

I. INTRODUCTION

A. Purpose

As provided in this Natural Groundwater Aquifer Recharge Sub-element, the City of Ocoee has developed guidelines based on the St. Johns River Water Management District's programs. These guidelines are intended to manage and regulate groundwater aquifer recharge and the Florida Department of Environmental Protection's (DEP) objectives of encouraging and promoting effluent disposal by reuse irrigation for groundwater recharge and protection of the aquifer. EPA's National Pollution Discharge Elimination System (NPDES) program deals with regulation of illicit discharges into stormwater systems and waters of the United States; Ocoee has been complying with these regulations for over five years. These programs have been in effect for many years and their implementation is becoming more of an issue with the continued growth and development in the state and the effect of climatic conditions on rainfall.

B. Terms and Concepts

Aquifers are water-bearing layers of porous rock, sand or gravel. Several aquifers may be present below one surface location, separated by confining layers of materials, which are impermeable or semipermeable to water. The surficial aquifer is located approximately 20 to 40 feet deep with ground water levels between 1 to 6 feet. The Floridan Aquifer, where the City of Ocoee obtains its potable water from, is located beneath a clay confining layer known as the Hawthorne Formation. The Floridan Aquifer ranges from approximately 100 feet below ground surface to over 2000 feet deep.

The primary source of water in aquifers is rainfall. Under the force of gravity, rainfall percolates downward through porous surface soils to enter the aquifer strata. Because of the variable permeability of different soil types, the rate of aquifer recharge from percolating rainfall may vary from one location to another. Areas of the City having soils determined by the Soil Conservation Service (SCS) as Type "A" Hydrologic Soil Group (HSG) are classified as a "high recharge rate" area by the United States Geological Survey, while those areas having soils determined by the SCS as Type "C" or "D" HSG are classified as a "low recharge rate" area.

SJRWMD has also identified the City to be within the "Most Effective Recharge Area" of the Wekiva River Hydrologic Basin. The District also defines areas having Type "A" HSG as being the "Most Effective Recharge Area." SJRWMD has a recharge standard that specifically applies to the "Most Effective Recharge Area" of the Wekiva River Hydrologic Basin. Figure 3 in the Future Land Use Element is a map of the groundwater recharge areas in the City.

Since aquifer recharge areas are surface features, they are subject to alteration by development. Covering a recharge area with impervious surfaces, such as roads, parking lots, and buildings reduces the area available for rainfall percolation, altering the total rate and volume of recharge in that area. Increasing the rate at which stormwater drains from recharge area surfaces also decreases recharge potential.

A second concern related to development within aquifer recharge areas is the potential for contamination of groundwater within the aquifer. Just as with stormwater runoff to surface waters, pollutants picked up by runoff, which enters an aquifer, can degrade the quality of the groundwater. Since water flows within an aquifer in a manner similar to surface water flow, downstream portions of the groundwater may be polluted over time. This becomes particularly significant when the aquifer is tapped as a potable water supply downstream.

Over the past ten years, DEP and St. Johns River Water Management District guidelines have worked towards maximized aquifer recharge. The St. Johns River Water Management District regulations require storage of stormwater runoff for treatment purposes and for retention/detention to enhance the ability of the rainfall runoff to percolate into the ground instead of running off into the waterways. In addition, the increased use of treated wastewater effluent for irrigation of agricultural lands, golf courses and residential and commercial properties has also provided an additional source of water for groundwater recharge.

C. Environmental Setting

The City of Ocoee lies within three major river basins: 1) the Kissimmee, 2) the Oklawaha and 3) the Middle St. Johns. The City is within an area identified as the Mt. Dora Ridge, characterized by undulating hills with well-drained sandy soils, dotted with frequent lake depressions. The summers are long, hot, and humid. Winters are mild with infrequent cold fronts dropping temperatures to below freezing. The mean annual precipitation is approximately 48 inches. Three ecological communities are present in and around the City: 1) Longleaf Pine-Turkey Oak Hills, 2) Oak Hammocks, and 3) the Freshwater Marsh or wetlands. The City is characterized by many sinkholes and depressions that usually contain water.

The United States Geological Survey identifies a large percent of the land area of the City of Ocoee as being in a "high recharge area" to the Floridan Aquifer. High recharge areas are those areas that donate between 10 and 20 inches of water to the aquifer per year. These areas are generally well drained upland areas characterized by poorly developed stream drainage systems and many closed depressions, some of which contain water perennially.

The soil characteristics of Ocoee are detailed in the Drainage Sub-Element. Also identified are areas of high recharge due to soil conditions and surface water locations. Development within these areas is governed by the St. Johns River Water Management District in relation to stormwater runoff and its detention/retention for ensuring adequate groundwater recharge. The City follows these regulations very closely and even further enhances them in areas of land locked drainage basins by requiring larger retention ponds, that not only aid in preventing flooding but allow for more time for groundwater recharge.

D. Regulatory Framework

In 1986, the Federal Safe Drinking Water Act (P1 93-523) was amended to strengthen protection of public water system wellfields and aquifers that are the sole source of drinking water for a community. The amendments for well-field protection require states to work with local governments to map wellhead areas and develop land use controls that will provide long-term protection from contamination for these areas. Under the guidelines of Chapter 62 of the FAC, DEP established the Source Water Assessment and Protection program to provide an effective mechanism to proactively protect the State's water sources from potential contamination.

Included and as an addition to this program, DEP has promulgated regulations on wellhead protection and watershed management. In 1998, EPA approved Florida's wellhead protection program, which will coordinate and build on existing programs and rules that protect the state's ground water resources. The implementation of these programs is projected to take place over the next five years.

In implementing the Florida Safe Drinking Water Act (Ch. 403, FS), DEP has developed rules classifying aquifers and regulating their use (Chapter 62-520, FAC). DEP has also established regulatory requirements for facilities which discharge to groundwater (Section 62-3, FAC) and which inject materials directly underground (Chapter 62-528, FAC).

The task of identifying the nature and extent of groundwater resources available within the state has been delegated to the regional water management districts. Each district must prepare and make available to local governments a Groundwater Basin Resource Availability Inventory (GWBRAI), which the local governments are to use to plan for future development in a manner, which reflects the limits of available resources. Ocoee follows these regulations and guidelines as required by the water management district.

EPA's NPDES regulations were promulgated in 1990, to control stormwater discharges and to track and monitor sources of stormwater pollution. While this program does not directly affect aquifer recharge, it does aid in the control of possible pollution contamination of stormwater runoff and its ability to percolate into the groundwater and affect the quality of the aquifer. Ocoee has been actively involved in the establishment of and the continued monitoring of possible illicit discharges into the stormwater collection and storage systems throughout the City.

Orange County has not enacted any additional restrictions on the protection of groundwater and the aquifers. Orange County is aiding DEP in the administration of their programs.

II. EXISTING CONDITIONS

The surficial aquifer in Ocoee lies just below the surface and encompasses the entire city. All surface water systems (lakes) are directly connected to this aquifer. Water enters this aquifer by infiltration from rainfall in varying degrees, depending on percolation rates of soils and extent of impervious areas caused by development. Also, rainwater enters the aquifer through the several lakes in Ocoee. This surficial aquifer level varies seasonally throughout the city.

The Floridan Aquifer lies below the Hawthorne Formation and its water level is measured by obtaining the potentiometric level. Differences between recharge and withdrawals will cause a difference in this level. Yearly rainfall amounts will also affect the potentiometric level in the Floridan Aquifer, although slower than its effect on the surficial aquifer. Consecutive years of excessive rainfall will cause an increase in the piezometric level and consecutive years of below average rainfall will have a negative effect on the level.

As growth continues and withdrawals increase, the Floridan Aquifer water level will decrease, unless measures are taken to increase the amount of water put back into the ground to counteract the increased withdrawal. The eastern half of the City is located in a high recharge area averaging between 10 to 20 inches per year, which aids in aquifer recharge. The western half is located in a low recharge area averaging between 0 to 3 inches per year in aquifer recharge. Both of these recharge areas are shown Figure 2.4 from the PEC report. The City of Ocoee obtains 100 percent of its potable water supply from the Floridan Aquifer. Groundwater withdrawal rates in 2000 averaged 6.303 MGD.

As development continues in Ocoee, the amount of undeveloped recharge area will decrease. Presently, the southern and eastern portions of the city are continuing to experience increased growth. The water management district policies require reduction of groundwater withdrawals and aquifer protection. These policies are in conjunction with those of DEP. The City presently can utilize the same criteria of the Drainage Sub-element, which controls contaminants to surface waters. This program will aid in protecting the surficial aquifer from any further source of pollution.

III. NEEDS ASSESSMENT

With the approval of the DEP wellhead protection and groundwater management programs, Ocoee will be working closely with DEP and the water management districts to implement these programs within Ocoee and to coordinate with the surrounding entities to enact a concerted effort in water resources management to protect the aquifers, allow for adequate recharge, and to ensure against possible contamination.

A citywide groundwater aquifer recharge plan and wellhead protection program will be developed to protect aquifer recharge volumes as DEP and water management district programs are enacted. The aquifer recharge plan will be similar to the anticipated water management district's plan, except address concerns only in Ocoee. Included in the aquifer recharge plan will be development guidelines and regulations for development in all high recharge areas. This plan will be finalized after the review of the approved DEP and water management district's groundwater aquifer recharge policies.

IV. CONCLUSIONS

Due to high growth rates and reduced annual rainfall, replenishing and protecting the aquifer has become a major concern to the City of Ocoee. The City will continue to participate and review the United States Geological Survey monitoring program concerning changes in the potentiometric surfaces.

The city anticipates developing and implementing an aquifer protection program that is in compliance with the requirements and recommendations of DEP and the local Water Management District and Orange County. The City will also encourage cluster development that promotes the creation of open space for recharge and discourages urban sprawl.

The element is based on the best available data and mandates future analysis for specific programs.

V. GOALS, OBJECTIVES, AND POLICIES**GOAL: TO PROTECT THE GROUNDWATER QUALITY AND ASSURE MAXIMUM NATURAL GROUNDWATER AQUIFER RECHARGE AMOUNTS POSSIBLE WITHIN THE CITY OF OCOEE.**

Objective 1: The City shall protect aquifer recharge areas and the functions of stormwater basins and natural drainage features.

Policy 1.1: The City shall review and cooperate in development of the local Water Management District's plan for protection, replenishment and maintenance of aquifer recharge areas, groundwater basins, and natural drainage features.

Policy 1.2: Within one year of adoption of the Water Management District's Groundwater Aquifer Recharge Plan, the City shall incorporate the pertinent restrictions into the land development regulations.

Policy 1.4: The City will continue to follow DEP and Water Management District regulations for defining protection areas and water supply sources. As these regulations and programs are revised, the City will review and update its policies as they apply to the revised regulations and the Ocoee area.

Policy 1.5: The City will continue to develop and expand, as able, its reuses program to maximize groundwater recharge by irrigation with treated wastewater effluent.

Objective 2: The City shall coordinate with other government entities regarding development of protection standard for groundwater basins.

Policy 2.1: The City Engineer shall cooperate with the local Water Management District in preparation of a Groundwater Basin Resource Availability Inventory.

Policy 2.2: The City Engineer shall continue to cooperate with the local Water Management District and Orange County to identify and eliminate potential pollution sources that may contaminate the aquifer.

Policy 2.3: The City Engineer shall cooperate with Orange County to provide information and technical assistance in developing a uniform set of guidelines for protection of the aquifer and groundwater basin.

Policy 2.4: The City Engineer shall coordinate with Orange County in developing and implementing a contamination-monitoring program.

Objective 3: The City shall update the stormwater Sub-element and the Capital Improvement Element of the Comprehensive Plan by March 2010, to ensure the

implementation of the master stormwater management plan under ss.369.321(2), F.S. [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F. S.]

Policy 3.1: The City shall implement the updates to the Stormwater Sub-element and the Capital Improvement Element within six months of the stipulated settlement agreement based on the regional stormwater management plan as required under ss. 369.319, F. S.

Policy 3.2: The goals, objectives and policies of the Stormwater Sub-element and the Capital Improvements Element shall be amended within six months of the stipulated settlement agreement based on the region stormwater management plan. [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F. S.]

Policy 3.3: The amendments shall include an assessment of existing problems and deficiencies together with identification of projects to meet long-range needs; priorities to address existing deficiencies; measures to address redevelopment; schedule for completing needed improvements; evaluation of the feasibility of stormwater reuse; requirements for inspection and maintenance of facilities; and, funding implementation of mater stormwater plans and maintenance. [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F. S.]

Objective 4: As of the effective date of this objective, in order to minimize the contribution of nitrates to groundwater and to foster long-term stewardship of the springs, special design and best management practices (BMPs) shall be instituted for all development within the Wekiva Study Area. [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F.S.]

Policy 4.1: Development shall use joint or shared access to the maximum extent feasible in order to minimize impervious surfaces. [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F.S.]

Policy 4.2: Non-residential development shall use shared parking to the maximum extent possible in order to minimize impervious surfaces. All parking lots with 100 or more spaces be designed with a minimum of twenty (20) percent of the parking spaces in pervious areas. [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F.S.]

Policy 4.3: Design of parking lots, sidewalks, buildings and other impervious surfaces shall minimize connections between impervious surfaces through techniques shown on a site plan such as [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F.S.):

- a. Directing flows from roof drains to vegetated areas or to rain barrels or cisterns for reuse of water;
- b. Directing flows from paved areas to vegetated areas;
- c. Locating impervious surfaces so that they drain to vegetated buffers or natural areas; and,
- d. Breaking up flow directions from large paved surfaces.

Policy 4.4: Porous pavement materials, pervious concrete and pervious asphalt should be used to minimize the amount of impervious surface within new development and redevelopment. [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F.S.]

Policy 4.5: Drainage for streets and roads shall be through roadside swales and berms where rural patterns of development are utilized. [Wekiva Parkway and Protection Act (WPPA): Ch. 269.321(3), F.S.]

Policy 4.6 Commercial and industrial development shall be designed to minimize site disturbance by limiting clearing to the minimum area necessary to accomplish development [Wekiva Parkway and Protection Act (WPPA): Ch. 369.321(3), F.S.]:

- a. Avoid or minimize the removal of existing trees and vegetation;
- b. Minimize soil compaction by delineating the smallest disturbance areas feasible;
- c. Maximize disconnection of impervious surfaces to reduce water runoff flows and increase opportunities for infiltration.

Policy 4.7 In order to be consistent with the City's Drainage Sub-Element of the Comprehensive Plan, the following policy is added. All new development, except non-substantial redevelopment projects, shall utilize best management practices in combination as part of a BMP treatment train to protect water quality and minimize flooding. BMPs shall be used in the design of stormwater management facilities and systems. The following stormwater BMPs shall be instituted to reduce nitrate loading within the Wekiva Springs Overlay Protection District:

- a. All rural residential development shall use swales with swale blocks or raised driveway culverts, whenever possible, except when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida.
- b. Vegetated infiltration areas shall be used to provide stormwater treatment and management on all non-urban sites (i.e. parks, churches) except when soil, topography, or seasonal high water conditions are inappropriate for infiltration as determined by a professional engineer licensed in the State of Florida. Design of the stormwater systems for non-urban uses shall use bio-retention areas (below grade vegetated areas) to increase stormwater treatment and reduce stormwater volume. Downspouts for non-urban development shall be directed from the roof to vegetated swales, where possible, or directed to the stormwater management system for treatment.
- c. Wet detention systems shall be used for stormwater treatment and management only if dry infiltration systems are not feasible.
- d. Sensitive karst features, including sinkholes with a direct connection to the aquifer and stream-to-sink features, shall not be utilized as stormwater management facilities. Prior to subdivision approval, all depressions will be investigated by a licensed professional geologist using a professionally acceptable methodology for suitability of water

retention area using generally accepted geo-technical practices with an emphasis on identification of potential connections to the aquifer. If connections are determined to exist, the depression shall not be used for stormwater retention and the area draining to this feature under pre-development conditions shall be preserved through a conservation easement.

- e. All development approval by the City of Ocoee shall require the applicant to submit to the City of Ocoee a copy of the SJRWMD or DEP stormwater permit and the NPDES notice of intent to be covered by the construction generic permit prior to any land clearing.
- f. Karst features with a direct connection to the aquifer will be identified and placed in a conservation easement so that they will be thereafter used solely for passive recreation subject to permitted activities in subparagraph (d) herein.
- g. All components of the stormwater treatment and management system shall be owned and maintained by the responsible legal entity identified in the SJRWMD or DEP stormwater permit, typically a homeowner or property owners association.

Policy 4.8: In addition to requiring minimum level of service standards established by the Comprehensive Plan Drainage Sub-element, the City shall ensure that post-development recharge volume conditions approximate pre-development recharge volume conditions within the Wekiva Study Area protection zone. This shall be accomplished in the Land Development Regulations by requiring that the first three inches of stormwater be retained on site within Type A soil areas in the Wekiva Protection Zone for basins that have a positive outfall. For land-locked basins, retention for the 100-year 24-hour storm will be required for the entire site. As an alternative for positive outfall basins, an applicant may conduct a hydrological survey and site analysis to demonstrate that post-development recharge is equal to or greater than pre-development recharge.

Policy 4.9 By January 2010, develop an educational program, incentive program, and appropriate regulations to protect groundwater supply and enhance the functions of water recharge areas in the City of Ocoee Wekiva Study Area.

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