INFRASTRUCTURE ELEMENT

September 12, 2011

Infrastructure Element Data and Analysis

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Terms and Concepts

Regional Facilities

Regional facilities are large scale sanitary sewer systems which generally provide service to densely populated areas. These facilities are comprised of three components which perform the basic functions of collection, treatment and disposal sewage.

The collection system is composed of a network of sewer pipes which collect sewage (also called wastewater) from individual establishments and convey it to a central location for treatment. The collection network is generally laid out in a pattern roughly analogous to the branching pattern of a tree.

The major components of the collection network are the trunk mains and interceptors. Interceptors are defined as sewers which connect directly to and convey sewage to the treatment plant. Trunk mains are defined as sewers which connect directly to and convey sewage to an interceptor.

The treatment plant is the component of the regional sanitary sewer facility which functions to remove solid and organic materials from the sewage. There are a large number of processes which can accomplish this, but they are generally grouped into one of the following three categories depending on the proportions of materials removed.

Primary Treatment

This refers to the removal of between 30 and 35 percent of the organic materials and up to 50 percent of the solids from the sewage. This is also commonly referred to as physical treatment because screens and settling tanks are the most common methods used to remove the solids.

Secondary Treatment

Secondary treatment processes remove between 80 and 90 percent of total organic materials and suspended solids from sewage. This level of treatment generally requires multiple steps involving one biological process and one or more processes from removal of suspended solids.

Tertiary Treatment

Sewage may also contain large quantities of synthetic organic compounds or inorganic chemicals which may create pollution problems if not removed. Tertiary (or advanced) treatment adds steps to primary and secondary processes to remove these pollutants. The most common tertiary processes remove compounds of phosphorus and nitrogen. The effluent of advanced treatment processes often approaches potable water quality standards.

Effluent and sludge are the waste products of the treatment process. Effluent is the treated wastewater which flows out of the treatment plant. Effluent disposal alternatives include discharge to a water body, irrigation, reuse or injection into deep aquifers. Sludge refers to the accumulated solid residues of the treatment process. Prior to final disposal, sludge is usually subjected to an additional biological treatment process to remove pathogens and to physical dewatering process to facilitate transportation and disposal. Common disposal methods include burial in solid waste landfills and land application as a soil conditioner for agricultural purposes.

Package Treatment Plants

Package treatment plants are essentially small treatment systems which have a collection network, treatment plant and disposal system. Package plants may be designed to provide any level of treatment, but plants providing secondary treatment are most commonly used. Package plants are available in a range of capabilities up to one million gallons per day. They are generally used to serve isolated development and are usually partially or completely preassembled by the manufacturer prior to shipment to the site of use.

Septic Tanks

Septic tank systems are usually used to serve single housing units, although relatively large-scale systems have proven successful. The system consists of two components, the septic tank and the drainage field. The tank receives wastewater from the home and provides a period of settling, during which time a significant portion of the suspended solids settle out. The settled solids are gradually decomposed by bacteria in the tank. The remaining liquids are discharged through underground drainage pipes into the drainfield and percolate into the soil where microorganisms and filtration process purify the liquids. Septic tanks generally require cleaning every three to five years to remove accumulated solids. These solids, called septage, are generally transported to regional sanitary sewer facilities for treatment prior to disposal.

Regulatory Framework

Federal

The Federal Water Pollution Control Act (PL 92-500) is the controlling national legislation relating to the provision of sanitary sewer service. The goal of this act is the restoration and/or maintenance of the chemical, physical, and biological integrity of the nation's waters. The act established the national policy of implementing area-wide waste treatment and management programs to ensure adequate control of sources of pollutants. Under Section 201 of PL 92-500, grants are made available to local governments to construct facilities to treat "point sources" of pollution, which includes effluent from sewage treatment processes. The U.S. Environmental Protection Agency (EPA) is responsible for implementing the act.

State

The Florida Department of Environmental Protection (DEP) is responsible for ensuring that the State carries out responsibilities assigned to it under PL 92-500. The FDEP has adopted rules for

the regulation of wastewater facilities in Chapter 17-6, F.A.C. These rules apply to facilities which treat flows exceeding 5,000 gallons per day for food service establishments, and where the sewage contains industrial, toxic or hazardous chemical wastes.

The Florida Department of Health (DOH) regulates septic tank and drainfield installation within the state. These requirements have been adopted by rule in Chapter 64E-6, F.A.C. This code and F.S. 381.00655 require that septic tank users hook-up to sewer service within one year of the date availability. Pursuant to recent legislation, inspections of septic tank systems for operational integrity will be required every 5 years.

County

The Citrus County Environmental Health Department is the local state office of the DOH agency responsible for permitting and regulation of septic tanks, drainfields and package treatment plants. This department enforces the governing Environmental Health Code 64E-6, F.A.C. and F.S. 381.00655.

Municipal

The City of Crystal River has also adopted rules and regulations governing sewer system hook-ups which are consistent with State Environmental Health Code 64E-5, F.A.C. and F.S. 381.00655, but provides for a shorter (three month) mandatory hook-up time period.

Existing Conditions

The City of Crystal River has one wastewater treatment plant in operation, with a treatment capacity of 1.5 million gallons a day (MGD). The City contracts with a private-sector entity (Veolia Water, Inc.) to operate the wastewater treatment plant, all collection lines and related infrastructure, and the sprayfield utilized for effluent disposal. Municipal treatment facilitates are located in the City adjacent to NE 11th Street.

Residential uses comprise the largest component of sewage treated by the City's treatment plant with 1,778 connections within the city limits and two connections outside the city limits. Commercial and industrial uses represent a small percentage of sewage treated by the City's treatment facility with 398 commercial connections within the city limits and no registered commercial connections outside the city limits. A few septic tanks remain in operation within the City of Crystal River. Noting these exceptions, the geographic service area for central sanitary sewer is the area of jurisdiction for the City of Crystal River. Connection information pertaining to industrial customers was not available during the data collection process.

Elimination of Septic Tanks & Package Plants

The City of Crystal River has made it a priority to eliminate septic tanks within its service area due to concerns with potential groundwater contamination and the resultant impact on the Kings Bay/Crystal River waterway systems. The City successfully secured a Disadvantaged Small

Communities (DSC) grant from the Florida Department of Environmental Protection (FDEP) in 1999 for the purpose of extending sewer service into the majority of areas within its service territory not served by central sewer service at that time. While the City initially struggled to move forward with this grant for a variety of reasons, it has over the past four years completed all of the grant areas within the city limits. As a result of the work done under the DSC grant within the city limits, it is estimated that no more than twenty (20) locations are still on septic tank service within the city limits at this point. These locations have not been connected to central sewer service due to remote locations and the resultant high cost of connection. The City is continuing to look at options to provide these locations with central sewer service.

The City's difficulties in moving forward with the DSC grant had led to some consideration of terminating that grant upon completing work within the city limits, which would have resulted in sewer service not being extended into an unincorporated area adjacent to the City that includes approximately 600 residential septic tank systems. In August, 2009, however, the City executed an Interlocal Agreement with Citrus County that commits the City to extend sewer service into the areas originally covered by the DSC grant. As a result of that agreement, the City has proceeded to finalize engineering design plans for extending sewer service into a significant portion of that area and those plans have been submitted to FDEP for grant funding consideration. Engineering design will be completed for the remaining portion of the area once a funding timeline is received from FDEP for the plans that have been submitted.

The City extended sewer service to the Plantation Resort in 2009, which allowed the package plant that had previously served that facility to be eliminated. As a result, there are no package plants currently in operation within the City's service area.

Treatment Capacity

The current treatment capacity of the City's wastewater treatment plant is 1.5 MGD. In October, 2005, the City had a wastewater treatment facility capacity report completed. That report anticipated that the maximum 3-month average daily flow through the wastewater treatment facility was expected to exceed the 1.5 MGD capacity by as early as June, 2006, based on a then-daily average daily flow (ADF) in excess of 1.1 MGD through the plant and the pending construction of three major residential developments. On the basis of that projection, the City entered into a contract for the design of a plant expansion in May, 2006.

Although that design work was completed, several changes have subsequently taken place that has significantly impacted the planned course of action. First, economic conditions have resulted in none of the three proposed developments going forward, substantially reducing the future demand projections. Secondly, the City initiated an aggressive program to address an ongoing problem with inflow and infiltration (I & I) into its sewer collection system in 2008 which resulted in the ADF through the plant being reduced from the 2005 level of 1.1 MGD to a current 12-month average ADF of .815 MGD, inclusive of designated reserved capacity requirements. The City is currently completing a second phase of I & I repair that is expected to further reduce the ADF. Finally, the previously-mentioned Interlocal Agreement executed with Citrus County in 2009 gives the City the option of installing an inter-tie with the county sewer collection

system for the purpose of diverting an amount of flow equal to that generated by the portions of the DSC grant that are within the unincorporated area for a period not to exceed ten (10) years from the point that the City notifies the County of the intent to establish such a inter-tie connection. The Interlocal Agreement also re-defines and reduces the City's service area for the provision of sewer service and thus significantly reduces future demand.

Needs Assessment

The City of Crystal River has adopted a Level of Service for Sanitary Sewer Service of 151 gallons per capita per day for average and peak flow. The adopted standard within the City reflects typical municipal wastewater output of 150 gallons per capita per day in the United State at large. Thus, the adopted standard is appropriate and should support the public's exceptions for quality of service.

Existing sanitary sewer system capacity is 1.5 million gallons per capita per day. The 2010 flow rate is 228 gallons per capita per day, which leaves surplus system capacity of 665,150 gallons per capita per day. Based on this information, it is possible to conclude that the City's sanitary sewer system's present operations achieve compliance with the minimum, adopted level of service standard. Projecting future demand as a function of population growth shows that demand for sanitary sewer service will increase over the planning timeframe proportionally. The City of Crystal Rivers population is forecast to increase from 4,153 persons to 4,632 persons by the end of the first and second planning periods in 2015 and 2020, respectively.

As a consequence, by 2015, the average daily flow will increase from the 2010 rate of about 815,000 gallons per capita per to 947,601 gallons per capita per day. Accordingly, that level of demand leaves 36.8% of total sanitary sewer system capacity available as surplus for the second planning period. By 2020, total demand for sanitary sewer would increase to 1,056,853 gallons per capita per day with a remainder of 29.5% of total system capacity available to meet demand growth beyond the end of the first and second planning period. Thus, the City will have adequate capacity to meet future and projected needs throughout both planning periods, and it is not necessary to identify options for mandatory system expansion and capacity development at this time to maintain LOS compliance.

An operating Level of Service analysis has been completed as part of the Capital Improvements Element (CIE). This analysis details the existing LOS analysis, as well as, a future operating LOS analysis for the years 2014-2015. Future LOS analysis will be part of the annual CIE updates, which will be carried throughout the remaining planning period to 2020. Information from the annual CIE update will help determine future demand for sanitary sewer service as well as flow rates.

At this time, the City has completed design documents for a 1 MGD expansion of its wastewater treatment plant that could be accomplished within the current plant site, but does not plan to proceed with such and expansion until the need for the additional capacity is demonstrated in accordance with the provisions of Rule 62-600.405, Florida Administrative Code, which addresses planning for wastewater facilities expansion.

Soil Analysis

To aid the process of assessing a location's suitability for septic tanks, the Soils Map contained in the Future Land Use Map Series may be utilized. [9J-5.011(1)(f)(4)] But generally, soils in developed areas that are utilizing septic tanks are not favorable. The accompanying soils table specifies the soil types and characteristics found in the affected subdivisions. Four of the soils, Bassinger Fine Sand, Eau Gallie Fine Sand, Okeelanta-Lauderhill-Terra Ceia Mucks, and Terra Ceia-Okeelanta Association are in the wetlands (or hydric) category. These soils are generally not suitable for development and are for the most part vacant and unimproved. Except for one moderate designation, the remaining soils categories also rank as severe for septic tank drain field usage.

The problem of soil suitability is reduced somewhat by the practice of adding fill to lots to be developed, and by specifically elevating the septic tank. However, given the overall problems of wetness, ponding, poor filtering and potential for surface and subsurface water contamination, the only viable long-range solution is totally convert from septic tank to sanitary sewer usage.

Effluent Disposal

The City currently uses a spray-field to dispose of its treated wastewater effluent, which is highly treated but not to a sufficient extent to qualify for public re-use purposes. Discussions are underway with the Southwest Florida Water Management District (SWFWMD) and Progress Energy, an electric utility that operates a major power-generation site within Citrus County. The intent of these discussions is to develop an agreement whereby the city's treated effluent would be piped to the Progress Energy site for their use in lieu of groundwater withdrawal within the newly-installed desulphurization process at that location. Since this would reduce Progress Energy's permitted groundwater withdrawal by approximately one-third (1/3), SWFWMD has indicated a willingness to fund a significant portion of the project. The effluent is already treated to a sufficient level to serve the intended purpose within the de-sulphurization process, and that process requires sufficient daily flow to take 100% of the City's effluent flow. Once in place, this will allow the city to eliminate use of the spray-field except under contingency situations.

Sanitary Sewer Sub-Element
Goals, Objectives, and Policies

GOAL 1: The City of Crystal River will ensure adequate collection, transmission, treatment, and effluent disposal capacity to meet existing and future sanitary sewer demands within its defined service area.

OBJECTIVE 1.1: The City will provide adequate sanitary sewer treatment capacity to meet the current and projected demand within its defined service area.

POLICIES:

A). The City shall provide sanitary sewer service within its Utility Service area only pursuant to an executed interlocal agreement with Citrus County. This will result in a lower and more predictable pattern of growth.

B). The City will conduct a capacity analysis and review of the Utility Service Area boundaries as part of annual update of the Capital Improvements Element to document its average daily flow (ADF) and maximum daily flow performance metrics versus available wastewater treatment plant capacity.

C). The City will continue to monitor inflow & infiltration of sewer and make repairs to minimize the flow to be treated at the wastewater treatment plant.

D). The City will evaluate and establish an inter-tie with the County sewer collection system if required to allow for excess flow to be diverted.

E). The Capital Improvements Element shall establish a minimum level of service standard for sanitary sewer by policy adoption.

OBJECTIVE 1.2: The City will evaluate and extend sanitary sewer collection lines to those areas within its defined service area that are not currently served by sanitary sewer service.

POLICIES:

A). The City will identify all areas within its defined service area that are not currently served by sanitary sewer service.

B). The City will develop plans to extend sanitary sewer collection lines to areas not currently served by sanitary sewer service, with execution of that plan to be conditioned on the availability of sufficient funding.

C). The City will pursue federal and state funding assistance for the extension of sanitary sewer collection lines whenever such funding assistance is available.

OBJECTIVE 1.3: If the City determines through annual update of the capital improvements element that a sanitary sewer LOS deficiency exists, then such deficiencies will be eliminated by improvements programed into the 5-Year Schedule of Capital Improvements.

POLICIES:

A). The City Public Works Department will monitor the performance of the municipal sanitary sewer system parameters, reporting annually to the Planning and Community Development Department as part of the CIE update any recommendations for necessary improvements in response to unexpected change in LOS related conditions. Recommendations shall also include guidance on necessary replacement of system components and identification of priority projects needed for sanitary sewer system development.

B). The City will install a parallel force main to serve the southern end of its defined service area, as recommended in the flow study conducted in February, 2010.

~~B~~C). Flow studies on the sanitary sewer system will be conducted every three (3) years.

OBJECTIVE 1.4: The City will pursue the replacement of its current sprayfield operation with a more environmentally-friendly means through which to dispose of its treated wastewater effluent.

POLICIES:

A): The City will pursue the installation of a transmission line to the Progress Energy complex to provide treated wastewater effluent as an alternative to their use of groundwater in a desulfurization process and the City's continued use of a sprayfield for effluent disposal.

OBJECTIVE 1.5: The City shall maximize the use of existing sanitary sewer facilities, expanding central sewer service in a way that furthers implementation of the physical development pattern identified on the Future Land Use Map. [

POLICIES:

A). The local development review process shall require new development or expansion of an existing use to achieve compliance with adopted level of service for sanitary sewer service as well as all municipal codes and requirements.

Solid Waste
Data and Analysis

Terms and Concepts

The comprehensive plan is required to include an analysis discussing solid waste facility needs, identifying potential waste management system problems, and advancing solutions. DCA rule defines the terms used to classify and describe solid waste in the comprehensive plan. Pursuant to DCA rule, such terms have set meanings that function to help structure the sub-element's data and analysis as well as aid understanding of its content.

Specifically, the materials dealt with in this element fall under the definition of "solid waste" adopted in Section 9J-5.003 (119), *Florida Administrative Code* (FAC), which reads:

"Solid waste means sludge from a waste treatment works, water supply treatment plant, or air pollution control facility or garbage, rubbish, refuse, or other discarded material, including solid, liquid, semisolid or contained gaseous material resulting from domestic, industrial, commercial, mining, agricultural, or governmental operations."

In addition, this element will also address planning duties for "hazardous wastes" as defined in Section 9J-5.003 (34), FAC, which reads:

"Hazardous waste means solid waste, or a combination of solid wastes, which because of its quantity, concentration, or infectious characteristics, may cause, or significantly contribute to, an increase in mortality or an increase in serious irreversible or incapacitating reversible illness or may pose a substantial present or potential hazard to human health or the environment when improperly transported, disposed of, stored, treated, or otherwise managed."

For the purpose of this element, the term "solid waste" excludes hazardous waste and has been used to include the following classifications which indicate general characteristics of the materials and their sources of generation.

Residential wastes are mixed household wastes, including yard wastes, generated by the general population.

Commercial wastes are generated by the commercial and institutional sectors. Physical characteristics of these wastes are similar to those of residential wastes, in that they consist largely of combustible materials in the form of paper and food waste from offices, restaurants, retail establishments, school, hospitals, motels, and churches.

Industrial wastes include wastes generated by industrial processes and manufacturing operations, excluding hazardous wastes. These wastes also include general industrial housekeeping and support activity wastes.

Special wastes include wastes having special characteristics or requiring special handling. These wastes include oversize bulky wastes and materials generated in demolition and construction projects.

The primary focus of this element is to establish how the city manages disposal of the solid waste and hazardous waste generated during the comprehensive planning timeframe. For hazardous waste, only collection will be addressed since disposal of such wastes within solid waste landfills is not permitted in Florida.

Regulatory Framework

Although local regulation of solid waste is accomplished by the comprehensive plan, state and federal standards apply. State and federal regulation inform local solid waste management practice. In combination with existing conditions and system parameters, external regulation of solid waste also determines what quality of service it is possible to achieve at the local level. The section below discusses relevant areas of jurisdictional control.

Federal

The potential environmental impacts of solid waste facilities have led to the development of an extensive network of permitting requirements at the federal and state levels. Impacts on air and water quality are reviewed by the U.S. Environmental Protection Agency (EPA) and the Florida Department of Environmental Protection (DEP), and where dredging and filling might occur, by the U.S. army Corps of Engineers (ACOE). The regional water management district also provides state level review for water quality and quantity impacts. Actual construction and operation of solid waste facilities requires further permits and review by DEP. For processing plants which will generate electrical power or require tall emission stacks, further DEP and Federal Aviation Administration (FAA) review may be required.

For hazardous waste, the national Resource conservation and Recovery Act (RCRA) of 1976 directed EPA to develop a national program to regulate and manage hazardous waste and provide incentives for states to adopt consistent programs. Broadly, the act seeks to promote organization of waste disposal in a way that is environmentally sustainable. Local action that seeks to further recycling from the waste stream or minimize the production of solid waste is consistent with RCRA priorities.

The national Comprehensive Emergency Response and Compensation Liability Act (CERCLA), passed in 1980 provided EPA with authority and funds to respond to incidents requiring site clean-up and emergency mitigation (the EPA “Superfund” Program). This act also defined the liability of business engaged in hazardous waste generation, transport and disposal and provided enforcement processes.

State

Within the state of Florida, operations of solid waste management facilities are controlled by the Florida Department of Environmental Protection (DEP) rule chapters 62-701 through 62-722 FAC. These standards supplement planning rule referenced earlier. DEP rule controls the construction, operation, and regulation of solid waste facilities in the best interest of the public's health, welfare and safety by supporting environmental quality. The rule functions to implement Florida Resource Recovery and Management Act, which controls solid waste disposal through Sections 403.702 to 403.7721 Florida Statutes. Like DCA rule, DEP rule importantly differentiates between hazardous and non-hazardous waste for the purposes of landfill operations. Rule 62-701.200, FAC, provides a specific definition of solid waste types as follows:

"Class I waste means solid waste that is not hazardous waste, and that is not prohibited from disposal in a lined landfill …"

"Class III waste" means yard trash, construction and demolition debris, processed tires, asbestos, carpet, cardboard, paper, glass, plastic, furniture other than appliances, or other materials approved by the Department, that are not expected to produce leachate that poses a threat to public health or the environment."

Consequently, landfills are identified as either Class I or as Class III. Because DEP rule controls landfill operations, it is important to note its content. It serves as a reference to better understanding the needs of how best to plan for solid waste disposal and management.

Planning for hazardous waste is a special concern. At the state level, the Florida Resource Recovery and Management Act (Chapter 403.7, F.S.), passed in 1980, adopted federal guidelines and directed DEP to develop and implement a hazardous waste management program. This act provided for: 1) adoption of federal hazardous waste definitions; 2) a system to monitor hazardous waste from generation to disposal; 3) an annual inventory of large hazardous waste generators; 4) permit requirements regulating treatment, storage and disposal of hazardous waste; 5) funds for hazardous waste spill and site clean-up; 6) hazardous waste management facility site selection procedures; and 7) fines and penalties for violators.

Amendments to the Florida Act in 1983 provided directions and funds to establish a cooperative hazardous waste management program between local, regional and state levels of government. These changes included provisions for city-level hazardous waste management assessments, regional and statewide facility needs assessments, and site selection for hazardous waste management facilities at the county, region, and state levels. Subsequent amendment of the act, in 1988, mandated reductions to solid waste generation through implementation of recycling at the county-level throughout Florida. A number of named items, such as lead acid batteries, were also banned from landfills. Then, in 2002, the scope of county-level recycling was expanded. Counties must now recycle at least half of the following categories of recoverable waste: 1) bottles, 2) steel cans,3) aluminum cans, 4) plastic bottles, 5) newspapers, 6) cardboard, 7) office paper and 8) yard waste.

County

The Citrus County Department of Public Works, Solid Waste Management Division, oversees the planning operation of the Citrus County Central Landfill. That facility is the only landfill in operation within the county. The Central Landfill is constructed from component cells that are designed to receive either Class I or Class III waste types. Because Class III waste is more inclusive than Class I, containing recoverable materials, Class I cells are best utilized to dispose of that type of waste as they have been designed to provide a higher standard. Landfill operations do not prohibit but strictly control the disposal of Class III waste onsite.

Intergovernmental coordination between the City of Crystal River, the City of Inverness and Citrus County promotes effective solid waste management, representing a regional approach to associated planning issues. Such action furthers implementation of the Crystal River comprehensive plan. However, no specific capacity is reserved for the City of Crystal River. When viewed from a regional perspective, disposal of Crystal River solid waste in the Central Landfill represents only a small percentage of total available capacity to 2020, and it has not been determined as necessary to date to provide a ceiling on the amount of municipal waste disposed of onsite. As a matter of policy only refuse originating within the county's jurisdiction is accepted, unless otherwise approved by the Board of County Commissioners.

Existing Conditions

The Citrus County Landfill, receiving site for all of the county's solid waste, is located on a 60 acre parcel of the Withlacoochee State Forest – Citrus Tract. The site has been operational since 1975. Disposal takes place at the Citrus County Central Landfill site. The Central Landfill is located 11 miles east of the City of Crystal River, in unincorporated Lecanto, adjacent to State Road 44. From design to construction and operations, the facility conforms to all applicable local, state and federal standards in an effort to maximize public health and environmental benefits. The Central Landfill is a Class I facility owned and operated by Citrus County, and the City of Crystal River does not have direct responsibility for landfill operations, Regional solid waste partnership within Citrus County has proven beneficial to all as service is organized on a highly efficient basis that minimizes cost for municipal and county residents alike. This organization between Citrus County and cities has proven desirable as it allows solid waste produced in anywhere in the county to be disposed of locally, avoiding the cost of transport to out of county landfills for permanent disposal.

Starting in 2003, the City of Crystal River began contracting with a private-sector company for the removal of solid waste within the city. Residential service is provided on a twice-a-week basis and participation is mandatory. The frequency of commercial service is determined by the nature and needs of individual businesses. Residential and commercial rates are subject to review and modification on an annual basis.

The City currently offers single-stream curbside recycling services to its residential customers; this service is built into the base service level and thus there is no cost disincentive to participation. Recycling service is available to commercial customers on an optional contract

basis. The City generally supports maintaining and expanding recycling service as part of its overall approach to solid waste management need within the community.

The level of service standard for the city is based upon a unit contribution rate of 2.5 pounds of residential solid waste per capita per day, excluding yard waste and recycled material. This rate has been calculated by dividing the average daily tonnage by the functional population. It is subject to revision through annual update of the Capital Improvements element, based on local conditions, long-range planning priorities, changes in factors impacting solid waste facility performance, or a combination of factors. The City of Crystal River communicates with all interested stakeholders about solid waste planning issues.

Crystal River Hazardous Waste Management Assessment

The City's contracted service provider has a policy of not collecting hazardous waste. Route crews are instructed not to accept used oil, batteries, non-water base paint, "empty" 55 gallon drums or any other conspicuous hazardous material. The Citrus County Landfill has established programs to accept various classes of hazardous waste on-site. Because the City neither owns nor operates solid waste facilities, issues of hazardous waste disposal are best managed on a regional basis. The City is willing to work with stakeholders to develop solutions on an ongoing basis.

Needs Assessment

As stated throughout this sub-element, Crystal River owns no solid waste related facilities or other equipment. Capital expenditures, including equipment upgrades and facility improvements, are not necessary to ensure continued LOS compliance during the planning timeframe. As a result, the City has addressed identified needs for collection and disposal of solid waste.

Improvements to the county landfill have been made as needed in the past. The Citrus County Comprehensive plan contains capacity assessment and a detailed program from landfill expansion. There are no current nor projected deficiencies to be addressed. Future improvements to the Citrus County Landfill would be programmed the County's financially feasible 5-Year Schedule of Capital Improvements as part year annual update of the CIE.

Hazardous Waste Facilities

The city does not provide for storage or transfer of hazardous wastes. Residents may coordinate directly with Citrus County Solid Waste Management Division staff to learn what the available options for hazardous waste disposal are in a given case. The City generally supports amnesty days, community outreach, and other opportunities that promote options for the proper, lawful management of hazardous waste as well as a greater awareness of solid waste planning issues.

Performance Assessment

A primary purpose of the Infrastructure Element is to evaluate current and future facility needs. This analysis is based on facility design, system capacity and forecast demand. Yet the City of Crystal River does not operate or maintain any solid waste facilities. As a consequence, it has no jurisdictional responsibility to program expenditures relating to solid waste service provision. Level of service provision for solid waste is satisfied on a joint basis within the region through partnership with other Citrus County local governments. Therefore, the performance assessment which follows is intended to provide information relating to the feasibility of that arrangement.

Solid Waste Services – City

The City's refuse collection system generates approximately 149 tons of residential and commercial solid waste per month. In addition, the recycling program generates approximately 17 tons of recycled material per month, and a separate yard waste program collects approximately 35 tons per month. In Fiscal Year 2010, the City of Crystal River generated 1788 tons of aggregate solid waste, which represents about 1.6% of the total solid waste disposed of at the Central Landfill for that same period. There is no information from private waste hauler presently available in city records for segments of waste transported to the Central Landfill.

The City of Crystal River has adopted a level of service standard for solid waste in its Capital Improvements Element of 2.5 pounds per capita per day. The City will provide for the collection and disposal of at least this quantity of solid waste. Expressed as ratio to population, the amount of solid waste generated per person per day equals 2.71lbs. This means the City has achieved compliance with adopted level of service standards by coordinating disposal of more than the required, minimum quantity of solid waste per capita.

The current contractor has adequate resources to handle the established routes and to provide back-up equipment as required due to mechanical break-down. The City has determined that adequate competition exists within the market to ensure future service availability of contracted solid waste collection services to the city. The City will monitor solid waste service provision as part of the annual CIE update to ensure that solid waste level of service is maintained.

Solid Waste Facilities – County

The current 80 acre land fill operated by Citrus County was opened in 1990 and contains one large cell being constructed in multiple phases. The cell accepts all Class I and may accept Class III wastes, has a leachate treatment facility and a recycling collection facility. The life space of the 80 acre site is not known at this time. According to Citrus County the site is of a scale that could last between 20 and 40 years, depending on the details of the cell construction. The first phase included a 34-acre, 80' deep pit, about half of which was lined. This provided approximately seven years of disposal volume. The second phase will line an additional three-acre area and will provide 4.5 years of disposal volume by filling above grade. Citrus County has adopted a level of service of 3.50 pounds per capita per day for Class I waste and 2.69 pounds per capita per day for Class III waste.

The County is currently considering several options for further use of the site, including either continued landfill operation or use as a transfer station. Citrus County has developed plans to operate a transfer station at the current landfill site at such time as capacity no longer exists, and been permitted for such a function. Options continue to be explored, however, on a regional basis.

The landfill is still in operation at this time, and the site is of adequate size to accommodate projected disposal needs beyond 2020. Current calculations for the Citrus County Landfill indicate that there will be 2,351,602 cubic yards of available air space for trash disposal as of October 1, 2010. Table 5-3 in the Citrus County comprehensive plan's solid waste sub-element forecasts the amount of waste that will be generated on an annual basis as a function of total county population projection. Based on these figures, available surplus capacity at the landfill will amount to 2,240,226 million cubic yards in 2010 and 1,7401,96 million cubic yards by fiscal year 2014-2015.

The actual quantity of available capacity utilized by City of Crystal River municipal waste stream over the planning time frame to 2010 is minimal compared to existing disposal capacity at the landfill site. Crystal River solid waste should only occupy approximately 1,798 cubic yards in 2010-2011. This amount will increase to 9,289 and then 19,325 cubic yards by the middle and end of the 2020 planning timeframe, respectively. When viewed in terms of the total quantity of available capacity onsite as measured well over 2 million cubic yards, the amount of landfill space needed to serve the City of Crystal River should not have a significant impact on landfill storage capacity.

Hazardous Waste Management

The Citrus County landfill has a set of standard operating procedures which reduce the likelihood of the illegal dumping of hazardous wastes. These procedures include: 1) a sign at the entrance posting prohibited wastes; 2) visual inspection of loads; 3) visual inspection of dumped materials; 4) notification to the Florida Department of Environmental Protection of infractions; 5) contingency plans for clean-up and removal.

Solid Waste Sub-Element
Goals, Objectives, and Policies

GOAL 1: The City of Crystal River shall ensure solid waste collection and disposal services are available to its residents and businesses as required to meet present and future demand.

OBJECTIVE 1.1: The City will offer solid waste collection and disposal services in a cost-effective manner.

POLICIES:

A). The City will monitor and review solid waste collection services as part of annual update of the Capital Improvements Element to ensure service is provided in a cost-effective and market-competitive manner.

B). The City will utilize the Citrus County disposal facilities to benefit from the scale and scope of their operations.

C). The Capital Improvements Element shall establish a minimum level of service standard for solid waste by policy adoption.

OBJECTIVE 1.2: The City will secure contingency contracts for debris removal in the event of hurricanes and other major events that would overwhelm the capacity of city staff and the regular solid waste contractor.

The City will seek to reduce the volume of landfill capacity required to meet the demand of City residents and businesses.

POLICIES:

A). The City will encourage recycling programs to both residential and commercial users.

B). The City will help make available and recommend curb-side recycling services to its residential users at no cost beyond the standard base monthly charge to encourage universal participation.

C). The City will work with all stakeholders to help develop commercial recycling options designed to reduce bulk waste disposal (i.e. cardboard shipping containers).

Drainage Sub-Element
Data and Analysis

Terms and Concepts

Drainage Systems

Water flowing overland during and immediately following a storm event is called stormwater runoff. Under the effect of gravity, this runoff flows toward sea level through depressions and channels which comprise the drainage system of an area. The drainage system may consist of natural features, manmade features, or a combination of both.

Natural drainage systems are defined by the topography of an area, the largest local feature of such systems referred to as the watershed (see Map D-1). The boundary of the is the line of natural land elevation within which runoff is directed toward a common major surface conveyance or drainage feature, such as a river, lake or bay. In some instances, watersheds may not contain surface conveyance or drainage features, but instead be internally drained through groundwater percolation or sinks. The major drainage feature is often called the receiving body and the smaller features are its tributaries.

Manmade drainage facilities are artificial structures designed to store or convey stormwater runoff. Swales, ditches, canals, and storm sewers are typical conveyance structures, collecting stormwater runoff and directing it toward downstream receiving waters. Stormwater storage structures are generally classified as either detention or retention facilities. Detention facilities are designed to temporarily impound runoff and release it gradually to downstream portions of the drainage system through an outlet structure. Retention facilities are impoundments which release stormwater by evaporation and by percolation into the ground, with no direct discharge to surface waters.

Drainage and Stormwater Management

The occurrence of stormwater runoff is highly variable, dependent on the amount of rain falling during each storm event and on conditions within the watershed. Since most storm events are relatively moderate, natural drainage features typically evolve to accommodate moderate quantities of stormwater runoff. Occasionally, severe storm events create runoff volumes in excess of what these features can handle, resulting in temporary flooding of adjacent land. This periodic flooding is part of the natural cycle of events and often has beneficial effects on the watershed ecosystem. Flooding is generally not perceived as a problem until development occurs in flood-prone areas.

Historically, the typical strategy adopted in response to stormwater flooding of developed areas was to modify the drainage system to convey runoff away from developed sites more rapidly. Initially, this response may result in limited success in reducing nuisance effects and property damage.

However, as urbanization of a drainage basin increases, storm events produce proportionately more and faster runoff, primarily due to the increase in impervious surfaces in the watershed. As a result, the capacities of natural drainage features and previously constructed drainage facilities are exceeded more frequently and stormwater flooding problems increase, as do expenditures for further drainage improvements.

In addition to exacerbating flood problems, this strategy for coping with stormwater runoff has detrimental effects on water quality. Soil eroding from development sites and materials such as oil, grease, pesticides and fertilizers from urban land uses are washed off by runoff, increasing pollutant loading on receiving waters. The increased velocity of runoff also disrupts natural drainage features by destabilizing channels, leading to further sediment loading and debris accumulation.

The term "stormwater management" refers to comprehensive strategies for dealing with stormwater quantity and quality issues. The central tenet of these strategies is to ensure that the volume, rate, timing, and pollutant load of runoff after development is similar to that which occurred prior to development. To accomplish this combination of structural and non-structural techniques is utilized. Structural techniques emphasize detention and retention of stormwater to reduce runoff rates and provide settling and filtration of pollutants. Non-structural techniques include many of the practices embodied by Low Impact Development (LID) design which emphasize preservation or simulation of natural drainage features to promote infiltration, filtering and slowing of runoff. The objective of stormwater management is to utilize a combination of techniques that provide~~s~~ adequate pollutant removal and flood protection in the most economical manner.

One of the key principles of current stormwater management techniques is recognition of the need for watershed planning. The stormwater management system must be designed beginning with the final outlet point to ensure adequate capacity to handle all discharges from the upstream portion of the basin under conditions present at the time of design. It is then necessary to ensure that subsequent development upstream utilizes stormwater management techniques and systems which maintain predevelopment runoff conditions so that the downstream system is not overloaded. By ensuring that all development within the watershed is based on and supportive of a plan for the entire watershed, the functions and useful life of both natural and manmade components of the system will be protected and extended.

There are two basic factors involved in establishing a successful stormwater management program around these principles:

1) Establishing and applying uniform design standards and procedures; and
2) Ensuing adequate maintenance of system components once they are constructed. The design standard which is of primary importance is the design storm event. These standards specify-the intensity (rate of rainfall) and duration of the rainfall events to be used in the design of the facilities.

Data on rainfall intensity and duration have been summarized for various regions of the state by the Florida Department of Transportation (DOT). The conventional method is to indicate the

required frequency and duration of the event, which allows the intensity and total rainfall amount to be interpreted from the appropriate hydrograph for the region. Ideally, the selection of a standard design storm balances the cost of structures needed to avoid flooding against savings from reduced flood damage and disruption of community activities. The design storm must also be consistent with facility design for pollution abatement goals.

Standard procedures for sizing and designing facilities should also be part of the stormwater management program. This will ensure that systems are structurally and functionally compatible. The program should also provide for routine inspection and maintenance of facilities to ensure proper performance during the facility life.

Regulatory Framework

Federal

The U.S. Environmental Protection Agency has published rules to implement the National Pollutant Discharge Elimination System (NPDES) as mandated under Section 402(p) of the Clean Water Act (1977 Amendment to the Federal Water Pollution control Act) . The NPDES Program regulates stormwater discharge by means of a permitting mechanism for municipal separate storm sewer systems (MS4s), construction activities, and industrial activities. The State of Florida submitted a request to the EPA for delegation of NPDES permitting. A main component of this permitting process will be submittal of a Stormwater Pollution Prevention Plan (SWPPP) to identify and mitigate both stormwater and non-stormwater flows.

Section 208 of the Federal Water Pollution control Act (PL92-500, 1972) is the directing federal law with respect to water pollution abatement implementing the Act, the Environmental Protection Agency (EPA) identified pollutants carried in stormwater runoff as a major source of water contamination. To achieve the pollution abatement goals of the act, EPA provided assistance to state and local governments to develop Areawide Water Quality Management Plans, or "208 Plans" as they are commonly known. These 208 Plans studied a broad range of potential water pollution sources and abatement needs as well as development of regulatory programs to ensure implementation. At present, there are no federal regulations for stormwater management concerning the quantity of stormwater runoff.

State

The Florida Department of Environmental Protection (DEP) has adopted a Stormwater Rule (Ch. 17-25, F.A.C.) to fulfill part of the state's responsibilities under Section 208 of the Federal Water Pollution Control Act. The rule's basic objective is to achieve 80-95 percent removal of stormwater pollutants before discharge to receiving waters. This rule requires treatment of the first inch of runoff for sites less than 100 acres in size and the first one-half inch of runoff for sites 100 acres or greater in size.

Treatment is generally accomplished through retention or through detention with filtration. Retention requires the diversion of the required volume of runoff to an impoundment area with

no subsequent direct discharge to surface waters. Pollutant removal through settling and percolation of stormwater through the soil is relatively effective for most constituents. Detention facilities are typically within the line of flow of the drainage system. Stormwater from a site passes through the detention facility and is filtered prior to discharge to remove pollutants.

Implementation of the stormwater rule is achieved through a permitting process. By formal agreement, DEP has delegated its responsibility of regulating stormwater to the Southwest Water Management District (SWFWMD). Sections 373 and 402, F.S., provide the SWFWMD specific authority to regulate stormwater drainage, while Chapters 40D-4, 40D-40, and 62-25, F.A.C., provide rules within SWFWMD for the management and storage of surface waters. Regulations for the construction and operation of any new surface water management system or the alteration of any surface water management system, as well as exemptions of these regulations are also provided in Chapter 40D-4 and 40D-40, F.A.C.

In its role as permitting agency, SWFWMD grants relief to the conditions outlined above in some instances. Exemptions to the permit requirements are provided for: 1) facilities serving individual sites for single-family, duplex, triplex or quadruplex units; 2) facilities serving dwelling unit sites which are less than ten acres in total land area, have less than two acres of impervious area, and which comply with local stormwater management regulations or discharge to a permitted regional facility; and 3) facilities for agricultural or silvicultural lands which have approved management plans.

County

The Citrus County Public Works Department, Engineering Division, Permits and Compliance Section is the county agency responsible for all drainage related matters. This includes oversight of hydrology, engineering, permitting, enforcement and stormwater runoff in the unincorporated areas.

The permitting and review process is also subject to the rules and regulations of the Southwest Florida Water Management District, U.S. Army Corps of Engineers and the Florida Department of Environmental Protection.

Existing Conditions

Natural Drainage Features

The City of Crystal River lies within the coastal plain region of Citrus County. The terrain is predominantly low and flat except for the occurrence of small sand hills on the extreme eastern side of the jurisdiction. Almost all of the land area west of the SCL Railroad easement is at or below the five foot mean sea level elevation.

The mean annual rainfall is 56 inches. Most of the precipitation issues out of conventional thunderstorms from June to September. The passage of continental winter frontal systems yields only moderate rainfall levels, as a norm. The autumn and spring seasons are the driest.

The natural drainage pattern of the City of Crystal is for stormwater to drain into depressional wetlands or to drain into the Crystal River which discharges to the Gulf of Mexico. Water is carried to the river by way of natural spring runs and sheet flow through hammocks and fresh water marshes. Most of the natural drainage patterns have been altered by development, roadways and manmade drainage structures. However, the basic pattern throughout most of the city is for water to ultimately discharge to the river and out to the Gulf. There are a few wetlands in the east side of the city that are isolated and do not drains into the river.

The Crystal River and Kings Bay are the most prominent drainage feature of the city. The river runs from Kings Bay to the Gulf of Mexico seven miles away. The tide rises and falls daily along the river and within Kings Bay. Tidal action backs water up into freshwater marshes hammocks, and spring runs and then drains these same areas. Most of the city's stormwater drainage outfalls are found along the shores of the Crystal River.

Freshwater marshes serve to drain adjacent uplands and convey these waters to the river. These freshwater marshes are found along the shores of the river. These wetlands are subject to tidal flooding and primarily serve to attenuate and drain tidal waters to the river.

Wetland hammocks are low-lying wooded areas. The hammocks drain adjacent uplands and serve to conduct water to the river by way of sheet flow. There are few defined channels in the hammocks, so drainage occurs slowly. In some places the hammocks drain into sink holes. These hammocks are primarily in the northwest portion of the city. The natural drainage patterns of these hammocks have been interrupted by adjacent development, roads and drainage canals.

Spring runs are another natural drainage feature of the city. These creeks function to release groundwater discharge to the bay and river. They spring runs also serve to convey stormwater that drains from adjacent uplands. Many of these features have been altered by man-made canals.

Much of the city drains into depressional areas in the form of isolated wetlands hammocks and cypress swamps. Some of the water which drains into these depressional areas works its way into the aquifer by way of sink holes or is returned to the water cycle through evaporation. Some of these isolated wetlands have been connected to the river by drainage ditches.

Man-made Drainage Features

There are a number of man-made drainage features in Crystal River. The Citrus County Mosquito Control Board historically constructed drainage ditches throughout the northeast quarter of the city. The city maintains several drainage ditches along street right-of-ways and in special drainage easements. The Florida Department of Transportation has constructed an extensive system to drain S.R. 44 and U.S. Hwy. 19. Newer developments both of commercial and residential class have constructed drainage retention and treatment facilities.

The existing man-made features are designed to accept stormwater from private property and roadways and convey stormwater as quickly as possible to in the bay or river. The newest

facilities are designed to provide some attenuation and treatment before discharge. Most of the facilities are inter-connected with one system feeding into another.

Performance of the System

Even though the city drains adequately after most rain events, minor street and lot flooding occurs in Picardy Village and in the Crystal Park area. Tidal flooding has posed problems for the Port Paradise area in the past. In general, tidal flooding is a serious threat west of U.S. Highway 19. This same area experiences few problems even during heavy rains because stormwater is virtually unobstructed from reaching Kings Bay. On the east side of U.S. Hwy. 19, rainfall is the cause of flooding problems.

Given the low elevation of the City, there is only limited opportunity to avoid flooding under conditions of high rain and/or storm surge. For that reason, many of the stormwater projects identified place more emphasis on improving water quality as opposed to moving/storing water quantities.

The natural drainage features of the City remain essentially the same. Construction of new roads has resulted in additional facilities to collect stormwater runoff. The city has adopted a stormwater management manual to regulate stormwater facilities built within the city. A Master Drainage Plan has been prepared and adopted, and recommended improvements scheduled pursuant to that plan. Also refer to the discussion in the Conservation Element regarding the SWIM plan for a more complete discussion of drainage issues.

Level of Service

Because the SWFWMD was delegated responsibility to regulate stormwater from the DEP, in accordance with Chapter 62-25, F.A.C., local level of service standards are informed by SWFWMD guidance. The City of Crystal River's level of service, design capacity, and other data are found in the Capital Improvements Element. Crystal River's stormwater drainage regulations are also embodied in the City of Crystal River Land Development Code (LDC). Existing regulations and programs, which govern land use and development of natural drainage features, are contained within the LDC. These regulations contain level of service standards, in accordance with SWFWMD's level of service standards, for drainage facilities and specific design standards. They also include regulations that address the protection of natural drainage inclusion of protective measures for natural drainage features. [

Drainage Projects

The City had a Watershed Management Plan developed in 2004 that evaluated the capacity of the Crystal River watershed to protect, enhance, and restore water quality and natural systems, while achieving flood protection. The 2004 Plan identified thirty-four (34) stormwater/drainage projects on a prioritized basis, which the City has addressed to the degree that financial resources have allowed. To date, a total of ten (10) of the projects have been completed and two (2) more are currently underway. The City has been working with the Southwest Florida Water

Management District (SWFWMD) to utilize their Cooperative Funding Initiative (CFI) program, matched with City funding, to address drainage concerns and install stormwater treatment devices (i.e., CDS units) where possible.

In 2008, the City participated with the Florida Department of Transportation (FDOT), SWFWMD, and Citrus County in the development of a Surface Water Assessment project that identified stormwater flows by sub-basin within Crystal River and the adjacent unincorporated areas. The project was part of a larger project to identify surface water flows throughout Citrus County. The 2008 study verified/revised the assumptions utilized within the 2004 study and utilized inter-connected ponding route (ICPR) modeling to identify the locations where stormwater "ponds".

The City, as part of a multi-party effort, recently acquired the Three Sisters Springs site, a 57-acre undeveloped parcel within the city limits, for development as an extension of the Crystal River National Wildlife Refuge. A portion of the site will be utilized for the construction of a wetland treatment area that will provide added water quality treatment for stormwater run-off from a large commercial sector adjacent to Highway 19. The SWFWMD is funding design and construction of the wetland treatment area and estimates that the project will be completed by 2012.

Drainage Sub-Element
Goals, Objectives, and Policies

GOAL 1: The City of Crystal River will install infrastructure to address drainage and stormwater related runoff issues on a planned and systematic basis.

OBJECTIVE 1.1: The City shall review performance monitoring of drainage facilities as part of annual update of the Capital Improvements Element, taking necessary action to address any present or future level of service deficiency through the programming of projects within the 5-Year Schedule of Capital Improvements.

POLICIES:

A). The City will pursue implementation of the projects identified in the 2009 Watershed Management Plan and the 2000 Surface Water Improvement and Management (SWIM) plan.

B). The City will apply for at least one Cooperative Funding Initiative (CFI) grant project from the Southwest Florida Water Management District (SWFWMD) in each annual funding cycle.

C). The City will include matching funding for a CFI project in its Capital Improvement Program (CIP) each year, subject to funding availability.

D). The Capital Improvements Element shall establish a minimum level of service standard for drainage and stormwater management facilities by policy adoption.

OBJECTIVE 1.2: The City will participate in cooperative efforts to address watershed and basin drainage issues as those opportunities arise.

POLICIES:

A). The City will maintain an active and engaged interaction with SWFWMD, the Department of Environmental Protection (FDEP), Citrus County, and other agencies involved in stormwater and related environmental issues.

B). The City will seek technical assistance from the Kings Bay Working Group to further consistent, cross-jurisdictional implementation of stormwater best management practices and to develop joint strategies to respond to interrelated natural system impacts.

OBJECTIVE 1.3: The City will develop and enforce land development regulations that reasonably and consistently require new development to address its stormwater requirements and the related water quality issues.

POLICIES:

A). Land development regulations shall effectively control point and non-point stormwater discharge by reference to Department of Environmental Protection (DEP) Rule Chapter 62-25 FAC and South West Florida Water Management District (SWFWMD) Rule 40-D, so as to protect surface water and natural resource quality, prevent the creation of new flood hazards while addressing existing floodplain management issues, and minimize damage to soils through erosion and sedimentation.

B). At least once annually, or more frequently when needed, the local planning agency shall agenda a discussion to review the most recently available surface water monitoring and springs discharge data to evaluate connections between land development regulations and issues of environmental quality. The purpose of such a meeting shall be to identify all opportunities to further implement stormwater management best practices, low impact development, and sustainable zoning through development of recommendations for revision to adopted land development regulations.

OBJECTIVE 1.4: The City shall utilize existing publicly maintained stormwater management facilities in conjunction with LDR requirements to discourage urban sprawl when permitting development.

POLICIES:

A). In proportion to the availability of committed funding sources, the City shall enhance existing publicly maintained stormwater management facilities through improvements programmed within the 5-Year Schedule of Capital Improvements contained in the CIE.

B). The local development review process shall require new development or expansion of an existing land use to achieve compliance with adopted level of service for drainage as well as all municipal codes and requirements applicable to stormwater management.

Potable Water
Data and Analysis

Terms and Concepts

A potable water supply system normally consists of a water supply source, a treatment plant, and a distribution and storage network. Either surface water, stored in natural lakes or man-made reservoirs, or groundwater, or some combination of the two usually constitute the supply source for a system. The source selection process for any system must consider the type and quality of the available source and the cost of developing the source for use. Before being used for public consumption, most water must be treated. Treatment removes impurities from the raw water in order to improve its quality for either public health or aesthetic reasons, or both. The treatment process adds to the cost of supplying water but it also expands the range of raw water sources that can be utilized.

After treatment, water is supplied to individual users in a community by way of a network of pipes and storage reservoir. Large transmission lines, called distribution mains, carry water to major demand areas and inter-connect with a network of smaller lines which eventually supply individual establishments. Both the distributing mains and distribution network should be inter-connected to form loops to allow water to circulate from the various portions of the systems to areas of high demand.

Water is delivered under pressure within the distribution system in order to ensure adequate flow to meet demands. Demand fluctuates throughout each day, usually exhibiting peaks during the morning and evening, corresponding to periods of highest residential use. Localized demand peaks also occur when the system is utilized for firefighting purposes. In order to provide adequate quantities and pressure to meet peak use and fire flow demands, storage tanks are linked with the distribution system at strategic locations. During low demand periods these tanks are filled as water is pumped into the system to augment flows and maintain pressure. Ground level and elevated storage tanks are both commonly used. Elevated tanks (water towers) are the most economical. Many systems also include auxiliary pups which operate only during peak demand periods.

Regulatory Framework

Federal

The federal government has established quality standards for the protection of water for public use, including operating standards and quality controls for public water systems. These regulations are provided in the Safe Drinking Water Act Public Law 93-523. This law directed the Environmental Protection Agency (EPA) to establish minimum drinking water standards.

The EPA standards are divided into “primary” (those required for public health) and “secondary” (recommended for aesthetic quality) categories.

State

In accordance with federal requirements, the Florida legislature has adopted the Florida Safe Drinking Water Act, Sections 403.850 – 403-864, Florida Statutes (F.S.). The Florida Department of Environmental Protection (DEP) is the state agency responsible for implementing this act. In this regard, DEP has promulgated rules classifying and regulating public water systems under Chapter 17-22, Florida Administrative Code (F.A.C.). The primary and secondary standards of the Federal Safe Drinking Water Act are mandatory in Florida.

The Southwest Florida Water Management District (SWFWMD) is the regional agency responsible for managing water supplies to meet existing and future demands. The regulation of consumptive uses of water is achieved through the SWFWMD's Water Use Permitting (WUP) process which water resources are allocated among the permitted consumers. The SWFWMD rules pertinent to Citrus County are contained in Chapter 40D-2, F.A.C. In accordance with Section 163.3177(6)(c), F.S., and pursuant to the City's inclusion within the Northern Planning Region of the SWFWMD's 2010 Regional Water Supply Plan (RWSP), the City will be required to develop a 10-Year Water Supply Facilities Work Plan within 18 months of RWSP approval by the SWFWMD.

County

The Citrus County Health Department, as an arm of the Florida Department of Health (DOH), is responsible for monitoring water quality. Both raw water at the well and treated water in the delivery system are tested for fecal coliform. Tests for the presence of volatiles within the potable water are conducted by the DOH at its Jacksonville laboratory.

Existing Conditions

The City's potable water system includes the Crystal Street Water Supply Facility, the 5th Street Water Plant, and a package water treatment plant located on North CR 495 that is not currently linked to the City water distribution system. The combined maximum flow capacity of the two main plants is 2.16 million gallons a day (MGD), which includes a 500 gallon per minute (GPM) design for fire flow. The 5th Street water plant is normally operated only in stand-by mode for fire protection and flushing, which reduces the actual maximum daily flow capacity to 1.44 MGD, excluding fire flow. As of April 30, 2010, the 12-month average daily flow rate was 741,694 gallons.

It should be noted that Well P-2 at the Crystal Street facility is currently off-line due to the presence of a nearby contaminant plume and was not included in capacity calculation provided above. The contaminant plume is being tracked and appears to be moving away from the city water supply, but the timing of the required clean-up efforts cannot be determined with any certainty. Given this situation, the plan is to keep the well off-line for at least the next 5 years to ensure adequate protection of the city's drinking water supply from the contaminant plume.

The City's wells pump water directly from the Floridan aquifer, which is the source of 30 springs within the Crystal River/King's Bay system. The natural quality of the water source is such that chlorination is the only treatment necessary to meet current potable water drinking standards.

The primary delivery system is comprised of 8" and 12" water mains, 6" trunk lines, and storage tanks. The City of Crystal River currently provides potable water within the city limits to 1,825 residential accounts, and 338 outside city limits. Additionally, 79 connections within the city are utilized for irrigation, 387 commercial connections within city limits and 5 commercial connections outside city limits.

An Interlocal Agreement for both water and sanitary sewer service is in place between Crystal River and Citrus County to define and coordinate utility service outside city limits. The two systems are inter-connected and can assist each other in emergency situations. The Crystal River system is also inter-connected with the Ozello Water Association distribution system located to the south of the City's service area.

Needs Assessment

The city currently has sufficient potable water supply for the foreseeable future as presented in the LOS analysis contained in the CIE. However, as a precaution the city acquired a 12" fire well and package water treatment plant in 2005 that is located to the north of the city limits adjacent to County Road 495. The City had a Water Facility Plan Update performed in 2007 that identified the capital improvements that would need to be made in order to bring this new well-field into service within the city-wide potable water distribution.

These improvements include the construction of a new on-site water treatment plant, the installation of a 12" water transmission main from the CR 495 site south to existing lines along Turkey Oak Boulevard, and the drilling of a new 12" potable water well. Funding for these improvements has been built into the City's long-term rate plan, but the actual construction of the improvements will not be initiated until actual demand establishes the need for additional capacity as defined by Chapter 62-555, F.A.C.

The City is also proceeding with improvements aimed at enhancing flow capacity throughout the system. The City anticipates moving forward with the installation of a 12" water main to the south end of the city limits in 2010 to improve water pressure and fire flow, and ultimately plans to install a 12" line along Turkey Oak Boulevard west to Highway 19 to provide a contingency loop in the transmission infrastructure for the northern end of the city service area.

Existing potable water system capacity is 1.44 million gallons per day. The 2010 flow rate is 203 gallons per day, which leaves a surplus system capacity of about 698,306 gallons per day. Based on this information, it is possible to conclude that the City's potable water system's present operations achieve compliance with the minimum, adopted LOS standard. Projecting future demand as a function of population growth shows that demand for potable water will increase over the planning timeframe proportionately. The City of Crystal River's population is forecast to increase from 4,153 persons to 4,632 persons by the end of the first and second

planning periods in 2015 and 2020, respectively.

As a consequence, by 2015, the average daily flow will increase from the 2010 rate of 741,694 gallons per capita per day to 841,864 gallons per capita per day. Accordingly, that level of demand leaves 41.5% of total potable water system capacity available as surplus for the second planning period. By 2020, total demand for potable water would increase to 938,925 gallons per capita per day with a remainder of 34.8% of total system capacity available to meet demand growth beyond the end of the first and second planning period. Thus, the City will have adequate capacity to meet future and projected needs throughout both planning periods, and it is not necessary to identify options for mandatory system expansion and capacity development at this time to maintain LOS compliance.

An operating LOS analysis has been completed as part of the Capital Improvements Element (CIE). This analysis details the existing LOS analysis as well as a future operating LOS analysis for the end of the first and second planning periods. Information from the annual CIE update will help determine future demand for potable water service.

Potable Water Sub-Element
Goals, Objectives, and Policies

GOAL 1: The City of Crystal River will ensure that the City has an adequate supply of potable water to meet existing and future demands within its defined service area.

OBJECTIVE 1.1: The City will maintain adequate pumping capacity to meet current and future demands.

POLICIES:

A). The City will coordinate design and construction of additional pumping capacity with potable water sources identified in its 10-year water supply facilities work plan.

B). The City will continue to monitor the chemical tracking now being done on the contaminated plume associated with Well # P-2 at the Crystal Street water plant to ascertain when/if that well can be brought back into production.

C). The Capital Improvements Element shall establish a minimum level of service standard for potable water by policy adoption.

OBJECTIVE 1.2: The City will provide adequate redundancy for emergency water supply requirements.

POLICIES:

A). The City will maintain an inter-tie with the County water system to ensure water supply in the event the City system is not available.

B). The City will provide greater water flow/pressure to the south end of the City water system through the installation of an appropriate diameter water line along Cutler Spur Blvd.

C). The City will loop the water supply network to Woodland Estates, thus providing an alternative means of water transmission to that area, through the installation of an appropriate diameter line along Turkey Oak Blvd.

OBJECTIVE 1.3: The City will limit water consumption through an active leak detection program and encouraging consumer conservation.

POLICIES:

A). The City will seek to limit unaccounted water usage to not more than 15% of total pumped volume through an active leak detection program and ongoing meter testing program. [

B). The City will periodically educate the public on water conservation options with the intent of achieving/maintaining a per capita usage of 150 gallons per day, which is the consumption goal established by the Southwest Florida Water Management District.

OBJECTIVE 1.4: If the City determines through annual update of the capital improvements element that a potable water LOS deficiency exists, then such deficiencies will be eliminated by improvements programed into the 5-Year Schedule of Capital Improvements.

POLICIES:

A). The City Public Works Department will monitor the performance of the municipal potable water system, reporting annually to the Planning and Community Development Department as part of the CIE update any recommendations for necessary improvements in response to unexpected change in LOS related conditions. Recommendations shall also include guidance on necessary replacement of system components and identification of priority projects needed for potable water system development.

OBJECTIVE 1.5: The City shall maximize the use of existing potable water facilities, expanding potable water service only in a way that furthers implementation of the physical development pattern identified on the Future Land Use Map (FLUM).

POLICIES:

A). The City shall extend new potable water service only within its defined Utility Service Area to users outside its incorporated boundaries pursuant to an executed Interlocal agreement with Citrus County.

B). Each year, as part of update of the capital improvements element, the local planning agency shall review the boundaries of the Utility Service Area.

OBJECTIVE 1.6: The City will facilitate implementation of the Southwest Florida Water Management District (SWFWMD) water reuse, alternative supply and conservation programs, applicable to the City of Crystal River, through an adopted Regional Water Supply Plan for the district's northern planning region.

POLICIES:

A). Pursuant to the requirements of sub-paragraph 163.3177(6)c Florida Statutes, the City of Crystal River shall, within 18 months after SWFWMD governing board approves an updated regional water supply plan, the City shall amend its potable water sub element to develop a 10-year water supply facilities work plan, incorporating the alternative water supply project or projects selected by the local government from those identified in the regional water supply plan pursuant to subparagraph 373.0361(2)(a) Florida Statutes or proposed by the local government under subparagraph 373.0361(8)(b) Florida Statutes.

B). The City shall work cooperatively with the Withlacoochee Regional Water Supply Authority (WRWSA), other units of local government, and all other interested stakeholders to develop regional solutions to issues of water supply and conservation planning.

OBJECTIVE 1.7: The City of Crystal River shall consult with the Southwest Florida Water Management District (SWFWMD) to ensure that the City has access to adequate water supply resources to serve its projected population and areas outside its municipal boundaries, as designated by the City of Crystal River.

POLICIES:

A). The City will coordinate with its water supply utility to determine whether adequate water supplies are available to serve new development and will be available no later than the date of issuance of a certificate of occupancy

B). The City will ensure that adequate water supplies to serve new development will be available no later than the date of issuance of a certificate of occupancy.

Natural Groundwater Aquifer Recharge Data and Analysis

Terms and Concepts

Aquifers are water-bearing layers of porous rock, sand, and/or gravel. Several aquifers may be present below one surface location, separated by confining layers of materials which are impermeable or semi permeable to groundwater flow or movement.

The principal source of water in aquifers is rainfall. Under 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 rainfall may vary from one location to another. The areas of highest recharge potential are called prime recharge areas. The presence of confining beds between the soils and aquifer strata also determines which surface areas will be effective recharge areas for a given aquifer, and is another factor in identifying prime recharge areas for the aquifer.

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 water, pollutants picked up by runoff which enters an aquifer can degrade the quality of the groundwater. Since water flows within an aquifer from recharge areas to regions of discharge, "downstream" portions of the groundwater may be polluted over time. This becomes particularly significant when the aquifer tapped as a potable water supply downstream.

Regulatory Framework

Federal

In 1986, the Federal Safe Drinking Water Act (PL93-523) 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 wellfield 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. The aquifer protection amendments require the EPA to develop criteria for selecting critical aquifer protection areas. The program calls for state and local governments to map these areas and develop protection plans, subject to EPA review and approval.

State

Protection of aquifer recharge areas is a responsibility shared by the Southwest Florida Water Management District (SWFWMD), the Florida Department of Environmental Protection, and local governments. In implementing the Florida Safe Drinking Water Act (Ch.403, F.S.), the Florida Department of Environmental Protection (FDEP) has developed rules classifying aquifers and regulating their use (Chapter 17.22, Part III, F.A.C.). These rules are currently being amended to strengthen protection of sole source aquifers and the wellfields tapping them. FDEP has also established regulatory requirements for facilities which discharge to groundwater (Section 17-4.425, F.A.C.) and which inject materials directly underground (Chapter 17-28, F.A.C.).

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. The Criteria for the inventories, and legislative intent for their use, are found in Chapter 373, Florida Statutes.

Upon completion, a copy of the groundwater basin availability inventory shall be submitted to each affected municipality, county, and regional planning agency. This inventory shall be reviewed by the affected municipalities, counties, and regional planning agencies for consistency with the local government comprehensive plan and shall be considered in future revision of such plan. It is the intent of the legislature that future growth and development planning reflect the limitations of the available groundwater or other available water supplies (Sec. 373.0395, F.S.). SWFWMD also regulates the impacts of development and surface water management by potentially requiring Water Use, Environmental Resources, and Well Construction permits.

The Florida Legislature has directed local government to include topographic maps of areas designated by the water management districts as prime recharge areas for the Floridan or Biscayne aquifers in local comprehensive plans, and to give special consideration to these areas in zoning and land use decisions.

Local

At this time the City has not enacted an ordinance specifically for the protection of aquifer groundwater, but has adopted a wellhead protection plan that was last updated in 2004.

Groundwater

Existing Conditions

Natural Groundwater Aquifer Recharge Areas

The City of Crystal River is located in the Coastal River Basin area of the Southwest Florida Water Management District (SWFWMD). The area is predominantly flat except for the

occurrence of some sand hill formations. Soils range from somewhat poorly to very poorly drained. Groundwater recharge is generally less than 2 inches per year, a minimal amount.

The areas are underlain by a single very active aquifer, the Upper Floridan aquifer. Its thickness varies from 0 to 500 ft. in coastal areas to more than 1500 ft. along the easternmost part of the Northern West-Central Florida-Ground-Water Basin. The Upper Floridan aquifer is poorly confined and has no upper confining layer in western Citrus County.

The Crystal River Group of springs, which exceed 35 in number (see Map AR-1), is classified in the first magnitude category. The combined average flow is 916 cubic feet per second. The Crystal River area is primarily a region of aquifer discharge rather than recharge. Another characteristic is the karst topography (see Map D-1, Natural Drainage Features in the Drainage Sub-Element). Numerous depressions, caverns and sinkholes are present. These features occur as surficial limestone formations are partially dissolved by rainfall percolating downward through soil, or by moving groundwater.

A surficial aquifer system is also present. It varies in depth from about 3 to 6 feet below the land surface. The water table varies with the amount and intensity of rainfall, and the potentiometric level of the Upper Floridan aquifer.

Effects of Development

The SWFWMD has designated the Crystal River area as being highly susceptible to groundwater contamination. This is due primarily to the proximity of the Floridan aquifer system to the land surface. This combined with the aforementioned unconfined nature of the system creates the high risk environment. Since the aquifer flows generally in a west to southwesterly direction there are no other communities downstream which could receive possible contamination flow. Furthermore, going inland the aquifer quickly drops further below the land surface which acts as a buffer from pollutants.

Two types of point source pollution have been of particular concern. The first involves septic effluent and improperly maintained package treatment plants. This has been addressed through the extension of central sewer system service into areas previously served by septic systems, with approximately 600 houses adjacent to the southern end of Kings Bay slated to be moved on to central sewer service over the next three years.

The second problem is that of industrial and commercial point source contamination. This is of particular interest since this source of contamination was once a threat to the city's potable water supply (see Map AR-2). Industrial wastewater from a local manufacturing company was apparently being disposed of in a nearby depressional area i.e. cypress head. This resulted in heavy contaminants known as "sinkers" filtering down into the Upper Floridan aquifer. The contaminants, 1, 2 trans-dicholorethylene and trichloroethylene are highly toxic and considered unsafe in concentrations above three parts per billion. On site clean-up and other mitigation is being pursued to alleviate the hazard. Other than this particular case, industrial and commercial development seems to have had relatively little impact on groundwater quality.

No city regulations presently exist for protecting groundwater. A wellhead protection ordinance regulating land use and stormwater runoff was adopted to preserve groundwater quality near critical groundwater withdrawal sources. The development of well site location standards and the creation of a regional water supply network also could assist in protecting groundwater.

Summary and Conclusions

As with most of the Withlacoochee Region, almost every area of the City of Crystal River allows water to percolate to underlying areas. Wetlands and city wellfields comprise the principal area of concern for groundwater recharge. Quality rather than quantity of the water recharged remain the fundamental issue.

The groundwater system is still in a relatively undisturbed condition. It is therefore in the public interest to take reasonable and necessary safeguards to protect ground and surface water quality. This would include the cooperation of the municipal government with other regulatory bodies such as the SWFWMD, the FDEP, and the Army Corp of Engineers.

At the time of the 1989 plan adoption concerns included pollution from septic effluent and industrial pollution. New septic tank~~s~~ service is no longer allowed within the city and nearly all pre-existing septic systems have been removed. Clean-up is underway for the industrial pollution that resulted in the closing of Well #2 at the Crystal Street Water Plant, with the status of that clean-up program monitored on a monthly basis. That monitoring has indicated that contaminant levels have been reduced, the plume of contaminated groundwater is under control and showing improvement, and the remediation efforts are working. An analysis of the remediation efforts conducted in 2007 indicated that, based on pilot study results, the site could be clean enough to allow regular operation of Well #2 within 3-5 year. No definite plans have yet been developed to return that well to regular service in the foreseeable future, however.

The City continues to be active in the Kings Bay Working Group, an inter-disciplinary group involved in working with water quality issues in and around Kings Bay. This group monitors studies on the quality/volume of spring vent flows, the proliferation of non-native plant life, and the increasing salinity of Kings Bay.

The City has adopted a local ordinance that prohibits the use of “fast-release” fertilizers within the city limits in an effort to curb excessive nitrogen/phosphate levels in its adjacent waters.

Natural Groundwater Aquifer Recharge Sub-Element
Goals, Objectives, and Policies

GOAL 1: The purpose of this sub-element is to ensure that the comprehensive plan helps facilitate the performance of regulatory agencies in their duty to maintain suitable groundwater levels and protect groundwater quality for the benefit of public health, welfare and safety.

OBJECTIVE 1.1: The City will monitor the contamination that has forced action to take Well #2 at the Crystal Street Water Plant off-line until that site has been certified as clean.

POLICIES:

A). The City will review the monthly reports received related to the status/location of the contamination plume until that site has been certified as clean.

B). The City will coordinate with appropriate regulatory agencies to monitor all known incidents of industrial contamination in the vicinity of its primary source of potable water.

OBJECTIVE 2.1: The City will continue to be involved as an active participant with the Kings Bay Working Group.

POLICIES:

A). The City will be involved with ongoing efforts to identify and resolve issues of concern related to the quality of aquifer discharge within the City and adjacent water ways.

B). The City will seek technical assistance from Kings Bay Working Group to support aquifer function and to develop strategies to respond to interrelated natural system impacts.

OBJECTIVE 2.2: The City will continue to evaluate and adopt legislative measures that protect the quality of the aquifer.

POLICIES:

A). The City shall encourage stormwater reuse systems and water conservation measures to minimize water withdrawals.

B). Through the local development review process, the City shall minimize the development of new impervious surface area to allow for adequate infiltration and interflow to support aquifer and natural resource systems function.

C). Wellfield protection areas shall be established to include all land area within a five hundred foot radius of a public potable water wellhead or a site officially designated as a future wellhead by the city council after a duly noticed public hearing.

D). Sites located within wellfield protection areas and areas draining into karst features shall be prohibited from developing land uses that risk contaminating groundwater or otherwise adversely impacting the aquifer system, landform or related natural resources. Such prohibited uses shall include the following: 1) Onsite storage of hazardous wastes without secondary containment, 2) Cemeteries, 3) Commercial or industrial use of hazardous waste defined by the EPA under Title III of the Superfund Amendments and Reauthorization Act (SARA), 4) Uses discharging industrial wastewater to groundwater, 5) Gasoline service stations, 6) Injection wells, 7) Junkyards or salvage operations, 8) Septic Tanks, 9) Solid waste disposal facilities, 10) Underground storage tanks, 11) Wastewater treatment facilities.

E). Areas of high recharge value that have a direct impact on local aquifer system conditions, but are presently located outside city boundaries, should be evaluated for annexation as part of long-range planning for investment in public facilities during annual Capital Improvements Element (CIE) update.

F). The City will evaluate and adopt development regulations that provide reasonable and prudent best management practices for aquifer recharge areas.