates to approximately $2.1 million for each 0.01 of millage, considering the entire WMD area. The subset of property values for the WSA would have to be determined before a millage could be considered.

### WSA Special District

Florida law allows for the designation of special taxing districts for regional purposes. Chapter 298, F.S. allows for special taxing districts to be formed by special act of the Florida Legislature and provides for the collection of taxes for the funding of district programs. This chapter, however, envisions a water control district, much like the five water management districts and additional legal review would be necessary before this option is deemed able to be implemented.

### Stormwater Utility Fee

The overall concept for this option is the collection of a stormwater user fee for the implementation of projects within the WSA. A number of challenges face this option:

- Not all of the jurisdictions have existing stormwater utility fee revenues. Lake County has a stormwater MSTU of 0.5 mills; but Orange and Seminole have no dedicated stormwater funding. Potentially, non-ad valorem assessments could be set up in all counties to collect stormwater assessment revenues to cover the WSA.

- The only method to collect the assessments would be the county tax collectors. Usually, such fees in cities are collected using other utility bills (e.g., water). The City of Altamonte Springs, the City of Apopka, the Town of Eatonville, the City of Eustis, the City of Lake Mary, the City of Longwood, the City of Mount Dora, the City of Ocoee, the City of Orlando and the City of Winter Garden have adopted stormwater utility fees, but the coverage of billing would not be sufficient for the entire basin, except through the tax collector's offices.

- Chapter 403.0893, F.S., authorizes cities and counties to create benefit areas in cooperation according to Chapter 163.01 (Interlocal Cooperation Act), which is defined in the text insert below. Subsection 3 of this statute provides for revenues to be based on a per-acre charge, rather than a classical stormwater utility fee based on impervious area.

**403.0893 Stormwater funding; dedicated funds for stormwater management.**--In addition to any other funding mechanism legally available to local government to construct, operate, or maintain stormwater systems, a county or municipality may:

(1) Create one or more stormwater utilities and adopt stormwater utility fees sufficient to plan, construct, operate, and maintain stormwater management systems set out in the local program required pursuant to s. 403.0891(3);

(2) Establish and set aside, as a continuing source of revenue, other funds sufficient to plan, construct, operate, and maintain stormwater management systems set out in the local program required pursuant to s. 403.0891(3); or

(3) Create, alone or in cooperation with counties, municipalities, and special districts pursuant to the Interlocal Cooperation Act, s. 163.01, one or more stormwater management system benefit areas. All property owners within said area may be assessed a per acreage fee to fund the planning, construction, operation, maintenance, and administration of a public stormwater management system for the benefited area. Any benefit area containing different land uses which receive substantially different levels of stormwater benefits shall include stormwater management system benefit subareas which shall be assessed different per acreage fees from subarea to subarea based upon a reasonable relationship to benefits received. The fees shall be calculated to generate sufficient funds to plan, construct, operate, and maintain stormwater management systems called for in the local program required pursuant to s. 403.0891(3). For fees assessed pursuant to this section, counties or municipalities may use the non-ad valorem levy, collection, and enforcement method as provided for in chapter 197.

### 7.4.5 Recommendations

In order to implement the recommendations made throughout this MSMP, a dedicated continuous funding source should be established for projects and programs in the WSA. Currently, 10 out of the 13 (not including the SJRWMD) local governments have established such a funding mechanism in the form of a stormwater utility. The overall concept of a joint stormwater utility as a method of funding projects within the WSA would be too difficult to implement and faces several challenges due to a number of factors mentioned in the previous sub-section. It is recommended that the affected Stakeholders that currently do not have a dedicated stormwater funding mechanism, such as a utility, consider developing one in order to fund the planning, implementation and O&M of projects within the WSA. The local governments would include Lake, Orange and Seminole Counties and the Town of Oakland. In addition to a dedicated stormwater fund it is recommended that the Stakeholders develop a joint planning agreement that would allow them to plan and implement regional projects in the WSA that are part of the CIP.

## 7.5 Summary of Recommendations

Recommendations made throughout the report are summarized in **Table 7-15,** located at the end of this section. This table identifies each recommendation, where it is referenced in the MSMP, as well as the identified Stakeholders that each recommendation applies to.

## 7.6 Schedule

Section 369.319, F.S. of the WPPA requires that the MSMP establishes a schedule to complete the needed improvements. A recommended schedule was developed with input from the Stakeholders in order to address the recommendations summarized in Table 7-15. The recommended schedule itself is shown in **Table 7-16,** located at the end of this section.

Governor Jeb Bush signed Senate Bill 360 into law in June 2005 which reforms the State's growth management laws. This bill appropriates $1.5 billon for 2005-2006 in new money for various transportation, water and school infrastructure programs. The bill requires a local government's comprehensive plan to be financially feasible and the capital improvements element in a local comprehensive plan to include a schedule of improvements that ensure the adopted level-of-service standards are achieved and maintained. It also requires an annual review of the capital improvements element to maintain a financially feasible 5-year schedule of capital improvements. Capital improvements element amendments must be adopted and transmitted no later than December 1, 2007. The bill provides for sanctions if the amendment and subsequent updates are not transmitted timely. Financial feasibility is defined in the bill as follows:

*"...sufficient revenues are currently available or will be available from committed funding sources for the first 3 years, or will be available from committed or planned funding sources for years 4 and 5, of a 5-year capital improvement schedule for financing capital improvements, such as ad valorem taxes, bonds, state and federal funds, tax revenues, impact fees, and developer contributions, which are adequate to fund the projected costs of the capital improvements identified in the comprehensive plan necessary to ensure that adopted level-of-service standards are achieved and maintained within the period covered by the 5-year schedule of capital improvements."*

The recommended schedule for this MSMP was developed keeping the 5-year schedule identified in Senate Bill 360 in mind, thus the schedule was developed using 5-year increments as shown in Table 7-16.

**Table 7-1**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - Lake County**

| | Lake County | |
|---|---|---|
| **Area within WSA** | 146 square miles | |
| **Staff** | 71 | |
| **Maintenance** | **Activity** | **Frequency** |
| **Operations** (Note 1) | Inspections | complaint driven |
| | Maintenance | complaint driven |
| **Outsourced** | Ditch Cleaning | |
| **Operations** | Pipe Cleaning | |
| **Equipment** | **Type** | **Number** |
| | Trucks | UNK |
| | Tractors | UNK |
| | Compactor/Rollers | UNK |
| | Loaders | UNK |
| | Backhoes | UNK |
| | Dump Trucks | UNK |
| | Flatbeds | UNK |
| | Water Trucks | UNK |
| | Irrigation Pumps | UNK |
| | Total | 123 |

Notes:
1. The County is moving toward scheduled maintenance and inspection activities as the mapping of the drainage infrastructure continues.
UNK = unknown

**Table 7-2**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Eustis**

| | Eustis | | Maintenance/Inspection Items | | |
|---|---|---|---|---|---|
| **Area within WSA** | 5.2 square miles | | | | |
| **Staff** | 5 | | | | |
| **Maintenance Operations** | **Activity** | **Frequency** | Stormwater Treatment Ponds | Storm Sewer System | Roadways |
| | Maintenance | | | | |
| | Mowing | Weekly (Note 1) | √ | | |
| | Debris Removal | Weekly (Note 1) | √ | | |
| | Pipe and Inlet Cleaning | As needed | | √ | |
| | Street Sweeping | Note 2 | | | √ |
| **Outsourced Operations** | None | | | | |
| **Equipment** | **Type** | **Number** | | | |
| | Street Sweeper | UNK | | | |
| | Backhoes | UNK | | | |

Notes:
1. Weekly in summer, less as season dictates.
2. Residential/commercial - monthly, industrial - bimonthly, downtown core - weekly.
UNK = unknown

**Table 7-3**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Mount Dora**

| | Mount Dora | | Maintenance/Inspection Items | | | |
|---|---|---|---|---|---|---|
| **Area within WSA** | 4.9 square miles | | | | | |
| **Staff** | 3 (12 Temps after storm events) | | | | | |
| **Maintenance Operations** | **Activity** | **Frequency** | Open Drainage (ditches) | Stormwater Treatment Ponds | Storm Sewer System | Roadways |
| | Inspections | | | | | |
| | Structures | Note 1 | | | √ | |
| | Maintenance | Note 2 | | | | |
| | Street Sweeping | Daily | | | | √ |
| | Structure Cleaning/Repair | As Needed | | | √ | |
| | Mowing | Weekly rotation | | √ | | |
| | Ditch Cleaning | Monthly rotation | √ | | | |
| **Outsourced Operations** | Waste/Trash Disposal | | | | | |
| | Tree Stump Grinding | | | | | |
| **Equipment** | **Type** | **Number** | | | | |
| | Street Sweeper | 1 | | | | |
| | Vac-Truck | 1 | | | | |
| | Riding Mowers | UNK | | | | |
| | Bush Hog | 1 | | | | |
| | 1-ton Flatbed Truck | 1 | | | | |
| | Weed Eaters | UNK | | | | |
| | Chain Saws | UNK | | | | |
| | Hedge Trimmers | UNK | | | | |

Notes:
1. Stormwater structures and oufalls inspected twice/yr.
2. Complaint driven and by inspections
UNK = unknown

**Table 7-4**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - Orange County**

| | Orange County | | Maintenance/Inspection Items | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 183.4 square miles | | | | | | | |
| **Staff** | 60 (Note 1) | | | | | | | |
| **Maintenance Operations** | **Activity** | **Frequency** | Stormwater Treatment Retention Ponds | Weirs | Channel Control Structures | Drainage Wells | Pump Stations | Channels |
| | Inspections | | | | | | | |
| | Primary Canals | 4 week cycle | | | | | | √ |
| | Non-MSTU Retention Ponds (Note 2) | 4 week cycle | √ | | | | | |
| | Drainage Wells | 2 week cycle | | | | √ | | |
| | Pump Stations | 2 week cycle (Note 3) | | | | | √ | |
| | Primary Control Structures | Continuous | | √ | √ | | | |
| | Maintenance | | | | | | | |
| | Primary Canals (Note 4) | 4 week cycle | | | | | | √ |
| | Non-MSTU Retention Ponds (Note 4) | 4 week cycle | √ | | | | | |
| | Drainage Wells (Note 5) | 2 week cycle | | | | √ | | |
| | Pump Stations (Note 6) | 2 week cycle | | | | | √ | |
| | Primary Control Structures (Note 5) | Continuous | | √ | √ | | | |
| **Outsourced Operations** | Pond Maintenance Activities | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | |
| | Backhoe | 1 | | | | | | |
| | Trackhoes | 2 | | | | | | |
| | Bull Dozer | 3 | | | | | | |
| | Dragline | 1 | | | | | | |
| | Mobile Crane | 1 | | | | | | |
| | Front End Loader | 1 | | | | | | |
| | Dump Trucks | 3 | | | | | | |
| | Transport Tractor | 1 | | | | | | |
| | Transport Trailer | 2 | | | | | | |
| | Heavy Eq. Crew Trucks | 11 | | | | | | |
| | Spray Trucks | 2 | | | | | | |
| | Air Boats | 2 | | | | | | |
| | Marsh Masters | 2 | | | | | | |
| | Spray Crew Trucks | 2 | | | | | | |
| | Misc. Equipment | numerous | | | | | | |

Notes:
1. As of FY 2001/2002; information for inspections and maintenance obtained from *Overview of the Drainage Section Maintenance & Operation Program* (Orange County, 2002)
2. Municipal Services Taxing Unit (MSTU) ponds are funded and thus maintained separately.
3. Drainage wells are inspected daily during heavy rainfall periods.
4. Includes trash pickup, mowing/edging, chemical spray and general repairs.
5. Includes mowing, vegetative cover control, trash and debris removal,sediment removal and general repairs.
6. Includes cleaning intakes, checking mechanical equipment and control systems, checking for pipe leaks removal of sediment and general repairs.

**Table 7-5**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Apopka**

| | Apopka | | Maintenance/Inspection Items | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 29.4 square miles | | | | | | | | | | | | | |
| **Staff** | 16 (Note 1) | | | | | | | | | | | | | |
| | | | Stormwater Treatment Ponds- Dry & Wet Detention, Dry Retention | Exfiltration Trench | Natural Lakes | Ditches/Swales | Roadways | Storm Sewer System | Drainage Wells | Wetlands | Weirs | Channel Control Structures | Pump Stations | Inlets and Catch Basins |
| **Maintenance Operations** | **Activity** | **Frequency** | | | | | | | | | | | | |
| | Inspections | | | | | | | | | | | | | |
| | Roadway Structures | Ongoing | | | | | √ | | | | | | | |
| | Lakes | 1/week | | | √ | | | | | | | | | |
| | Treatment Ponds | 18/year | √ | √ | | √ | | | | √ | | | | |
| | Structures | 2/year | | | | | | √ | √ | | √ | √ | √ | √ |
| | Maintenance | | | | | | | | | | | | | |
| | Mowing, weed eating, litter and debris removal | 8/year | √ | | | | | | | | | | | |
| | Roadway Structures | Ongoing | | | | | √ | | | | | | | |
| | Lakes | 1/week | | | √ | | | | | | | | | |
| | Treatment Ponds | 18/year | √ | √ | | √ | | | | √ | | | | |
| | Structures | 2/year | | | | | | √ | √ | | √ | √ | √ | √ |
| **Outsourced Operations** | None | | | | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | | | | |
| | Lawn Mowers | 15 | | | | | | | | | | | | |
| | Weed Eaters | 20 | | | | | | | | | | | | |
| | Backhoes | 2 | | | | | | | | | | | | |
| | Street Sweepers | 2 | | | | | | | | | | | | |
| | Bush Hogs | 2 | | | | | | | | | | | | |
| | Vacuum Truck | 1 | | | | | | | | | | | | |
| | Dump Truck | 1 | | | | | | | | | | | | |
| | Transport Trailer | 4 | | | | | | | | | | | | |
| | Pumps | 2 | | | | | | | | | | | | |
| | Hand Tools | Numerous | | | | | | | | | | | | |

Notes:
1. 8 employees and 8 Orange County inmates.

**Table 7-6**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - Town of Eatonville**

| | Eatonville | |
|---|---|---|
| **Area within WSA** | 0.7 square miles | |
| **Staff** | UNK | |
| **Maintenance Operations** | **Activity** | **Frequency** |
| | Maintenance (Note 1) | monthly |
| **Outsourced Operations** | Television Camera Inspections | |
| **Equipment** | **Type** | **Number** |
| | Lawn mower | UNK |
| | Front-end loader | UNK |
| | Vactron vacuum | UNK |

Notes:
1. The Town performs monthly inspections of stormwater facilties. Maintenance activities include mowing, street sweeping, cleaning of retention ponds, and cleaning manholes within the Town limits.
UNK = Unknown

**Table 7-7**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - Town of Oakland**

| | Oakland | |
|---|---|---|
| **Area within WSA** | 1.7 square miles | |
| **Staff** | 1 | |
| **Maintenance** | **Activity** | **Frequency** |
| **Operations** | Maintenance (Note 1) | As Needed |
| **Outsourced** | Road Grading | |
| **Operations** | Swale Repair | |
| **Equipment** | **Type** | **Number** |
| | Backhoe | 1 |
| | Misc. equipment | UNK |

Notes:
1. The Town is responsible for maintaining one detention pond and swales within the Town limits.

UNK = Unknown

**Table 7-8**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Ocoee**

| | Ocoee | | Maintenance/Inspection Items | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 13.3 square miles | | | | | | | | | | | |
| **Staff** | 5 | | | | | | | | | | | |
| **Maintenance** | **Activity** | **Frequency** | Stormwater Treatment Ponds (Dry Retention) | Stormwater Treatment Pond (Dry Detention with Sand Filtration System) | Storm Water Treatment Pond (Wet Detention Facility) | Stormwater Treatment Pond (Wet Detention with Sand Filtration) | Exfiltration Trench | Weirs | Channel Control Structures | Pump Stations | Channels | Inlets and Catch Basins |
| **Operations** | Inspections (Note 1) | | | | | | | | | | | |
| | Detention Ponds (Notes 2 and 3) | Semi Annual | √ | √ | √ | √ | | | | | | |
| | Structures (Note 4) | Semi Annual | | | | | √ | | | √ | | √ |
| | Structures (Note 5) | Quarterly | | | | | | √ | √ | | √ | |
| | Channels | Annual | | | | | | | | | √ | |
| | Maintenance (Note 1) | | | | | | | | | | | |
| | Repairs | Note 1 | √ | √ | √ | √ | | | | √ | | |
| | Scraping/Discing | Note 1 | √ | | | | | | | | | |
| | Mowing | Note 1 | √ | √ | √ | √ | | | | | √ | |
| | Litter/Debris Removal | Note 1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Nutrient/Pest Control | Note 1 | √ | √ | √ | √ | | | | | | |
| | Invasive Plant Removal | Note 1 | | | √ | √ | | | | | √ | |
| | Sediment Removal | Note 1 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| **Outsourced Operations** | Mowing | | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | | |
| | Street Sweeper | 1 | | | | | | | | | | |
| | Vacuum Truck | 1 | | | | | | | | | | |
| | Backhoe | 1 | | | | | | | | | | |
| | Climbing Excavator | 1 | | | | | | | | | | |

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000011 (see Appendix C).
2. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
3. Wet detention ponds are inspected annually.
4. Includes exfiltration trenches, pump stations, inlets and catch basins.
5. Includes weirs, channels and control structures.

**Table 7-9**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Orlando**

| | Orlando | | Maintenance/Inspection Items | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 9.2 square miles | | | | | | | | | | | |
| **Staff** | 47 | | | | | | | | | | | |
| **Maintenance** | **Activity** | **Frequency** | Open Drainage (dry swales, canals, ditches) | Stormwater Treatment Ponds (Dry Retention) | Storm Water Treatment Pond (Wet Detention Facility) | Natural Lakes | Wetlands | Storm Sewer System | Roadways | Drainage Wells | Pump Stations | Sedimentation Devices |
| **Operations** | Inspections (Note 1) | | | | | | | | | | | |
| | Open Drainage (Note 2) | Monthly | √ | √ | √ | √ | | | | | | |
| | Structures (Debris Collection Devices) | 4/yr | | | | | | √ | | | | √ |
| | Structures (Note 3) | Ongoing Program | | | | | | √ | | | | |
| | Structures (Flood Prone Areas) | Large Storm Events | | | | | | √ | | | | |
| | Drainage Wells | Complaint Driven | | | | | | | | √ | | |
| | Pump Stations | Monthly | | | | | | | | | √ | |
| | Maintenance (Note 1) | | | | | | | | | | | |
| | Repairs | As needed | √ | √ | √ | √ | | √ | | √ | | |
| | Scraping/Discing | As needed | √ | √ | | | | | | | | |
| | Mowing | 7/yr | √ | √ | √ | √ | | | | | | |
| | Litter/Debris Removal | Monthly | √ | √ | √ | √ | | √ | √ | | | |
| | Nutrient/Pest Control | As needed | √ | √ | √ | √ | | | | | | |
| | Aquatic Plant Management & Harvesting | As needed | | | | | √ | | | | | |
| | Invasive Plant Removal | Semi-Annually | | √ | | | | | | | | |
| | Street Sweeping | | | | | | | | | | | |
| | Urban Core | Daily | | | | | | | √ | | | |
| | Industrial Areas | Weekly | | | | | | | √ | | | |
| | Residential/Interstate | Monthly | | | | | | | √ | | | |
| **Outsourced Operations** | Mowing | | | | | | | | | | | |
| | Litter Removal | | | | | | | | | | | |
| | Open SW System Inspections | | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | | |
| | Vactor Trucks | 2 | | | | | | | | | | |
| | Dump Trucks | 12 | | | | | | | | | | |
| | Street Sweepers | 8 | | | | | | | | | | |
| | Long-Reach Backhoes | 2 | | | | | | | | | | |
| | Bull Dozer | 1 | | | | | | | | | | |
| | Mini-Excavator | 1 | | | | | | | | | | |
| | Skid Loader | 1 | | | | | | | | | | |
| | Gradalls | 2 | | | | | | | | | | |

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000014 (see Appendix C)
2. Includes dry swales, canals and ditches, wet detention ponds and natural lakes.
3. Includes culverts, manholes, catch basins, inlets, outfalls and weirs.

**Table 7-10**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Winter Garden**

| | Winter Garden | | Maintenance/Inspection Items | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 14 square miles | | | | | | | | | | | |
| **Staff** | 4 (Note 1) | | | | | | | | | | | |
| **Maintenance** | **Activity** | **Frequency** | Stormwater Treatment Ponds (Dry Retention) | Stormwater Treatment Pond (Dry Detention with Sand Filtration System) | Storm Water Treatment Pond (Wet Detention Facility) | Stormwater Treatment Pond (Wet Detention with Sand Filtration) | Exfiltration Trench | Weirs | Channel Control Structures | Pump Stations | Channels | Inlets and Catch Basins |
| **Operations** | Inspections (Note 2) | | | | | | | | | | | |
| | Detention Ponds (Notes 3 and 4) | Semi Annual | √ | √ | √ | √ | | | | | | |
| | Structures (Note 5) | Semi Annual | | | | | √ | | | √ | | √ |
| | Structures (Note 6) | Quarterly | | | | | | √ | √ | | √ | |
| | Channels | Annual | | | | | | | | | √ | |
| | Maintenance (Note 2) | | | | | | | | | | | |
| | Repairs | Note 2 | √ | √ | √ | √ | | | | √ | | |
| | Scraping/Discing | Note 2 | √ | | | | | | | | | |
| | Mowing | Note 2 | √ | √ | √ | √ | | | | | √ | |
| | Litter/Debris Removal | Note 2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Nutrient/Pest Control | Note 2 | √ | √ | √ | √ | | | | | | |
| | Invasive Plant Removal | Note 2 | | | √ | √ | | | | | √ | |
| | Sediment Removal | Note 2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| **Outsourced Operations** | Sewer Lining | | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | | |
| | Backhoe | 1 | | | | | | | | | | |
| | Street Sweeper | 2 | | | | | | | | | | |
| | Dump Truck | 1 | | | | | | | | | | |
| | Menzei Muck | 1 | | | | | | | | | | |
| | Crew Truck | 1 | | | | | | | | | | |

Notes:
1. Stormwater Engineer and 3 operators.
2. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000011 (see Appendix C).
3. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
4. Wet detention ponds are inspected annually.
5. Includes exfiltration trenches, pump stations, inlets and catch basins.
6. Includes weirs, channels and control structures.

**Table 7-11**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - Seminole County**

| | Seminole County | | Maintenance/Inspection Items | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 53.6 square miles | | | | | | | | | | |
| **Staff** | 20 | | | | | | | | | | |
| **Maintenance Operations** | **Activity** | **Frequency** | Stormwater Treatment Ponds (Dry Retention) | Stormwater Treatment Pond (Dry Detention with Sand Filtration System) | Storm Water Treatment Pond (Wet Detention Facility) | Stormwater Treatment Pond (Wet Detention with Sand Filtration) | Canal Bank | Pump Stations | Grass Swales (Dry) | Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers) | Primary Stormwater Management System |
| | Inspections (Note 1) | | | | | | | | | | |
| | Detention Ponds (Note 2) | Semi-Annual | √ | √ | √ | √ | | | | | |
| | Structures (Note 3) | Annual | | | | | √ | √ | | √ | |
| | Swales | Semi-Annual | | | | | | | √ | | |
| | Roadway Structures | Semi-Annual | | | | | | | | | √ |
| | Maintenance (Note 1) | | | | | | | | | | |
| | Repairs | As needed | √ | √ | √ | √ | | √ | √ | | √ |
| | Scraping/Discing | As needed | √ | √ | | | | | √ | | |
| | Mowing (Note 4) | As needed | √ | √ | √ | √ | | | | | √ |
| | Litter/Debris Removal | As needed | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Nutrient/Pest Control | As needed | √ | √ | √ | √ | | | √ | | |
| | Invasive Plant Removal | As needed | | | √ | √ | | | | | |
| | Sediment Removal | As needed | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Maintenance of Primary Stormwater Management System (Note 5) | Semi-Annual | | | | | | | | | √ |
| **Outsourced Operations** | Mowing (Note 4) | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | |
| | Long-Reach Backhoes | 1 | | | | | | | | | |
| | Skid Loader | 1 | | | | | | | | | |
| | Wheeled Excavator | 1 | | | | | | | | | |
| | Track Excavator | 1 | | | | | | | | | |
| | Vacuum Trucks | 2 | | | | | | | | | |

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000038 (see Appendix C)
2. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
3. Includes pump stations, exfiltration trenches, channel control structures, pollution control boxes and swirl boxes.
4. Mowing of County-owned ponds and flat areas along ditches and canals is monthly, slope mowing of ditches and canals is every 3 months.
5. PSMS consists of inlets, catch basins, grates and ditches.

**Table 7-12**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Altamonte Springs**

| | Altamonte Springs | | Maintenance/Inspection Items | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 8.3 square miles | | | | | | | | | | |
| **Staff** | 7 | | | | | | | | | | |
| **Maintenance** | **Activity** | **Frequency** | Stormwater Treatment Ponds (Dry Retention) | Stormwater Treatment Pond (Dry Detention with Sand Filtration System) | Storm Water Treatment Pond (Wet Detention Facility) | Stormwater Treatment Pond (Wet Detention with Sand Filtration) | Pump Stations | Grass Swales (Dry) | Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers) | Swirl Box | Inlets and Catch Basins |
| **Operations** | Inspections (Note 1) | | | | | | | | | | |
| | Detention Ponds (Note 2) | Semi-Annual | √ | √ | √ | √ | | | | | |
| | Structures (Note 3) | Annual | | | | | √ | | √ | √ | |
| | Swales | Semi-Annual | | | | | | √ | | | |
| | Primary S/W Mgmt System (PSMS) | Semi-Annual | | | | | | | | | √ |
| | Maintenance (Note 1) | | | | | | | | | | |
| | Repairs | As needed | √ | √ | √ | √ | √ | √ | | | √ |
| | Scraping/Discing | As needed | √ | √ | | | | √ | | | |
| | Mowing | As needed | √ | √ | √ | √ | | | | | |
| | Litter/Debris Removal | As needed | √ | √ | √ | √ | √ | √ | √ | | √ |
| | Nutrient/Pest Control | As needed | √ | √ | √ | √ | | √ | | | |
| | Invasive Plant Removal | As needed | | | √ | √ | | | | | |
| | Sediment Removal | As needed | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Maintenance of PSMS | Semi-Annual | | | | | | | | | |
| **Outsourced Operations** | Concrete<br>Pipe Lining<br>Pipeline and Structure Cleaning<br>Pond Demucking | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | |
| | Vacuum Pumps | 2 | | | | | | | | | |
| | Diaphragm Pump | 1 | | | | | | | | | |
| | Miscellaneous Pumps | 3 | | | | | | | | | |
| | Truck-Mounted Mini-Vac | 1 | | | | | | | | | |
| | Mowers | 3 | | | | | | | | | |
| | Hydro-Seeder | 1 | | | | | | | | | |
| | Dump Truck | 1 | | | | | | | | | |
| | Crew Truck | 1 | | | | | | | | | |
| | Bobcat | 1 | | | | | | | | | |
| | Generator | 1 | | | | | | | | | |
| | Concrete Mixer | 1 | | | | | | | | | |
| | Air compressor | 1 | | | | | | | | | |
| | Chopsaws | 2 | | | | | | | | | |
| | Chainsaws | 3 | | | | | | | | | |
| | Trimmers | 4 | | | | | | | | | |
| | Compactors | 2 | | | | | | | | | |

Notes:
1. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000038 (See Appendix C)
2. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filration.
3. Includes pump stations, pollution control boxes and swirl boxes.

**Table 7-13**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Lake Mary**

| | Lake Mary | | Maintenance/Inspection Items | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 0.5 square miles | | | | | | | | | | | | |
| **Staff** | 1 - Full-time, 8 Part-time (Note 1) | | | | | | | | | | | | |
| **Maintenance** | **Activity** | **Frequency** | Stormwater Treatment Ponds (Dry Retention) | Stormwater Treatment Pond (Dry Detention with Sand Filtration System) | Storm Water Treatment Pond (Wet Detention Facility) | Stormwater Treatment Pond (Wet Detention with Sand Filtration) | Exfiltration Trench | Channel Control Structures | Pump Stations | Grass Swales (Dry) | Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers) | Swirl Box | Inlets and Catch Basins |
| **Operations** | Inspections | Note 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| | Maintenance | Note 2 | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ | ✓ |
| **Outsourced Operations** | Street Sweeping | | | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | | | |
| | Mowers (Note 1) | | | | | | | | | | | | |
| | Backhoes (Note 1) | | | | | | | | | | | | |
| | Front-End Loader (Note 1) | | | | | | | | | | | | |
| | Pumps (Note 1) | | | | | | | | | | | | |
| | Vacuum Machine (Note 1) | | | | | | | | | | | | |

Notes:
1. P/T staff and equipment is from Public Works, available to Stormwater Manager.
2. Complaint driven, otherwise inspect & maintain systems monthly.

**Table 7-14**
**Wekiva Parkway & Protection Act**
**Master Stormwater Management Plan Support**
**Stormwater Inspection & Maintenance - City of Longwood**

| | Longwood | | Maintenance/Inspection Items | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Area within WSA** | 0.97 square miles | | | | | | | | | | | | |
| **Staff** | 2 -Full-time, 10 Part-time (Note 1) | | | | | | | | | | | | |
| **Maintenance** | **Activity** | **Frequency** | Stormwater Treatment Ponds (Dry Retention) | Stormwater Treatment Pond (Dry Detention with Sand Filtration System) | Storm Water Treatment Pond (Wet Detention Facility) | Stormwater Treatment Pond (Wet Detention with Sand Filtration) | Exfiltration Trench | Channel Control Structures | Pump Stations | Grass Swales (Dry) | Pollution Control Boxes (Catch Basins with Oil, Grease & Grit Separation Chambers) | Swirl Box | Primary Stormwater Management System |
| **Operations** | Inspections (Note 2) | | | | | | | | | | | | |
| | Detention Ponds (Note 3) | Semi-Annual | √ | √ | √ | √ | | | | | | | |
| | Structures (Note 4) | Annual | | | | | √ | √ | √ | | √ | √ | |
| | Swales | Semi-Annual | | | | | | | | √ | | | |
| | Primary S/W Mgmt System (PSMS) | Semi-Annual | | | | | | | | | | | √ |
| | Maintenance (Note 2) | | | | | | | | | | | | |
| | Repairs | As needed | √ | √ | √ | √ | | | √ | √ | | | √ |
| | Scraping/Discing | As needed | √ | √ | | | | | | √ | | | |
| | Mowing | As needed | √ | √ | √ | √ | | | | | | | |
| | Litter/Debris Removal | As needed | √ | √ | √ | √ | | √ | √ | √ | √ | | √ |
| | Nutrient/Pest Control | As needed | √ | √ | √ | √ | | | | √ | | | |
| | Invasive Plant Removal | As needed | | | √ | √ | | | | | | | |
| | Sediment Removal | As needed | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| | Maintenance of PSMS (Note 5) | Semi-Annual | | | | | | | | | | | |
| **Outsourced Operations** | Mowing<br>Aquatic Maintenance<br>Pipe Lining<br>Street Sweeping<br>Major Maintenance Work | | | | | | | | | | | | |
| **Equipment** | **Type** | **Number** | | | | | | | | | | | |
| | UNK | | | | | | | | | | | | |

Notes:
1. There are 2 full-time staff and up to 10 additional staff available as needed.
2. Schedule and specific inspection and maintenance activities follow NPDES MS4 Permit No.FLS000038 (see Appendix C).
3. Includes dry retention, dry detention w/ sand filtration, wet detention and wet detention w/ sand filtration.
4. Includes pump stations, exfiltration trenches, channel control structures, pollution control boxes and swirl boxes.
5. PSMS consists of inlets, catch basins, grates and ditches.

UNK = Unknown

**Table 7-15**
**Wekiva Parkway Protection Act**
**Master Stormwater Management Plan Support**
**Summary of Recommendations**

| | | | Jurisdiction | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Recommendation No. | Recommendation Description | MSMP Reference | Lake County | Eustis | Mount Dora | Orange County | Apopka | Eatonville | Oakland | Ocoee | Orlando | Winter Garden | Seminole County | Altamonte Springs | Longwood | Lake Mary |
| 1 | For those subbasins in the WSA with predicted percent increases in pollutant loads between existing and future conditions, evaluate the use of controls in addition to what is already required for stormwater treatment by local governments and permitting agencies, where most beneficial and where feasible. A list of the types of BMPs to help reduce pollutant loading is provided in Section 5.2.2. | Appendix E - Section E.4.2, Section E.5, Table E-17, Section 5.2.2 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| 2 | Implement recommendations for existing deficiencies based on the prioritization developed as part of this MSMP. | Section 4.3, Table 4-2, Appendix D | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| 3 | Develop a detailed master stormwater management plan or update older existing plans which should at a minimum address the requirements of the WPPA and have the following components: data collection; identification of problem areas; hydraulic/hydrologic analysis of the primary stormwater management system; water quality; recommendations, estimated costs for capital improvements. | Figure 4-1, Section 4.4 | √ | | √ | | | | | | | | | | | |
| 4 | Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Section 5.2 (methodology includes subbasin ranking and prioritization, flow charts showing how to apply methodology, and 10 example projects of how the management strategy is applied) | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| 5 | Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Section 5.2 (methodology includes subbasin ranking and prioritization, flow charts showing how to apply methodology, and 10 example projects of how the management strategy is applied) | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| 6 | For those areas not already served by reclaimed water, identify large potential users (i.e., golf courses, parks, recreational areas) and implement stormwater irrigation practices where practicable and financially feasible. Potential sites will have to be evaluated independently on a case-by-case basis based on actual conditions. | Section 6.4 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| 7 | Strengthen or add language to existing codes where it pertains to redevelopment and stormwater management. | Section 7.2.1 | | √ | | | √ | √ | √ | √ | | | | √ | | √ |
| 8 | Continue to implement stormwater maintenance and inspection activities as defined by the NPDES MS4 permit or by already established programs. | Appendix C | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| 9 | Develop a pro-active routine inspection and maintenance program of stormwater facilities. | Section 7.3 | √ | | | | | | | | | | | | | |
| 10 | Evaluate individual maintenance programs to identify areas where improvements can be made. The use of a standard rating system, such as a level of service for maintenance, could be used to evaluate such a program. | Section 7.3 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |
| 11 | Establish a dedicated funding source, such as a stormwater utility, that can be used for planning, implementation and O&M of regional projects within the WSA. | Section 7.4.5 | √ | | | √ | | | √ | | | | √ | | | |
| 12 | Establish a joint planning ageement between local governments in the WSA that will facilitate the planning and implementation of regional projects. | Section 7.4.5 | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ | √ |

* These are recommendations that the local governments should consider, however determining those recommendations that are feasible and affordable are the responsibility of the local governments.

**Table 7-16**
**Wekiva Parkway Protection Act**
**Master Stormwater Management Plan Support**
**Recommended Schedule**

| Recommendation No. | Recommendation Description | Comments | 2006 | 2007 | 2008 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | 2024 | 2025 | 2026 | 2027 | 2028 | 2029 | 2030 | 2031 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | For those subbasins in the WSA with predicted percent increases in pollutant loads between existing and future conditions, evaluate the use of controls in addition to what is already required for stormwater treatment by local governments and permitting agencies, where most beneficial and where feasible. A list of the types of BMPs to help reduce pollutant loading is provided in Section 5.2.2. | Dependent on planning horizons for build-out conditions for each Stakeholder. | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | |
| 2 | Implement recommendations for existing deficiencies based on the prioritization developed as part of this MSMP. | Implement identified recommendations for 20 percent of the prioritized deficiencies every 5 years. | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ |
| 3 | Develop a detailed master stormwater management plan or update older existing plans which should at a minimum address the requirements of the WPPA and have the following components: data collection; identification of problem areas; hydraulic/hydrologic analysis of the primary stormwater management system; water quality; recommendations, estimated costs for capital improvements. | Evaluate 1 basin (i.e. watershed) every 5 years. | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ |
| 4a | Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "1" and "2" in the first 5 years, implementation of financially feasible projects the following 5 years | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | | | | | | |
| 4b | Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "3" and "4", implementation of financially feasible projects the following 5 years | | | | | | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | |
| 4c | Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "5" and "6", implementation of financially feasible projects the following 5 years | | | | | | | | | | | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | |
| 4d | Apply the Surface Water Conservation, Groundwater Protection & Reuse Management Strategies to the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "7" and "8", implementation of financially feasible projects the following 5 years | | | | | | | | | | | | | | | | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ |
| 5a | Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "1" and "2" in the first 5 years, implementation of financially feasible projects the following 5 years | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | | | | | | |
| 5b | Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "3" and "4", implementation of financially feasible projects the following 5 years | | | | | | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | |
| 5c | Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "5" and "6", implementation of financially feasible projects the following 5 years | | | | | | | | | | | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | |
| 5d | Apply the Surface Water Treatment and Flood Control Management Strategy for the subbasins in the WSA using the methodology described in Section 5.2 to identify CIPs where most beneficial and where feasible. | Evaluate and identify CIPs for subbasins receiving a rank of "7" implementation of financially feasible projects the following 5 years | | | | | | | | | | | | | | | | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ |
| 6 | For those areas not already served by reclaimed water, identify large potential users (i.e., golf courses, parks, recreational areas) and implement stormwater irrigation practices where practicable and financially feasible. Potential sites will have to be evaluated independently on a case-by-case basis based on actual conditions. | Evaluate 1 basin (i.e. watershed) every 5 years, reference watershed list | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ |
| 7 | Strengthen or add language to existing codes where it pertains to redevelopment and stormwater management. | 5 year duration or as directed by the Wekiva Parkway & Protection Act Legislation | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | | | | | | | | | | | |
| 8 | Continue to implement stormwater maintenance and inspection activities as defined by the NPDES MS4 permit or by already established programs. | | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ |
| 9 | Develop a pro-active routine inpection and maintenance program of stormwater facilities. | 5 year duration | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | | | | | | | | | | | |
| 10 | Evaluate individual maintenance programs to identify areas where improvements can be made. The use of a standard rating system, such as a level of service for maintenance, could be used to evaluate such a program. | 5 year duration | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | | | | | | | | | | | |
| 11 | Establish a dedicated funding source, such as a stormwater utility, that can be used for planning, implementation and O&M of regional projects within the WSA. | 10 year duration or as directed by the Wekiva Parkway & Protection Act Legislation | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | | | | | | |
| 12 | Establish a joint planning ageement between local governments in the WSA that will facilitate the planning and implementation of regional projects. | 5 year duration | ♦ | ♦ | ♦ | ♦ | ♦ | | | | | | | | | | | | | | | | | | | | |

*It is recommended the schedule should be updated every 5 years at a minimum

# Section 8
# References


Barraclough, J.T. 1962. Ground-water Resources of Seminole County, Florida: Florida Geological Survey Report of Investigations No. 27, 91 pp.

Birdie, T.R., and Blandford, T.N. 1994. Ground-water Flow and Solute Transport Modeling Study for Seminole County, Florida, and Adjoining Regions: St. Johns River Water Management District Special Publication SJ94-SP6, 65 pp.

Bush, P.W., and Johnston, R.H. 1988. Ground-water Hydraulics, Regional Flow, and Ground-water Development of the Floridan Aquifer System in Florida and in parts of Georgia, Alabama, and South Carolina: U.S. Geological Survey Professional Paper 1403-C, 80 pp.

Camp, Dresser & McKee, Inc. 2005. Wekiva River Basin Engineering Assistance for Rulemaking.

Camp, Dresser & McKee, Inc. 1998. Rouge River National Wet Weather Demonstration Project, User's Manual: Watershed Management Model Version 4.1.

Center for Watershed Protection. 2001. Redevelopment Roundtable Consensus Agreement, Smart Site Practices for Redevelopment and Infill Projects.

Charlotte Harbor National Estuary Program. 2003. Assessing the Densities and Potential Water Quality Impacts of Septic Tank Systems in the Peace and Myakka River Basins.

Conklin, Porter & Holmes, Inc. 2002. City of Eustis Master Stormwater Plan.

Dyer, Riddle, Mills & Precourt, Inc. 2003. Big Wekiva Basin Engineering Study and Drainage Inventory Phase II.

Environmental Research & Design, Inc. 2005. Sweetwater Cove Tributary Surface Water Restoration Project Phase 2 Restoration Plan.

Florida Department of Environmental Protection. Division of Water Resources. 2005. Florida's Total Maximum Daily Load Program: the First Five Years – A Report to the Legislature and Governor. 26 pp.

Florida Department of Environmental Protection. 2004. A Strategy for Water Quality Protection: Wastewater Treatment in the Wekiva Study Area.

Florida Department of Environmental Protection. 2004. Draft Nutrient Total Maximum Daily Load for Trout Lake, Lake County, Florida.

Florida Department of Environmental Protection. Division of Water Resources. 2003. Basin Status Report: Middle St. Johns. 345 pp.

Florida Department of Environmental Protection. Division of Water Resources. 2003. Water Quality Assessment Report: Ocklawaha. 437 pp.

Florida Department of Environmental Protection. Division of Water Resources. 2001. Basin Status Report: Ocklawaha. 315 pp.

Florida Department of Health. 2004. Wekiva Basin Onsite Sewage Treatment and Disposal System Study.

Cichon, J.R., et. al. 2005. Report of Investigation No. 104, Wekiva Aquifer Vulnerability Assessment Published for the Florida Geologic Survey.

Fulton et. al. 2003. Interim Pollutant Load Reduction Goals for Seven Major Lakes in the Upper Ocklawaha River Basin. St. Johns River Water Management District. Draft.

German, E.R., and Adamski, J.C. 2005. Hydrology and Water Quality in Lakes and Streams in Orange County, Florida: USGS Scientific Investigations Report 2005-5052.

German, E.R., and Adamski, J.C. 2004. Hydrogeology and Quality of Groundwater in Orange County, Florida: USGS Water-Resources Investigations Report 03-4257, 113 pp.

Harper, H. 1999. Pollutant Removal Efficiencies for Typical Stormwater Management Systems in Florida.

Harper, H. 1994. Stormwater Loading Rate Parameters for Central and South Florida.

Hartman & Associates, Inc. 2003. The Central Florida Drainage Well Inventory.

Lichtler, W.F. 1972. Appraisal of Water Resources in the East-Central Florida Region: Florida Geological Survey Report of Investigations No. 61, 52 pp.

McAlister, T. 1999. Stormwater reuse: a balanced assessment. In Stormwater 2000: The Green with the Gold: Conference Proceedings 26-28 April 1999, ed. J.A. Wood. Stormwater Industry Association.

McGurk, B., and Presley, P. F. 2002. Simulation of the Effects of Groundwater Withdrawals on the Floridan Aquifer System in East-Central Florida: Model Expansion and Revision: St. Johns River Water Management District Technical Publication SJ2002-3, 196 pp.

McKenzie-Arenberg, M., and Szell G. 1990. Middle St. Johns Ground Water Basin Resource Availability Inventory: St. Johns River Water Management District Technical Publication SJ 90-11, 56 pp.

Miller, J.A. 1986. Hydrogeologic Framework of the Floridan Aquifer System in Florida and in parts of Georgia, Alabama, and South Carolina: U.S. Geological Survey Professional Paper 1403-B, 91 pp.

Miller-Sellen & Associates, Inc. 1996. Border Lake Master Plan, Phase I

Murray, L.C., Jr., and Halford, K.J. 1999. Simulated Effects of Projected Ground-Water Withdrawals in the Floridan Aquifer System, Greater Orlando Metropolitan Area, East-Central Florida: U.S. Geological Survey Water-Resources Investigations Report 99-4058, 26 pp.

Murray, L.C., Jr., and Halford, K.J. 1996. Hydrogeologic conditions and simulation of ground-water flow in the Greater Orlando Metropolitan Area, East-Central Florida: U.S. Geological Survey Water-Resources Investigations Report 96-4181, 100 pp.

Post, Buckley, Schuh & Jernigan., Inc. 2002. Draft Orange County Utilities Master Plan.

Professional Engineering Consultants, Inc. 2001. Big Wekiva River Basin Stormwater Management Master Plan.

Schiffer, D.M. 1996. Hydrology of the Wolf Branch Sinkhole Basin, Lake County, East-Central Florida: U.S. Geological Survey Open-File Report 96-143, 29 pp.

Sheffield, C.W., et. al. 1995. "Drainage Wells – A Dual Purpose." Florida Water Resources Journal.

Southeastern Geological Society Ad Hoc Committee on Floridan Hydrostratigraphic Unit Definition. 1986. Hydrogeologic Units of Florida: Florida Geological Survey Special Publication No. 28, 8 pp.

Spechler, R.M., and Halford, K.J. 2001. Hydrogeology, Water Quality, and Simulated Effects of Ground-water Withdrawals from the Floridan Aquifer System, Seminole County and Vicinity, Florida. U.S. Geological Survey Water-Resources Investigations Report 01-4182, 116 pp.

St. Johns River Water Management District. 2004. Pollutant Load Reduction Goals for Seven Major Lakes in the Upper Ocklawaha River Basin: Technical Publication SJ2004-5, 125 pp.

St. Johns River Water Management District. 2003. Draft Water Supply Assessment: Technical Publication SJ2003-XXX, 176 pp.

Tibbals, C.H. 1990. Hydrology of the Floridan Aquifer System in East-Central Florida: U.S. Geological Survey Professional Paper 1403-E, 98 pp.

Toth, D., Rohrer, K.P., and Munch, D.A. 1989. Water Quality Assessment of the Floridan Aquifer in the Wekiva River Basin of Orange, Lake, and Seminole Counties: St. Johns River Water Management District Technical Publication SJ89-5, 46 pp.

United States Environmental Protection Agency. 2003. National Management Measures to Control Nonpoint Source Pollution from Agriculture.

United States Environmental Protection Agency. 1986. Forecasting Onsite Soil Absorption System Failure Rates.

University of Central Florida Stormwater Management Academy. 2003. Stormwater Education Toolkit (SET), Volume II: Business/Industry & Government.

Wanielista, M., and Yousef, Y. 1993. Design and Analysis of an Irrigation Pond Using Urban Stormwater Runoff: Engineering Hydrology (C. Kuo, ed.), 7 pp.

Wekiva River Basin Coordinating Committee. 2004. Final Report.