ATTACHMENT 6

LEVY COUNTY COMPREHENSIVE PLAN (LEVY COUNTY 2008A)

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CHAPTER 7

INFRASTRUCTURE ELEMENT

Introduction

Scope Of The Element

This element has been prepared to meet the requirements of the Local Government Comprehensive Planning and Land Development Regulation Act, Chapter 163, Florida Statutes [F.S.]. In relevant part, the Act requires comprehensive plans to describe: 1) sanitary sewer, solid waste, drainage, potable water and aquifer recharge protection problems and needs; 2) ways to provide for future requirements; and, 3) general facilities that will be required for solution of the problems and needs. In addition, the element was prepared in accordance with Chapter 9J- 5, Florida Administrative Code [F.A.C.], "Minimum Criteria for Review of Local Government Comprehensive Plans and Determination of Compliance". An optional subelement entitled "Electric Utilities" has also been added to this chapter.

Organization Of The Element

This element contains the support documents, which are the technical reports summarizing the data and analyses on which the element is based. The support documents are presented as subelements for the different types of facilities dealt with in the element and for natural groundwater aquifer recharge areas. Each subelement includes: 1) background information about relevant terms, concepts and regulatory provisions; 2) a survey of existing conditions; and, 3) an assessment of existing and future needs and recommendations for meeting those needs.

Definition Of Public Utility

As used herein, a "public utility" is an enterprise providing essential services authorized and regulated by state or national public utility commissions or services owned, franchised or permitted by Levy County.

This provision comprehends both structures and uses and includes gas, water and electric, waterpower, well houses, electric utility poles, transmission towers and electric substations, sewerage, telephone facilities, utilities poles and street lighting, and other similar equipment necessary for the furnishing of adequate service.

Sanitary Sewer

Background Information

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 of sewage.

The collections 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. This classification scheme identifies sewers according to their location within the network and not according to their size. Since sewage flow within the network is from the periphery toward the treatment plant, this scheme allows for easy identification of downstream components which will be affected be sewage flows from a peripheral area.
The major components of the collection network which will be discussed in this element 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 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 proportion of materials removed.

Primary Treatment

This refers to the removal of between thirty and thirty-five percent [30%-35%] of the organic materials and up to fifty percent [50%] of 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 solid.

Secondary Treatment

Secondary treatment processes remove between eighty and ninety percent [80%-90%] 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 for 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 seeps 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 purity.

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 re-use 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 de-watering processes 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 capacities up to one million gallons per day. They are generally used to serve isolated development and usually partially or completely pre-assembled 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 processes purify the liquids. Septic tanks generally require cleaning every three [3] to five [5] 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 include effluent from sewage treatment processes. The U. S. Environmental Protection Agency is responsible for implementing the act.

State

The Florida Department of Environmental Regulation [D.E.R.] is responsible for ensuring that the State carries out responsibilities assigned to it under PL 92-500. D.E.R. 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 five thousand [5,000] gallons per day for domestic establishments, three thousand [3,000] gallons per day for food service establishments and where the sewage contains industrial or toxic or hazardous chemical wastes.

The Florida Department of Health and Rehabilitation Services [D.H.R.S.] regulates septic tank and drainfield installation within the state. These requirements have been adopted by rule in Chapter 10D-6, F.A.C.

Local

Since population densities in unincorporated areas have not forced the establishment of a central sewer system, County regulations address only lot size and soil percolation requirements pursuant to septic tank permitting [Schedule II, Ordinance No. 75-1 and, as amended, Ordinance 81-2] and toilet connection requirements for septic tanks [Article 8,

Section 01- 03, in the code of Levy County Ordinances].

The Levy County Public Health Unit, Environmental Health Section, administers the "On-site Sewage Disposal System Program" in Levy County which involves site evaluation, soil evaluation, permits and inspections [for improvements]. Levy County has adopted local rules and regulations for septic tank installation consistent with Chapter 10D-6, F.A.C. These rules are, in some cases, more stringent. For instance, in the case of subdivisions served by private water systems, the state requires lots to be a minimum of one-half [½] acre in size as opposed to the one [1] acre minimum lot size required by Levy County. Similarly for subdivisions served by a central [community] water system, the County's zoning ordinance requires a one-half [½] acre minimum lot size and the state's standard is for a minimum lot size of one-quarter [1/4] acre.

Current Facility Conditions

For the majority [77.6%] of County citizens, wastewater is treated in septic tanks. There are two "201" planning areas in Levy County; one in Chiefland and one in Williston. Both plans are older than five [5] years and therefore require reaffirmation by the D.E.R. before federal funding would be available.

On a population density basis it is evident why there are no sewer systems in unincorporated Levy County. The County ranks 55th in the state at approximately twenty [20] persons per square mile for all land and four point five [4.5] persons per acre of residential land.

The ability of the soil to process wastewater such that there is no resulting pollution to surface or groundwater might be described as the "wastewater treatment capacity" of the land. For septic tanks, the maximum flow of wastewater per day allowed by state law [based on Chapter 381.272(7)(b)] is one thousand five hundred [1,500] gallons per day for lots platted prior to 1972, and two [2] dwelling units per acre for lots platted after that date and without central water. Since it is estimated (1) that each bedroom generates one hundred fifty [150] gallons of wastewater per day, the implied maximum density is ten [10] bedrooms or twenty [20] persons per acre. Since the current density on residential land is one [1] dwelling unit per three point five [3.5] acres, or about zero point seventy-four [0.74] persons per acre, then four percent [4%] of capacity is being used if seen in terms of population. If seen in terms the capacity to treat wastewater, current use if at eighteen point three percent [18.3%] of capacity in developed, unincorporated Levy County [Table 7-1].

It needs to be noted that these are preliminary estimates for the sole purpose of assessing the overall magnitude of septic tank effluent in Levy County. These calculations are not intended to imply, support, or indicate that Levy County will allow as many as ten persons to occupy a single lot served by a single septic tank.

In view of these figures on population density and wastewater treatment capacity, it is readily apparent why there are no documented problems with the treatment and disposal of sewage in unincorporated Levy County. Virtually all developments in the unincorporated areas utilize individual septic tanks rather than package treatment plants.

With reference to the conservation element of this plan, there are in excess of forty thousand [40,000] domestic animals in the County which generate wastes. Additionally, untold numbers of wild animals contribute to the bio-mass waste products, as evidenced by high coliform counts in estuaries following rainfall. No data are currently available on either the amounts of impacts of these non-human waste sources.

Sewage Features

Each residential and commercial entity is responsible for the purchase and proper installation of their septic tanks.

Zoning ordinance regulations require that each place of living or work must have a

septic tank whether the property lies within or outside the city limits.

The level of service for septic tanks, which rely mainly upon the owners responsibility, is controlled by Department of Environmental Regulations [D.E.R.] and local Health Department rules. The Health Department gets involved only when there is a spillage that creates a health problem, and when someone needs a permit.

The design capacity is dependent on the use and size of each individual structure. There are no reports available on current demand by septic tank users.

It is extremely likely that without adequate regulation, water quality problems in individual wells or the river could be experienced in the future due to more extensive septic tank usage, inadequate maintenance of existing systems, poor soil conditions and water table problems.

TABLE 7-1

WASTEWATER TREATMENT CAPACITY OF LEVY COUNTY LANDS

Political Entity	Population	Generated Waste Generated Percent On 6/ [gallons/day] 5/	Wastewater Theoretical Capacity Used Septic Tanks [gallons/day] 2/	Total Area Suitable For Septic Tanks [Acres] 3/	Wastewater Treatment Area Suitable for Septic Tanks [Acres] 4/	Theoretical Residential Wastewater Treatment Area Per Acre Total Residential	Total Residential Acreage
Levy County							
1986	23,800	1,785,000					
1990	25,923						
County - Unincorporated Area -							
1986	14,414	1,081,050	102,400	3,935		10.6	274
				0.7%	18.3%		
1990	18,009	1,350,675				13.2	343
						0.9%	22.9%

Footnotes:

1/ Data from the Bureau of Economic and Business Research, University of Florida. Estimates of Population and Municipality as of April 1, 1986 and the 1990 Census Summary.

2/ Projection based on the assumption of 75 gallons of waste generated per person per day.

3/ Estimated from soils map, suitability for septic tanks.

4/ Residential acres found in areas where a Septic Tank is allowed.

5/ The amount of liquid waste which each acre of land would receive if all wastewater were uniformly distributed over the acreages in Column 3 and 4.

6/ Actual G.P.D. / Acre divided by 1,500 G.P.D. / Acre Maximum.

Example: 10.6 divided by 1,500 = .007 = 7%
13.2 divided by 1,500 = .009 = 9%
274 divided by 1,500 = .183 = 18.3%
343 divided by 1,500 = .229 = 22.9%

Based upon available Storet data 1/, the fecal coliform in the Withlacoochee River frequently exceed state standard, thereby creating a potential health hazard. [No cause-and-effect relationship has been documented linking the problem to septic tanks in unincorporated Levy County.]

Although there are not available data showing the capacity of individual septic tanks, the user demand upon these facilities can be estimated by calculating the water consumption per capita per day. This estimate for unincorporated Levy County is approximately one million eighty one thousand fifty [1,081,050] gallons per day of raw sewage, based upon seventy-five [75] gallons per person per day.

There are not any surpluses or deficiencies in sewage facilities as septic tanks currently meet the needs of each household or business.

It has been customary practice to think of major central sewer systems as the only alternative to sewage waste disposal, beyond septic tank usage. This is not the case. While no provision of central sewer facilities will inhibit growth [particularly industrial growth], the existing pace of residential development may be effectively served by septic tank systems.

To continue to rely on septic tank systems in Levy County will require that each system function properly with an efficient drainfield. Establishment of new septic tank systems is regulated through the Department of Health and Rehabilitative Services. These rules provide for the proper location of new systems. The problem in this instance is not necessarily the location of new systems, but proper inspection and maintenance of existing systems.

The concept of the septic tank district, or On-Site Wastewater Management District [O.S.W.M.D.] has been proposed to remedy the lack of inspection and maintenance of septic tanks. This procedure has been applied in several different forms but basically sets up a central system to inspect and maintain septic tanks, as well as monitor water quality.

Several additional alternatives are available for improving septic tank usage, such as dual drainfields, aerobic septic units, spray irrigation "evapotranspiration", elevated drainfield and low-cost central collection systems for treatment of septic tank effluent. As previously noted, an improved drainage system would also improve the functions of drainfields during periods of heavy rainfall and localized flooding. Some of these practices may not be allowed in certain instances, and some are experimental.

Based on population projections and current user demands [assumed to be seventy-five (75) gallons per person per day], a future needs assessment can be made as shown in Table 7-2.

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1 Storet data provided by Liz Ulmen.

Projected Facility Needs

At this time, the Board of County Commissioners has not expressed any intention of constructing, owning or operating any sewage treatment systems. Since seventy-five percent [75%] of all new housing in the last ten [10] years has been mobile home installation, the dominant trend has been sparse development to inexpensive lots out in the county. It is most likely that this trend will continue unless certain population magnets, such as heavy industry, appear. In that event, the County expects that the local municipality will be extending its sewer services out to the industrial, commercial and residential uses associated with the municipal growth.

However, a note of caution should be added to temper any conviction that the County's ample area can handle septic wastes for the foreseeable future. Map 7-1 shows that the majority of Levy County soils have limitations, often severe, for the use of septic tanks. More recent interpretations by the Florida Department of Natural Resources [Geological Survey], indicate that there may be even more limitations upon the use of septic tanks than thought in 1975. The new County-wide soils atlas will be utilized to resolve the contradictions, and it should become available in late 1989 or early 1990. Table 7-3A provides an analysis of the soil limitations and potentials for community development. Table 7-3B provides an analysis of the soils suitability and limitations associated with each soils association shown on Map 7-2. Only one hundred two thousand [102,000] acres [Table 7-1] or about fourteen percent [14%] of Levy County is suitable for septic tank use. In regard to development with septic tanks, of the eighteen [18] soil associations in Levy County, thirteen [13] have severe limitations, two [2] have very severe limitations, two [2] have slight limitations and one [1] has mild limitations. The reasons for this limitation have to do with 1) wetness; 2) depth to rock; 3) slow percolation; 4) poor filtration; and, 5) slope.

TABLE 7-2

FUTURE RAW SEWAGE OUTPUT IN LEVY COUNTY

	1990	1995	2000	2010	2020
County-Wide Population	25,000	27,200	29,000	32,200	35,700
Unincorporated Population	15,000	16,320	17,400	19,320	21,420
Projection of Total Sewage	1,125,000	1,224,000	1,305,000	1,449,000	1,606,500

Developed by Central Florida Planning & Development Corporation, 1987.

Methodology: From Table 7-1, unincorporated population in 1986 = 141,414 divided by county-wide 23,800 = 60%.

County-wide population by year X .60 = unincorporated population.

Unincorporated population X 75 G.P.D. = total sewage.

TABLE 7-3 A

1975 SOIL LIMITATIONS AND POTENTIALS FOR COMMUNITY DEVELOPMENT

Map Symbol	Soil Association	Limitation For Septic Tanks	Potential For Truck Crops	Potential For Improved Pasture
1	St. Lucie - Kuneb - Rimini	Slight	V. Low	V. Low
2	Alpin Blanton	Slight	Low	Low
3	Candler - Apopka	Slight	Low	

				Low
4	Jonesville - Chiefland - Archer	Slight	Moderate	Moderate
5	Arredondo - Gainesville	Slight	Moderate	High
6	Hernando - Archer - Chiefland	Severe	High	High
7	Chipley - Leon - Osier	Moderate	Moderate	Moderate
8	Sparr - Lochloosa - Tavares	Moderate	Moderate	Moderate
9	Adamsville - Osier	Severe	High	High
10	Broward, var.	Severe	Low	Low
11	Bushnell - Wabasso - Felda	Severe	Moderate	High
12	Blichton - Flemington - Kanap	Severe	High	High
13	Leon - Mascotte - Surrency	Severe	Low	High
14	Lynne - Pomona - Pompano	Severe	Moderate	High
15	Plummer - Rutlege	Severe	Low	Moderate
16	Fresh Water Swamp	V. Severe	V. Low	V. Low
17	Salt March	V. Severe	V. Low	V. Low

* New soils mapping has been completed for Levy County, but the report has not been

released as of September, 1989. A Florida Geologic Survey Map [1988 - See Map 7-3B] is inconsistent with both this table and the atlas upon which it is based. The New Soils Map Series will resolve the discrepancy.

Abbreviation: V. = Very

Source: The Florida General Soils Atlas With Interpretations For Regional Planning Districts V 7 VI - Division of State Planning, Bureau of Comprehensive Planning July, 1975. [See Map 7-3A for soils map.]

TABLE 7-3 B

TABLE 7-3 B [Continued]

MAP 7-1

1975 SOILS LIMITATIONS FOR SEPTIC TANKS

In light of the limitations for septic tank use on more than three quarters of Levy County land, eventually the use of more efficient processor, preferably centralized sewage treatment plants, must be faced. The types of development requiring central sewers would be in areas where soils are generally suitable for septic tanks, any proposed density in excess of two [2] dwelling units per acre. As provided in the land use element, central sewer systems need to be provided as an integral part of any of Florida's Quality Developments Program Community proposed with the Forestry/Rural Residential Land Use category. Given the fact that the Board of County Commissioners wants to remain out of the sewer business, the municipalities already in the business or needing to be in the business should provide the service. This potential remains unexplained at this time. Both the capacity of existing systems, and the interest of the affected political jurisdictions, remain to be explored and coordinated, respectively.

Performance Of Septic Tanks And Problems

Many factors influence the efficient operation of septic tank systems. The most important factors influencing septic tank operation in Levy County are proper soils to act as an absorption field and sufficient depth to the water table. The poor soil condition coupled with a high water table present a potential water quality problem in Levy County.

In septic tanks, solids are separated, and biological degradation is accomplished within the soils of the drainfield. In low-lying areas and areas with poor soil conditions, the effluent often leaches through the soil too rapidly. This leachate may be inadequately degraded when it reaches the water table or the river, and may arrive in a contaminated condition, polluting the water with bacteria and nutrients.

Problems with soils and the water table substantiate the need for drainfields to be of proper size and have adequate soil absorption rates. When soil absorption of waste is poor and septic tanks do not drain properly, the potential exists for water quality problems. When tides or heavy rains raise the water table, liquid waste can saturate the soil and flow overland. Untreated sewage waste which flows or percolates into adjacent water may cause high coliform counts. The coliforms could indicate or suggest the presence of harmful organisms which could restrict the use of the water.

Water quality from a health standpoint is not currently a problem in Levy County. As more development occurs, and even greater amounts of sewage effluent are disposed of through the soils, the potential for water quality problems increases, especially since Levy County relies upon individual water wells in most instances.

There are potential problems in low lying areas where flooding occurs, causing

contamination of surface water and possibly the pollution of shallow private wells.

The provision of central sanitary sewer facilities is not viewed as economically feasible or unnecessary at this time. The cost of installing major central facilities for an ultimate design population that will not be reached for many years does not justify construction or such system, especially when septic tank usage has proven to be effective. As population densities increase along with the use of septic tanks with wastewater drainage fields, the probability of bacterial contamination of wells will great increase with most problems occurring in the incorporated areas of the County.

As noted by the Levy County Health Department, the major problem currently involved with locations of septic tanks in some areas of the county, is encountering rock from one [1] to three [3] feet below the ground surface. This requires special precautions when locating the drainfield. In certain instances, the drainfield may have to be elevated.

Problems And Opportunities For New Sanitary Sewage Facility Siting

The major disadvantage of installing a central sewage system is the large dispersion of the population thus causing the cost per household to be prohibitively high.
The only "opportunity" for the Board of County Commissioners would occur when either a subdivision with septic tanks developed a threat to the public health because the tanks failed and the only available solution was to install central wastewater treatment plant, or if a development which already has a wastewater treatment plant abandons the system or refuses to maintain and operate the system in compliance with State [DER] rules. Problems with the County allowing new wastewater treatment plants to initiate operations, include:

1. It increases the probability, that the County will eventually be in the sewer business.

2. Allowing wastewater treatment plants would be an incentive for development to occur at inappropriate locations.

3. The availability of wastewater treatment plants would induce higher population densities and potentially contribute to "urban sprawl", i.e. leapfrog development into rural areas with urban densities and services, leaving gaps of undeveloped land.

The adopted Levy County Comprehensive Plan has identified numerous commercial nodes, but the development of these nodes is constrained because central sewer systems are prohibited by plan policies. In addition, there already exist some commercial

establishments or developments at environmentally sensitive locations (such as Fowlers Bluff and Waccasassa River, as examples) which could benefit from the availability of central sewer and simultaneously be of public benefit by enhancing economic development. Finally, the plan encourages cluster development and P.U.D.'s, and it provides density bonuses for agricultural land preservation, but the restrictions on central sewer are inconsistent with, and work counter to those policies.

On the other hand, historic problems with privately owned residential sewer systems (such as occurred at Manatee Springs in 1992) necessitate that central residential sewer systems which are private should not generally be permitted, because:

a. Failure by the owners to operate and maintain the system to acceptable standards would pose a threat to the public health, safety and welfare.

b. In the event of abandonment of such a system by the owners, the Board might be forced into the sewer treatment business. This business is more appropriate to municipalities, the Board does not currently operate any such systems, and it has no intent to do so in the future.

c. Chapter 163, F.S. mandates that adopted plans must discourage urban sprawl. The provision of, or the potential for a proliferation of, central sewer systems throughout the unincorporated area would be inconsistent with that policy, and could be an inducement to higher population densities than currently planned.

Correspondence from the (then) Florida Department of Environmental Regulation (now F.D.E.P.) to D.C.A. in 1992 documented their concerns about "package" treatment plants. 1/ That letter states:

"Package plants can, in theory and by design, function to adequately treat wastewater. Nonetheless, they often do not function properly for the following reasons:

1. Economies of scale: Package plants often are installed to serve small nodes of higher density development which are beyond the current limits of larger regional facilities. As such, the package plant user population is small relative to larger regional facilities. Nevertheless, the initial construction costs, recurring

1/ Letter dated November 3, 1992, addressed to Mike McDaniel, from John Outland.

capital expenses for repair and replacement, continual operation/maintenance (O&M) and monitoring costs are

present whether a facility is a package plant or larger.

Economies of scale tend to favor larger facilities where such costs can be dispersed among a large user population and focused at maintaining one (or a few) facility(ies). Smaller facilities, with their limited user base, can not as easily spread cost and are often faced with having to incur high per capita costs to properly run the facility or ignore problems and allow regular violations of permit limits.

Further, larger sized plants have output waste streams (e.g., sludge and treated waste-water) at sufficient quantities, qualities, and of a continuous nature to allow support of secondary uses. Thus, waste-water reuse for irrigation or cooling, use of sludge as a burnable fuel for generation of electrical energy, or use as fertilizer each become feasible alternatives as the plant size increases.

2. Package plants, due to their smaller volumes, have difficulties maintaining the active biological processes necessary for a properly functioning waste-water treatment plant. Surges in flow to the facility or the introduction of contaminants by one of a few individual users can more easily upset the biological processes used by waste-water facilities to achieve pollutant removal. Larger plant design greatly reduces the frequency of surges and contamination of the biological processes. The larger sized plants, because of their greater and more continuous flows, essentially ensure a buffering of the requisite biological processes necessary for pollutant removal reliability.

3. Efficient package plant design is quite costly and it is often expedient for a developer to minimize cost by purchasing less efficient package plants (e.g., commonly used but poorly designed package plants do not provide adequate circulation and have substantial volumes of "dead space" which reduce treatment efficiency). In addition, package plant facility planning for both the treatment plant and the collection and transmission components often relies on a "minimal" approach wherein, facility sizing and material quality are the bare minimum necessary to achieve development approval. This approach, though initially cost effective for the developer and development (e.g., lower development cost should translate into lower cost for the initial homeowner), becomes quite costly over time. Repair, replacement operation/maintenance and monitoring costs may soon outweigh the earlier advantage (post-development responsibilities are often turned over to homeowners association or to the local government). Due to the other

reasons cited here (e.g., monetary and physical economies of scale available to larger plants), the per capita cost of maintaining a properly functioning package plant becomes high.

4. Facility monitoring and on-site supervision requirements are minimal for package plants. This relates to the lack of economies of scale, i.e., the small suer base and inability to handle costs. The result is often inadequate treatment, episodes of malfunctioning equipment and a lack of on-site supervision requirements are minimal for package plants. This relates to the lack of economies of scale, i.e., the small user base and inability to handle costs. The result is often inadequate treatment, episodes of malfunctioning equipment and a lack of on-site O&M and process supervision to react in a timely fashion to correct problems as they arise. Homeowner associations usually contract to have monitoring, operation and maintenance and repair handled by firms specializing in this line of work. Though some of the contracted forms are diligent in trying to properly manage and maintain package plants, FDER district staff report that negligence often prevails and the money and manpower necessary to ensure a properly functioning plant are not consistently provided.

Summary

Package plants can be designed, constructed and operated to meet pollution reduction needs. In some instances, they may be the best alternative to ensure environmental/public health protection needs. Nevertheless, experience has repeatedly demonstrated that the smaller plants often lack physical and monetary economies of scale necessary to assure adequate treatment of sanitary waste overtime."

From the Levy County perspective, the plan policies currently in place (1995) are adequate to negate any and all of the above-noted concerns, provided that any special district created is large enough(has adequate hookups) to provide: economies of scale; minimal surges; adequate design, inclusive of an adequate budget for repair, replacement and operation/maintenance, and adequate monitoring and supervision. The existing plan policies are not adequate to treat with those situations where development is proposed in locations where regional facilities are not proposed, but the development proposal is for types of development or densities high enough to require central services.

Other counties have addressed this issue as a part of their comprehensive plans. Portions of the data base and analysis from Martin County, Lake County and Brevard County are presented in the subsections which follow.

Martin County

A. Septic Tanks. The majority of septic tank approvals have been in rural areas, costal communities and old "grandfathered" subdivisions. Septic tank systems may pose potential health and public safety problems if they are located in areas with unsuitable soils. Since septic tanks discharge waste-water of a lower quality compared to a treatment plant, a high density of homes with septic tanks can threaten a well-field or surface water quality. Problems may also arise from improper installation or maintenance. Regardless of the cause, septic tank failure or ground water contamination may result. Several areas in Martin County have experienced individual system failure. Therefore, Martin County has established a policy of connecting to centralized sewer service septic tank areas that experience problems.

B. Package Plants. "The use of package plan systems will be allowed outside the primary and secondary Urban Service District provided the proposed use meets the criteria established in the Future Land Use Element, Section 4-6,

Strategy D.3."

"Martin County contains 107 waste-water treatment plants, excluding the six existing regional facilities. Many of these facilities were operational prior to Martin County's policy on interim systems and usually serve one development. Each plant has its own effluent disposal system ranging from drainfields or percolation ponds to golf course irrigation. The most commonly used methods of effluent disposal are by drainfields or percolation ponds. The majority of these systems are package plants, ranging in design capacity size from 3,300 gallons per day to 300,000 gallons per day. Only nine of these facilities have a design capacity of 100,000 gallons per day or more."

"Previous planning studies have identified numerous problems with package type treatment plants located in Martin County. Many of these facilities are not properly financed or operated. Effluent quality and odor problems result. Fourteen waste-water treatment plants in Martin County are currently subject to enforcement action by the Department of Environmental Regulation (DER). Surface water degradation is a concern with the plants located on Hutchinson Island and in other costal areas because many do not meet the 500 foot setback from surface water, as recommended by DER. Accordingly, Martin County has established a policy of connecting to central sewer systems those areas served by package plants experiencing problems."

C. Regional Facilities "Due to the problems associated with package plants and septic tanks, Martin County has pursued a policy of consolidation of waste-water systems. Six private and/or governmental owned systems were designated as regional systems. These systems serve a specific geographic area of the County. Acquisition of waste-water treatment facilities by the County has been used to promote consolidation."

D. Issues in Waste-water Management. The issues that emerge from the current conditions in Martin County are as follows:

1. Many of the 107 waste-water treatment plants are not properly financed or operated, resulting in unacceptable effluent quality and odor problems.

2. Many existing plants do not meet the recommended setback of 500 feet from the Indian River, a Class II water.

3. High densities of septic tanks on small lots, septic tanks in

unsuitable soils, and poor construction or poor maintenance of septic tanks can lead to contamination of potable water wells.

4. Conservation of potable water can be enhanced if waste-water effluent reuse were more prevalent.

5. The regional systems will need further expansion in order to serve existing residents who currently are on septic tank or package plant systems and to serve future residents.

6. Proliferation of new systems will be costly and environmentally unacceptable.

Lake County

In Lake County, "Rural Residential" densities are limited to 1 unit per five (5) acres. Densities greater than this are rural village, suburban or urban. In the Green Swamp Area of Critical State Concern, the Ridge Area allows up to 4 units per acre of uplands. From the Lake County Future Land Use Element:

> "Developments with a density greater than 1 unit per acre must be connected to a regional sewer system, defined as a central sewer system with a capacity of 500,000 GPD or greater. However, a central sewer system having a capacity of at least 100,000 GPD or more may be permitted on a temporary basis until such time as a regional system becomes available. The temporary system shall be staffed by a class C or higher operator for a minimum of three hours per day for five days per week and one visit on each weekend day. Further, these temporary facilities shall be planned, designed, and constructed so that they either serve as the nucleus of a future regional system that later developments will also connect to, or can be abandoned and the system merged into a regional sewer system constructed at another location."

> From the Lake County Sanitary Sewer Sub-Element, we find: "Policy 6A-1.5: Adoption of Design and Construction Regulations for On-Site Waste-water Disposal Systems. By February 1992, Lake County shall prepare and adopt a Design and Construction Ordinance for On-site Domestic Waste-water Disposal Systems complying with Chapter 381.272, Florida Statutes and Chapter 10D-6, Florida Administrative Code. The ordinance, which shall be incorporated into the Land Development Regulations, shall include quantitative requirements for use of on-site disposal systems for proposed developments; design and construction requirements for

assuring the future sewer-ability of proposed developments; and definition of variances from mandatory connection, at a minimum, meeting the provisions in Chapter 10D-6, Florida Administrative Code, due to financial, environmental and/or public health considerations."

Brevard County

This county has adopted a comprehensive plan which, in sewer policy 3.10E states: "A binding development agreement shall be established for all new private treatment plants and such agreement will address the following, at a minimum:

1. Identification of a closure agreement with a permanent service provider."

This county is in no way comparable to Levy County, which is much more rural and has no permanent service providers outside the municipal boundaries, with the sole exception of Springside at Manatee.
As a part of this data base and analysis, Levy County has surveyed other, more rural counties, that are more typical of the socio-economic and physical features of Levy County. Those counties were Gilchrist, Dixie, Suwannee and Marion. For each of those counties, the following sections summarize their data base and analysis as well as their adopted package treatment plant policies.

Suwannee County

Data Base and Analysis. "Based upon the data and analysis within the future land use portion of this document the future waste-water treatment needs for the unincorporated areas of the County will be accomplished through the continuance of the use of septic tanks. Although the County has the authority to establish, maintain and operate public sanitary sewer systems, the future land use analysis does not provide for the level of population densities in the County which would require the construction of a comprehensive sanitary sewer system."

Policy IV.2.3. "The County upon adoption of this Comprehensive Plan shall allow septic tanks and package waste-water treatment facilities until such time as centralized sanitary sewer service is accessible, conditioned on the following requirements:....."

Policy IV.2.4. "The County upon adoption of this Comprehensive Plan shall permit package waste-water treatment facilities to serve development until such time as a centralized sanitary sewer system is accessible conditioned on the requirements

stipulated within Policy IV.2.3, but in any case such package waste-water facilities shall not be permitted to operate 5 years after the date such centralized sanitary sewer system is scheduled on the 5-year Schedule of Improvements or completion of the centralized sanitary sewer system, whichever is earlier."

Gilchrist County

Data Base and Analysis. "Based upon the data and analysis within the future land use portion of this document the future waste-water treatment needs for the unincorporated areas of the County will be accomplished through the continuance of the use of septic tanks. Although the County has the authority to establish, maintain and operate public sanitary sewer systems, the future land use analysis does not provide for the level of population densities in the County which would require the construction of a comprehensive sanitary sewer system.

Policy IV.2.5. "The land development regulations shall limit development which proposes the construction of package waste-water treatment facilities outside the urban development areas to public uses and special use facilities such as rest stops, parks and resource based recreation uses and commercial/industrial uses not complementary with the urban development areas."

Dixie County

Data Base and Analysis. "Based upon the data and analysis within the future land use portion of this document, the future waste-water treatment needs for the unincorporated areas of the County will be accomplished through the continuance of the use of septic tanks. Although the County has the authority to establish, maintain and operate public sanitary sewer systems, the future land use analysis does not provide for the level of population densities in the County which would require the construction of a comprehensive sanitary sewer system.

According to the U.S. Department of Health and Human Services, Public Health Service, Environmental Health Planning Guide, public sanitary sewer systems are not normally justified until population densities increase to approximately 2,500 people per square mile. The 1985 population density for the County was about 10 people per square mile and is projected to be a maximum of 12 people per square mile by the year 2010."

Policy IV.2.3. "The County's land development regulations shall allow existing septic tanks and package waste-water treatment facilities to remain in service

until such time as centralized sanitary sewer service is available."

Policy IV.2.4. "The County's land development regulations shall allow the temporary use of package waste-water facilities within urban development areas where a centralized waste-water service has been planned and is part of the five year schedule of improvements within the Capital Improvements Element of this Comprehensive Plan."

Policy IV.2.5. " The land development regulations shall limit development which proposes the construction of package waste-water treatment facilities outside the urban development areas to public uses and special use facilities such as rest stops, parks and resource based recreation uses."

Marion County

Data Base and Analysis. "In 1991 approximately 150 package treatment plants were operating in Marion County. The existing waste-water treatment plants and six municipal plants discussed in the next section of this report are illustrated in Figure 3-4. This location map is keyed by reference number to Table 3-3 which lists the treatment plant names, the facility operator, the contact name, the design capacity, the geographic service areas, the land uses, the treatment type, the general facility performance, the facility problems and opportunities, replacement or expansion considerations, the impact of these facilities on the natural environment and finally, the possible solution to existing package treatment problems. Throughout Marion County these package treatment plants are used by subdivisions, motels, restaurants, shopping plazas, and mobile home parks. The treatment type of the majority of these package treatment plants is extended aeration, followed by effluent disposal to percolation ponds. As illustrated, the package treatment plants range in size from 2,600 gpd (.0026) to 8000,000 gpd (.08)."

"Over the past year the local HRS has enforced the correction of minor, marginal and major package treatment plant problems. Since the local HRS office has taken over some of the responsibilities which the DER previously handled, resolution 91-R-39 was adopted so that the local HRS could receive a nominal fee for the inspection and enforcement of package treatment plants. When the local HRS office takes over the majority of DER's inspection and enforcement of package treatment plant responsibilities, then the local HRS office will formally be known as the Environmental Engineering Health Unit."

"Until the local HRS formally becomes a EEHU facility, it will functioning between a typical HRS office and complete EEHU facility. Now the local HRS can decreases the amount of time that it normally took DER to correct the package treatment problems. Under this new system the local HRS package treatment plant correction process, for both marginal and major problems, can be corrected within one year time, instead of the three years previously taken by DER."

"Under this new system, the local HRS office still inspects all minor package treatment plant problems twice a year and copies of these inspection reports are mailed to DER. The process for correcting marginal package treatment problems requires an initial inspection, then a follow-up inspection with both the operator and the owner present. If the problem still is not corrected, then the owner is brought in for a conference and a consent order is issued, and finally, if the problem is still not corrected within six months, an arrest warrant is issued. The process for correcting major package treatment problems is the same as the process for correcting marginal package treatment problems; except, for correcting major package treatment problems, photo evidence is required, a joint site inspection with DER, the wastewater operator and HRS staff is required."

Recommendations. "There are package treatment facilities in the County that are improperly operated or stressed beyond their design limits. The HRS and DER document approximately 675 violations annually. This greatly increases the potential for pollution of the Floridan Aquifer and surface water resources. The County should take an active role in the permitting and monitoring of these facilities. As part of the permitting process the County should examine the possibility of setting design standards that would allow package plants to become integrated with centralized systems."

Policy 1.4: "Package treatment plants located within certain environmentally sensitive areas of the County may be required to provide Tertiary Treatment, if a site analysis determines that it is necessary."

Policy 4.1: " For non-clustered development within Urban Areas or Rural land and for development in Hamlets, on-site swage disposal systems for waste-water treatment shall be allowed provided soils and environmental conditions are satisfactory."

Policy 4.2: "For development in Traditional Neighborhood Overlay District, Environmentally Sensitive Overlay Zones, Rural Towns, DRI's and FQD's, package waste-water treatment systems, or alternative systems which will create a comparable effluent quality built to county specification and meeting the LOS standard established in Policy 2.2, shall be required. When located in a future

waste-water service area, as identified in the support materials such systems may be an interim measure until regional or sub-regional waste water treatment facilities are available for mandatory hookup."

Policy 4.4: "Waste-water facilities to be provided by the developer shall be guaranteed in an enforceable development agreement."

Conclusions

Some urban counties have taken over the ownership of poorly designed and ill-operated package treatment plants, they have created sub-regional sewerage districts, and new package treatment plants are generally prohibited. All of the more urban counties surveyed have projected population densities and associated development which justify and necessitate regional sewer systems.

From the preceding data base and analysis, it appears that Marion County has recognized the need to resolve existing package treatment plant problems, to develop a more efficient monitoring process, and to allow new package plants where necessary. Marion County differs from Levy County in that it allows package plants for residential development, it has many more existing plants, and various portions of the county are scheduled for sub-regional and regional sewer systems.
Dixie County has taken the approach of generally limiting package plants to urban service areas, considered comparable to the Levy County Municipal Service Districts. Both Suwannee County and Gilchrist County allow the permitting of package facilities without the urban service constraint. None of these more rural counties have plans which envision development outside the urban service areas that might require central sewer districts.

Levy County is unique, by having had the only residential package system in the county create an awareness that there is a huge public liability attached to allowing owner-occupied residential developments to be served by package systems. On the other hand, the adopted Levy County Comprehensive Plan has created commercial nodes and it encourages planned development, both of which might require central sewer services if they are to be developed/implemented.

The Board of Levy County Commissioners remains unwilling to allow private franchises to operate residential sewer systems serving owner-occupied housing except in the MSD's under special circumstances. Similarly, no other special districts are envisioned at this time.

The preceding data, however, have documented that package plants can be utilized pursuant

to rigid standards for:

A. Design
B. Facility Monitoring
C. Operations/Maintenance
D. Financing

If non-owner projects using package plants are designed, monitored, operated/maintained and adequately financed, in accord with comprehensive plan policies directed at these issues, they can and will meet or exceed State performance standards. In the unlikely event that such a system should fail to meet minimum standards, it can be shut down completely without any threat to the life savings, health or safety of individuals. This will keep the Board out of the water and sewer business.

Balance is needed between the extremes of over-regulation and under-regulation. This plan, which until 1993 prohibited private sewer treatment systems except within the municipal service districts, recognizes that the comprehensive plan has been too successful in stopping urban sprawl, i.e. it has precluded some significant growth and development which could have been allowed without any threat to the public health, safety or general welfare. Levy County intends to adopt stringent performance standards for package treatments plants, requiring them to be allowed outside the MSD's for non-owner residential and other non-residential uses, and, requiring them to be designed, operated and maintained at a level of service equal to that for sub-regional and regional facilities. It remains in the public interest to make certain that private residential sewer systems (owner-occupied) are virtually guaranteed to be self-perpetuating and economically viable. This requires that only the larger residential developments, or those which are well-planned and designed, should be allowed to contain private sewer systems. On the other hand, this plan also recognizes that non-owner residential developments as well as agricultural, commercial and manufacturing operations that require central sewer systems can be permitted without posing a significant threat to the public health, safety or general welfare.

Based upon this data base and analysis, it is the intent of the Board to be a state-wide role model for other rural counties, by adopting innovative policies which allow package treatment plants pursuant to performance standards which reasonably assure that they operate at a level equal to larger systems. This is consistent with the legislative intent adopted in Chapter 163.3177 (11)(a), F.S. which states:

> (11)(a) The Legislature recognizes the need for innovative planning and development strategies which will address the anticipated demands of continued urbanization of Florida's coastal and other environmentally

> sensitive areas, and which will accommodate the development of less populated regions of the state which seek economic development and which have suitable land and water resources to accommodate growth in an environmentally acceptable manner. The Legislature further recognizes the substantial advantages of innovative approaches to development which may better serve to protect environmentally sensitive areas, maintain the economic viability of agricultural and other predominantly rural land uses, and provide for cost-efficient delivery of public facilities and services.
>
> (b) It is the intent of the Legislature that the local government comprehensive plans and plan amendments adopted pursuant to the provisions of this part provide for a planning process which allows for land use efficiencies within existing urban areas and which also allows for the conversion of rural lands to other uses, where appropriate and consistent with the other provisions of this part and the affected local comprehensive plans, through the application of innovative and flexible planning and development strategies and creative land use techniques, which may include, but not be limited to, urban villages, new towns, satellite communities, area-based allocations, clustering and open space provisions, mixed-use development, and sector planning.

The Florida DCA has, in its objections, recommendations and comments report dated August 8, 1996, objected to Plan Amendment #7 on the basis of an inconsistency between Table 7-27 and Table 8-5. To eliminate the inconsistency, DCA has recommended that Table 8-5 should be amended to indicate that central wastewater systems in Conservation Areas cannot be permitted to serve densities as high as 6 units/acre as is currently shown in Table 8-5. The Board has agreed to this revision, as will be indicated in Plan Amendment #7 which incorporates revised and new wastewater treatment policies.

Soils Survey

There are a total of eighteen [18] soil variations throughout Levy County. Each has different suitability levels for septic tanks which range from moderate to very severe. The most severe places for septic tanks are along the coastline according to the solid maps. The most suitable place for septic tanks within Levy County based on the soils [both soils maps are in agreement] is in the northwest and eastern portion of the County, extending to the southeast from Bronson. The remaining portions of the County have severe soil limitations.

Solid Waste

Background Information

The materials dealt with in this element fall under the definition of "solid waste" adopted in section 9J-5.003(88), F.A.C., 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 "hazardous wastes" as defined in Section 9J-5.003(34), F.A.C., 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, schools, hospitals, motels and churches.

Industrial wastes include wastes generated by industrial processes and manufacturing operation, 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 identify the facilities which the County will need in order to manage and dispose of the solid waste and hazardous waste generated in the county during the planning period. For solid wastes, these include transfer stations, processing plants and landfills. For hazardous waste, only transfer stations will be addressed since disposal of such wastes within solid waste landfills is not permitted in Florida [Section 403.722, F.S.].

The term "transfer station" refers to a facility for the temporary collection of solid waste prior to transport to a processing plant or to a final disposal site. For the purpose of this element, only permanent facilities which would require attendance by trained operators will be addressed.

The term "processing plant" refers to a facility designed for incineration, resource recovery or recycling of solid waste prior to its final disposal. This element will address only such facilities as would serve the needs of the County as a whole. The purpose of these facilities may include any or all objectives of reduction of the volume of wastes disposed, energy recovery from wastes or recovery of reusable materials.

The term "landfill" refers to the final disposal site of solid wastes, and as it implies, involves burial of the wastes. Landfills are classified for regulatory purposes according t the characteristics of the wastes they are permitted to receive. This element will address only the type identified as a Class I landfill, which can receive the solid wastes typically generated in the County and is the only type currently operating in the County.

Regulatory Framework

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 [E.P.A.] and the Florida Department of Environmental Regulation [D.E.R.], and where dredging and filling might occur, by the U. S. Army Corps of Engineers [C.O.E.]. The regional water management district also provides state level review and water quality and quantity impacts. Actual construction and operation of solid waste facilities requires further permits and review by D.E.R. For processing plants which will generate electrical power or require tall emission stacks, further D.E.R. and Federal Aviation Administration [F.A.A.] review may be required. These federal and state responsibilities are summarized in Table 7-4.

For hazardous waste, the National Resource Conservation and Recovery Act [RCRA] of 1976 directed E.P.A. to develop a national program to regulate and manage hazardous waste and provide incentives for states to adopt consistent programs. The national Comprehensive Emergency Response and Compensation Liability Act [CERCLA], passed in 1980 provided E.P.A. with authority and funds to respond to incidents requiring site clean-up and emergency mitigation [the E.P.A. "Superfund" Program]. This act also defined the liability of business engaged in hazardous waste generation, transport and disposal and provided enforcement processes.

State

At the state level, the Florida Resource Recovery and Management Act [Sec. 403.7, F.S.], passed in 1980, adopted federal guidelines and directed D.E.R. 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.

TABLE 7-4

FEDERAL AND STATE REGULATORY REVIEWS APPLICABLE TO SOLID WASTE FACILITIES

Air Quality Activity Where Review Is Applicable	Review Agency
New and Modified Source Review Requirements	
1. Prevention Of Significant Deterioration [PSD]	DER, EPA 1/ Air Emissions In Attainment Areas
2. New Source Review For Non-attainment	DER Air Emissions In Non-attainment Areas
Permit To Construct Air Pollution Sources	DER Construction Of Air Pollution Sources [subsequent to testing]
Water Quality	
Permit To Dredge And Fill	DER, COE 2/ Dredging And Filling Where Possible; Effect On Water Quality
Permit To Construct Wastewater Discharge	DER Discharge Into State Waters [operation]
Water Quality And Quantity	
Consumptive Use Permit	WMD Consumptive Use Of Surface And Groundwater And Drilling Of Wells
Solid Waste	
Permit To Construct A Solid Waste Facility	DER Construction Of Solid

		Waste Facility
Permit To Operate A Solid Waste Facility	DER	Operation Of Solid Waste Facility
Other		
Certification Of Proposed Electrical Power Generating Plant Site	DER 3/	Any Power Plant Over 50 MW. Optional For Smaller Facilities
Notice Of Proposed Construction	FAA	Construction Of A Tall Emissions Stack.
Environmental Impact Statement Provisions	EPA, COE Or Other	EIS Requirements Dependent Upon Federal Involvement.

Footnotes:

1/ DER reviews permit and recommends to EPA the action to take. Final determination issued by EPA.
2/ Joint application between DER and Corps of Engineers.
3/ Use Of the Florida Electrical Power Plant Siting Act [PPSA] may preclude the need for individual permit applications under Florida law since it serves as a clearinghouse for these various permits. A Memorandum of Understanding has been reached with EPA. Their permit requirements may also be addressed under the PPSA.

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 County-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.

Local

At the County level, the Levy County Mosquito Control Department supervises the Levy County Solid Waste Division and is responsible for managing the county landfill. This includes processing permit applications for new facilities and ensuring that existing facilities are operated in conformance with permit requirements and in compliance with water quality objectives.

Current Facility Conditions

Area Served And Responsible Authority

The single solid waste facility in Levy County is a Class I sanitary landfill. The entity having operational responsibility of the landfill is Levy County Mosquito Control Department, which is supervised by the Levy County Board of County Commissioners. This responsibility includes processing permit applications for new facilities and ensuring that existing facilities are operated in conformance with permit requirements and in compliance with water quality objectives. The service area of the facility is one hundred percent [100%] of Levy County [one thousand one hundred three (1,103) square miles], since the closure in December, 1984 of five Class II sanitary landfill sites serving Bronson, Chiefland, Cedar Key, Williston and Inglis/Yankeetown. In addition to unincorporated Levy County, all towns and cities contribute solid waste to this facility. The predominant types of land uses served by the Levy County landfill are residential and commercial land uses.

The Levy County landfill [LCL] is located on a one hundred sixteen [116] acre land parcel [Section 24, Township 12 South, Range 17 East]. As shown on Map 7-3, this location is south and east of Levy County Road No. C-335 approximately three miles southeast of the Town of Bronson. Map 7-2 presents soils in Levy County ... the landfill site is located in an area of Astatula-Candler soils.

Impacts On Adjacent Natural Resources

The LCL is located on the Brooksville Ridge whose surface lithology is predominately sand up to ten [10] feet in depth. Underlying this is a diverse mixture of sands, silty sands, clay sands and sandy clays. The lower strata contain harder phosphatic materials

with a relatively low permeability (4). This area seems well suited for solid waste disposal, given efficient operation, for the following reasons:

1. Individual trenches are easily excavated from the loose surficial sand layer.

2. The distance between ground surface and ground water is great enough to allow efficient depth without interacting with the ground water.

3. Underlying deposits will hinder leachate migration toward the aquifer and a modicum of leachate attenuation by ion exchange and adsorption (4).

The Soil Conservation Service [Table 7-3] in its "Soil Interpolations Record" [FL0019] ascribes severe limitations in using Astatula-Candler soils for sanitary landfill. The main reasons for this are: 1) seepage - the sandy soils allow liquids to readily leak from the site, and 2) slope - uneven terrain makes it hard to excavate. For this reason the County has been lining the bottom with clay, and as a further precaution, will begin using a plastic liner at D.E.R.'s insistence. These liners should add to the innate resistance to seepage found in the clayey sands and sandy clay from one hundred twenty [120] to one hundred thirty-five [135] feet below the surface.
Current opinion (4) is that the site is not prone [though also not immune] to sinkhole formation in that all surface evidence of subsurface fractures [lineaments] shows little indication of fracture intersection or multiple fractures.

Groundwater studies using test base wells indicated that there is no sizable subsurface water movement which would spread pollution (4).

The slight hydraulic gradient measures indicates the lack of a strong driving force to dispel ground water from this site. This suggests that it may be possible to capture and treat any contamination before it leaves the site. Any plume of pollution, if it exists, would probably move slowly (4).

MAP 7-2

GENERAL SOILS MAP

MAP 7-3

LEVY COUNTY LANDFILL LOCATION MAP

In summary, the LCL is not a threat to rare vegetation since the plant communities [longleaf pine, sand pine, turkey oak and sand live oak] are common in this region. There is a possible threat to the Floridan aquifer from a leachate plume, however a low hydraulic gradient, natural impeding layers of sandy clays, and the addition of a protection liner appear to satisfactorily neutralize that danger.

Design Capacity And Current Demand

The predominant form of solid waste entering the LCL is residential waste. A smaller portion consists of "construction/demolition debris and yard trash" (4). Special waste [abandoned automobiles, waste oil, dead animals, agricultural or industrial waste, septic tank pumpings, infections or hazardous waste] is prohibited from the site. As shown in Table 7-5, current monthly use is about one thousand [1,000] tons, as of 1986. This corresponds to roughly forty-seven percent [47%] of the maximum design capacity. Given current county population estimates of around twenty-four thousand [24,000] people, this averages at two point eight [2.8] pounds of solid waste per day for each county resident (4).

TABLE 7-5

1986 CAPACITY AND DEMAND OF THE LEVY COUNTY LANDFILL

Design Capacity [Tons]

	Average	Maximum	Minimum
Daily	62.00	68.00	52.00
Monthly	1,831.00	2,100.00	155.00
Annual	22,000.00	24,239.00	18,570.00

Current Demand [Tons]

	Average		Maximum		Minimum	1986	1992
Daily	30.51	35.60	33.66	25.78			
Monthly	915.20	1,082.75	1,009.93	773.35			
Annual	10,982.42	12,993.20	12,119.16	9,280.20			

Source: Levy County Mosquito Control Department, June 1987, updated in 1992. Table 7-6 shows an estimate (4) of the waste composition based on EPA publications.

TABLE 7-6

WASTE COMPOSITION SUMMARY

Component	Moisture [% by weight]	Amount [% of total]	
		1987	1992
Paper	10	45	39
Food Waste	72	20	11
Glass and Metal	2	15	10
Construction/Demolition	10	5	5

Yard Trash	40			3			4	
White goods		2			3			4
Plastic, rubber, etc.		2			4			
						10		
Other		10			5			
						17		

In the period July, 1991 through June, 1992, the landfill received solid waste at the rate of 12,993 tons per year. This equals 2.75 pounds per capita per day... identical to the 1986 rate.

Proportional Capacity Allocated To Municipalities

The Board of Levy County Commissioners has not "allocated" any specific proportion of the LCL to any one municipality; rather, they have agreed to dispose of all solid waste generated. In 1989, based upon information from the Levy County Administrative Assistant's office and as provided by the County Engineer 1/, fifty-two point two percent [52.2%] of the solid waste stream is generated by the municipalities; however, some municipal collections include unincorporated areas.

Collection System

The Board does not grant franchises, it operates no County- owned trucks or transfer stations, and it does not mandate subscription to a collection service. Some remote portions of the County cannot receive collection services.

Levels Of Service

The level of service provided by the facility meets or exceeds all state and federal regulations such as prevention of pollution to the Floridan Aquifer. In addition, the facility is designed to receive one hundred percent [100%] of all solid waste produced by Levy County, based upon a level of service standard of 5.5 pounds per capita per day. In 1989, demand was two point eight [2.8] pounds per capita per day, or fifty percent [50%] of the design capacity.

Projected Facility Needs

Expected Life

The current estimate of the Levy County Landfills [LCL] total operating life expectancy is three [3] years (4). This estimate assumes:

1. Annual population increase will remain around 2.66%;
2. Refuse disposal per person will remain around 2.8 pounds per person per day; and,
3. Disposal equipment will remain the same.

1/ Mills Engineering, Recycling and Education Grant Application, Page 17, 1989. Cedar Key = 8.1%; Chiefland = 19.3%; Williston = 15.7%; Bronson = 4.3%; Inglis = 2.7%; Yankeetown = 2.1%; Otter Creek = N/A

The facts currently supporting each of these statements can change radically. Population increase due to tourist or retiree immigration to Levy County could rise dramatically. Dramatic increases in population density have been occurring over the last several years in Gulf coast counties to the south of Levy County. It is possible that Levy County's rural, undeveloped character will prove increasingly attractive to retirees who are tired of crowding, and that the resulting influx will boost County population substantially.

Refuse disposal per person could increase due to 1) introduction of new waste creating consumer products. In the latter case, synthetic diapers are a dramatic example of a new technology which has greatly increased waste flow to landfills [some estimates range as high as thirty percent [30%] of the flow]. Synthetic diapers unfortunately offer a new threat to ground water in that their burial places large amounts of untreated human waste near ground water.

The final assumption could also prove false should new types of waste processing technology and work place organization be introduced to the LCL. For instance should a shredder or an incinerator or a compactor be used to reduce the waste flow volume, the LCL's life could be extended. Similarly, should recycling be introduced either on-site at the LCL and/or County- wide in people's homes, then the waste volume would be reduced and life expectancy of the LCL increased.

For instance, should negotiation be successfully completed with the firm which has the contract to recycle wastes for Taylor County, waste flow could be reduced by as much as twenty to twenty-eight percent [20%-28%] (5). The life of the LCL could be extended by some ten [10] years. Given the large potential for new technologies, consumer products and forms of social organization to change waste flows, estimates of expected life are subject to radical change and should be re-examined every five years.

Service Over First And Second Planning Increments

Assuming that all the factors used for projecting the LCL's expected life hold constant, service levels by the end of the first planning increment [1987-1995] will have reached a monthly flow of one thousand one hundred forty-two [1,142] tons or fifty-two percent [52%] of the maximum design capacity for the facility. By the end of the second increment of the planning period [1995-2020] the solid waste flow will have reached one thousand four hundred ninety-nine [1,499] tons/month, still below the maximum design flow. Therefore, in terms of rate, the LCL can easily handle solid waste flow through the next planning period. [See Table 7-7.]

TABLE 7-7

WASTE FLOW OVER 1ST AND 2ND PLANNING PERIOD INCREMENTS

Planning Period Increment 1/	Year 2/	Population 2/	Waste Flow Tons Per Month 3/
First	1987	23,800	1,000
	1990	25,923	1,104
	1995	28,943	1,232
Second	2000	31,599	1,346
	2010	36,437	1,552
	2020	41,275	1,758

Footnotes:

1/ Planning Period Increments: First = 5 year, Second = 15 year.
2/ Population projections from University of Florida, Bureau of Economic and Business Research, 1991.
3/ Waste Flow - assume 2.8 pounds/day/person, 30 days/month.
Population X .0425833 = Tons Per Month.

In terms of total volume of landfill utilized, current projections (4) are for the LCL to reach maximum capacity by the year 2019. Therefore, by the end of the initial planning period the LCL should have another fourteen [14] years of operation remaining at the current waste generation rates.

General Performance Of Existing Facility

Overall, the performance of the existing facility is good. It is operating at or above all local, state and federal standards. In addition, the facility currently has a surplus capacity as the user demand is approximately forty-nine percent [49%] of the capacity.

The expected life of the solid waste disposal facility, as stated previously, is approximately thirty-three [33] years as of 1987, or, 2020.

Since the year 2020 extends beyond the total time frame covered by this plan, immediate actions are not necessary to make provisions for the future.

Levy County Recycling Program - Summary

Levy County is located on the west coast of North-Central Florida and has a total area of approximately one thousand one hundred [1,100] square miles. The population is estimated to be twenty-five thousand nine hundred twenty-three [25,923] [1990 Census] with the majority of people [eighteen thousand, one hundred forty-eight (18,148)] living in unincorporated areas. The population per square mile is estimated to be twenty-three [23]. On April 1, 1989, the number of households in Levy County was estimated to be nine thousand six hundred fifty-five [9,655] with an average household size of two point fifty-six [2.56]. Levy County has eight [8] municipalities, the two [2] largest being the City of Williston and the City of Chiefland with populations of two thousand one hundred seventy-nine [2,179] and one thousand nine hundred seventeen [1,917], respectively.

Solid waste collection in Levy County is provided by nine [9] private and municipal haulers. Solid waste is brought to the Levy County Landfill near Bronson. A number of recycling options also exist in the County. A summary of the larger recycling programs and the solid waste generators served is as follows:

Curbside collection of recyclable materials is provided by the City of Williston and serves residential, commercial and governmental/institutional generators in and around Williston. Curbside collection is also under discussion in the City of Cedar Key at this time.

Curbside collection of office paper and other recyclable materials is provided to commercial and governmental/institutional generators County-wide by Levy County.

A drop-off center for recyclable materials is maintained by Levy County at the Levy County landfill near Bronson. A public used-oil collection center and yard trash mulching site are also located at this site. These facilities serve residential, commercial and governmental/institutional generators County-wide.

Drop-off centers are located in Cedar Key, Inglis and Chiefland and are maintained as cooperative efforts between Levy County and the municipalities. These centers serve residential, commercial and governmental/institutional generators in and around the respective municipalities. Levy County is currently in the process of establishing more drop-off centers County-wide.

A recycling facility is located at the Levy County Landfill and operated by Levy County. This facility is a combination Volume Reduction Facility and Materials Recovery Facility [M.R.F.]. Solid waste brought to the landfill is sorted to remove recyclable

materials prior to disposal at this facility. In addition, recyclable materials collected from all of the programs listed above are processed at and marketed from this facility. This facility services residential, commercial and governmental/institutional generators County-wide.

Buy-back centers operated by a private company are located in Chiefland and Williston. These centers serve residential, commercial and governmental/institutional generators County-wide.

Levy County Recycling Program - History

A study on the feasibility of recycling in Levy County, funded by the Governor's Energy Office, was completed in June, 1990. The objective of this project was to determine the feasibility of establishing and operating a Recycling [Volume Reduction/Resource Recovery] Facility at the Levy County Landfill and to examine ways of increasing the efficiency of the facility. Options for reducing the volume of non-recyclable materials were also examined.

Levy County received a permit modification from the Department of Environmental Regulation in March of 1988 to include construction of a Volume Reduction [Recycling] Facility at the Levy County Landfill site. This facility operates by removing recyclable materials from the solid waste entering the landfill site. Removal of recyclable materials is accomplished by a combination of mechanical and manual means. Female inmates from the Department of Correction's Levy Forestry Camp near Bronson as well as five [5] County employees staff the facility. Recyclable materials undergo processing and storage at the facility before being sold to private companies. The facility also serves as a processing center for recyclable materials collected by Williston's curbside collection program and drop-off centers County-wide.

Construction of the metal building and foundation was completed in December of 1988. Paving of the area surrounding the building, installation of water septic facilities, and equipment installation were completed in August, 1989. Testing of equipment at the facility and operations began September 29, 1989. A used compacting garbage truck was purchased and modified during the spring of 1990 for transporting the unrecyclable solid waste to the landfill trench. A second compacting truck was purchased and modified during the spring of 1991.

An extension to the building was added during the summer of 1990. This extension provides cover over the end of the conveyor belt and keeps rainwater from infiltrating the unrecyclable solid waste. This extension also provides additional storage space for recyclable materials. The sorting conveyor and associated walkway were extended during

the spring of 1991 to allow more inmates to sort solid waste.

A pole-barn type structure was built during 1990 near the entrance to the landfill to serve as a drop-off center for recyclable materials for the public. The landfill site accepts these materials at no charge, while unsorted solid waste costs fifty cents [$0.50] a bag. This structure also serves as the site of a public used oil collection center.

Levy County began a pilot office paper collection program in the Town of Bronson during June, 1990. The Town of Bronson was chosen as the site of the pilot program because it is the County seat. The Levy County Courthouse, Agriculture Center, School Board offices, and various legal and professional offices are all located within close proximity to each other. In addition, the Levy County Recycling Facility is located a relatively short distance away. Levy County expanded this program County-wide to include all of the schools, municipal offices, and post offices by the end of September, 1990. Private businesses have been added as requested.

Levy County provides each participating office with desk top boxes printed with the words "We Recycle" and reusable woven polypropylene bags printed with "Levy Co. Recycling". The desk top boxes are emptied into these bags for collection by County personnel. A pick-up truck with a topper was purchased to transport the paper to the Recycling Facility for further sorting and processing. White office paper, colored paper, computer paper, cardboard and newspaper are collected in this program.

The collection program is currently serving over ninety [90] locations County-wide with approximately one thousand [1,000] people and four thousand seven hundred [4,700] school children participating. During the summer of 1991, the program began collecting aluminum cans, glass, telephone books and other recyclables in addition to the materials previously collected.

Levy County plans to continue to expand this program. A mobile drop-off trailer pulled by a pick-up truck [see description below] will be used to collect materials.

The South Levy Recycling [drop-off] Center opened in the Inglis-Yankeetown area on May 15, 1991. Levy County built the building and picks up materials while the Withlacoochee Gulf Area Chamber of Commerce provides publicity and monitors the building. A drop-off center was also set up at WalMart in the City of Chiefland during July, 1991. The container was provided by Browning Ferris Industries, but materials are collected by Levy County. Additional drop-off centers are being established. Levy County is in the process of purchasing modified twenty [20] foot "cattle" trailers that can be placed at locations around the County, including the Levy Forestry Camp. These mobile drop-off

centers will be transported by Levy County to the Recycling Facility as needed.

Levy County purchased a "chipper" during the 1989-1990 year to mulch yard trash at the landfill site. Previously, yard trash was mulched using a "chipper" belonging to the Levy County Road Department. This mulch is either used in County landscaping projects or given away to the public. All white goods received at the landfill site have been recycled since March, 1990.

The Levy County Landfill is also permitted as a Waste Tire Processing Facility. Waste tires are collected and stock-piled in a designated area at the landfill site. These tires were previously collected from the site by a private company and taken to a processing site elsewhere. Most of the tires were recycled as used or recapped tires, although some were used as fuel. This company no longer collects the tires, however, and tires are now being chipped into small pieces. These tire chips will be used as landfill cover until another tire recycler can be found.

In addition to the recycling programs, Levy County has permitted a Class III disposal area for construction and demolition debris and yard trash that cannot be chipped [large stumps] at the landfill site. Scrap metals are removed from the construction and demolition debris for recycling prior to disposal.

A waste composition study took place in February, 1991. TIA Solid Waste Management Consultants and Mills Engineering Company worked with Levy County personnel to plan, supervise and summarize the results of the study. Sorting of the solid waste was performed by County personnel and inmates from the Levy Forestry Camp.

Other Recycling Programs A number of other recycling activities are taking place in Levy County. These programs are not being funded by Levy County, however, information on these programs is presented throughout this application. Levy County continues to update information on recycling activities throughout the County as it becomes available.

Recycling Education Program. A public relations firm was hired by Levy County in August, 1989 to develop a public recycling education campaign for the County. This campaign involved the use of cartoon animal characters that were used to educate the public about the importance of recycling and proper solid waste disposal, and how the consumer can reduce solid waste volume. The theme of the education campaign was "Recycling - Preserving Your Environment".

The cartoon characters were used in newspaper advertisements in local newspapers and on posters that were placed in retail stores throughout the County. The advertisements began running approximately two [2] weeks prior to the opening of the Recycling Facility and continued running for approximately sixteen [16] to [18] weeks. Four [4] different advertisements were alternated in five [5] local newspapers with a combined circulation

of approximately ten thousand six hundred fifty [10,650]. The advertisements also ran in the "Tri-County Bulletin" which has a circulation of thirteen thousand nine hundred [13,900] in Levy, Dixie and Gilchrist Counties. Additional advertisements were run in these newspapers during the winter of 1989-1990.

In addition, "coloring pages" were distributed to elementary school children to introduce them to the cartoon characters used in the education campaign. These coloring pages were not designed to teach recycling, simply to draw attention to the media campaign. Press releases to publicize the opening of the Recycling Facility were also submitted to local newspapers.

Preparation began during the summer of 1990 of the "Levy County Recycling News", a newspaper concerning recycling in Levy County. This newspaper was prepared by personnel of Mills Engineering Company, the Levy County Cooperative Extension Service, and the Administrative Assistant to the Board of County Commissioners. The newspaper describes recycling programs in Levy County as well as providing information on a variety of topics, including materials that can be recycled, ways to reduce waste, and facts about recycling. The coloring pages and one of the cartoons from the initial education campaign were also included.

This newspaper was direct mailed to approximately five thousand eight hundred [5,800] households and five thousand two hundred [5,200] post office boxes, in Levy County during the first week in October, 1990. It has also been distributed to the public whenever possible.

Volume 2 of the newspaper was direct mailed to five thousand three hundred one [5,301] post office boxes in Levy and six thousand six hundred seventy-seven [6,677] households in Levy and surrounding counties during September, 1991. The newspaper will also be distributed to locations that participate in the office paper collection program and to businesses in Williston. It is anticipated that Volume 3 of the newspaper will be mailed to residents during the spring of 1992.

A logo for the Levy County recycling program was also designed during the summer of 1990. This logo has been used on the newspaper, on decals for the recycling program trucks, on bumper stickers [four hundred (400) printed to date] for County vehicles and school buses, and on a plaque hung on the Recycling Facility. The purpose of the logo is to increase recognition of the program and to instill pride in those participating in it. The bumper stickers have been distributed to County employees, volunteers assisting with the education program, members of various organizations, and residents of Levy County who bring recyclable materials to the drop-off center at the landfill site. More bumper

stickers may be printed during the 1991-1992 year if the demand for them exceeds the current supply.

The education campaign involves volunteers to distribute materials as well as to perform the telephone surveys being used to measure the success of the education program. The volunteers are trained and taught about recycling and waste reduction by personnel from Mills Engineering Company and the Levy County Cooperative Extension Service. The use of volunteers has had an additional benefit of increasing the level of involvement by the public in the recycling program in Levy County.

"Talks" have also been presented to various organizations during the past year by the Recycling Coordinator, an employee of Mills Engineering Company, and the Levy County Home Economics Agent. These talks educate the public about recycling in general and specific recycling programs in Levy County. Copies of the Recycling Newspaper and bumper stickers are distributed at these talks as well. Speakers will continue to be made available to local organizations as requested.

Public service announcements will be distributed to local newspapers to announce the locations of new mobile drop-off centers as they become established. Information on the expansion of materials collected by the office paper collection program will be distributed by hand-outs to participating locations.

The Levy County Extension Service is also working on a puppet show for children and a recycling display that can be set up in stores and at other locations around the County.

In addition to the public education program, all municipalities in Levy County were sent a report at the beginning of September, 1989 that described how Levy County will implement some of the requirements of the 1988 Solid Waste Management Act. This report discussed not only the recycling facility, but also the recycling education campaign and some of the goals of the recycling program for the 1989-1990 year. It is anticipated that another report will be sent to the municipalities and other solid waste haulers during the 1991-1992 year.

Business And Accounting Plans Levy County will comply with any required accounting or reporting procedures specified by the Department of Environmental Regulation for the grant funds. The Board of County Commissioners established a separate budget for the recycling facility at the beginning of the 1988-1989 fiscal year. Costs related to the recycling facility for the previous fiscal year were accounted for as part of the general landfill budget. The budget for the Recycling Facility was recombined with the landfill budget during 1989-1990, however, costs for the landfill and the recycling program are accounted for separately.

All accounting records related to the grant will be maintained on file for a minimum of three [3] years and will be accessible for State or Federal audit. Levy County follows the "Uniform Accounting System" and conforms with generally acceptable accounting principles. Grant funds will be incorporated into Levy County's annual audit by an independent auditor.

The fiscal officer responsible for handling fiscal matters on behalf of the Levy County Board of County Commissioners is Douglas M. McKoy, Clerk of Circuit Court. However, Sheila Rees, Fiscal Supervisor, has been authorized to verify and sign the required quarterly reports of grant fund expenditures.

As of 1992, recycling was removing ten percent [10%] of the solid waste received at the landfill. By 1995, this is expected to increase to thirty percent [30%].

Problems And Opportunities

The question of maintaining the capability to dispose of solid waste is clouded by the previously mentioned uncertainties concerning waste generation and disposal. New industries and new consumer products can greatly increase waste flow while new technologies and social attitudes can greatly decrease such flow. Consequently, the Levy County Board of County Commissioners (5) has been advised that in regard to replacement, expansion and new siting of solid waste facilities, it is not wise to plan too far ahead ... with current technologies in mind, the picture can change too quickly. Certain watershed events such as Three Mile Island or Love Canal can change public attitudes and engender legislative changes so quickly that previously accepted technologies are suddenly considered obsolete.

Therefore, while the areas surrounding the current landfill site currently have a potential for being used as part of an expanded landfill, they are not being counted on. The chances that landfills will no longer be regarded in twenty [20] years as satisfactory waste disposal are too high for such contingency planning.

On the other hand, Levy County has not been attracted to plans of a regional waste facility centered in Alachua County. The abundance of available land in Levy County and the great hauling distances make such a prospect look non-cost effective (5). The County is also aware of the potential trap of such mass burn facilities. If the economics of such a facility are geared to certain minimum waste flows, then any attempt to recycle or otherwise reduce waste flow would be discouraged since the county would have to guarantee delivery of a certain waste volume each day. Rising petroleum costs will probably make reduced waste hauling appear much more cost effective over the long run than any

waste-to-energy agreement.

Therefore, the long term challenge will be to reduce waste flow. Disposal methods are rising quickly in cost or are being eliminated as usable alternatives, as the public becomes more anxious about the potential of wastes to pollute natural resources. Public resistance to waste disposal methods is progressively lengthening the selection process and making it more expensive. Ed Culpepper, engineer for Alachua County, estimates it takes ten [10] years from identification of a need for a solid waste disposal facility to actual operation.

The opportunities in solid waste disposal involve new technologies which reduce waste volume either through physical techniques [compaction and shredding] or through recycling. The latter appears most imposing since it involves educating a public whose appetite for consumption has only grown for the last four [4] decades. However, experiments around the nation with recycling appear to be successful, especially when the public is aware of the dangers and actively participates. So the challenge for County leadership will be to spearhead public education and cooperation with county departments involved in waste disposal.

This will not be easy given the severe problem with illegal dumping in many of the uninhabited areas of the County (5).

Existing And Projected Impacts On Adjacent Natural Resources

The only adjacent resource vulnerable to the current landfill is the Floridan aquifer. State-of-the-art materials and techniques for landfill construction and management (4) have been recommended primarily to protect the aquifer from pollution by leachate plumes. These protective measures in the construction phase include (4):

1. Preparation of impermeable trenches for waste storage.

    (a) Berming and ditching around trenches to direct storm water away.

    (b) Proof rolling the trench bottom to give a uniform surface.

    (c) Removal of all objects [sticks and rocks] which could puncture the liner.

    (d) Installation of a bottom liner of either sixty [60] mil unreinforced membrane [PVC or polyethylene] or thirty [30] mil reinforced membrane

to prevent leaking downward from the trench.

(e) Installation of a similar top liner to ward off storm waters from above the trench. storm waters from above the trench.

2. Installation of a Leachate Collection System within the lined portion of the trench prior to lining.

(a) Cut and line a ditch in the trench bottom and then line it with a geotextile fabric to protect against drainage by drain gravel.

(b) Line the ditch with drain gravel on which shall rest a perforated PVC leachate collection pipe which in turn is covered with more gravel up to the trench bottom.

(c) A non-perforated pipe connects the trench with the leachate collection pipe.

(d) The leachate collection system is then covered with fine sand so as to cushion and protect the trench liner placed on top of it.

These construction techniques exemplify the careful approach to all phases of the creation and running of the landfill as recommended by Mills Engineering (4). The key factor protecting the aquifer will be the rigorous application of these methods and materials. Well designed technology improperly applied affords little protection.

One crucial area will be the proper supervision of waste disposal such that hazardous wastes are prevented from entering the landfill. In this manner, progress in developing hazardous waste storage and disposal systems is tied to the success of solid waste disposal systems. For so long as hazardous waste facilities do not exist or function well, there is a threat of improper disposal of said wastes in solid waste facilities.

As of 1989, no pollutants have been recovered from monitoring wells. There have also been no objections from surrounding landowners regarding odor or blowing debris, and regular compacting and covering of landfill materials has eliminated rodent and bird problems. Based upon these facts, it may be concluded that the landfill has not had, and it is not having, any adverse impacts on adjacent natural resources.

APPENDIX

(1) Van Huffnagel, Wastewater Management and grants, DER, Tallahassee.
(2) Don May, Department Health and Rehabilitation Services, Bronson.
(3) Soil Interpretations Record, U.S. Soil Conservation Service, U.S. Government.
(4) Mills Engineering Company "Levy County Landfill - Engineering Report, Vol. I" Bronson, Florida.
(5) Jerry Ward, County Administrative Assistant, Levy County, Bronson, Florida.
(6) Withlacoochee Regional Planning Council [1986] Hazardous Waste Assessment - Levy County, Ocala, Florida.

Hazardous Waste

Terms

As a starting point, it is important to have a clear understanding of several key terms that are used throughout this report. Selected terms that are defined below are hazardous waste, small quantity generator, large quantity generator, and storage/transfer facility.

Hazardous Waste

A hazardous waste is any substance that can result in a threat to human health or the environment. The U. S. Environmental Protection Agency [E.P.A.] defines a hazardous waste as a material having any of the following four properties: ignitable; corrosive; reactive; or toxic. There are approximately three hundred [300] chemical compounds that are classified by the E.P.A. as hazardous. For the purposes of defining what constitutes a hazardous waste in Florida, the state has adopted the E.P.A.'s definition.

Examples of hazardous materials include pesticides, paints, solvents, inks and adhesives. These materials become hazardous waste when they are no longer needed and must be discarded.

Small Quantity Generator

A small quantity generator is defined as an entity that produces less than one thousand [1,000] kilograms of hazardous waste in a month. Common examples of small quantity generators include print shops, funeral homes, auto mechanic shops, and photographic shops.

Large Quantity Generator

Large quantity generators are defined as entities producing over one thousand [1,000] kilograms [two thousand (2,200) pounds] of hazardous waste in a month. Examples of large quantity generators include power plants and chemical manufacturers.

Storage/Transfer Facility

A storage/transfer facility can be described as a warehouse- type operation where containerized hazardous wastes are stored for temporary periods of time. Upon arrival at the storage/transfer facility, the material is tested, consolidated and made ready for shipment to either a treatment facility or to an out-of-state disposal facility.

An example of a storage/transfer facility is found in Pompano Beach, Florida. Since 1981, Chemical Waste Management, Inc. has operated a hazardous waste storage/transfer facility adjacent to the Broward County landfill.

Regulatory Framework

Federal Hazardous Waste Regulations

Even though concern regarding hazardous waste can be traced back to the beginning of recorded history, legislation regulating hazardous waste is incredibly recent. The United States Congress fully focused on the hazardous waste issue for the first time in 1970 when it directed the E.P.A. to study hazardous waste disposal practices. Five [5] years later, Congress passed the Hazardous Materials Transportation Act. This Act provided a means of regulating the transportation of materials by establishing labeling, shipping and handling criteria.

The year 1976 marked the beginning of more comprehensive and stringent regulations to manage the production and disposal of hazardous waste. One Act, called the Toxic Substances Control Act, provided the E.P.A. with greater authority over the manufacture and distribution of new and existing chemicals. The Resource Conservation and Recovery Act [RCRA] established a means of monitoring the disposal of hazardous waste. Specific objectives of RCRA are:

1. Establishment of a manifest system to document the trail of hazardous waste from "cradle to grave";

2. Development of criteria to identify what constitutes a hazardous waste;

3. Promulgation of standards for disposing of hazardous waste through a permitting system; and,

4. Establishment of state-based waste management programs where feasible.

In 1980, Congress adopted another landmark piece of legislation called the Comprehensive Environmental Response, Compensation, and Liability Act. This legislation provided for the cleanup of abandoned hazardous waste dump sites. Finally, the Hazardous and Solid Waste Amendments of 1984 serve to expand and strengthen the provisions of the RCRA. These amendments, for example, broaden those subject to federal hazardous waste regulations to include small quantity generators.

Florida State Hazardous Waste Regulations

Concurrently with legislative directives begin promulgated at the federal level, Florida has taken positive steps in managing hazardous waste generation and disposal within its

boundaries. As encouraged by RCRA, Florida has received final authorization from E.P.A. to administer its own hazardous waste program. The State of Florida also adopted federal hazardous waste legislation and regulations for implementation in its state based hazardous waste program.

A major accomplishment of the Florida Legislature in addressing the hazardous waste issue was the passage of the Water Quality Assurance Act of 1983. This Act requires that all counties and regions complete the following work tasks:

1. Survey businesses to determine how much hazardous waste is being produced, what storage methods are being utilized, and how the hazardous waste is disposed;

2. Identify abandoned dump sites;

3. Identify landfill management practices;

4. Designated suitable areas where county storage/transfer facilities could be located if a need was demonstrated;

5. Designated suitable sites where regional treatment facilities could be located if a need was demonstrated.

Through the completion of these work tasks, the state will be able to comprehensively assess all aspects of the hazardous waste stream: specifically, where it is; what is it; and where it is going. The state is also required to site and build a hazardous waste "multipurpose facility".

Withlacoochee Region Hazardous Waste Program

The statewide hazardous waste assessment program initiated by the Water Quality Assurance Act was phased in over a three [3] year period. The regions with the highest populations conducted the assessments first, followed by the less populated regions. The Withlacoochee region encompasses five counties: Citrus, Hernando, Levy, Marion and Sumter. Map 1 depicts the five [5] county planning area. Levy County exercised its prerogative to have the Withlacoochee Regional Planning Council [W.R.P.C.] conduct its county assessment. The W.R.P.C. will compile the individual county assessment reports from each of the five counties into a regional assessment report.

Regional Coordination With the County

The hazardous waste program mandated by the Water Quality Assurance Act directed the County to address a very technical and sensitive subject. Consequently, adequate coordination was essential to ensure successful program implementation. Program coordination was accomplished in several ways: the formation of a County advisory subcommittee; discussion/presentations to County staff and the County Commission; media releases; and, presentations to civic and environmental associations.

A County advisory subcommittee was formed to provide the W.R.P.C. with direction and feedback in completing the County assessment report. The roles and responsibilities of the County advisory subcommittee were to:

1. Oversee and monitor the progress of the County hazardous waste assessment;

2. Provide direction to the W.R.P.C. regarding program implementation;

3. Review and provide feedback on program work products;

4. Recommend to the County Commission two areas in the County where a storage/transfer facility could be located; and,

5. Serve as a forum for hazardous waste awareness and mobilize support within the county to meet the objectives of the Water Quality Assurance Act of 1983.

In addition to meetings with the advisory subcommittee, the W.R.P.C. met with County staff to obtain technical information and solicit input. Council staff also coordinated with the County Commission to explain the County's responsibilities in carrying out the program and provide periodic updates on program progress.

The W.R.P.C. recognized early-on the key role of the media in facilitating the implementation of the hazardous waste program. Thus, every effort was made to generate media interest. At the beginning of the program, for example, a public information campaign was initiated to enhance public awareness of sensitivity to hazardous waste. The target group for the information campaign included newspapers, radio stations, and television stations in the Withlacoochee region. Media notices of all subcommittee meetings and public hearings were also distributed. The media responded very positively to the hazardous waste program and was instrumental in the dissemination of accurate information to the general public.

Finally, Council staff discussed the hazardous waste issue and the objectives of the hazardous waste program with various civic and environmental groups upon their request. These meetings provided Council staff with a forum to explain what are hazardous wastes and why we need to properly manage them.

All of the program coordination strategies identified above were successful for they broadened public official and citizen knowledge regarding hazardous wastes. With greater understanding of the issues, public confusion and resistance were minimized.

Current Facility Conditions

The management of hazardous wastes [HW] involves storage, processing and disposal. Facilities for these operations exist in Levy County or are available within the region. The following section assesses the current manner in which HW are generated in Levy County and how they are managed.

Current Demand Waste Generation Survey

Hazardous waste [HW] generators are concentrated near the urban areas of Levy County [Map

7-4]. Of the eighty-five [85] generators of HW, eighty-four [84] generated less than one thousand [1,000] kilograms [two thousand two hundred (2,200) pounds] per month [Small Quantity Generator] and one [1] generated more [Large Quantity Generator].

Some twenty-five [25] HW types are recognized in Florida [Table 7-8] of which thirteen [13] are known to be created in Levy County. Tables 7-9 and 7-10 give both HW quantity estimates based on survey and extrapolation (6). The latter estimates are attempts to eliminate unreliable survey responses.

Storage Methods

A wide variety of methods are employed for HW storage in Levy County. Small Quantity Generators [SQG] use some nine [9] methods [Table 7-11] ranging from cans and pails to pits and lagoons. The Large Quantity Generator [LQG] uses three [3] storage techniques for both SQG and LQG, drums and cans of pails appear to be the [Table 7-12] most commonly used storage methods.

Waste Disposal

Of the twelve [12] disposal methods employed in Levy County for HW, recycling appears to be the most common method. About eighty-three percent [83%] of SQG wastes and sixty-one percent [61%] of LQG wastes are handled in this way [Table 7-13]. The only other methods worth mention are: 1) hauling to the landfill [6.5%] and 2) permanent hazardous waste facility [6.4%]. This latter disposal method also accounts for some forty percent [40%] of all the HW which is not dealt with by recycling for LQG [Table 7-14].

It is of special concern that annually some twenty-three thousand eight hundred ninety-nine [23,899] pounds of HW are being disposed of in the County landfill (6). As noted in the Solid Waste subelement, the pits in the County landfill are designed to minimize leakage, but the best protection is on-site discovery and removal of HW from the waste stream. For the most part, these wastes are oils, greases and lubricants, although pesticides, heavy metal rinsings, inks, ignitable paints, heavy metal paints, solvents and lead acid batteries also find their way to the landfill (6).

Of three hundred thirty-three thousand three hundred seventy-five [333,375] pounds of HW annually generated in Levy County, approximately eight percent [8%] are improperly disposed of. The improper disposal methods are listed in Table 7-15 under the heading "REQUIRING FURTHER MANAGEMENT". Of these methods, hauler and generator disposal in the landfill account for some eighty-six percent [86%] of the twenty-seven thousand five hundred ninety [27,590] pounds improperly disposed.

Facility Needs Assessment

At present the only facilities for HW disposal located in Levy County are apparent uses on-site for recycling. As previously noted, over eighty-two percent [82%] of all County HW are disposed of in this manner. No estimate exists as to the expected life of such facilities; however, the bulk of such HW are waste oils and lubricants [fifty percent (50%) of all HW] and lead-acid batteries [twenty-nine percent (29%) of al HW]. These recycling technologies are readily available and well tested. Therefore, the need for long term planning to bring such technologies on line is small because they can be rapidly established as demand arises.

MAP 7-4

LEVY COUNTY HAZARDOUS WASTE
CONCENTRATIONS
[Generalized]

TABLE 7-8

HAZARDOUS WASTE TYPES AND UNIT CONVERSION TABLE

Code	Waste Type	Density (lb/gal)
A	Waste Pesticides	7.10
B	Pesticide Rinses	8.34
C	Empty Pesticide Containers	1 [lb/gal capacity]
D	Toxaphene Animal Dip	8.34
E	Other Dip Solutions	8.34
F	Heavy Metal Scrap	21.00
G	Electroplating Rinse	8.34
H	Electroplating Sludges	20.00
I	Waste Ink	8.75
J	Ignitable Paint Waste	7.86
K	Other Pain Waste	8.20
L	Spent Solvent	11.20
M	Distillation Bottoms	11.20
N	Dry Cleaning Filters	13.60 [lb/unit]
O	Cyanide Waste	8.34
P	Acids or Caustics	10.60
Q	Corrosive Plating Waste	8.80
R	Waste Ammonia	8.25
S	Photographic Waste	8.70
T	Other Ignitable Waste	6.80
U	Wood Preserving Waste	8.80
V	Waste Formaldehyde	6.80
W	Lead-Acid Batteries	38.00 [lb/unit]
X	Waste Explosives	6.00
Y	Waste Oils and Greases	7.62

Source: (6)

Analysis of wastes [Table 7-8] generated by small Quantity Generators shows that "oils, greases and lubricants" predominate at fifty-six point five percent [56.5%] of all HW and "lead-acid batteries" are the next largest quantity at thirty-one point five percent [31.5%]. Of the remaining HW types only solvents are of any significance [nine point two percent (9.2%)] and the rest comprise only two point eight percent [2.8%]. The Large Quantity Generator produces "oils, greases and lubricants" [forty-four point four percent

(44.4%)] for the most part, with the remainder of HW almost equally divided among paints, solvents and lead-acid batteries [Table 7-9].

TABLE 7-9

HAZARDOUS WASTE GENERATED ANNUALLY - SQG 1/ IN LEVY COUNTY

Waste Code	Surveyed Quantity	Extrapolated Quantity % [LBS]
Pesticides		
A	3	7 (0.002)
B	1,376	2,752 (0.8)
C	--	--
D	--	--
E	999,999	--
Heavy Metals		
F	--	--
G	934	1,351 (0.4)
H	--	--
Inks		
I	25	37 (0.01)
Paints		
J	908	1,404 (0.4)
K	20	37 (0.01)
Solvents		
L	16,434	29,804 (9.2)
M	--	--
N	--	--
Reactive Wastes		
O	--	--
P	--	--
Q	--	--
R	741	1,852 (0.5)
S	529	789 (0.2)
Ignitable Wastes		
T	374	748 (0.2)
Wood Preserving Wastes		
U	--	--
Formaldehyde		
V	--	--
Lead-Acid Batteries		
W	63,726	101,869 (31.5)

Explosives		
X	--	--
Oils, Greases Or Lubricants		
Y	99,003	182,793
Other		
Z	--	--
Total	1,184,072	323,443

1/ SQG = Small Quantity Generator.

TABLE 7-10

HAZARDOUS WASTE GENERATED ANNUALLY -LQG 1/ IN LEVY COUNTY

Waste Code	Surveyed Quantity	Extrapolated Quantity % [LBS]
Pesticides		
A		
B		
C		
D		
E		
Heavy Metals		
F		
G		
H		
Inks		
I		
Paints		
J	2,162	2,162 (21.0)
K		
Solvents		
L	1,848	1,848 (17.9)
M		
N		
Reactive Wastes		
O		

P		
Q		
R		
S		
Ignitable Wastes		
T		
Wood Preserving Wastes		
U		
Formaldehyde		
V		
Lead-Acid Batteries		
W	1,710	1,710 (16.6)
Explosives		
X		
Oils, Greases Or Lubricants		
Y	4,572	4,572 (44.4)
Other		
Z		
Total	10,292	10,292

1/ LQG = Large Quantity Generator.

TABLE 7-11

HAZARDOUS WASTE STORAGE METHODS - LQG

	Storage Method		
Waste Type	Below Ground Tank	Drums	Ground Or Floor
J		X	
L		X	
W			X
Y	X		

Source: (6)

TABLE 7-12

HAZARDOUS WASTE STORAGE METHODS - SQG IN LEVY COUNTY

Waste Type	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
Above ground Tank					X							X													X	
Below ground Tank																									X	
Drums		X							X	X		X								X					X	
Cans/ Pails	X									X	X	X						X	X							
Pits, Ponds, Lagoons																									X	
Ground or Floor																							X			
Dumpsters or Bulk Waste Container							X			X															X	
Lab Packs																										
Other Method (ie. Septic tank, sewer							X											X								

Source: (6)

TABLE 7-13

DISPOSAL METHODS - SQG IN LEVY COUNTY
[Pounds Per Year]

Waste Type	Hauler/ Landfill	Generator/ Landfill	Bury Waste on Site	Pits, Ponds or Lagoons	FHWF	Public Sewer	Septic Tank	Recycled	Burned for Fuel Value	Neutralized	Other	Total
A	5					2						7
B		2,752										2,752
G	100						1,251					1,351
I	37											37
J	1,000	2	48		354							1,404
K	17				20							37

L	45				18,172			8,806		2,781		29,804
R					1,852							1,852
S							781	8				789
T	748											748
W	6,391							95,478				101,869
Y	12,732	70	1,514	95	388			164,004	3,990			182,793
Z												
Total	21,075	2,824	1,562	95	20,786		2,032	268,296	3,990	2,781		323,443
Percent	6.5	0.8	0.5	0.03	6.4	-	0.6	82.9	1.2	0.9	-	100

TABLE 7-14

DISPOSAL METHODS - LARGE QUANTITY GENERATORS

Symbol	Waste Type Name	[lbs/year]	Permanent Hazardous Waste Facility [lbs/year]	Recycled
J	Ignitable Paint Waste	2,162		
L	Spent Solvents		1,848	
W	Lead-Acid Batteries		1,710	
Y	Waste Oils, Lubricants		4,572	
	TOTAL		4,010	6,282
	PERCENT		38.9%	61.0%

Source: Withlacoochee Regional Planning Council [1986] Hazardous Waste Assessment - Levy County.

TABLE 7-15

PROPER AND IMPROPER DISPOSAL METHODS

NOT REQUIRING FURTHER MANAGEMENT		REQUIRING FURTHER MANAGEMENT	
Code Number	Disposal Method	Code Number	Disposal Method
5	Permitted Hazardous	1	Hauler/Landfill
8	Recycled	2	Generator / Landfill
9	Burned	3	Buried
10	Incinerated	4	Pit/Pond/Lagoon
11	Injection Well	6	Sewer
12	Filtered	7	Septic Tank
13	Neutralized		

Table 7-16 shows that the more stringently monitored LQG disposes of all its waste in an environmentally sound manner. It would appear that the disposal problem centers largely on the activities of SQG's.

The wastes most frequently disposed of improperly are oils/greases/lubricants and lead-acid batteries (6). Map 7-4 shows geographic concentrations of hazardous wastes on a County- wide basis.

Some six percent [6%] of HW are disposed of in a permanent hazardous waste facility located outside Levy County whose life expectancy is as yet unknown. Another six percent [6%] are disposed of in the County landfill, but such disposal is unhealthy and illegal. While there is no imminent introduction of industry and related HW expected in the county, the nationwide trend shows an increase in HW usage proportional to population increase and increased demand for more sophisticated and reliable disposal methods.

TABLE 7-16
WASTE MANAGEMENT DISPOSAL PRACTICES - LEVY COUNTY [Pounds Per Year]

Waste Type	Amount of Waste that Requires Further Mgmt. SQG	Amount of Waste that Requires Further Mgmt. LQG	Amount of Waste Not Requiring Further Mgmt. SQG	Amount of Waste Not Requiring Further Mgmt. LQG	Total
A	7				7
B	2,752				2,752
C					
D					
E					
F					
G	1,351				1,351
H					
I	37				37
J	1,050		354	2,162	3,566
K	17		20		37
L	45		29,759	1,848	31,652
M					
N					
O					
P					
Q					
R			1,852		1,852
S	781		8		789
T	748				748
U					

V					
W	6,391		95,478	1,710	103,579
X					
Y	14,411		168,382	4,572	187,385
Z					
TOTAL	27,590		295,853	10,292	333,755

Note: Extrapolated Data

This usually means that HW are becoming too complex and dangerous to be handled on-site, and that new businesses specializing in off-site disposal are increasingly relied on (6). This trend has been accelerated by the desire of local businesses not to be entangled in progressively more complicated regulations. This trend is further amplified by the growing population and public awareness of the health risks of HW.

Service over the first and second planning period increments should readily adapt to a majority of HW disposal needs through the addition of recycling equipment. However, the minor portion of HW can still do heavy damage to local water supplies if improperly disposed of. Therefore, while it is very difficult to project the extent that HW disposal services must be increased, certain improvements can be anticipated in general.

Future Measures Of HW Disposal

The strong commitment County-wide to growth is a mandate for more industry, so a greater volume of HW can be expected. However, since the search for HW disposal methods are areas is already proving a challenge nationally, its incumbent on the county to tie into the better funded regional, state and national efforts to solve this complicated problem. As set forth previously (6), the following items will be needed: 1) additional transportation facilities, and 2) new storage facilities and additional treatment facilities [recycling, chemical treatment, physical processes, biological processes and incineration. Whether treatment facilities are secured locally or regionally will depend on demand, but at present growth rates, it is most likely that the County will have to rely on regional or state facilities. Storage and transportation facilities will be needed within the County.

Problems And Opportunities

Two major problem areas related to HW exist in Levy County; abandoned dump sites and management of the landfill. The former were created prior to enactment of federal and state regulations regarding disposal. Given their unregulated management, they pose a

threat to county groundwater. Table 7-17 lists abandoned dump sites in the County.

The latter problem has to do with the failure to prevent some twenty-three thousand eight hundred ninety-nine [23,899] pounds of HW from entering the county landfill. Since this landfill is not designed to handle HW, local groundwater supplies southeast of Bronson are threatened. The first step is to assess the pollution threat through the establishment of sixty-eight [68] monitoring wells located both up and down-gradient from the landfill. The following suggestions have been made to improve the decrease of the HW stream into the landfill (6):

1. Additional funding for more staff for better surveillance and inspection.

2. Enhanced HW training programs for staff.

3. Resource recovery operations to increase scanning of waste stream.

4. Public awareness programs.

Projected Impacts On Adjacent Natural Resources

Given that a majority of current HW are properly disposed of and that it is most probable that regional disposal facilities will take more of the HW stream, and hopefully, the portion of the HW which is improperly disposed of, it would seem that threats to the Floridan Aquifer will diminish. This situation must be reassessed to check the progress of development of regional facilities, because the County lacks the means to stop illegal dumping. The key to natural resource protection lies in offering HW generators an easy and affordable way to dispose of HW. That key lies with regional progress in waste disposal methods.

Summary And Recommendations

The threat to County welfare from HW must be met by a variety of methods which will emanate from local as well as regional, state and federal efforts. As such, the following strategies should reduce the chances of groundwater contamination by HW:

1. Reduce the HW volume produced through substitution of new materials in the production process which generate fewer wastes.

2. Enhanced waste recycling and waste exchange through research into new technologies and better public education and through development of better information networks such as the Southern Waste Information Exchange.

3. Establish a network of local collection centers and regional treatment sites.

4. Identify and study abandoned dump sites.

5. Identify and improve on landfill management practices.

Information Sources Cited

(1) Van Huffnagel, Wastewater Management and Grants D.E.R., Tallahassee, Florida.

(2) Don May, Department of Health and Rehabilitative Services, Bronson, Florida.

(3) Soil Interpretation Record U.S. Soil Conservation Services, U.S. Government.

(4) Mills Engineering Company "Levy County Landfill - Engineering Report, Vol. I", Bronson, Florida.

(5) Jerry Ward, County Administrative Assistant, Levy County, Bronson, Florida.

(6) Withlacoochee Regional Planning Council [1986] Hazardous Waste Assessment Levy County, Ocala, Florida.

TABLE 7-17

ABANDONED DUMP SITE INVENTORY IN LEVY COUNTY

Site	Status	Location					Groundwater Contamination	Owner(s)
		Sec.	Twn.	Range	Address	Type Of Site Potential		
Chiefland Site	Abandoned	06	12	15	—	—	Illegal Dump	Minimal
Chiefland Landfill	Closed	31	11	14	N. Hwy. 19	Brunswick Pulp Closed Landfill	Unknown	
Bronson Site	Abandoned	12	17	12	---	---	Illegal Dump	

								Minimal
Williston Landfill	Closed	33	12	19	---	---	Closed Landfill	Unknown
Otter Creek Site	Abandoned	28	13	15	---	---	Illegal Dump	Minimal
Raleigh Site	Abandoned	14	12	18	---	---	Illegal Dump	Minimal
East Chiefland Site	Abandoned	33	11	15	---	---	Illegal Dump	Minimal
Inglis Site	Abandoned	35	16	16	---	---	Illegal Dump	Minimal
Inglis/Yankeetown Landfill	Closed	03	15	17	---	---	Landfill	Closed Unknown
Cedar Key Landfill	Closed	09	15	13	Levy Co. Commissioners Levy County P. O. Box 306 Bronson, Florida 32621		Closed Landfill	Unknown
New Cedar Key Landfill	Closed	09	14	13	---	---	Closed Landfill	Unknown

Drainage

Drainage Systems

Water flowing over land during and immediately following a storm event is called stormwater drainage or stormwater run-off. Under the effect of gravity, the drainage 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 feature of a natural drainage system is the drainage basin, or watershed. The boundary of the basin is called the basin divide. This is a line where the natural land elevation directs run-off from the basin toward a common major drainage feature, such as a river, lake or bay. The major drainage feature is often called the receiving body and the smaller features are its tributaries.

Manmade drainage facilities include swales, ditches, canals and storm sewers, and are typical conveyance structures, collecting stormwater run-off 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 run-off 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.

Stormwater Management

The occurrence of stormwater run-off is highly variable, dependent on the amount of rain falling during each storm event and on conditions within the drainage basin. Since most storm events are relatively moderate, natural drainage features typically evolve to accommodate moderate quantities of stormwater run-off. Occasionally, severe storm events create run-off 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 basin ecosystem. Flooding is generally not perceived as a problem until development occurs in floodprone areas.

Historically, the typical strategy adopted in response to stormwater flooding of developed areas was to modify the drainage system to convey run-off 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 run-off, primarily due to the increase in impervious surfaces in the basin. 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 run-off 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 run-off, increasing pollutant loading on receiving waters. The increased velocity of run-off also disrupts natural drainage features by establishing 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 run-off after development is similar to that which occurred prior to development. To accomplish this, a combination of structural and non-structural techniques are utilized. Structural techniques emphasize detention and retention of stormwater to reduce run-off rates and provide

settling and filtration of pollutants. Non- structural techniques emphasize preservation or simulation of natural drainage features to promote infiltration, filtering and slowing of run-off. The objective of stormwater management is to utilize the combination of techniques which provides 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 basin-wide 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 pre- development run-off conditions so that the downstream system is not overloaded. By ensuring that all development within the basin is based on and supportive of a plan for the entire basin, the functions and useful life of both natural and manmade components of the system will be protected and extended.

There are two [2] basic factors involved in establishing a successful stormwater management program around these principles:

1. Establishing and applying uniform design standards and procedures; and,

2. Ensuring adequate maintenance of system components once they are constructed.

The design standard which is of primary importance is the design storm event. This standard specifies the intensity [rate of rainfall] and duration of the rainfall event to be used in the design of facilities. 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 to ensure proper performance during the life of the facilities.

Regulatory Framework

Federal

Section 208 of the Federal Water Pollution Control Act [PL92-500, 1972] is the directing federal law with respect to water pollution abatement. In implementing the Act, the Environmental Protection Agency [E.P.A.] identified pollutants carried in stormwater run-off as a major source of water contamination. To achieve the pollution abatement goals of the act, E.P.A. 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, including stormwater, and focused on identifying pollutant 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 run-off.

State

The Florida Department of Environmental Regulation [D.E.R.] 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 eighty to ninety percent [80%-90%] removal of stormwater pollutants before discharge to receiving waters. This rule requires treatment of the first inch of run-off for sites less than one hundred [100] acres in size and the first one-half [½] inch of run-off for sites one hundred [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 run-off to an impoundment area with no subsequent direct discharge to surface waters. Pollutant removal by settling and by percolation of the stormwater through the soil is almost total. 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. D.E.R. has delegated permitting responsibility to the two [2] regional water management districts with jurisdiction over the Levy County area. 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 [10] acres in total land area, have less than two [2] 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 silvacultural lands which have approved management plans.

Local

Levy County has adopted regulations regarding subdivisions' storm drainage, run-off and retention and roads and drainage [Chapter 16, Articles 4 and 5 - Code of Levy County Ordinance] as well as coastal flooding and river floodplain management [Chapter 9 - Code of Levy County Ordinances].

In the former case, the Levy County Road Department approves all construction plans and implementing any code provisions as part of the subdivision review process. In the latter case, the County zoning officer is responsible for the administration and implementation of the code's provisions.

To the extent that they have served a very rural County well, with no known drainage problems attributable to regulations, the existing regulations have been "strong" enough to be adequate. At the same time, there are known "weaknesses" with the regulations as viewed from the perspective of the board. A current weakness is the failure of the existing drainage regulations to adequately protect water quality, especially that of the Suwannee River, the Suwannee Sound, the Wacassasa River and Wacassasa Bay. The Suwannee River has been designated as an outstanding Florida water, and as such it requires an extra fifty percent [50%] additional treatment degree of protection not currently provided by the regulations.

Current Conditions

Natural Drainage Features

Levy County's physiography is predominantly a terraced coastal plain sloping south and westward from the Brooksville Ridge which runs northerly from Morriston to Bronson. To the east of the ridge lies the Western Valley, which passes at about one hundred [100] feet above mean sea level from north to south through Williston and down into Citrus and Sumter counties along the Withlacoochee River [Map 7-5].

Aside from the ridge and valley, the majority [more than seventy-five (75) percent] of the County is coastal lowlands ranging in elevation from zero [0] to one hundred [100] feet above mean sea level. The major part of the coastal lowlands, as defined in the

Coastal Zone Management Element, does not exceed twenty-five [25] feet in elevation. Therefore, in the Coastal Zone, the gradient is nearly flat, the elevation dropping some three [3] feet for every mile towards the Gulf of Mexico (7). In the higher portion of the lowlands, between Bronson and Otter Creek, the elevation might drop eleven [11] feet per mile (7), still a slope of less than one percent [1%].

There are four [4] major drainage basins in Levy County. Bracketing the County on its northwest and southern borders are the flood plains of the Suwannee and Withlacoochee Rivers, respectively [Map 7-6]. The Suwannee River basin covers some two point six percent [2.6%] of the County. The Withlacoochee covers two point two percent [2.2%].

These are fairly deeply incised rivers with few contributing creeks and no subordinate tributaries of any consequence in Levy County. More than half [fifty-five percent (55%)] the County is a broad lowland ["Coastal Area Basins" on Map 7-6] of many creeks and one major river, the Wacassasa. Some of the more important creeks in this drainage basin are Jack's Creek, Rocky Run, Otter Creek, MacGee Branch, Mule Creek, Cow Creek, Little Creek and Ten Mile Creek. The Eastern-most seventeen percent [17%] of the County is drained to the east into the Ocklawaha River Basin.

The average annual precipitation in Levy County is roughly fifty-six [56] inches as measured at the Usher Tower (8). This is the equivalent of 2,909 million gallons per day [m.g.d.] over the entire County. The regional evapotranspiration rate has been estimated (10) at thirty-eight point five [38.5] inches per year or 2,016 million gallons per day. After that seventy-one point four percent [71.4%] of the water budget has either evaporated from the ground or surface water or transpired through plants, three point six percent [3.6%] [109 m.g.d.] percolates to the Floridan Aquifer. The remaining twenty-five percent [25%] [763 m.g.d.] is direct run-off to features which drain the landscape or are base flow to lakes, streams and marshes.

The drainage picture derived from the soils record is not quite distinct. The Soil Conservation Service [SCS] "Soils Interpretation Record" (11) ascribes a flood frequency of "none" to fifty-one percent [51%] of Levy County soils and "rare" to fourteen percent [14%]. However, the same survey shows that fifty-one percent [51%] of all County soils have severe limitations for septic tanks due to wetness. A better idea might be derived from a flood prone area map [Map 7-7] taken from Federal Emergency Management Agency [F.E.M.A.]. The F.E.M.A. record shows that at least sixty percent [60%] of Levy County is flood prone. The effects of low elevation, low slope, shallow depth to rock or clay and occasional relatively high clay or organic content in the soil in some combination or another contribute to the tendency to flood in the County. Levy County participates in the National Flood Insurance Program, and the Board of County Commissioners has adopted ordinances dealing with coastal flooding, river lien flooding, and localized

flooding. Mosquito control ditches have been installed to help drain major flood areas in several cities within Levy County [Map 7-8].

MAP 7-5

GENERAL PHYSIOGRAPHY OF THE REGION AROUND LEVY COUNTY

MAP 7-6

DRAINAGE BASINS OF LEVY COUNTY

Design Capacity And Current Demand

The only drainage facility for the County is the infrastructure built to drain roads and highways. As shown per Table 7-18, County roads are drained by some six hundred sixty-six [666] miles of roadside ditches which can hold some 2,419 acre-feet [788 million gallons]. Aiding this drainage are some eight point five [8.5] miles of side drains, seven hundred forty-two [742] pipes under two [2] feet in diameter, one hundred thirty-one [131] pipes three [3] feet in diameter, forty-one [41] pipes over four [4] feet in diameter, one hundred eighty-seven [187] box culverts [two (2) to ten (10) foot] and one eleven (11) to nineteen (19) foot box culvert.

TABLE 7-18

DRAINAGE FACILITY SUMMARY

Description		Measure
1.	Length of Roads	486
2.	Roadside Ditches	
	a. Length in Mile	666
	b. Total Volume in Acre Feet	2,419
3.	Median Ditches	
	a. Length in Miles	40
	b. Number of Catch Basins	171
4.	Outfall Ditches, Piped Length in Feet	112
5.	Cross drains, Side Drain Pipe Length in Feet	44,910

Source: Levy County Road Department.

MAP 7-7

FLOOD-PRONE AREAS
IN LEVY COUNTY

MAP 7-8

MOSQUITO CONTROL DITCHES

No analysis of current demand on drainage facility capacity is available or possible, as all of the facilities are ditches and drains which are subject to intermittent flow; i.e. they are dry most of the time, and demand on capacity is a function of rainfall intensity and duration, soils types, with previous frequency and intensity added as another variable. Under normal [dry] conditions, demand is therefore zero percent [0%] of capacity.

Current capacities are estimated as follows:

1.	Roadside Ditches	2,419 acre feet 781 million cubic feet/second
2.	Side Drains	5358,560 cubic feet/second
3.	2 Foot Pipes	2,330 Cubic feet/second
4.	3 Foot Pipes	5,242 cubic feet/second
5.	4 Foot Pipes	925 cubic feet/second
6.	2 X 10 Box Culverts	3,740 cubic feet/second
7.	11 X 19 Box Culvert	209 cubic feet/second

These capacities are projected to remain constant through the initial planning period [1995] and through the remaining increment of the planning period [2020].

The capacity of the roadside ditches might be assessed by their performance under extremes. In any storm event involving a large amount of precipitation, for example two inches of rainfall, in a worst case scenario where all water runs off some five hundred eighty-nine [589] acre feet of water would be collected in the ditches. This represents only some twenty-four percent [24%] of the ditches' capacity for County road drainage. There are no drainage facilities in Levy County in 1989 that regulate stormwater quality.

Levels Of Service

These drainage facilities do provide services to other local government jurisdictions, including Bronson and Otter Creek and the facilities shared with the Department of Transportation.

The state, County, local government and developers all have the responsibility of keeping the drainage facilities in a functional condition.

The geographic service area of the drainage control is limited to the Levy County boundaries.

The current drainage system has a level of service which could handle a 25-year storm event, i.e. zero point six [0.6] feet in a 24-hour period. No water quality level of service exists.

Impacts On Adjacent Natural Resources

Aside from the clearing of land for logging or development or the filling of land for construction, the natural resources and vegetative communities of Levy County have not been greatly affected. To this date no measurable effect on natural resources has been observed by the redirection or impoundment of water. The only observable effect of development which relates to drainage facilities is the ponding of water on the road sides due to the lack of enough culverts to maintain historic levels of sheet flow across the landscape. This can be observed on S.R. 24 between Otter Creek and Rosewood during periods of heavy inundation. The ponding may have resulted in the introduction of species characteristic of wetter habitats to the vegetative communities immediately adjacent to some roads. However, these shifts in plant community type are quite minor in extent, and the steady improvement in road drainage requirements makes the possibility of similar effects spreading from future road construction unlikely.

Whether or not surface water drainage into naturally occurring sinkholes is a problem remains to be seen. U.S. 19, when constructed, resulted in increased run-off into at least two [2] sinkholes, one located on the west side of the highway south of Lebanon Station and just northwest of the Butler Grade intersection, and the other inside the Chiefland City limits. The direct connection between polluted surface water and groundwater used for potable water supplies constitutes an potential health hazard, especially in populated areas such as Chiefland.

It is noteworthy that the preceding examples referred to state highways, over which the Board has no jurisdiction. The board has assumed no responsibility to provide monitoring or improvements to Department Of Transportation stormwater quantity or quality.

The Board does have jurisdictional authority over:

1. Six [6] miles of waterfront on Lake Rousseau [private lands].

2. Yankeetown Beach [County lands].
3. Two [2] miles of coastline at Cedar Key.
4. Three miles of coastline extending north from Shell Mound [private lands].
5. Four [4] miles of waterfront along the Suwannee River near Fowler Bluff [private lands].
6. All lands along the Wacassasa River except for federal ownership along the coastline [private and County lands].

In comparison, state, federal, municipal and district lands total about seventy [70] to eighty [80] miles of shoreline.

A review of state "STORET" files and published documents has not revealed any water quality problems in any areas, except for low [seasonally] dissolved oxygen in Lake Rousseau. Levy County has neither the funding nor the staffing and equipment to monitor stormwater quality, and given the sparsely developed existing land uses and the existing land use controls adopted by the County, the need for such monitoring is not readily apparent.

The Board has already adopted river setback ordinances, as well as drainage requirements for subdivisions, and it has adopted a floodplain ordinance. The Board position has been, and it remains, that the regulations are generally adequate to protect the resource base, that any monitoring should either be done by the state or funded by the state, and only strengthening of existing ordinances is needed.

Drainage Problems And Opportunities For Replacement, Expansion And New Facility Siting

No drainage problems exist in Levy County other than periodic riverine flooding which is more of an inconvenience than a problem. The Levy County Road Department has not identified any County-owned and maintained facilities in need of replacement or expansion, and no new facilities are needed during the initial planning period [1995] or the second planning period [2020].

Existing And Projected Needs

Due to the rural-urban population and the insignificant number of large commercial businesses, the present drainage facilities are adequate. Based on the size of the culverts and pipes, the design capacity is adequate compared to current demand during a normal rainfall. Rather than facilities, the Board needs to concentrate on upgrading the existing ordinances.

Potable Water

Background Information

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 selection of a source for any system must consider the type and quality of sources available 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, the water is supplied to individual users in a community by way of a network of pipes and storage reservoirs. Large transmission lines, called distribution mains, carry water to major demand areas and interconnect with a network of smaller lines which eventually supply individual establishments. Both the distribution mains and distribution network should be interconnected to form flow loops to allow water to circulate from various portions of the system to areas of highest momentary demand.

Water is delivered under pressure within the distribution system in order to ensure adequate flow to meet demands. Demand fluctuates during 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 peak demand periods, water flows from the tanks back 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 pumps 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 [E.P.A.] to establish minimum drinking water standards. The E.P.A. 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, F.S. The Florida Department of Environmental Regulation [D.E.R.] is the state agency responsible for implementing this act. In this regard, D.E.R. has promulgated rules classifying and regulating public water systems under Chapter 17-22 of the F.A.C. The primary and secondary standards of the Federal Safe Drinking Water Act are mandatory in Florida.

The two [2] regional water management districts are responsible for managing water supplies to meet existing and future demands. Regulation of consumptive use is achieved through a permitting system, through which water resources are allocated among the permitted consumers. The water management district rules pertinent to Levy County are contained in Chapter 40D-2, F.A.C.

Local

No ordinances have been passed with respect to potable water directly. However, Article 4, Schedule II, which makes one- quarter [1/4] acre the minimum residential lot size for which central sewer is required, deals with potable water indirectly by protecting the original water source. This protects against a high density of septic tanks threatening the aquifer with a plume of effluent. The Levy County Public Health Unit Environmental Health Section enforces this ordinance.

Current Facility Conditions

There are no regional or County facilities for providing potable water in the County and the reason for this absence is identical to those which explain the lack of all other kinds of intense infrastructure in Levy County. The population and the uses requiring water, such as agriculture, are spread so thinly that centralized facilities would not be cost effective.

Some small scale potable water facilities exist for use in certain limited areas of the County. The characteristics of some of these facilities are listed in Table 7-19. The information gaps in this table are due to failures to respond to repeated requests for descriptions of the facilities. Since none of these facilities are of any significant size, [Manatee Utilities, for example had thirty (30) customers] the significance of these information gaps may not be enough to cause immediate concern.

Because numerous other public and private potable water facilities are located in the unincorporated area that did not respond to inquiries by mail or phone and because of the importance of municipal systems to the County's proposed land use policies, Table 7-23 A has been developed. That table lists all major wells permitted by the two water management districts. [At the request of the consultants, the S.R.W.M.D. limited its printout to permits in excess of one hundred thousand (100,000) g.p.d] The combined total permitted average daily pumpage is thirty-four [34] m.g.d., with a maximum permitted daily pumpage of one hundred eighty-two [182] m.g.d. Residential use represents about eleven percent [11%] of the permitted average, but only four percent [4%] of the permitted maximum. Agricultural use predominates throughout the County.

Areas Served And Responsible Authority

All potable water facilities in the County are run by the owners with the exception of Manatee Springs State Park which is run by the Parks Division of the Florida Department of Natural Resources. The areas served by these facilities are all within the local

vicinity [property boundaries] of the facility.

Design Capacity And Current Demand

The capabilities of those facilities found in the County property are designed for low intensity use. At ten thousand [10,000] gallons per day [g.p.d.], Manatee Springs State Park is designed to serve one hundred [100] people per day. Current demand figures show that most use is within design capacity limits with the exception of Jenkins One Stop where design capacity appears to equal current demand.

TABLE 7-19

POTABLE WATER FACILITIES IN LEVY COUNTY

	Springside Mobile Home	Univeristy Oaks Water Treatment Plant	Cedar Key Resorts	Bett's Big T	Jenkins Restaurant & Gifts	Manatee Springs State Park	holiday Times Motel
Address	24 W. Wimosa St Chiefland, FL 32626	University Oaks, #1 Archer, FL 32618	P.O. Box 88 Cedar Key FL 32625	P.O. Box 482 Chiefland, FL 32626	P.O. Box 1116 Chiefland, FL 32626	Rt. 2, Box 617 Chiefland, FL 32626	P.O. Box 141 Chiefland, FL 32626
Type of Use	Residential	Residential	Non-community	Commercial	Commercial	Recreation	Motel
# of Users	--	200	40	300	65	250	25
# of Connections	--	75	17	1	2	100	15
Average Plant Output	.003 (mgd)	.020 (mgd)	.006 (mgd)	.015 (mgd)	-	.003	--
Plant Capacity Design	Unknown	.648 (mgd)	.05 (mgd)	.03	--	--	.036 (mgd)
Storage	Unknown	5,000 gal.	420 gal.	250 gal.	--	4,000	80 gal.

Capacity							
Max. Daily Use	Unknown	.030 (mgd)	.008 (mgd)	.023 (mgd)	-	.0125	-

Note: Gaps are due to lack of response to questionnaires sent to individual facility owners.

Impacts On Adjacent Natural Resources

Even if each facility required the highest known daily use [ten thousand (10,000) g.p.d.], the one hundred thousand [100,000] g.p.d. would be less than one-tenth of one percent [1/10th of 1%] of all the water which is recharged to the aquifer on an average daily basis. On that basis, County-wide demand for water from separate potable water facilities would have to increase five hundred [500] times to use just half of the daily recharge water to the aquifer. If one considers all fourteen thousand five hundred [14,500] people living in unincorporated Levy County to require one hundred [100] gallons per day of potable water from individual wells, then this demand equals only thirteen percent [13%] of the water volume which daily recharges the aquifer [one hundred nine million (109,000,000) g.p.d.]. Agricultural water use, at twelve [12] m.g.d. [See Conservation Element] is still only at eleven percent of [11%] daily aquifer recharge. Clearly, current water demand is not threatening the volume of the Floridan Aquifer.

Capacity Assessment

As indicated, the County does not maintain a potable water system for its residents. Residents who are not hooked up to city water or private systems, currently utilize water wells for water supply.

Based on the 1988 population estimates, water consumption by residents in the unincorporated rural area totaled 2.17 million gallons per day. [Refer to Table 7-20]

Table 7-21 gives water consumption broken down into types of usage by water management districts. Agricultural water use is actually lower than is shown. The figures given by Suwannee River Water Management District and Southwest Florida Water Management District are permitted uses and not actual uses. Based on computations from the Levy County Extension Agent, three million [3,000,000] gallons per day. This amount was based on irrigation for the following acreages:

Crop	Acreages	Acre Inch	MGD
Watermelon	2,082	4	.621
Peanuts	1,056	4	.315
Corn	3,150	6	1.410
Total		2.346	

1 acre inch = 27,225 gallons

TABLE 7-20

ESTIMATION OF RURAL POPULATION WATER USE IN LEVY COUNTY

Total Pop.	Urban Pop.	Rural [uninc.] Pop.	Per Capita [gpcpd]	Rural Water Use [mgd]	Countywide Water Use [mgd]
1986					
24,498	10,045 [59% of total]	14,453	150	2.17	3.17
Based on extrapolations from the previous year.					
1990					
25,923	7,919	18,009	150	2.70	3.70

Note: Per capita water use figures are based on average for all counties.

Source: Estimated Water Uses, 1984. [S.W.F.W.M.D.] 1988 Population Estimates.

The current demand on the current water systems within Levy County is well below their design capacity, [refer to Table 7-19] with most systems operating at below one half of their capacity.

TABLE 7-21

LEVY COUNTY WATER USE [MILLION GALLONS/DAY]

	Public	Domestic	Agriculture	Industrial	Total
1990					
SRWMD	.44	.58	2.18*	0.0	3.20
SWFWMD	0.674	1.278	12.952*	0.0	14.904

* Includes livestock

1/ Public Supply and Domestic Water Use Summary, 1985. Suwannee River Water Management District [S.R.W.M.D.] Computer printout.

2/ Estimated Water Use, 1989-1990. Excerpts from the Southwest Florida Water Management District [S.W.F.W.M.D.] District Water Management Plan, October, 1992 Draft.

Agricultural water use has been further broken down by type of agricultural use in Table 7-22.

TABLE 7-22

LEVY COUNTY AGRICULTURE WATER USE [MILLION GALLONS/DAY]

	Citrus	Melons	Tomatoes	Vege's	Strawberry	Field Crops	Pasture	Turf	Fish	Ornamentals	Total
1990											
SRWMD 1/											
SWFWMD 2/	0.000	1.211	0.000	0.078	0.000	0.127	8.695	1.091	0.000	1.750	12.952

* Peaches, ornamentals, tobacco, peanuts, soybeans, misc. grains, forestry.

1/ Public Supply and Domestic Water Use Summary, 1985. Suwannee River Water Management District [SRWMD], Computer Printout.

2/ Water Use Estimates, 1985. Southwest Florida Water Management District.

Projected Demand

Projected demand for potable, agricultural and industrial water use is based on historical trends for average use. Large scale development in any of the three uses could significantly alter water use projections. The projections are the best indication of future use for average conditions.

Future water demands [Table 7-23] have been projected based on preceding Tables 7-20 through Table 7-22. Between 1989 and 1995, water consumption is projected to increase by eleven percent [11%], and between 1995 and 2020, this figure is expected to increase by seventeen percent [17%]. By the end of the overall planning period, 2020, rural residential use will approach three million [3,000,000] g.p.d.

The projected water use for agricultural purposes is expected to increase. Although the Future Land Use Element for Levy County indicates that agricultural lands will decline to other uses, it is not expected that irrigated agricultural lands will be depleted. Furthermore, additional irrigation is expected to be installed in the future thus increasing water demand for agricultural uses. At this time, there are too many unknown variables to allow the development of reasonable projections agricultural water use.

Based on the lack of historical data, water consumption for industrial uses is expected to remain constant throughout the scope of this plan.

Projected Facility Needs

Currently Levy County's population increases by some seven hundred [700] people per year, or roughly four point four percent [4.4%]. However, despite such a high growth

rate, the population is still too sparse [55th out of sixty-seven (67) counties in terms of population density] to require major infrastructural improvements. This disparity becomes even more evident if one considers the population density in unincorporated Levy County, fourteen point five [14.5] persons per square mile. If one considers Alachua County as an example of a County with a need for development of County facilities to meet demand in the unincorporated borders of the urban area, then one hundred eighty-seven [187] persons per square mile can be used as a very rough threshold density for the development of County potable water facilities. At current growth rates Levy County's density will not reach the threshold for one hundred sixty-nine [169] years (12).

TABLE 7-23A

WELLS PERMITTED BY THE WATER MANAGEMENT DISTRICTS, BY RECORD NUMBER, NAME, LOCATION, USE AND BOTH AVERAGE AND MAXIMUM DAILY RATE

SUWANNEE RIVER WATER MANAGEMENT DISTRICT

Number	Name	TRS	Use	Fnladr	Fnlmdr
42	Ward Farms	-111510	F2	1.0293	4.8960
71	Luther White	-111418	F2	4.5685	14.0976
165	White Const. Co. Inc.	-101423	F2	1.0702	8.7120
224	FL Rock Ind. Inc.	-141628	I2	2.6499	8.9928
241	W.C. Graham	-111516	F2	0.8614	4.4568
281	Vance Watson	-111506	F2	0.2963	4.5000
391	FL Division of Forestry	-121506	N	0.2521	4.6656
397	Wesley Sache	-111518	F2	0.4432	0.7820
411	Bobbie Lott	-11732	F2	0.1470	2.3760
412	J.D. Munn	-111619	F2	0.1083	2.3760
463	Thomas P. Carter	-121330	F2	0.2008	2.0347
464	Wesly Sache	-111517	F2	0.3442	2.3976
478	Thomas Brookins	-111519	F2	0.5212	3.4114
636	W.C. Graham	-111517	F2	0.1892	0.8136
638	W.C. Graham	-101426	F2	0.1892	0.8568
682	M. L. & W.L. Martin	-111718	F2	0.6175	1.5984

891	H.E. Mills	-121508	F7	0.1204	6.4296
910	E.T. Usher	-131407	F2	1.2347	3.5928
938	Lloyd W. Lane Sr.	-111526	P4	0.2885	1.6776
1073	Cedar Key SP WA & SEW DI	-151317	P4	0.2290	0.9000
1075	City of Chiefland	-111436	P4	0.6100	1.0080
1076	Town of Bronson	-121718	F2	0.2482	0.9216
1347	Irvin V. Watson	-111506	F2	0.1854	2.0232
1348	Irvin V. Watson	-111412	F2	0.2249	2.5200
1509	J.O. Beauchamp	-121435	F2	0.1354	1.4400
1741	James A. Asbell	-111508	F2	0.1356	0.8928
1809	Piedmont Farms	-101425	F2	0.2511	1.5552
1886	Virgil Windthrobe	-111511	F2	0.1664	1.5840
1905	Chiefland Country Club	-111429	G	0.2516	0.7200
1955	Piedmont Farms	-101425	F2	0.4290	0.9360
1974	Ronald St. John Sr.	-121421	F7	0.7402	4.3200
2061	Nacep Inc.	-101429	P2	1.0000	1.4400
2134	A.D. Andrews Nursery	-111533	N	0.1072	1.0080
2144	Jack Wilkinson	-111536	F2	0.1187	0.8640
2260	Crystal Water Company	-141707	P7	0.1270	0.3840
2265	White	-121704	F2	0.1015	1.4400

	Construction				
2276	Blanche Graham	-101426	F2	0.1547	0.8640
2277	Blanche Graham	-111517	F2	0.1547	0.8640
2314	Merle Jordan	-101532	F2	0.4644	2.8800
2321	Connolly Farms	-111515	F2	0.1745	0.8640
2328	Robert Asbell	-101532	F2	0.1096	1.0800
		TOTALS		21.2510	

* All wells over 100,000 gallons per day
F2 = Overhead irrigation
I2 = Limestone mining
P4 = Government-owned public water system
G = Golf course
P7 = Bottled water
F7 = livestock care
N = Nursery uses
P2 = Private residential system

TABLE 7-23A (Continued)

SOUTHWEST FLORIDA WATER MANAGEMENT DISTRICT

Number	Name	TRS	Use	Rate Permitted (MGD) Average Daily C.U.	Rate Permitted (MGD) Maximum Daily Rate
00099-00	Town of Inglis	171601	Public	0.017	0.700
01725-00	Folks	161735	Agriculture	0.429	0.864
01726-00	Folks	161707	Agriculture	0.435	0.864
03580-01	Burrel	141836	Agriculture	0.067	0.792
03753-01	Rowell	131807	Agriculture	0.036	0.396

03894-00	Wright	141815	Agriculture	0.291	2.160
04291-00	Marion	141801	Agriculture	0.475	2.800
04408-03	Cole	141920	Agriculture	0.023	1.008
04890-01	Hiers	141819	Agriculture	0.158	2.316
04927-00	Seiller	131931	Agriculture	0.141	0.720
04939-00	Mizon	141824	Agriculture	0.043	0.648
04945-01	McKoy	121702	Agriculture	0.143	0.792
04985-00	Bryant	141816	Agriculture	0.017	0.862
05078-00	Holder	131909	Agriculture	0.004	0.378
05095-00	Robinson	151703	Agriculture	0.568	5.621
05108-00	Bell	131811	Agriculture	0.060	0.864
05109-00	Brooks	131824	Agriculture	0.313	1.584
05111-00	Mikell	141814	Agriculture	0.025	0.960
05112-00	Miller	121722	Agriculture	0.064	0.960
05114-00	Fugate	121710	Agriculture	0.050	1.728
05115-03	Fugate	131803	Agriculture	0.089	1.350
05116-00	Fugate	121714	Agriculture	0.058	1.728
05117-01	Fugate	131725	Agriculture	0.041	0.924
05122-01	Whitehurst	121920	Agriculture	0.434	7.518
05159-01	Sandlin	121825	Agriculture	0.045	0.792
05160-01	Sandlin	131723	Agriculture	0.045	0.792
05169-01	Spanjer	131701	Agriculture	0.047	0.720
05191-00	Swift	141823	Agriculture	0.247	0.864
05215-01	Bell	121835	Agriculture	0.188	0.450

05551-00	Cannon	171704	Agriculture	0.020	0.864
05588-01	Brooks	141811	Agriculture	0.036	1.230
05589-00	Bell	131805	Agriculture	0.046	0.660
05606-02	Robinson	131801	Agriculture	0.024	0.648
05607-00	Dean	131710	Agriculture	0.046	0.792
05640-01	Williston	131801	Perc. Ponds	0.195	1.000
05658-00	Voigt	131711	Agriculture	0.126	0.799
05705-01	Verner	131834	Agriculture	0.163	1.323
06071-01	Circle Drive	131821	Septic Tanks	0.002	0.020
06073-01	Heitfield	131736	Agriculture	0.001	0.003
06249-00	Huber	131830	Agriculture	0.048	1.187
06298-02	Bradford	121813	Agriculture	0.004	0.360
06335-00	Brooks	131813	Agriculture	0.036	0.528
06405-00	Gillman	131806	Agriculture	0.079	0.396
06586-02	Huber	131826	Agriculture	0.000	0.965
06623-01	Pendray	131818	Agriculture	0.092	1.730
0 6659-01	Smith	141931	Agriculture	0.081	0.606
06703-01	Benton	131928	Agriculture	0.006	0.720
06760-01	Bell	131830	Agriculture	0.040	2.160
07096-00	Cole	141917	Agriculture	0.015	0.629
07167-01	Rogers	121836	Agriculture	0.000	0.806
07274-00	Dean	131702	Agriculture	0.037	1.440
07382-00	Bellot	121813	Agriculture	0.024	0.036
07445-00	Hiers	141918	Agriculture	0.016	0.567

07650-00	Williams	141804	Agriculture	0.022	0.528
07666-00	Smith	131801	Agriculture	0.005	0.360
07712-00	B & G	131907	Agriculture	0.006	0.660
07755-01	Yankeetown	161631	Septic Tanks	0.040	0.206
07825-00	Williston Highlands	131816	Septic Tanks	0.007	0.040
07862-00	Neal	131904	Agriculture	0.034	0.396
07915-00	Howell	131928	Agriculture	0.015	0.720
07943-00	Faircloth	141920	Agriculture	0.018	0.792
08219-00	Pendray	131724	Agriculture	0.111	1.728
08255-00	Markham	141825	Agriculture	0.063	0.600
08698-00	Griffin	121834	Agriculture	0.014	0.577
08745-00	Lovvorn	121821	Agriculture	0.016	0.720
08885-00	Crawford	131823	Agriculture	0.026	0.528
08902-00	FL Sheriff Y,R	161601	Septic Tanks	0.003	0.019
08953-00	Inglis	161633	Septic Tanks	0.130	0.744
08992-00	Bell	131802	Agriculture	0.000	0.100
09166-00	Rawls	141821	Agriculture	0.000	0.420
09479-00	Levy County	121724	Septic Tanks	0.006	0.040
09504-00	Rawls	141929	Agriculture	0.009	0.576
09505-00	Dean	131712	Agriculture	0.008	0.720
09610-00	Minshall	131824	Agriculture	0.003	0.006

	Total Permitted Aug.	Perm. Avg. Daily C.U.	Total Permitted Maximum
SWFWMD Totals	12.545 MGD	6.432 MGD	72.779
SWFWMD Total Public/Private Res.	1.534 MGD	0.558 MGD	2.769
SWFWMD % Public	12.2%	8.7%	3.8%
SRWMD Totals	21.251 MGD	N/A	109.17
SRWMD Total Public/Private Res.	2.210 MGD	N/A	4.654
SRWMD % Public	10.4%	N/A	4.3%
County-wide Totals	33.796 MGD	N/A	181.95
County-wide Total Public/Private Res.	3.744 MGD	N/A	7.423
County-wide % Public	11.1%	N/A	4.0%

TABLE 7-23B

PROJECTED RESIDENTIAL WATER CONSUMPTION FOR LEVY COUNTY

	YEAR				
	1995	2000	2005	2010	2020
Total Population	28,943	31,599	34,108	36,437	41,275
Unincorporated Population	19,970	21,803	23,534	25,141	28,480
Pre Capita Consumption (G.P.D.)	150	149	149	143	134
Unincorporated Consumption [M.G.D.	3.00	3.25	3.51	3.60	3.82
County-wide Consumption [M.G.D.]	4.34	4.71	5.08	5.21	5.53

Note: This Table assumes a constant 69% unincorporated area population.

Even if one anticipates higher growth rates once Pasco and Citrus County's densities increase to the point of making Levy County look attractively unspoiled, the overall County density should not come close to the threshold density within the next two increments of the planning period. Therefore, the mandate is to properly guide the establishment of sewer and water facilities for the local pockets of development in the County which will be privately constructed and owned to begin with. Publicly owned County water facilities are not on the planning horizon; therefore, it is appropriate for the County to coordinate with the cities, allowing their extension of central water services into urbanized areas around each incorporated area. Not only has the Board of County Commissioners historically been reluctant to "get into" the provision of central water systems, but state planning law and implementing rules mandate that the County must:

(a) Discourage urban sprawl; and,

(b) Clearly distinguish between urban and rural areas.

Based upon these requirements, it would also be appropriate for the Board to require a central water system for planned major developments; i.e. those which are at a density which precludes the use of septic tanks, or those proposed for areas which have soils limitations for the use of septic tanks. A review of available municipal comprehensive plans indicates that every municipality in Levy County has surplus water treatment capacity. Otter Creek and Inglis are constrained by the design capacity of their systems, and Chiefland is in need of a high-volume pump; however, all could service

unincorporated areas to some degree. As of 1989, Levy County has not coordinated with each municipality regarding their interest in serving, or their capacity to serve, surrounding unincorporated areas.

Expected Life

The expected life of most of the water systems listed on Table 7-19 are anticipated to extend beyond the scope of this plan, based on the age of the systems and demand/capacity ratio. However, Manatee Springs State Park indicated that its system had a life expectancy of only five [5] years.

Service During This Planning Period

The only facility to report, Manatee Springs State Park expects a twenty-five percent [25%] increase in demand in the first increment [five (5) years] and a forty percent [40%] demand increase in the second increment [fifteen (15) years].

It appears that the design capacity of the facility will be passed in the second increment. The need for improvement due to low life expectancy of the facility will force action before the design capacity service is surpassed.

Problems And Opportunities - Expansion

Manatee Springs State Park reported a need for improvement of their filtration and distribution systems. While no other facility reported on this aspect, more and more stringent safety requirements with respect to protection of the aquifer and the public health in relation to water consumption will force continued inspection of such facilities.

Projected Impacts On Adjacent Natural Facilities

The growth in demand foreseen for the next planning period will range from two point ninety-five [2.95] m.g.d. to four point nineteen [4.19] m.g.d. by the year 2020 [see Housing Element for Population Projections]. If one applies such a seventeen percent to sixty-six percent [17% - 66%] increase to agricultural water use, then that future demand will be fourteen point one [14.1] m.g.d. to twenty [20] m.g.d. Therefore, the total projected drain on daily aquifer recharge [one hundred nine (109) m.g.d.] will be fifteen point five percent to twenty-two percent [15.5% - 22%]. This projected demand would have to increase five [5] fold before one would begin to "mine" the aquifer or withdraw water faster than the rate of recharge. During the current planning period, the Floridan Aquifer does not appear endangered in terms of volume.

Summary And Recommendations

The County needs to focus its efforts on the one type of situation which will increase potable water demand in the unincorporated parts of the County; development of subdivisions outside city limits. In conjunction with the efforts of the water management districts, stringent requirements on the provision of potable water should be enforced in those subdivisions whose density requires a central water system.

Natural Groundwater Aquifer Recharge

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

The source of water in aquifers is rainfall. Under the force of gravity, rainfall percolates downward through porous surface soils to enter the aquifer strata. Because of the variable permeability of different soil types, the rate of aquifer recharge from rainfall may vary from one location to another. The areas of highest recharge potential are called prime recharge areas. The presence of overlying confining beds 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 run-off to surface waters, pollutants picked up by run-off which enters an aquifer can degrade the quality of the groundwater. Since water flows within an aquifer in a manner similar to surface water flow, downstream portions of the groundwater may be polluted over time. This becomes particularly significant when the aquifer is tapped as a potable water supply downstream.

Regulatory Framework

In 1986, the Federal Safe Drinking Water Act [P1 93-523] was amended to strengthen protection of public water system wellfields and aquifers that are the sole source of

drinking water for a community. The amendments for 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 E.P.A. 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 E.P.A. review and approval. Once a plan is approved, E.P.A. may enter into an agreement with the local government to implement the plan. As of this writing, E.P.A. has not completed development of the criteria needed to implement this program.

State

In implementing the Florida Safe Drinking Water Act [Chapter 403, F.S.], D.E.R. 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 well fields tapping them. D.E.R. has also established regulatory requirements for facilities which discharge to groundwater [Section 17-4.245, F.A.C.] and 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, which reads:

> "Each water management district shall develop a groundwater basin resource availability inventory covering those areas deemed appropriate by the governing board. This inventory shall include, but not be limited to, the following:
>
> 1. A hydro geologic study to define the groundwater basin and its associated recharge areas.
>
> 2. Site specific areas in the basin deemed prone to contamination or overdraft resulting from current or projected development.
>
> 3. Prime groundwater areas.
>
> 4. Criteria to establish minimum seasonal surface and groundwater basin.
>
> 5. Areas suitable for future water resource development within the groundwater basin.
>
> 6. Existing sources of wastewater discharge suitable for re-use as well as the feasibility of integrating coastal wellfields.
>
> 7. Potential quantities of water available for consumptive uses.
>
> Upon completion, a copy of the groundwater basin availability inventory shall be

> submitted to each effected municipality, County and regional planning agency. This inventory shall be reviewed by the effected counties, municipalities, and regional planning agencies for consistency wit the local government comprehensive plan and shall be considered in future revision of this 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." [Section 373.0395, F.S.]

The Florida Legislature has also directed local governments 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 [Section 163.3177(6)(c), F.S.]. As of this writing, the GWBRAI for Levy County has not been completed.

Local

There are no current regulatory programs or ordinances at the County level which deal specifically with the protection of natural groundwater recharge areas. Chapter 10, Article 8, of the Levy County Code of Ordinance, does regulate sewage disposal through the mandating permitting of sewer or septic construction. Furthermore, Levy County Ordinance Number 84-7 defines and regulates the disposal of "solid", "special" and "hazardous" wastes. These are indirect legal instruments for protecting the groundwater from toxic substances either deposited directly or leaching from above.

Existing Conditions

Groundwater in the area occurs in three distinct aquifers and in intervening less permeable confining beds that restrict the movement of water from one aquifer to another. The uppermost of these aquifers has been referred to by various investigators as the shallow aquifer, the clastic aquifer, the non-artesian aquifer, the surficial aquifer and the water-table aquifer. In this report it is designated as the surficial aquifer. The common characteristics attributed to the aquifer by these investigators are that the aquifer is comprised of unconsolidated [clastic] sediments and that it contains the water table.

Below the surficial aquifer, and interbedded with unconsolidated poorly permeable deposits in some parts of the area, are aquifers composed of beds of shell, sand, gravel and limestone commonly referred to as secondary artesian aquifers. These aquifers are perennially full of water under greater than atmospheric pressure. The poorly permeable deposits are referred to as confining beds when they resist the vertical flow of ground water allowing a build-up of artesian pressure in the aquifer below.

The lowermost and principal aquifer in the area is the Floridan aquifer. The Floridan is composed of a thick sequence of interbedded soft, porous limestone and hard, dense limestone and dolomite. In much of the area, the Floridan is perennially full and is overlain and confined by the less permeable deposits of clastic materials. In some parts of the area, however, the Floridan is unconfined, and contains the water table for the area.

Confining Beds

The relatively impermeable deposits lying between the surficial and Floridan aquifers generally act as confining beds. In areas where the potentiometric surface of the Floridan is above the bottom of the confining beds, the water in the Floridan is confined at greater than atmospheric pressure by the beds. In much of the area, however, the water level in the Floridan aquifer is non-artesian and in such areas, the beds permit a perched water table in the surficial aquifer.

Floridan Aquifer

The name "Floridan Aquifer" is commonly applied in Florida to the principal artesian aquifer of the southeastern United States. The aquifer consists mostly of limestones and dolomites, generally middle Eocene to middle Miocene in age, which act more or less as a single hydrologic unit in most of Florida, in southeastern Georgia, and in parts of Alabama and South Carolina. The aquifer is, however, of variable porosity and permeability and consists in many places of well developed cavernous intervals separated by zones of low permeability that act as confining layers. Thus, the Floridan aquifer may in places be thought of as a compound aquifer consisting of several sub-aquifers. It is one of the most extensive limestone aquifers in the United States.

One way to picture water flow through the aquifer is with the concept of "transmissivity" or the "rate at which water is transmitted through a unit width of aquifer under a unit hydraulicgradient" (10). The closest estimate of transmissivity is from just north of Crystal River along the southern boundary of the County and was two million square feet per day (10) or two million [2,000,000] gallons traveling every minute through a one [1] square foot section which extends from the top to the bottom of the aquifer. Considering that such figures range from ten thousand seven hundred [10,700] to 2.1 million gallons per minute across the Withlacoochee planning region, the transmissivity in Levy County is high and reflects the porous nature of the limestone beds.

The confining layers in the sediments allow much less water flow than is possible in the aquifer. Map 7-9 shows that the "leakance" or gallons per day which travel through a cubic foot of confining layer is only one-hundredth of a gallon over eighty percent [80%] of Levy County. The exception is the Brooksville ridge stretching from the southeast corner of the County through Bronson. There, leakance is one-thousandth of a gallon per day per cubic foot or ten [10] times slower than the rest of the County.

Aquifer Recharge And Discharge. Map 7-10 illustrates the pattern of recharge and discharge to the Floridan Aquifer Recharge out weighs discharge of the aquifer by a factor of 4.6. Table 7-24 shows that each year a total of 149.2 billion gallons are recharged to the aquifer while 32.4 billion gallons are discharged. The lack of region field study makes these numbers, which are based on generalized concepts, suspect.

Groundwater Flow. Groundwater flow [Map 7-11] runs generally westward along the northern one-third [1/3] of the County. The southern two-thirds [2/3] of the County have a southwesterly groundwater flow. Considering the line from Bronson to Cedar Key as the generalized transect of groundwater flow across the County, then the slope is nearly flat, 4/100 of one percent. It is probably safe to assume that on such a shallow gradient, groundwater flow is not rapid.

Effects Of Development

As noted in the drainage subelement, at least sixty percent [60%] of the County is prone to flooding or wetness. Thirteen percent [13%] [fifty-seven thousand nine hundred (57,900) acres] of that is publicly owned wherein development is either prohibited or not encouraged. The remainder of the flood prone zone is not likely to be developed due to the fact that most homeowners find wet ground unattractive as living space.

TABLE 7-24

RECHARGE AND DISCHARGE OF THE FLORIDAN AQUIFER

Area Recharge	Area Discharge				
				Volume Flow	Billion
				Gallons	
Rate [Inches Per Year]	Rate [Inches Per Year]	Acreage	Percent Of County	Recharge	Year Discharge

15 - 20			239,325	32% to 39% 11.7
5 - 10			239,033	17% to 21% 26.9
0 - 5			127,133	17% to 20% 8.6
0 - 10	238,835	20% to 32.4%		--- 32.4

Note: Sample calculation: [17.5 inches/year] X [1 foot/12 inches] X [239,325 acres/area] X [43,560 square foot/acre] X [7.48 gallons/cubic foot] = 113,719,300,000 gallons/year.

MAP 7-9

GENERALIZED LEAKANCE MAP

MAP 7-10

DISTRIBUTION OF RECHARGE TO AND DISCHARGE FROM THE FLORIDAN AQUIFER IN THE SUWANNEE RIVER WATER MANAGEMENT DISTRICT

MAP 7-11

MAXIMUM FLORIDAN AQUIFER GROUNDWATER LEVELS
AND DIRECTION OF FLOW

Source: Suwannee River Water Management District

Therefore, the flood prone areas where aquifer recharge is least are the least likely to be developed, and the brunt of development pressure will fall on areas of high aquifer recharge. Only a small fraction of subdivisions in Levy County are not found in high aquifer recharge areas. As the swamps are protected for their services for hydrological functions and wildlife value, the scrub oak and sand pine communities are sacrificed for their dry habitat, availability and ease of construction.

A substantial portion of the County area is used for agricultural, silvicultural and rangeland purposes, which have the potential to impact both the water table and Floridan aquifers. Although these activities do not typically produce significant changes in recharge area surfaces, they are potential sources of contaminants such as pesticides, fertilizers and animal wastes. It is incumbent on all concerned agencies of the County and state to provide technical assistance in implementing Best Management Practices to reduce these potential impacts. However, this threat is currently only a potential, for only a small fraction of the subdivided land has been built upon, and very little industry has been established anywhere in the County. As development begins to place hundreds of homes and establishments on dry sand communities a watchful eye must be kept on the disposal of wastes. Once polluted, aquifers may require hundreds of years to flush themselves clean.

Preliminary Water Quantity Estimates

Page 7-3 of the 1978 Levy County Comprehensive Plan contains the first attempt to establish just how much groundwater is available for use. The plan states:

> "Levy County is roughly divided in half from north to south, with the eastern one-half of the County being a recharge area, and the western one-half of the County being a water discharge area. 1/ In some areas, the recharge rate is over 20 inches per year.

1/ Water Resources Management Study, Hydrologic and Engineering Evaluation of the Four River Basins Area, Volume II, Appendices. U.S. Army Corps of Engineers, Jacksonville, March, 1977, [plate 19].

If one-half [½] of Levy County has a recharge averaging ten [10] inches per year, then the volume of water would be computed by multiplying ten [10] inches times three hundred sixty thousand three hundred eighty-six [360,386] acres times twenty-seven thousand one hundred fifty-four [27,154] gallons per acre inch, and dividing by three hundred sixty-five [365]. This equals about two hundred sixty-eight million [268,000,000] gallons per day. This estimate requires a qualifying statement that it is a rough approximation only, and with more reliable data on soil types and acreages, and input from hydrologists, the true groundwater value may vary greatly from this planning estimate. Also, some, but not all, of this groundwater may be additive to the surface water supplies, but large groundwater withdrawals could be expected to reduce springs and river flow by a presently undetermined amount.

In summary, the Levy County water budget may lie somewhere in the very broad range between two hundred seventy [270] m.g.d. and five hundred ninety-one thousand [591,000] m.g.d. More reliable estimates are needed, but in the interim period, these figures are useful for comparative purposes with existing and projected demand."

In 1980, the Withlacoochee Regional Planning Council expanded upon this preliminary water budget estimate. 1/ Beginning on page 8-4, this study states the following:

> "There is not, however, an unlimited supply of water within the study area. The previously referenced Base Conditions Analysis Of The Withlacoochee River Region has established individual County water crop estimates, using average annual rainfall as an estimate of gross available water. The water available after losses to evaporation and transpiration is estimated to equal one thousand two hundred twenty-seven [1,227] gallons per acre per day. For each portion of the study area, the water crop is estimated as follows:

1/ Coastal Water Resources Project, Withlacoochee Regional Planning Council, September 30, 1980. W.R.P.C.-80-R2.

Water Crop

1.	Citrus County	
	West	118 MGD
	Mid-west	161 MGD
2.	Hernando County	
	West	211 MGD
3.	Levy County	
	Northwest	171 MGD
	Southwest	396 MGD

No water budget is yet available for the study area or its parts. The preceding estimates may, however, be compared with the water use projections in Chapter 7, Table 7-1, to determine, on a preliminary basis, the relationship between 2020 consumption and the water crop. For each portion of the study area, the percent of the water crop to be consumed in 2020 is estimated to be:

Percent Water Crop Consumed

1.	Citrus County	
	West	8%
	Mid-west	6%
2.	Hernando County	
	West	13%
3.	Levy County	
	Northwest	Below 1%
	Southwest	Below 1%

Based upon this analysis, it appears that in relationship to the water crop, water consumption in both parts of Levy County will be "insignificant" in the year 2020. Using the five percent [5%] consumption level as a threshold, it appears that water consumption in Hernando County and both study areas in Citrus County will be "significant" in the year 2020. As previously noted, no water budget is available by which to evaluate the projection of total demand, and this is considered to be the major water-related problem at this time.

At what point would [or will] water withdrawals in Levy County become significant?

Assuring that agricultural use remains a priority over residential use, the population threshold which would trigger "significant" consumptive use is approximately one hundred eighty-eight thousand [188,000] persons. This population has been estimated by the formula:

$$P = \frac{[WC-Ag] \times .05}{150}$$

P = Population
WC = Water crop
Ag = Agricultural consumption use

.05 = Level of use [5%] at which "significant consumption" is reached
150 = Gallons consumed per capita per day

These numbers and the methodology itself are preliminary and they may be revised substantially through updating the plan.

At current growth rates in Levy County, the population of one hundred eighty-eight thousand [188,000] will not be reached within the time period covered by this plan. [See the future land use element for the total theoretical population at buildout]. [Note also that if the water crop is assumed to be as low as 109 m.g.d., the percolation rate to the Floridan Aquifer as provided in the drainage portion of this element, then the threshold population is a much lower thirty-five thousand three hundred thirty-three [35,333] persons ... only ten thousand (10,000) more than residing in the County in 1988!]

Needs Assessment

At the present time, insufficient information is available to allow the County to institute a site-specific comprehensive aquifer recharge area protection program. This problem should be remedied with completion of the GWBRAI for Levy County by the water management district. Unit the GWBRAI becomes available, the County should adopt interim measures to promote protection of aquifer recharge functions based on known characteristics of development within the County and general knowledge of aquifer recharged principles.

The pattern of development within the County is expected to remain relatively stable during the next few years, with urban development probably occurring within a ten [10]

mile radius of the three [3] major towns northeast of U.S. 19: Chiefland, Williston and Bronson.

The growth of subdivisions is not currently foreseen to be tied to creation of regional water and sewer facilities, though the potential for pollution should mandate that this need be reassessed on a regular basis.

The major impact in the urban area will come from reduction of the area available for recharge to the water table aquifer. To offset this impact, the County stormwater drainage regulations should emphasize the preservation of natural drainage features and the use of drainage retention structures to maximize aquifer recharge. The County should also continue to encourage reuse of treated effluent for irrigation in urban areas to increase recharge of water table aquifer. For all new development, the County should incorporate provisions in its land development code requiring conservation of areas with the greatest recharge potential, based on the soil survey for the County.

In the rural County areas, emphasis should be placed on identifying, mapping and managing areas with the greatest aquifer recharge potential. This should be done in cooperation with water management district, SCS and the Board of County Commissioners. These areas should be designated on the Future Land Use Map of the County Comprehensive Plan, including areas designated by the Water Management District as prime recharge areas for the Floridan aquifer, as conservation areas. In addition to recharge areas within the County, Levy County should cooperate with the Water Management District in any regional program to protect prime recharge areas of the Floridan Aquifer affecting County water supply sources.

Given that virtually all future development in Levy County will occur on upland sites in recharge areas, and also given that the major population centers of Chiefland and Williston are located in an area of active sinkhole formation, the threat of groundwater contamination is very real. For these reasons, it is imperative that all potable water wells, and any future wellfields [areas with more than one well used to supply a common system or user], must be protected from pollution.

When cones of depression are identified by Water Management District studies, it will be necessary to exclude pollutants from entering the core of depression and being drawn into the aquifer. This can be accomplished by excluding sheet flow [wide, shallow streams of stormwater run-off], by regulating land uses, and by treating stormwater.

Electric Utilities

This utility subelement for Levy County is intended to conform to the 10-year site plan required by the Florida Electrical Power Plant Siting Act [Part II, Chapter 402, Florida Statutes]. The act requires that all public utilities file a 10-year site plan describing their long-range plans for the provision of an adequate and reliable electrical supply.

This subelement provides a brief description of the existing primary electrical distribution system and proposed changes.

The action plan of this element contains a utility goal statement with various objectives and policies under subelement headings. The objectives and policies for electric utilities have been developed in cooperation with the various power companies, and they are cross-referenced within both the land use and intergovernmental coordination elements as appropriate.

It should be noted that both the data base and the objectives and policies for electric utilities have been incorporated in this plan at the option of Levy County. Reference by local government comprehensive plans to public electric utilities is not mandated by Chapter 163, F.S.

Existing Electric Utility Systems

Levy County's electric power is provided by four companies: Florida Power Corporation, Central Florida Electric Corporation, Clay Electric Cooperative and Sumter Electric Cooperative. This section describes existing facilities of each of these companies. The areas discussed are power sources; transmission system; present capability and service loads; and, emergency system capabilities.

Sources Of Electricity. No generating plants exist in Levy County. The nearest generating facility is in Crystal River [Citrus County] and is operated by Florida Power Corporation. Clay Electric Cooperative and Sumter Electric Cooperative purchase power from Seminole Electric Cooperative, Inc.

Substations And Transmission Lines. Although four [4] companies currently provide electric power to Levy County, only two [2] of them [Florida Power Corporation and Central Florida Electric] own and operate substations in the County. Map 7-12 shows the location of these substations and existing and proposed transmission lines.

MAP 7-12

LEVY COUNTY
ELECTRIC TRANSMISSION SYSTEM

Several major transmission lines are located in Levy County. Two 115 KV lines run north from Inglis to Gilchrist County. 69 KV transmission lines run northeast from Cedar Key to Bronson; northwest from Inglis to Gilchrist County; and, east and northeast from Williston.

Electric Power Consumption. The number of electric customers in Levy County has shown a steady increase during the last ten [10] years, particularly in the residential category. Table 7-25 shows the number and category of customers in Levy County served by Florida Power, Central Florida Electric, Clay Electric, and Sumter Electric in 1978. Table 7-26 updates the data to 1985.

TABLE 7-25

NUMBER AND CATEGORY OF ELECTRIC CUSTOMERS
LEVY COUNTY, 1978

Electric Company	Number of Customers			
	Residential	Commercial	Industrial	Other
Florida Power Corporation	893	280	1	11
Central Florida Electric Corp.	6,048	370	1	1,376
Clay Electric Cooperative	282	13	0	39
Sumter Electric Cooperative	376	108	-	6
Total	7,599	771	2	1,432

* Includes public buildings and irrigation facilities.

Source: Florida Power Corporation, Central Florida Electric Corporation, Clay Electric Cooperative and Sumter Electric Cooperative.

TABLE 7-26

NUMBER AND CATEGORY OF ELECTRIC CUSTOMERS
LEVY COUNTY, 1985

Electric Company	Number of Customers Residential	Commercial/Industrial	Total
Florida Power Corporation	1,849	379	2,228
Central Florida Electric Coop.			
Clay Electric Cooperative	Not Available In Separate Categories		473
Sumter Electric Cooperative	720	193	913
Total	2,569	572	3,614
Percent Change 1978 - 1985	28%	18%	100% 5%

Source: Florida Power Corporation, Central Florida Electric Cooperative, Clay Electric Cooperative and Sumter Electric Cooperative.

Emergency System. Power failures resulting from natural or other causes can be corrected by the respective electric companies with a minimum of delay. Though the use of portable substations, which can be moved to the site of a malfunctioning substation, repair crews can restore power in minimal time. The four companies also participate in mutual support agreements with other utility companies around the state to provide work crews for restoring power as rapidly as possible in the event of a major power failure.

Future Plans

Plans for meeting future electric power needs in Levy County have been outlined by each company in long-range plans in compliance with the Florida Electric Power Plant Siting Act. The plans provide for both intermediate [10-year] and long-range [20- year] power goals and system improvements necessary to achieve those goals.

No generating plants or substations are currently programmed for Levy County by the four electric companies. Current plans call for up-grading of existing facilities or expansion of distribution lines as demand requires.

Levy County Utilities Goal

It is the long-term goal of Levy County to develop and implement objectives and policies for sanitary sewer, solid waste, drainage, potable water, natural groundwater aquifer recharge and electric utilities so as to protect and enhance the environment and the public health, safety and general welfare.

Summary of Infrastructure Conditions at the Time of the EAR

Data and Analysis

Allocated Proportional Capacity

The 1990 Comprehensive Plan did not address "allocated proportional capacity", except in terms of Solid Waste. The Board of County Commissioners had not "allocated" any specific proportions of the landfill capacity to any one municipality, but rather agreed to dispose of all solid waste generated within Levy County. In 1989, approximately 52.2% of the solid waste stream was generated by the municipalities; however, some municipal collections included adjacent unincorporated areas (LCCP: 7-27).

Identification of Public and Private Facilities

Sanitary Sewer

The 1990 Census found that 79.82% of the homes in Levy County were sewered by septic tanks, the highest percentage in the Withlacoochee Region. Only 19.27% of homes were served by central sewer systems. Central sewer systems continued to be prohibited by the County except in an incorporated municipality, special district or a municipal service district. However, a proposed plan amendment to reverse this situation was under review at the time of the preparation of the EAR.

Solid Waste

The single solid waste facility in Levy County was a Class 1 (one) sanitary landfill. The Levy County landfill was located on a 116 acre tract in Section 24, Township 12 South, Range 17 East south and east of Levy County Road C-335 approximately three miles southeast of the Town of Bronson. The landfill was located in an area of Astatula-Candler soils (LCCP: 7-22).

Hazardous Waste

Small quantity generator (SQG) totals for Levy County are presented in Table 7-1.

Drainage

The only drainage facilities in the county were the infrastructure built to drain roads and highways. These included manmade drainage facilities such as swales, ditches, canals and storm sewers as typical conveyance facilities. Stormwater structure facilities were generally classified as retention or detention facilities. Detention facilities were designed to temporarily impound runoff and release it gradually to downstream portions of the drainage system; retention facilities were impoundments which release stormwater by evaporation and by percolation into the ground with no direct discharge to surface waters (LCCP: 7-51).

County roads were drained by approximately 666 miles of roadside ditches which could hold 2,419 acre-feet (788 million gallons) of runoff. Aiding this drainage were some 8.5 miles of side drains, 742 pipes under two feet in diameter, 131 pipes three feet in diameter, 41 pipes over four feet in diameter, 187 box culverts (two to ten feet) and one 11-19 foot box culvert (LCCP: 7-58). There were no drainage facilities in Levy County in 1989 that regulated stormwater quality (LCCP: 7-61).

No analysis of the then-current demand on drainage facilities capacity was available or possible since the facilities were ditches and drains subject to intermittent flow.

The then-present drainage facilities were seen as adequate due to the rural-urban population and the insignificant number of large commercial businesses. The 1990 Plan recommended that the County Commission needed to concentrated on upgrading the existing ordinances rather than facilities (LCCP: 7-63).

No drainage problems existed in the county other that periodic riverine flooding which was more of an inconvenience than a problem. The Levy County Road Department had not identified any county owned and maintained facilities in need of replacement or expansion, and no new facilities were needed during the initial planning period (1995) nor the second planning period (2020) (LCCP: 7-63).

The Board of County Commissioners had assumed no responsibility to provide monitoring or improvements to the Department of Transportation for stormwater quantity or quality. However, the County Commission did have jurisdictional authority over the following natural drainage features:

1. Six miles of waterfront on Lake Rousseau (private lands)
2. Yankeetown Beach (county lands)
3. Two miles of coastline at Cedar Key
4. Three miles of coastline extending north from Shell Mound (private lands)
5. Four miles of waterfront along the Suwannee River near Fowler Bluff (private lands)
6. All lands along the Waccasassa River except for federal ownership along the coastline (private and county lands) (LCCP:7-62)

By comparison, federal, state, municipal and water management district lands totaled about 70 to 80 miles of shoreline (LCCP: 7-63).

Potable Water

The 1990 Census found that 64.67% of all homes in Levy County obtained potable water from private wells, the highest percentage in the Withlacoochee Region.

Electric Utilities

Levy County included an optional sub-element that discussed electric power utilities in the county as it existed in 1990. The power supply in the unincorporated portion of the county was provided by the private sector, generated by four companies as discussed below. There were no electric generating facilities in Levy County in 1990, although several major transmission lines ran through the county (LCCP: 7-90).

Four companies provided electric power to Levy County at the times of the adoption of the Levy County Comprehensive Plan. These were: Florida Power Corporation, Central Florida Electric Cooperative, Clay Electric Cooperative, and Sumter Electric Cooperative. The latter two cooperatives purchased power from the Seminole Electric Cooperative (LCCP: 7-90). Only Florida Power Corporation and Central Florida Electric Cooperation owned and operated substations in the county (LCCP: 7-90).

Major transmission lines ran through the county in 1990. Two 115 KV lines ran north from Inglis to Gilchrist County; 69KV transmission lines ran northeast from Cedar Key to Bronson, northwest from Inglis to Gilchrist County, and east and northeast from Williston (LCCP: 7-90).

At the time of the preparation of the EAR, a company was seeking permission to construct a small hydro-electric generating facility at the earthen dam at the west terminus of Lake Rousseau on the Withlacoochee River. The plant would have minimal generating capacity and would presumably sell its electricity to the Florida Power Corporation which under Florida law would be required to purchase it.

Operating Entity, Geographic Service Area, Design Capacity, Current Demand and Existing Level of Service

Sanitary Sewer

Updated waste generation data (1992) indicate that the increased population in the unincorporated area now produces the equivalent of 1.351 million gallons per day in wastewater.

In 1990, there were three wastewater treatment systems in operation generating 0.54 mgd and serving approximately 5,000 persons (draft SRPP: IV-11).

A proposed plan amendment to allow package treatment plants was under review at the time of the preparation of the EAR.

Solid Waste

The average design capacity of the landfill is 62 tons per day. The current solid waste generated per capita is 2.75 pounds per person per day. When applied to the estimated 1995 population (29,843) this yields an estimated usage of 41 tons per day. The adopted level of service is being met. In 1992, recycling removed an estimated 10 percent of the solid waste received.

Hazardous Waste

Small quantity generators accounted for 1,184,072 pounds of hazardous materials according to extrapolated figures. This consisted primarily of lead-acid batteries (31.5%)

and solvents (9.2%) (LCCP: Table 7-9). Large quantity generators accounted for the production of 10,292 pounds of hazardous wastes. This largely consisted of oils, greases or lubricant (44.4%), paints (21.0%), solvents (17.9%) and lead-acid batteries (16.6%) (LCCP: Table 7-10).

Drainage

The geographic service area of the drainage control was limited to the boundaries of Levy County. Drainage facilities to provide services to other local jurisdictions, including Bronson and Otter Creek, and the facilities shared with the Department of Transportation. State, county, local government and private developers all have the responsibility of keeping the drainage facilities in a functional condition (LCCP: 7-61). County owned and maintained drainage facilities were under the jurisdiction of the Levy County Road Department.

The then-current drainage system had a level of service that could handle a 25-year storm event, i.e. 0.6 feet in a 24-hour period. No water quality level of service existed (LCCP: 7-61).

Potable Water

Water use data is currently being updated by a joint planning effort between the Suwannee River and Southwest Florida Water Management Districts in their preparation of the Levy County Water and Land Use Plan. This information will be included in the EAR and in the 1997 update of the Comprehensive Plan upon receipt.

Electric Utilities

In 1996, electric service-providers are still Florida Power Corporation, Central Florida Eclectic Cooperative, Clay Electric Cooperative, and Sumter Electric Cooperative.

Existing Facility Needs

Sanitary Sewer

A survey of economic development and municipal officials in Levy County in 1994 by the Withlacoochee Regional Planning Council during the preparation of the regional Overall Economic Development Plan identified the following sanitary sewer needs:

Levy County

- Extension of sewer and natural gas lines into the Williston Industrial Park
- Expansion of sewer capacity at the City of Chiefland Industrial Park
- New sewer treatment plant for the Town of Bronson.

Town of Bronson

- New sewer treatment plant and sewer lines

City of Cedar Key

- None

City of Chiefland

· Sewer capacity expansion at industrial park

City of Fanning Springs

· None

Town of Inglis

· None

Town of Otter Creek

· None

City of Williston

· None

Town of Yankeetown

· None

Source: Official Projects List, OEDP, Withlacoochee Regional Planning Council, 1995.

Solid Waste

None.

Hazardous Waste

None.

Potable Water

None.

Electric Utilities

None.

Identification of Major Natural Drainage Features and Groundwater Recharge Areas

Major Natural Drainage Features

Levy County's physiography was predominantly a terraced coastal plain sloping south and westward from the Brooksville Ridge which ran northerly from Morriston to Bronson. To the east of the ridge was the Western Valley, which passed at about 100 feet above mean sea level from north to south through Williston and down into Citrus and Sumter Counties along the Withlacoochee River. Aside from the ridge and valley, the majority of the county (more than 75%) were coastal lowlands ranging in elevation from zero to 100 feet above mean sea level. The major part of the coastal zone did not exceed 25 feet in elevation with a nearly flat gradient that dropped about three feet for every mile towards the Gulf of Mexico. In the higher portion of the lowlands between Bronson and Otter Creek, the elevation might drop eleven feet per mile, which was still a slope of less than one percent (LCCP: 7-54).

There were four major drainage basins in Levy County. These included the floodplains of the Suwannee and Withlacoochee Rivers, but more that half (55%) of the county was comprised of the Coastal Area Basins lowland. The eastern-most part of the county drained to the east into the Ocklawaha River Basin (LCCP: 7-55,56).

The average annual precipitation was roughly 56 inches, or the equivalent of 2,909 million gallons per day over the entire county. The regional evapotranspiration rate was estimated at 2,016 million gallons per day. After that, 71.4% of the water budget had either evaporated from the ground or surface water or transpired through plants, 3.6% (109 million gallons per day) percolates to the Floridan Aquifer. The remaining 25% (763 million gallons per day) was direct run-off to features which drained the landscape or was base flow to lakes, streams and marshes (LCCP: 7-54 to 7-58).

Major Groundwater Recharge Areas

Recharge potential of the Floridan Aquifer is depicted on Map 8-9 in the Natural Resources Series of maps in the Appendix to Part 2 of the EAR.

Existing Regulations Which Govern Land Uses and Development of Natural Drainage Features and Groundwater Recharge Areas

Revisions to Rule 9J-5 and Chapter 163, Part II, Florida Statutes regarding land use and development affecting natural drainage features and groundwater recharge areas are

summarized in the context of the local government comprehensive plan in Part 6 of this EAR.