

1.0 Purpose of and Need for Action

heart of the National Key Deer Refuge and is bordered on the north by the Great White Heron National Wildlife Refuge.

Little Torch Key

Little Torch Key is located between MM 28 and MM 29, and is immediately preceded to the northeast by Big Pine Key. The island covers approximately 790 acres, and has a population mostly confined to several moderately-populated subdivisions. Business activities are limited to a few resort-style marinas and one restaurant. Little Torch Key is positioned just south of the Great White Heron National Wildlife Refuge. Portions of Little Torch Key lie within the fragmented boundaries of the National Key Deer Refuge.

Middle Torch Key

Middle Torch Key is located west of Little Torch Key. The island covers approximately 833 acres, and is sparsely settled. Middle Torch Key lies within the heart of the National Key Deer Refuge and is positioned just south of the Great White Heron National Wildlife Refuge.

Big Torch Key

Big Torch Key is located northwest of Big Torch Key. The island covers approximately 1562 acres, and is sparsely settled. Big Torch Key is accessed from Middle Torch Key and does not have direct access to U.S. Highway 1. Big Torch Key lies within the heart of the National Key Deer Refuge and is bordered on the north by the Great White Heron National Wildlife Refuge.

Ramrod Key

Ramrod Key is located between MM 26 and MM 27.5, just to the southwest of Little Torch Key. The island covers approximately 1030 acres, and has a similar population density to most of the islands in the Lower Keys. Ramrod Key is positioned just south of the Great White Heron National Wildlife Refuge. Portions of Ramrod Key lie within the fragmented boundaries of the National Key Deer Refuge.

Summerland Key

Summerland Key is located between MM 24 and MM 25.5, directly west of Ramrod Key. The portion of island lying south of U.S. Highway 1 is moderately populated and includes a private residential airstrip, while the portion north of the highway is sparsely settled. Similar to other islands in the Lower Keys, businesses are located along the U.S. Highway 1 corridor. Summerland Key is positioned just south of the Great White Heron National Wildlife Refuge. Portions of Summerland Key lie within the fragmented boundaries of the National Key Deer Refuge.

Cudjoe Key

Cudjoe Key is located between MM 20.5 and MM 23, directly west of Summerland Key, and covers approximately 3580 acres. Similar to Summerland Key the majority of development is located on the south side of U. S. Highway 1. A solid waste transfer station is located

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approximately one mile north of the highway and a half mile west of Blimp Road. The proposed wastewater facility, which will serve the Cudjoe Regional Service Area, will be located adjacent to the west side of a county transfer station. Cudjoe Key is bordered on the northwest side by the Great White Heron National Wild Refuge. Portions of Cudjoe Key lie within the fragmented boundaries of the National Key Deer Refuge.

Upper Sugarloaf Key

Upper Sugarloaf Key is located between MM 19 and MM 20.5, directly southwest of Cudjoe Key. The island covers approximately 2300 acres, and is sparsely settled. Business activities are limited and there is a school on the corner of U.S. Highway 1 and Crane Boulevard, which serves pre-K thru Grade 8. Upper Sugarloaf Key is bordered on the north side by the Great White Heron National Wild Refuge. Portions of Upper Sugarloaf Key lie just within the fragmented boundaries of the National Key Deer Refuge.

Lower Sugarloaf Key

Lower Sugarloaf Key is located between MM 16.5 and MM 17.5, directly southwest of Upper Sugarloaf Key. The island covers approximately 710 acres. The portion of island lying to the south of U.S. Highway 1 is moderately populated. North of the highway is a resort-style lodge, which includes a private airstrip, restaurant, marina, several small businesses and volunteer fire station. Lower Sugarloaf Key lies just south of the Great White Heron National Wildlife Refuge.

The FCAA and Monroe County have partnered through Interlocal Agreements to provide wastewater conveyance and treatment strategies that will comply with the Monroe County Master Plan and the standards mandated by the Florida Legislature. The cost-effectiveness of various strategies has been evaluated and centralized sewer will be provided to a majority of the population within the Cudjoe Regional Service Area where cost-effective. These centralized areas are referred to as “Hot Spot” areas and those decentralized areas where centralized sewer is not deemed cost-effective are termed “Cold Spot” areas (**Figure 1-2**).

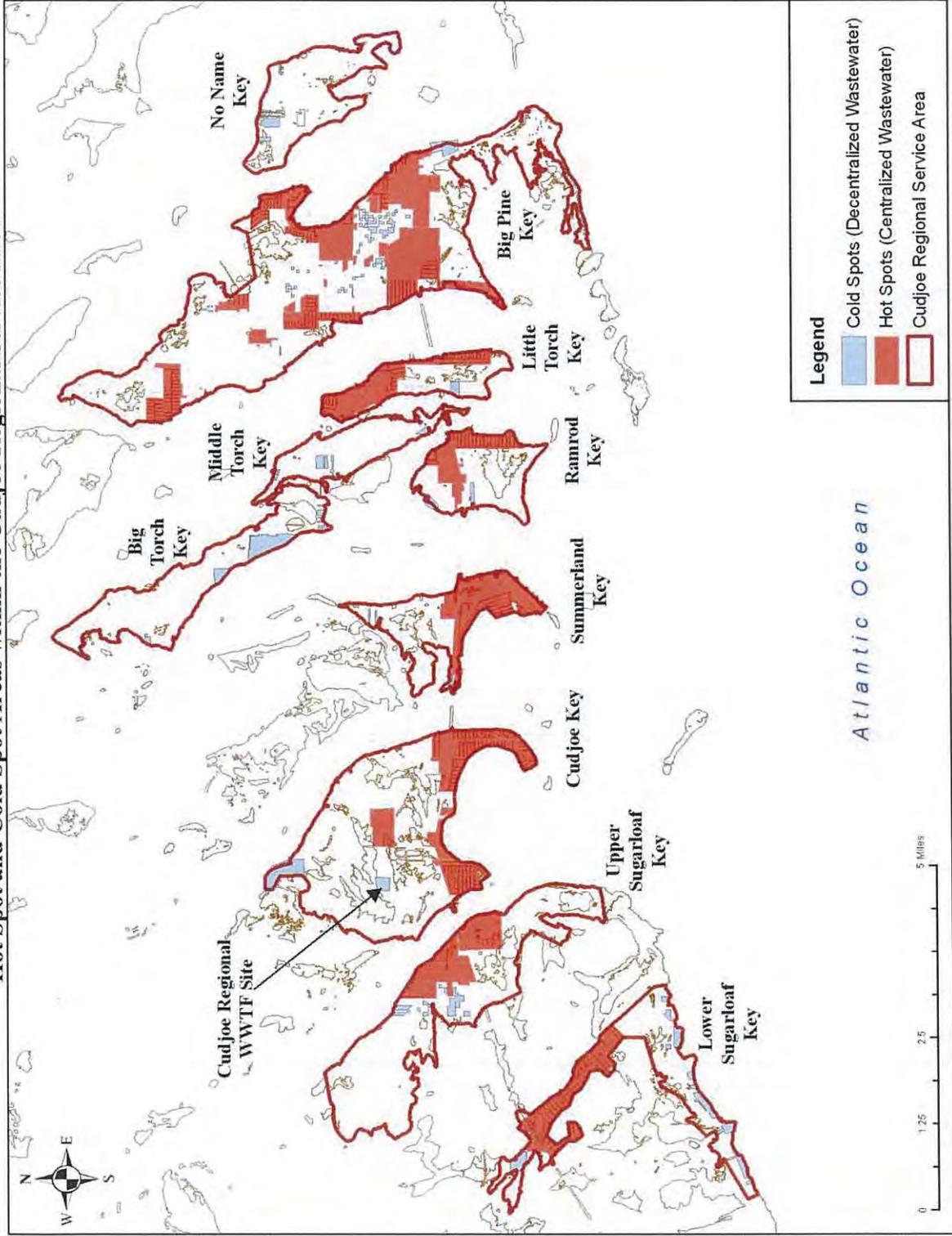
The proposed decentralized wastewater system will be centrally managed by the FCAA, as an U.S. Environmental Protection Agency (USEPA) Model 5 management entity. The proposal, as described by USEPA Grant ID 83310702-0, is for the FCAA to replace onsite systems in areas not scheduled to be provided with central sewer, with new Florida Department of Health (FDOH) approved Best Available Technology (BAT) systems and provide complete management of those systems. Cold Spot areas outside of the Cudjoe Regional Service Area may undergo additional review not included in this Draft EA.

1.3 Purpose and Need

In recognition of the importance of improving water quality in the Sanctuary, the purpose of the *Proposed Action* is to provide financial assist to the FCAA for the planning and implementation of a central wastewater system that will support the goals and objectives of the FKWQIA and FKWQIP. The *Proposed Action* is needed to reduce nutrient and bacteria loading to the Sanctuary, improve water quality in the Sanctuary, and comply with relevant federal and state regulatory standards.

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Figure 1-2
Hot Spot and Cold Spot Areas within the Cudjoe Regional Service Area



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The Sanctuary includes unique and nationally significant marine environments such as seagrass meadows, mangrove islands, and the only living coral barrier reef in North America. Similar to other Florida ecosystems, human activities during the past 100 years have affected water quality in the Sanctuary. Bacteria and nutrients from human wastes, and chemicals such as pesticides and mercury, that may reach this delicate ecosystem as a result of little or no treatment, can adversely impact water quality and pose a public health risk.

Water quality is critical to maintaining the marine ecosystem of the Sanctuary and influences the coral reef and the organisms dependent on the reef. Numerous scientific studies have documented the contribution of failing septic tanks and cesspools to the deterioration of canal and nearshore water quality in the Florida Keys. In addition, research has suggested that increased nutrient loadings from wastewater into canals and nearshore waters are one of the major contributors to the decline of water quality within the Sanctuary.

Most communities in the Florida Keys, with the exception of those within newly constructed central wastewater districts, rely on septic tanks, cesspools, and package treatment facilities and shallow injection wells for sewage disposal. These systems, if not properly operated, allow bacteria and nutrients to leach into nearshore waters. In some nearshore areas where water quality is monitored, beaches have been posted for health advisories due to fecal coliform bacteria contamination of surface waters after moderate rainfall events.

Within the Service Area there are approximately 7000 potable water customers. In the absence of a centralized wastewater system it is estimated that there are a similar number of onsite systems presently being used in the Service Area.

Average estimated reductions in wastewater loading to nearshore waters in the Florida Keys due to implementation of the FKWQIP are on the order of 69 and 73 percent in Total Nitrogen (TN) and Total Phosphorus (TP) loadings, respectively, using Advance Water Treatment (AWT) standards. Based on calculations prepared for similar central wastewater districts (Marathon, Islamorada and Key Largo) within the Florida Keys, reductions in TN, TP, and Total Suspended Solids (TSS) loadings between 85-88, 79-81, and 77-91 percent, respectively, are anticipated for the Cudjoe Regional Service Area as a result of implementing the proposed wastewater improvements.

The FKWQIP was created in response to regulatory requirements and in the interest of protecting public health and water quality. At the federal level, the Sanctuary and Protection Act of 1990 directed the USEPA and the State of Florida to develop a water quality protection plan for the Sanctuary. Locally, the Monroe County 2010 Comprehensive Plan mandates nutrient loading reductions in the marine ecosystem by the year 2010 and that wastewater systems meet more stringent Florida Statutory Treatment Standards. It is important to note that the Monroe County 2010 Comprehensive Plan is currently being updated to reflect the state's newly-extended 2015 deadline for advanced wastewater treatment.

1.4 Decision to be Made

Due to the high capital costs of implementing the proposed water quality improvement projects, municipal governments and public utility companies in the Florida Keys have requested assistance from the Federal government to develop and implement wastewater treatment and stormwater management actions that will reduce nutrient loadings and improve water quality in the Sanctuary. Based on the potential benefits of the Cudjoe Central Wastewater System and the adverse affects on the natural and manmade environment if water quality improvements are not made, the Corps must decide whether to provide financial assistance to the FKAA in developing and implementing wastewater improvements for the Cudjoe Regional Service Area. Once the proposed system is completed, Lower Keys residents and visitors can expect improved water quality in the surrounding Sanctuary and nearshore waters.

1.5 Scoping Issues

Under the NEPA, federal agencies are required to determine the scope of issues to be addressed for a project and identify the significant issues related to the *Proposed Action*. This process is called “scoping”.

Public meetings for various stakeholders, interested parties, and Lower Keys residents were held on December 8, 2008 and December 11, 2008. The scoping issues identified, which have guided the preparation of this document, are listed below.

- **Issue 1: Water Quality.** A number of recent scientific studies have documented the contribution of failing septic tanks and cesspools to the deterioration of the canal and nearshore marine water quality in the Florida Keys. The studies attribute increased algal blooms, seagrass die-off, and the decline in coral reef ecosystems health to inadequate wastewater treatment. Scientists concur that one of the principal sources of water quality degradation in the Sanctuary is the elevated level of nutrients in surrounding canals and nearshore waters. The USEPA has concluded that the magnitude and extent of estimated nutrient loadings from wastewater sources are regionally substantial (USEPA 1993). Based on calculations prepared for similar central wastewater districts within the Florida Keys (Marathon, Islamorada and Key Largo), reductions in TN, TP and TSS loadings of 85-88, 79-81, and 77-91 percent, respectively, are anticipated for the Cudjoe Regional Service Area as a result of implementing the proposed wastewater improvements.
- **Issue 2: Facility Location.** Vacant lands suitable for placement of a WWTF are scarce in the Florida Keys. As a result, potential sites for a WWTF may include sensitive or critical habitat for protected species (see issue 3, below). The proposed WWTF will be constructed on approximately 3 acres of a larger 10.2 acre parcel that is located on Cudjoe Key at the decommissioned landfill owned by Monroe County. Construction of sewer collection systems may cross naturally or culturally sensitive lands.
- **Issue 3: Protected Species.** The Florida Keys are a relatively small landmass in a subtropical to tropical island setting and provide habitat for many rare and protected plants and animals. Because remaining natural areas are scarce, any action by the FKAA

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that results in the loss of natural areas has the potential to impact protected species. Protected species that occur or may occur in the Service Area, associated habitats, and regulatory framework affecting these species, are addressed in this Draft EA. Consultation with U.S. Fish and Wildlife Service (USFWS) will be continual.

- **Issue 4: Effluent Disposal.** Residents within the Service Area currently rely on septic tanks, cesspools, and package treatment facilities. Shallow injection wells may be used for WWTFs with capacities less than two MGD. The Cudjoe Regional WWTF treated effluent would be disposed of through 4 shallow injection wells once a centralized WWTF is constructed. Shallow injection wells are governed by Chapter 62-528 Florida Administrative Code (FAC). Shallow injection wells would be designed and constructed to meet both Florida Department of Environmental Protection (FDEP) Class V reliability standards and FDEP Underground Injection Control (UIC) Class V well construction and monitoring requirements.
- **Issue 5: Tourism.** The quality of life for tourists in the Florida Keys relies on a healthy marine ecosystem and can be negatively impacted by water quality degradation. Over two million individuals per year visit the Florida Keys to enjoy its unique natural features. Water related activities, including snorkeling, diving, fishing, and other activities support 70 percent of tourism in the Florida Keys, which generates over \$1.3 billion per year and supports over 21,000 jobs. Poorly treated wastewater presents a public health risk to nearshore water of the Florida Keys, which in turn can result in beach advisories, decreases in tourism, and fewer individuals participating in recreational activities in the Sanctuary.
- **Issue 6: Environmental Justice.** Nearly 25 percent of population within the Service Area is made up of individuals regarded as either low income or over 65 years of age. Approximately 7.7 percent of the population was living below the poverty level in 2008, and the portion of residents over the age of 65 is estimated to be approximately the same as that of the county and state (14.7 percent and 17.6 percent, respectively). This segment of the population often lives on fixed incomes and, while their income may not be below the poverty level, they are affected by cost of living changes. These factors suggest that while the majority of the residents within the Service Area are above poverty levels, there are considerable impacts to residents associated with the costs of the Cudjoe Regional Wastewater System, raising potential environmental justice concerns.

1.6 Related Environmental Documents

Documents related to the Cudjoe Regional WWTF and water quality improvements in the Service Area that may influence the scope of this Draft EA include the Federal Emergency Management Agency (FEMA) Programmatic Environmental Assessment for Wastewater Improvements in the Florida Keys (2002) and the Florida Keys Carrying Capacity Study (FKCCS) (Corps 2002). These and other relevant documents are discussed in the PEIS.

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1.7 National Environmental Policy Act Requirements

Under the NEPA of 1969 and the CEQ regulations implementing NEPA (40 CFR Parts 1500 to 1508), the Corps must consider the environmental consequences of proposed federal actions (*Proposed Action*). Accordingly, the Corps has prepared this document to evaluate the environmental consequences of constructing the Cudjoe Regional Wastewater System. These project-specific improvements include wastewater collection, treatment and disposal options. This Draft EA tiers from the PEIS for the FKWQIP as described previously.

1.8 Summary of Prior Regulatory Action

A historical chronology of regulations applicable to the construction of wastewater treatment improvements and stormwater Best Management Practices (BMPs) in the Florida Keys was provided in the previously prepared PEIS to inform the reader of the more stringent Florida statutory treatment standards that will confront residents and commercial entities of Monroe County in the coming years. The Monroe County Year 2010 Comprehensive Plan (1997) mandated reductions in nutrient loadings to the marine ecosystem by the year 2010. Currently, the Monroe County 2010 Comprehensive Plan is being updated to reflect the state's newly-extended 2015 deadline for advanced wastewater treatment. In 1998, the Florida Governor issued Executive Order (EO) 98-309, directing local and state agencies to coordinate with Monroe County in the implementation of their Year 2010 Comprehensive Plan to eliminate cesspools, failing septic systems, and other substandard On-Site Wastewater Treatment Systems (OWTS).

1.9 Document Organization

The basic elements of a Draft EA, as well as all applicable sub-elements, are presented in this document. Subsequent individual sections of the Draft EA are listed and briefly described below.

- **Chapter 2. Description of Alternatives.** Presents a description of alternatives, including the *Proposed Action*, considered in the planning of the Cudjoe Regional Wastewater System, thereby providing the basis for decision-making.
- **Chapter 3. Affected Environment.** A description of existing conditions within the Cudjoe Regional Service Area. Provides a context in which to evaluate the alternatives.
- **Chapter 4. Environmental Consequences.** This chapter provides an analysis of the potential environmental consequences anticipated as a result of the *Proposed Action* considered as part of this Draft EA.
- **Chapter 5. Public Involvement.** Water quality and the need to reduce nutrient loading in the nearshore waters of the Florida Keys, including the Cudjoe Regional Service Area, are of interest to regulatory agencies and citizens alike. Consequently, public participation has been an important component throughout the preparation of this Draft EA to ensure compliance with the intent of NEPA and other applicable statutes.

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- **Chapter 6. Conclusion.** In this chapter, conclusions regarding potential environmental impacts of the three alternative actions proposed for the Cudjoe Regional Wastewater System to the physical, biological and human environment within the Cudjoe Regional Service Area are presented.
- **Chapter 7. Bibliography.** The bibliography documents the literature cited throughout the Draft EA as well as documents used during the preparation of the Draft EA that were not specifically cited.
- **Chapter 8. Glossary of Terms.**

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2.0 Description of Alternatives

Wastewater project alternatives for the FKAA's Cudjoe Regional Wastewater Treatment Service Area are described and evaluated in this section, providing the basis for decision making and thereby making up the core of this Draft EA. While this chapter relies on supporting information presented in *Chapter 3.0 Affected Environment* and *Chapter 4.0 Environmental Consequences*, it is in this chapter that the environmental consequences are clearly and concisely differentiated for each of the alternatives. The three alternatives evaluated as part of this Draft EA are listed below and discussed in the sections that follow.

- **Alternative 1: No Action.** No federal agency would provide funding to the FKAA for implementation of wastewater treatment improvement projects that would address state mandates to meet wastewater treatment standards. Public entities would not construct or operate WWTFs. Lower Florida Keys residents, communities, and businesses would be responsible for addressing state mandates aimed at improving water quality in the Sanctuary.
- **Alternative 2: Proposed Action.** Provide federal financial assistance from the Corps, as part of the FKWQIP, to develop and implement a regional wastewater collection and treatment system for the Cudjoe Regional Service Area that would address mandatory state wastewater treatment standards.
- **Alternative 3: Pursue Other Sources of Funding for Project Implementation.** In the absence of federal funding, provided by the Corps, alternative funding sources would be pursued to implement projects for the FKAA that would address state mandates and improve water quality in the Sanctuary. Sources of monies may include other state and federal funding mechanisms (other than Corps) and/or additional costs levied against Florida Keys residents.

While other funding sources are currently being evaluated to assist in implementing wastewater improvement projects in the Lower Florida Keys, the proposed federal funding would expedite construction of the regional WWTF and associated infrastructure.

2.1 Delineation of Alternatives

The enabling legislation for the Act directs the Corps to coordinate with local and state agencies as part of the planning process identifying the developing water quality improvement projects designed to decrease nutrient loading and improve the water quality of the Sanctuary. At the programmatic level, the alternatives analysis examined the potential environmental effects of alternative proposed water quality improvement projects to identify those with the greatest potential for improving water quality throughout the Sanctuary.

Planning at the county level has also addressed water quality improvements in the Florida Keys, primarily in response to the mandated Florida Statutory Treatment Standards. In addition, local municipalities in Monroe County have prepared sanitary wastewater treatment master plans during the past eight years. Consequently, the water quality improvements projects proposed for the FKAA have undergone a rigorous analysis of alternatives, including facility siting and treatment technology applications. Therefore, additional plan formulation was not undertaken for this project-specific activity. It should be noted that MCSWMP recommendations included

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the construction of wastewater treatment systems to serve the highest ranked “hot spot areas” for the Lower Florida Keys.

2.2 Description of Alternatives

Three alternatives have been proposed for improved wastewater treatment for the Cudjoe Regional Service Area, and are described in the following sections.

2.2.1 **Alternative 1 (No Action): No Implementation of Wastewater Treatment Improvement Projects for the Cudjoe Regional Service Area**

Under the *No Action* alternative, no federal funding would be provided to the FKAA, as part of the FKWQIP, for needed improvements or upgrades to wastewater collection and treatment systems that would address state mandates to improve water quality in the Sanctuary. Residents and commercial businesses in the Service Area would continue using on-site systems, such as cesspools and septic tanks, to treat wastewater.

Reliance on individual and privately owned cluster or package treatment facilities would continue under the *No Action* alternative. Individual property owners and commercial businesses would be responsible for meeting the defined Level of Service (LOS) standards prescribed by county ordinance or state regulation. Public entities would not own or operate any of the proposed WWTF. Under the *No Action* alternative, the residents within the Service Area would not benefit from financial assistance, which would otherwise be provided by the Federal government.

2.2.2 **Alternative 2 (Proposed Action): Provide Federal Financial and Technical Assistance to Develop and Implement Wastewater Improvement Projects for the Cudjoe Regional Service Area.**

The *Proposed Action* includes financial assistance for the FKAA to construct a WWTF and associated infrastructure to serve the Cudjoe Regional Service Area. The Proposed Action would accomplish the goals listed below:

- Meet objectives of the Act;
- Address local and regional water quality issues;
- Achieve nutrient loading reductions and commensurate improvements in water quality in nearshore waters of the Service Area and subsequently, the Sanctuary; and
- Comply with federal and state mandated regulatory water quality treatment standards in a timely manner.

The *Proposed Action* would include new service to residents with OWTs in the Service Area. All single-family residences and almost all small commercial entities currently use some type of OWTs, either permitted/unpermitted septic tank systems, or illegal cesspools. Once the proposed facility is completed, residents would be connected to the new collection system over an anticipated two to three year period of time.

2.0 Description of Alternatives

The concept of Equivalent Dwelling Units (EDUs) has been employed in the planning process to compare the costs of various wastewater alternatives. EDUs are also utilized in the apportionment of the costs of wastewater management implementation. As defined by the FKAA, a single dwelling unit is considered one EDU and non-residential EDUs are based on a minimum of one EDU per parcel, equivalent to an average day water use of 167 Gallons Per Day (GPD). Non-residential EDUs are calculated by dividing the average day water used of the three highest consecutive months during a consecutive 24-month period by 167 gallons. Water use records are used to estimate wastewater discharge. Growth projections for projected wastewater flows were completed for 2008 and 2018. The estimated increase in total wastewater flow in all of the Florida Keys for the entire 20-year planning period (1998 to 2018) is 1.0 MGD, or about 14 percent (MCSWMP).

At the owner's expense, existing residential septic systems and cesspools would be removed from residences and businesses in the Service Area. Similarly, service recipients would be responsible for the installation of conveyance pipes from their residence or business to the wastewater collection system service lateral to the street. Removal of existing systems would be phased in accordance with construction of the collection system, and pursuant to FDOH requirements.

2.2.2.1 Alternative Site Selection

The decommissioned-landfill site located on Cudjoe Key is one of 13 sites originally evaluated for the proposed WWTF as part of the Wastewater Facilities Plan (Monroe County 1998) that was developed as part of the Comprehensive Sanitary Wastewater Master Plan for Monroe County. Potential sites throughout the Cudjoe Regional Service Area were evaluated with respect to location, existing and future land use, adjacent land uses, general environmental and habitat considerations, present ownership, development constraints, and cost. The decommissioned-landfill site is preferred primarily because of its centralize location within the Service Area and existing land use. Additionally, the site has already been improved and cleared of vegetation.

2.2.2.2 Wastewater Collection and Transmission System

Several wastewater collection options are available throughout the Florida Keys, as described in the PEIS (Section 2.2.2.1). Conventional gravity and low pressure sewer systems are the preferred wastewater collection technology for the Cudjoe Regional Service Area. An analysis of alternative wastewater collection systems concluded a hybrid system should be implemented consisting of a combination of (1) conventional gravity sewer systems to serve the densely populated areas; and (2) low pressure sewers to serve the less dense and outer reaching areas.

Collection System. Wastewater would be conveyed from houses and businesses via transmission lines to lift stations located in or near the Rights of Way (ROWs) in the Service Area. Service laterals necessary for residential connections to the collection system would be provided up to the ROW. Connection to the collection system would be the responsibility of the property owner. Soil would be excavated for the installation of gravity sewer mains, lift stations, and gravity service laterals.

2.0 Description of Alternatives

Conventional Gravity. Conventional gravity flow sewer systems are the most widely used method of wastewater collection in residential and other developed areas. In a conventional gravity sewer system wastewater is transported by gravity from each service connection to a main gravity sewer. The main gravity sewer is sloped to provide a flow velocity adequate to convey solids and minimize settling. Manholes are placed on the sewer lines at intervals of 300 to 400 feet and at all intersections and changes of slopes. Manholes allow access for inspection, cleaning and repair. Because of the continuous slope, the depth of gravity sewers increases with distance downstream until the depth becomes too great for economical construction. Typically, for the Florida Keys this depth is 8 feet due to the subsurface conditions. Once the maximum depth is reached, a lift station is required to pump the wastewater to a shallower gravity-sewer system manhole, through a force main to another lift station, which will ultimately pump through a force main system to the regional WWTF. The Cudjoe Regional Service Area will rely on numerous lift stations, of which five will be master pump stations that pump directly to the WWTF.

Low Pressure. Low pressure systems utilize a small grinder pump station at each wastewater source and small-diameter, low pressure force mains for transmission either to lift stations or directly to a WWTF. The grinder pump station accepts the entire wastewater stream from the residence or business and is not used in conjunction with a septic tank. Stations serving single residential units typically utilize fiberglass or HDPE wet-wells 24 to 30 inches in diameter. The grinder pumps typically range from 1 to 3 horsepower, depending on the type of pump selected and the number of units served by the pump station. All solids in the waste stream are ground to a slurry and pumped through small diameter pressure sewers. Since these systems do not rely on gravity, the sewers can be constructed with minimum cover. Since there are no septic tanks utilized in low pressure pump systems, installation costs and seepage handling costs associated with the septic tanks are avoided.

Transmission System Components. Wastewater would be conveyed from the lift stations to the wastewater collection tank at the WWTF through 6- to 14-inch force mains. There will be one transmission main constructed in the ROW of U.S. Highway 1, before it diverts toward the WWTF along Blimp Road.

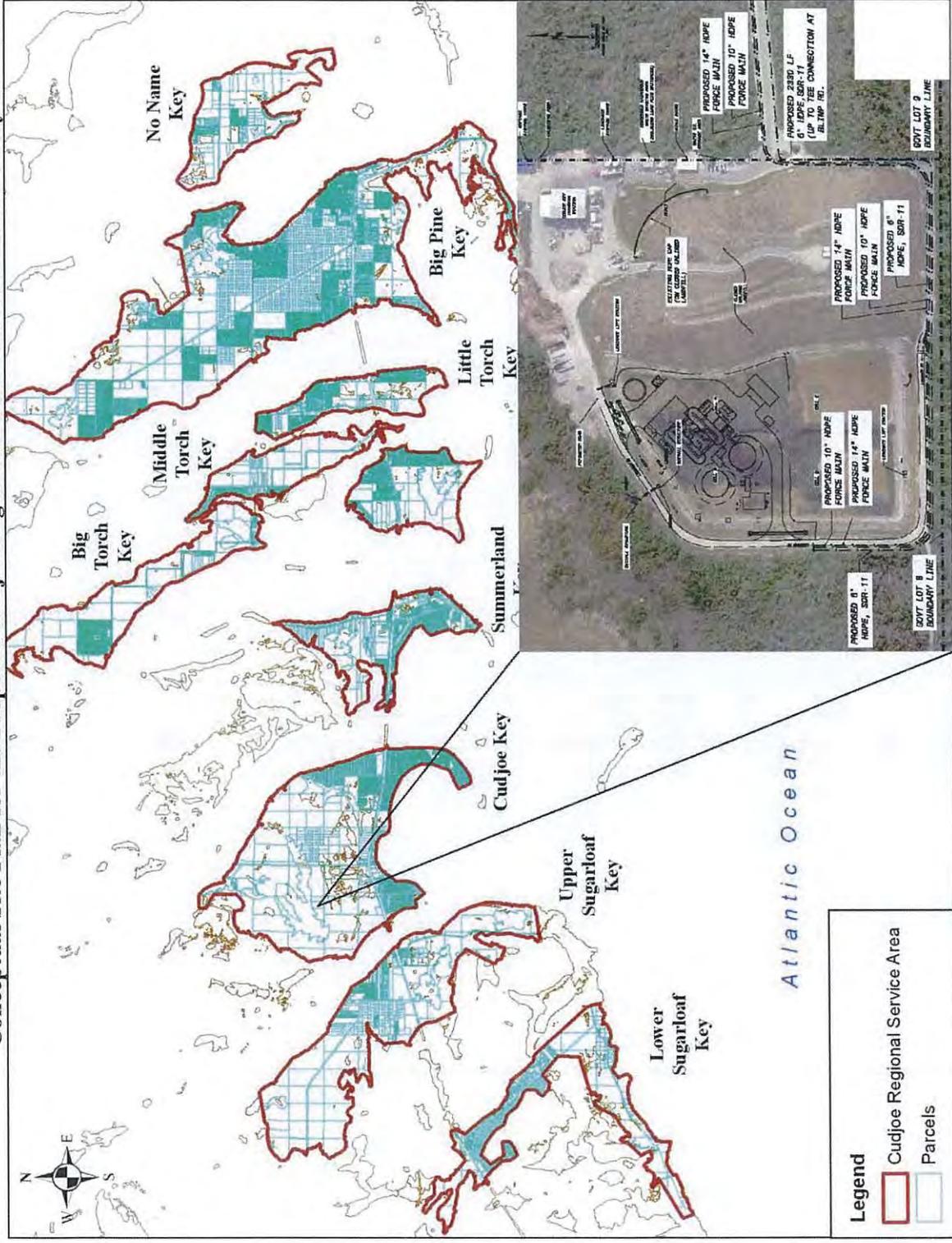
2.2.2.3 Wastewater Treatment Facility

Site Description. The proposed WWTF will be constructed on approximately 3 acres of a larger 10.2 acre parcel and is located on Cudjoe Key at the decommissioned landfill owned by Monroe County (**Figure 2-1**). The site is cleared and contains existing stormwater retention swales.

The WWTF site is in close proximity to a tropical hardwood hammock. However, the limits of the construction footprint are located solely within previously developed land associated with the former Monroe County landfill. No native upland or wetland habitats are located on the proposed WWTF site.

2.0 Description of Alternatives

Figure 2-1
Conceptual Site Plan for the Proposed Cudjoe Regional Wastewater Treatment Facility



2.0 Description of Alternatives

2.2.2.4 Construction Activities

Proposed construction includes building the WWTFs and associated infrastructure, installing treatment tanks, underground and aboveground transmission lines, pumping stations, and sand or fabric filtration facilities. Removal of septic systems and pipeline trenching activities would occur throughout the Service Area at the residents' expense.

Excavation activities for the collection system and WWTF site development, transmission lines, and septic tank and cesspool removals would require heavy construction equipment, such as trenching equipment, excavators, bulldozers, front-end loaders, and dump trucks to transport material, equipment, and construction debris. Existing utilities within the ROWs on either side of U.S. Highway 1 may require the construction of portions of the wastewater collection mains, force mains, and transmission mains under one or more paved lanes of U.S. Highway 1, resulting in temporary traffic delays in proximity to the construction. All construction will meet Florida Department of Transportation (FDOT) requirements to minimize traffic impacts, and conform to FDOT standards for restoration of roadways. Depending on the time required for construction on U.S. Highway 1, construction may take place during evening hours.

All construction activities would be conducted pursuant to applicable facility planning regulation at the state level.

2.2.2.5 Operation and Maintenance

The new WWTF would be operated and maintained by the FKAA.

Wastewater Treatment Components. Design of the new WWTF include the facility, storage for maintenance, treatment, effluent disposal and operations materials, parking, paved access roads, and emergency power. The WWTF design includes influent flow measurement and pretreatment screening, Biological Nutrient Removal (BNR) reactors, chlorine contact basins, sludge holding facilities, odor control equipment as required, four shallow injection wells, and ancillary equipment such as pumps and blowers to support each unit process.

Wastewater Treatment System Operation. The WWTF will generally include a field-erected treatment facility, an emergency power generator, four shallow inject wells, headworks, odor treatment, an operations building, facility pump station, and a blower/electrical building. Roads and stormwater retention will also be included. Influent and effluent concentrations for which the facilities will be designed are as noted in **Table 2-1** below.

Table 2-1
Design Wastewater Influent and Effluent Characteristics

Parameter	Influent Concentration	Effluent Concentration
BOD 5	172 parts per million (ppm)	5 ppm
TSS	216 ppm	5 ppm
TN	54 ppm	3 ppm
TP	8 ppm	1 ppm

2.0 Description of Alternatives

WWTF would provide biological treatment, solids removal, nitrogen and phosphorus removal, filtration, effluent disinfection and disposal to injection wells. A flow meter would measure and record the wastewater flow into the WWTF.

Bardenpho-Process technology is proposed for the WWTF. The overall Bardenpho Process is similar to a conventional activated sludge flowsheet. Raw or settled sewage enters the biological reactor and is mixed with return settled sludge. Mixed liquor from the reactor flows to a clarifier where biological solids are removed from the treated wastewater and are recycled to a reactor basin. A portion of the sludge is wasted, removing excess cell material generated during processing. Sludge wasting also removes phosphorus from the system.

The Bardenpho system is an advance modification of the activated sludge process consisting of a multi-stage biological reactor. High levels of Biological Oxygen Demand (BOD), suspended solids, nitrogen, and phosphorus removal are consistently achieved without the use of chemicals. Influent is mixed with activated sludge, returned from the final clarifier, in the fermentation stage. After contact, liquid is transported to an anoxic zone where it is mixed with nitrates from the nitrification zone. Oxygen, which is added in the nitrification zone, converts BOD to carbon dioxide, and ammonia to nitrate. In the second anoxic zone, nitrate is reduced to nitrogen gas. The final stage of the Bardenpho Process is a reaeration zone where the dissolved oxygen concentration in the mixed liquor is increased to prevent phosphorus from being released in the final clarifier.

The Cudjoe Regional WWTF design is a five-stage Bardenpho-Process domestic wastewater treatment plant. The permitted (FLA671932-001) capacity for the facility's three-month average daily flow is 0.84 MGD. The major unit operation units of the headworks are two fine screens, two bar racks and two 140,000-gallon equalization tanks. The WWTF will have two clarifiers with 60-foot diameters. There are two filter units, which each having four disk filters. The surface area of each disk is 53.8 square feet. The disinfection system consists of two 7,600-gallon chlorine contact chambers and a gaseous chlorine feed system. The solids processing facilities consist of two rotary drum thickeners, a thickening polymer feed system, two 50,000-gallon aerated sludge holding tanks, a dewatering polymer feed system and one centrifuge.

Effluent and Sludge Disposal. By-products of the wastewater treatment process include liquid effluent and a solids residual or sludge.

Effluent Disposal. Effluent disposal for the proposed WWTF would be through shallow well injection. Shallow injection wells are considered Class V wells by the EPA, and the required effluent quality is dependent in the capacity of the WWTF. The effluent quality for the proposed WWTF is as stated in **Table 2-1**.

These wells will extend 110 feet below ground with an 80-foot casing in the upper portion of the well. The effluent gravity flows through the upper cased portion of the well and out through the lower 30-foot portion of the well into a porous limestone formation. Chlorine would be added to effluent to reduce risk from bacterial and viral organisms.

2.0 Description of Alternatives

Sludge Disposal. Current plans for managing sludge at the proposed site include temporary storage followed by off-site processing and disposal.

2.2.3 Alternative 3 (*Alternative Funding Sources*): Pursue Other Sources of Funding for the Cudjoe Regional Wastewater Improvement Projects

Under Alternative 3, *Alternative Funding Sources*, including state and federal funding alternatives (other than Corps funds), would be pursued to implement the Cudjoe Regional Wastewater Improvement Project. This alternative is not within the jurisdiction of the Corps and no monies would be obtained from the Corps. Consequently, the project would be implemented as funding became available, potentially delaying full implementation. The overall potential impacts of implementing *Alternative Funding Sources* are briefly summarized below:

- Fail to meet objectives of the Act until alternate funding is identified and obtained;
- Delay addressing local and regional water quality issues;
- Delay nutrient loading reductions and commensurate improvements in water quality in nearshore waters of the Service Area and subsequently, the Sanctuary; and
- Delay compliance with federal and state regulatory water quality standards until all funding is made available.

2.3 Comparison of Alternatives

The alternatives examined as part of this Draft EA were premised on the need to implement water quality improvement projects that will reduce nutrient loading and result in commensurate water quality improvements in the Sanctuary. The environmental consequences are summarized in **Table 2-2** and a more detailed analysis is presented in *Chapter 4.0 Environmental Consequences*.

Table 2-2			
Comparison of Environmental Consequences			
Resulting from the Alternative Actions			
Scoping Issue	Alternative 1 <i>No Action</i>	Alternative 2 <i>Proposed Action</i>	Alternative 3 <i>Alternative Funding Sources</i>
3. Water Quality	Adverse impacts due to continued untreated wastewater runoff and associated nutrients, toxins, bacteria, and viruses to canals and nearshore waters in the Sanctuary. State and federal mandates to improve water quality in the Sanctuary may not be addressed.	Benefits of centralized wastewater treatment include water quality improvements due to decreased nutrient and other contaminants into canals and nearshore waters of the Sanctuary. Reductions in TN, TP and TSS loadings between 85-88, 79-81 and 77-91 percent, respectively, are anticipated. These improvements will address state and federal legislation.	Continued degradation of water quality is anticipated until funding is obtained to construct all the regional WWTF. Piece-meal construction may delay full achievement of project and program objectives.

2.0 Description of Alternatives

4. Facility Location	No impacts are anticipated. No lands will be required for the location and construction of wastewater facilities. Therefore, with the exception of the other scoping issues, existing residences, fish and wildlife habitats, and land uses will not be disrupted.	Net environmental benefits due to improved water quality. The facility is located at a decommissioned landfill, contain little to no ecological value. Therefore, no adverse impacts are anticipated.	Impacts similar to those described under the <i>Proposed Action</i> area expected.
3. Protected Species	Adverse impacts to protected species anticipated as a result of continued runoff of untreated wastewater into canals and nearshore waters and subsequent water quality degradation. Because no new facilities would be required, no impacts to habitat for protected species are anticipated.	Section 7 USFWS/ National Marine Fisheries Service (NMFS) consultation and Florida Fish and Wildlife Conservation Commission (FFWCC) for protected species will occur as needed. No critical habitat will be impacted.	Impacts similar to those described under the <i>Proposed Action</i> are expected, with delays in benefits, in addition to potentially greater impacts due to larger number of smaller facilities being constructed.
4. Effluent Disposal	Adverse impacts anticipated as a result of unchanged effluent disposal practices. Runoff from cesspools and septic tanks will continue to enter canals and nearshore waters in the Sanctuary.	Construction of centralized sewers will expedite the removal of cesspools, septic tanks and associated pollutants in the Cudjoe Regional <i>hot spots</i> .	Construction of sewers will be less effective due to fragmented approach. Delays in construction are also anticipated.
5. Tourism	Increasing impacts anticipated related to water quality degradation. Continued beach health advisories would adversely affect immediate recreational and tourist opportunities, and long-term impacts could be detrimental to tourism and the local economy.	Improved water quality would decrease the incidence of beach advisories and closings, thereby increasing the opportunity for saltwater-based recreation. Temporary adverse impacts would include transportation delays due to construction activities.	Improved water quality would decrease the incidence of beach advisories and closings, thereby increasing the opportunity for saltwater-based recreation albeit at a slower pace than the <i>Proposed Action</i> .
6. Environmental Justice	Adverse impacts to low-income households who will have difficulties affording the cost of meeting 2015 mandates for wastewater treatment are expected.	Without special consideration and financial assistance, low-income and fixed-income households may have difficulty paying for wastewater hook-up and service fees.	Without special consideration and financial assistance, low-income and fixed-income households may have difficulty paying for wastewater hook-up and service fees.

2.4 Preferred Alternative

The preferred alternative is Alternative 2, the *Proposed Action*. Under the *Proposed Action*, the Corps would provide financial assistance to the FKAA for implementation of a wastewater improvement project that would reduce nutrient loads and pollutants to nearshore waters in the Sanctuary.

2.5 Summary of Mitigation Requirements

Some unavoidable impacts may occur as a result of the Proposed Action and would require mitigation. Proposed mitigation measures are described below.

Biological Resources. Minimal to no adverse impacts to biological resources are anticipated as a result of the proposed project. The collection system will be constructed in previously disturbed ROW. However, minimal avoidable impacts to mangrove habitat may occur as a result of installing portions of the transmission main along U.S. Highway 1. The WWTF will be constructed on a former solid waste site, containing no vegetation. Additionally, no wetlands occur within the proposed WWTF construction foot print. If unanticipated adverse impacts to biological resources occur during construction, appropriate mitigation will be required.

Cultural Resources. The results of a Florida Master Site files review indicated a total of 39 archaeological sites and 49 historic structures throughout the Service Area. However, no known archaeological or historic sites are located on, or in direct proximity to, the proposed WWTF site. Additionally, the proposed wastewater infrastructure will be constructed within previously distributed ROW. Consequently, no affect on historic, archaeological, or cultural resources is anticipated as a result of the proposed project. Should any historic or archeological item be discovered during project work, all activities would be terminated and the FKAA would consult with the Corps, State Bureau of Historic Preservation Office (SHPO) and other appropriate agencies for further guidance.

Environmental Justice. EO 12898 directs federal agencies to provide for participation by minorities and low income populations in the federal decision-making process and further directs agencies to fully disclose any adverse effects of plans and proposals on minority and low-income populations. As described in the Florida Keys Water Quality Improvements Program (FKWQIP) PEIS, over 25 percent of the Florida Keys population is made up of individuals regarded as either low income or over 65 years of age. The segment of population over the age of 65 often lives on fixed incomes and while their income may not be below the poverty level, they are affected by cost of living changes. These factors suggest that while the majority of the residents within the Service Area are above poverty levels, there are considerable impacts to residents associated with the costs of the Cudjoe Regional Wastewater System, raising potential environmental justice concerns. Four potential approaches that the FKAA may elect to address for this issue are presented below, as previously outlined in the PEIS.

2.0 Description of Alternatives

- ***Subsidize Connection Fees.*** Subsidize the cost of connection for residents. The principal issue associated with providing subsidies for this group of residents is the source of funding, which could be provided by the water treatment utility or local government property tax revenues. In each case, the potential for funding would have to be evaluated.
- ***Subsidize the Recurring Cost of Sewer Service.*** Again, the principle issue would be the source of funding. A major difference between funding requirements for subsidizing connection charges and recurring charges is the continuing nature of the recurring charges.
- ***Implement a Modified Rate Structure Based on Water Volume Use.*** Apply different service fees based on the volume of water actually used. Such a rate structure would include a very low base charge for the first 3,000 gallons of water use per month, with a sharply increasing charge for greater volumes of water use.
- ***Subsidize Abandonment of Existing Onsite Treatment Facilities.*** Subsidize the cost of abandoning onsite treatment (i.e., septic tank and drainage field) for low income or fixed income residents. As stated above, the principle issue would be the source of funding.

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3.0 Affected Environment

A PEIS was previously prepared by the Corps for the proposed FKWQIP. The PEIS was prepared in accordance with the NEPA, the CEQ regulations implementing NEPA (40 CFR 1500-1508), and FEMA regulations (44 CFR Part 10, Environmental Considerations). These laws and regulations require the Corps to consider and address issues when funding any federal action.

The PEIS was published in the Federal Register in September 2004 and provides a framework to address potential environmental impacts associated with design and implementation of the FKWQIP. This Draft EA tiers off from the PEIS for the FKWQIP and thereby incorporates the PEIS by reference, in accordance with 40 CFR Part 1508.28. The *Proposed Action* is the construction of a centralized wastewater treatment system to service residents and commercial businesses located in the Cudjoe Regional Service Area. The proposed design capacity of the WWTF is one MGD.

The affected environment addressed by this Draft EA lies within the Cudjoe Regional Service Area, which extends from MM 17 to MM 33, and includes ten islands (from north to south):

- No Name Key
- Big Pine Key
- Little Torch Key
- Middle Torch Key
- Big Torch Key
- Ramrod Key
- Summerland Key
- Cudjoe Key
- Upper Sugarloaf
- Lower Sugarloaf

The environmental components addressed in the Draft EA are summarized in **Table 3-1**. While global or regional conditions such as climate will not be affected by the alternatives under consideration, habitat, protected species, environmental justice, and water quality are issues of concern and are therefore evaluated in appropriate detail. This chapter provides a current baseline against which comparisons of alternatives discussed in Chapter 4, *Environmental Consequences*, can be made.

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3.0 Affected Environment

**Table 3-1
Relationship Between Scoping Issues and Environmental Resources**

Section	Affected Environment	Scoping Issues					
		Water Quality	Facility Location	Protected Species	Effluent Disposal	Tourism	Environmental Justice
3.1	Climate & Rainfall						
3.2	Geology, Topography & Soils	✓	✓		✓	✓	
3.3	Water Resources	✓	✓	✓	✓	✓	
3.4	Water Quality	✓	✓	✓	✓	✓	
3.5	Ecological Habitats	✓	✓	✓		✓	
3.6	Protected Species	✓	✓	✓		✓	
3.7	Essential Fish Habitat	✓	✓	✓		✓	
3.8	Air Quality & Noise		✓				
3.9	Cultural Resources		✓				
3.10	Demographics & Socioeconomics	✓	✓			✓	✓
3.11	Recreation	✓	✓	✓		✓	
3.12	Open Space & Aesthetic Resources	✓	✓	✓		✓	
3.13	Environmental Justice		✓			✓	✓
3.14	Land Use & Planning	✓	✓	✓	✓	✓	✓
3.15	Infrastructure		✓				
3.16	Hazardous Materials & Domestic Waste		✓				

3.1 Climate

Climate

The climate in the Lower Keys is the same as that described for the Florida Keys in the PEIS (Section 3.1). The Florida Keys are marked by a wet summer season (June to October) characterized by numerous thunderstorms, while winters (November to May) are dry with infrequent, fast-moving cold fronts (30-40 each year). Precipitation in the Florida Keys is low compared with other portions of Florida. Rainfall averages 40 inches per year and peaks in June and late September and accounts for most of the precipitation in the Florida Keys.

3.2 Geology, Topography & Soils

The geology, topography and soils in the Florida Keys are described in the PEIS (Section 3.2). The Florida Keys make up a low-lying archipelago extending from Key Largo to Key West for approximately 110 miles and covering 66,000 acres. The islands are located at the southernmost

3.0 Affected Environment

tip of the Florida Platform. Coral reefs roughly define the southern boundary of the Florida Platform. Just east of the Platform, the depth increases to 2,640 feet or more into the Straits of Florida and to nearly 10,000 feet deep farther west in the Gulf (Randazzo and Halley 1997).

The Lower Keys geologic portion, extending from Lower Matecumbe Key to Key West, is comprised of rock of oolitic (limestone made up of small spherical grains) origin, referred to as the Miami Limestone Oolite (Randazzo and Halley 1997). These oolitic islands are thought to have formed as a sub-tidal marine ooid-shoal, during a sea level high during the Pleistocene Epoch. The oolitic rock of the Lower Keys contains an abundance of marine fossils while quartz makes up a relatively small portion of the rock. The Miami Oolite in the Lower Keys is oriented perpendicular to the continental shelf and has the configuration of a tidal bar with low flooded areas between the bars (Evans 1987).

Service Area. Soil maps of the Cudjoe Regional Service Area (U.S. Department of Agriculture [USDA] Natural Resources Conservation Service [NRCS] 1990) indicate nine soil map units in the Service Area. Cudjoe tidal complex is the dominate soil type, covering approximately 33.7 percent of the Service Area. Key Vaca gravelly loam is the second most dominant cover type, comprising approximately 12.3 percent of the Service Area. Udorthents (11.5%) and Matecumbe muck (9.3%) comprise the third and fourth dominant soil types within the Service Area. The remaining six soil types make up approximately 25.6 percent of the Service Area, and are Saddlebunch marl, Matecumbe muck, Lignumvitae marl, Key Largo muck and Islamorada muck (**Table 3-2**).

Soil Map Unit	Area (acres) of Interest	Percent
Cudjoe tidal complex	6791.2	33.7 %
Key Vaca gravelly loam	2479.6	12.3 %
Udorthents	2320.3	11.5 %
Matecumbe muck	1870.2	9.3 %
Cudjoe marl	1859.0	7.3 %
Saddlebunch marl	1416.7	7.0 %
Lignumvitae marl	892.0	4.4 %
Islamorada muck	526.0	2.6 %
Key Largo muck	484.9	2.4 %

The Cudjoe tidal complex consists of shallow, poorly drained, moderately to moderately rapid permeable soils in tidal and other flooded areas of the Florida Keys. They formed in calcareous marl over rippable coral or oolitic limestone. Depth to bedrock ranges from 3 to 20 inches. Reaction ranges from neutral to moderate alkaline throughout. Most areas of Cudjoe soils are used as wildlife habitat. The dominant native vegetation is black mangrove, red mangrove and white mangrove, along with saltwort, glasswort and poisonwood (USDA-NRCS 2003).

The Udorthents soils complex is composed of crushed oolitic limestone or coral bedrock spread over original soil material and consequently does not support vegetation growth. These soils are moderately well drained and have a water table at two to four feet Below Land Surface (BLS) during the wet season. Houses and other urban structures occur on approximately 40 percent of the Udorthents in the Florida Keys (USDA 1990).

Nearly 77 percent of the soils in the Cudjoe Regional Service Area are poorly drained soils with high runoff potential, while the remaining soils have more moderate infiltration and runoff characters (USDA 1990). There are no prime farmlands in Monroe County that fall under the Farmland Protection Policy Act.

WWTF Location. The Cudjoe Regional WWTF location was once made up entirely of Key Vaca gravelly loam (USDA 1990). However, in conjunction with the original landfill, a primary liner was installed covered by a total of two feet of sand.

3.3 Water Resources

Ground water, surface waters, nearshore and marine waters in the Florida Keys are the environmental resources targeted by the FKWQIP and the project for the Lower Keys, as described in the PEIS (Section 3.3). The Cudjoe Regional Wastewater System will address 12 of the 45 water quality hot spots in the Florida Keys (Monroe County 2000).

3.3.1 Ground Water

Service Area. Water in the Biscayne Aquifer provides a potable water source only on the mainland of Florida, although the geologic structure extends as far as the Florida Keys. The aquifer ranges from brackish to saline throughout the Florida Keys and is not used as a potable water source (that is, it is not a designated underground source of drinking water, or USDW) except as input for desalination systems. The FKAA is the sole provider of potable water for all residents of the Florida Keys and no new domestic water supply wells have been permitted in the Florida Keys since 1986 (FEMA 2002). However, a freshwater lens on Big Pine Key has been the subject of published water-resources studies by the U.S. Geological Survey (USGS).

WWTF Location. Geotechnical borings revealed ground water at depths of about 3 feet below the existing ground surface. Those depths are at elevations just above mean sea level which is typical for a coastal site. The water table at the site should be expected to fluctuate several feet in response to the bay tides (Jammal & Associates, Inc. 1987).

3.3.2 Surface Waters and Stormwater Runoff

Service Area. Surface waters make up approximately 59.4 percent of the Cudjoe Regional Service Area and include artificial ponds, canals and boat basins, in addition to mangroves,

3.0 Affected Environment

estuaries and freshwater marshes (Table 3-3). Inland canals and access channels in the Florida Keys are often 10 to 20 feet in depth and discharge directly to the ocean, as described in the PEIS (Section 3.3). In a 1985 study, the FDEP (formerly Florida Department of Environmental Regulation [FDER]) concluded that the majority of the Florida Keys met the criteria for designation as Outstanding Florida Waters (OFWs), except canals and other specific areas. Many of the canal systems tested exhibited low values of dissolved oxygen, high nutrient values, and violations of the fecal coliform standard (Kruczynski, W. 1999).

Wetland Habitat Type	Area (acres) of Interest	Percent
Freshwater Marsh	967.43	4.8 %
Salt Marsh	1302.21	6.5 %
Mangrove Swamp	2582.13	12.8 %
Scrub Mangrove	4237.59	21.0 %
Buttonwood	1669.41	8.3 %
Open Water	1217.92	6.0 %
Total	20176.64	59.4 %

Subsequent recommendations made by EPA and the South Florida Water Management District (SFWMD) through an interagency workshop for the Water Quality Protection Program (WQPP) (1996) for the poorly designed canal systems included installation of BAT wastewater treatment of stormwater runoff, and improvements to canal circulation.

WWTF Location. There are no surface waters in the proposed WWTF location. Stormwater runoff is contained onsite by existing berms and stormwater retention areas.

3.3.3 Nearshore and Offshore Waters

Service Area. The Cudjoe Regional Service Area includes nearshore waters of the Gulf of Mexico and Atlantic Ocean, which are home to the largest living coral reef system in the U.S. The reef system provides habitat for 80 percent of fish species in the U.S., and most commercially valuable fish species depend on nearshore waters at some point during their development, as described in the PEIS (Section 3.3.3). In addition to valuable fish and wildlife habitat, nearshore and marine waters provide numerous recreational opportunities, such as boating, diving, swimming, snorkeling and fishing. In general, nutrient pollutants from the Florida Keys have greater nearshore affects than offshore affects due to dilution by tides and currents (Kruczynski 1999, Szmant and Forrester 1996).

WWTF Location. The propose WWTF does not occur on or directly adjacent to nearshore or offshore waters.

3.4 Water Quality

The purpose of the proposed WWTF for the Cudjoe Regional Service Area is to decrease the discharge of nutrients and other pollutants and consequently improve water quality in the Sanctuary, consistent with the mission of state and federal entities. The proposed project is designed to protect the biodiversity, natural beauty and recreational opportunities of the Florida Keys that are important to Florida's tourism industry which make up a significant part of the nation's collective natural resources.

The water quality of the nearshore environment of the Florida Keys is affected by nutrient loading from approximately 23,000 private onsite systems and 246 small wastewater treatment plants. Onsite systems are comprised of approximately 15,200 permitted septic systems, 640 Aerobic Treatment Units (ATUs) and 7,200 unknown systems. About 2,800 of the 7,200 unknown systems are suspected to be illegal cesspools (MCSWMP, 2000). Average estimated reductions in wastewater loading to nearshore waters in the Florida Keys due to implementation of FKWQIP are approximately 69 and 73 percent in TN and TP loadings, respectively, using AWT standards. Based on calculations prepared for similar central wastewater districts (Marathon, Islamorada and Key Largo) within the Florida Keys, reductions in TN, TP, and TSS loadings between 85-88, 79-81, and 77-91 percent, respectively, are anticipated for the Cudjoe Regional Service Area as a result of implementing the proposed wastewater improvements. The proposed WWTF would meet AWT standards and includes disinfection.

3.4.1 Ground Water Quality

The Cudjoe Regional Service Area is considered a pollutant source to nearshore coastal waters. Numerous cesspools and septic systems, which provide little to no treatment due to high groundwater levels, release effluent into canals and the nearshore environment. As of 2000, there were 20 FDEP permitted package plants in the Service Area, with a total permitted capacity of 0.29 MGD and an average daily flow of 0.15 MGD (MCSWMP).

WWTFs are required to treat effluent to AWT or BAT standards. For facilities that treat over 100,000 GPD, the AWT standards are five milligrams per liter (mg/L) BOD, five mg/L TSS, three mg/L TN, one mg/L (5:5:3:1); and for facilities treating less than 100,000 GPD the BAT standards are ten mg/L, ten mg/L, ten mg/L and one mg/L (10:10:10:1) respectively. Generally, WWTFs in the Florida Keys dispose of their treated effluent into shallow injection wells (cased zero to 60 feet with open hoes from 60-90 feet) and into the highly permeable Upper Water-Bearing Zone limestone of the Biscayne Aquifer. This disposal system is categorized as a Class V well by the State of Florida and is designated for treatment facilities with capacities greater than 100,000 GPD. Chlorine would be added to effluent to reduce risk of potential harmful bacteria and viral organisms.

3.4.2 Surface Water Quality and Stormwater Runoff

The pollutant loads in stormwater runoff, and subsequently surface and nearshore waters, are largely a function of rainfall quantity, pervious nature of soils and land use. As described previously in this Draft EA (Section 3.2), the amount of soil in the Florida Keys and the Cudjoe Regional Service Area is minimal, moderately impervious and has a high runoff potential.

Swales along U.S. Highway 1 are the primary drainage system in the Florida Keys and convey stormwater along the highway into the ocean, although much of U.S. Highway 1 has no drainage system (Monroe County 1997b). Stormwater discharge is regulated at the federal level through the Clean Water Act (CWA) and the National Pollution Discharge Elimination System (NPDES) permit programs.

3.4.3 Nearshore and Offshore Water Quality

The relationship between fecal contamination and nutrient enrichment of nearshore waters and septic tanks has been reviewed in many studies, including Lapointe and Clark (1992) and Paul *et al.* (1995 and 1997). These studies generally concluded that septic tank use increases the nutrient contamination of ground water and consequently, shallow nearshore waters, and that transport of contaminant from septic tanks can occur in hours or days (ten hours for Key Largo and 53 hours for the middle Keys). Several authors (Lapointe and Clark 1992, Lapointe and Matzie 1996 and Lapointe and Matzie 1997) have concluded that nutrient enrichment at offshore reefs is possible following heavy rains and/or high wind events, but have also noted that nutrient concentrations in sediments decreased rapidly from the shore.

The Southeast Environmental Research Center (SERC) at Florida International University (FIU) has collected water quality data from the National Marine Sanctuary WQPP since 1995. Nearshore water quality stations revealed elevated levels of dissolved inorganic nitrogen (DIN), which was not found in the nearshore environment of Dry Tortugas, pointing to a land use source of elevated DIN. Data from 154 monitoring stations in the Florida Keys were used to characterize the status and trends in water quality. Thirteen monitoring stations along the Lower Keys off the ocean side of U.S. Highway 1 (SERC 2007) characterize the status and trends in water quality. Inshore water quality stations along Key Largo showed similar water quality conditions, including a gradient of elevated DIN, TP, total organic carbon (TOC) and turbidity from inshore to offshore (Boyer and Jones 2003).

Fecal contamination of nearshore waters due to untreated or poorly treated wastewater has also been examined in the Service Area. Six canal sites between Lower Sugarloaf Key and Big Pine Key were sampled for viral pathogens and microbial indicators. Six indicators of fecal pollution were assessed in canals at the sites (Griffin *et al.* 1999). Contamination results varied greatly within the Service Area. The sample sites located in the Port Pine Heights and Eden Pine subdivisions on Big Pine Key had high levels of contamination and ranked 16th and 13th (19

being the most contaminated) respectively, overall of 19 sites for presence of these indicators. Two additional sites on Big Pine Key ranked 9th and 10th, while the sample sites on Lower Sugarloaf Key and Cudjoe Key ranked 2nd and 3rd, respectively. This study did not address seasonal variability.

Water Quality Hot Spots. The Cudjoe Regional WWTF will address 12 of the 45 water quality *hot spots* in the Florida Keys (MCSWMP 2000). *Hot spot* locations correspond with higher-density urban areas and higher ranks represent neighborhoods and subdivisions with the poorest sewage treatment and strongest need for central sewage facilities.

Health Advisories. Clean public beaches and nearshore water quality are leading health concerns in Monroe County. Of the 17 Monroe County beaches monitored in 2010, only one was found to have elevated bacterial levels that resulted in a water quality advisory. This beach advisory was not located within the Cudjoe Regional Service Area (FDOH 2010).

3.5 Ecological Habitats

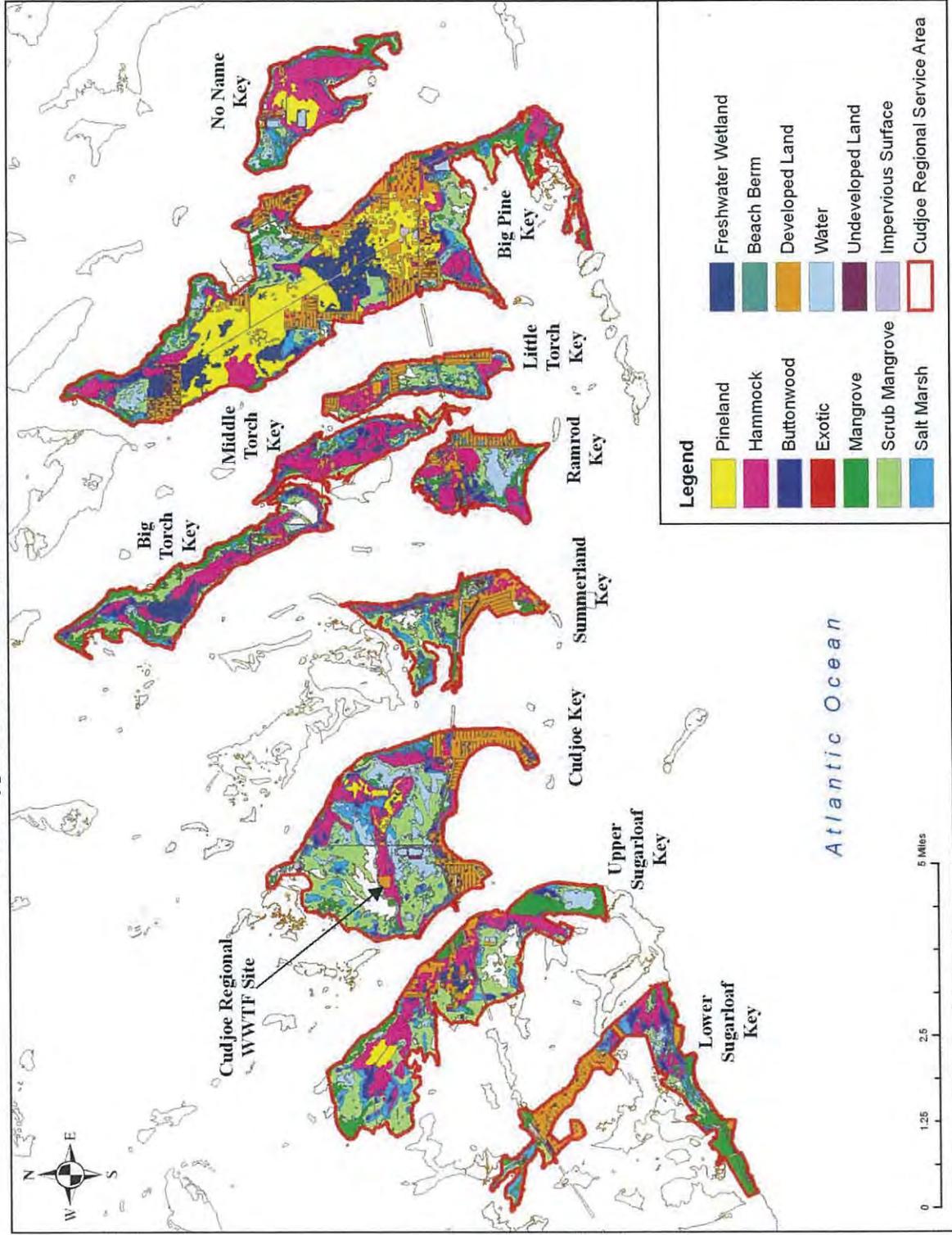
Unique and nationally significant resources, most notably the only living barrier coral reef in North America, emphasize the importance of the Florida Keys and Sanctuary as part of a complex ecosystem that includes numerous public conservation areas and habitat for protected species. The Cudjoe Regional Service Area and associated nearshore waters are a component of this complex ecosystem, which supports over 6,000 species of plants, fishes and invertebrates and is dominated by the third largest coral reef system in the world. These habitats can be altered by anthropogenic influences, including increased urban development, water quality degradation, altered groundwater flows, and expansion of non-native and invasive species.

Wetlands comprise approximately 59.4 percent of the habitat within the 20,177-acre Service Area. Wetlands include mangroves, buttonwood, salt marsh, tidal flats and freshwater marsh. Uplands make up approximately 40.6 percent of the Service Area and include pinelands, tropical hardwood hammocks and developed lands (**Figure 3-1** and **Table 3-4**). An additional 21,509 acres of benthic habitat comprised of hardbottom, seagrass and barren substrate are discussed in this section. Since developed land does not provide significant or essential ecological habitat for wildlife or native plants, it is not discussed in this section.

The ten habitat types identified in the Service Area, listed according to frequency of occurrence, are: scrub mangrove (21%), tropical hardwood hammock (14.7%), developed land (13.5%), mangrove swamp (12.8%), buttonwood (8.3%), pineland (8.2%), salt marsh (6.5%), open water (6.0%), freshwater marsh (4.8%), undeveloped land (2.2%), impervious surface (1.5%) and exotic vegetation (0.5%) (**Table 3-4**).

3.0 Affected Environment

Figure 3-1
Habitat Types within the Cudjoe Regional Service Area



Class	Area (acres) of Interest	Percent
Scrub Mangrove	4237.59	21.0 %
Hammock	2957.56	14.7 %
Developed Land	2722.60	13.5 %
Mangrove Swamp	2582.13	12.8 %
Buttonwood	1669.41	8.3 %
Pineland	1660.17	8.2 %
Salt Marsh	1302.21	6.5 %
Open Water	1217.92	6.0 %
Freshwater Marsh	967.43	4.8 %
Undeveloped Land	448.55	2.2 %
Impervious Surface	294.31	1.5 %
Exotic Vegetation	91.76	0.5 %

3.5.1 Upland Habitats

Service Area. Of the thirteen land cover classes identified within the Service area, two (tropical hardwood hammocks and pineland) are classified by the Florida Fish and Wildlife Conservation Commission (FFWCC) as upland habitats. The PEIS (Section 3.5.1) describes the general characteristics of the tropical hardwood hammocks, pinelands and beach berms of the Florida Keys.

Tropical Hardwood Hammocks. Tropical hardwood hammocks account for 14.7 percent of habitat cover within the Service Area (**Table 3-4**). These hammocks are mostly distributed evenly throughout the Service Area. However, Lower Sugarloaf Key contains only small patches, while No Name Key is dominated by tropical hardwood hammocks.

Pinelands. Pinelands (pine rocklands) account for 8.2 percent of the habitat cover within the Service Area (**Table 3-4**), with a majority located on Big Pine Key. Pine rocklands can also be found in moderately sized stands on Upper Sugarloaf Key, Cudjoe Key and No Name Key.

WWTF Site. The proposed WWTF located on Cudjoe Key is in close proximity to a tropical hardwood hammock. However, the limits of the construction footprint are located solely within previously developed land associated with the former Monroe County landfill. No upland habitats are located on the proposed WWTF site.

3.5.2 Non-Native and Invasive Species

Service Area. Data obtained from the Florida Natural Areas Inventory (FNAI) (2010) indicates invasive vegetation is concentrated mostly in developed areas throughout the Service Area.

3.0 Affected Environment

Florida Exotic Pest Plant Council (FLEPPC) Class I invasive species located in the Service Area include Brazilian pepper (*Schinus terevinthifolus*), Australian pine (*Casuarina Equisetifolia*) and seaside mahoe (*Thespesia populnea*).

WWTF Site. The proposed WWTF located on Cudjoe Key is bordered by a fringe of invasive plant species, mostly identified as Brazilian pepper. However, vegetation within the proposed WWTF construction footprint is limited to lawn grass associated with the former Monroe County landfill.

3.5.3 Estuarine and Freshwater Wetland Habitats

Service Area. Wetlands include areas where water is present either at or near the surface of the soil for all or part of the year, resulting in characteristic soils, water regimes and plant species. FFWCC Habitat and Land Cover data (FFWCC 2004) indicates the presence of estuarine and freshwater wetlands in the Service Area. Freshwater wetlands make up less than one percent of the Service Area.

Mangrove and Scrub Mangrove. Mangrove and scrub mangrove habitat types comprise approximately 12.8 percent and 21.0 percent of the Service Area, respectively (**Table 3-4**). The three species of mangrove found in the Florida Keys are the red mangrove (*Rhizophora mangle*), black mangrove (*Avicennia germinans*) and white mangrove (*Laguncularia racemosa*) (Tomlinson 1986). Based on FFWCC data, mangrove habitats are distributed throughout the Service Area. Although, concentrations of mangroves are typically uniform throughout the Service Area, Cudjoe Key and Upper Sugarloaf exhibit larger quantities.

Buttonwood. Button habitat comprises approximately 8.3 percent of the Service Area (**Table 3-4**). Buttonwood is distributed evenly throughout the Service Area and it typically adjacent to Scrub Mangrove Habitat.

Salt Marsh. Based on FFWCC data, salt marsh comprises approximately 6.5 percent of the Service Area (**Table 3-4**), and are distributed throughout. Additionally, a large area of salt marsh is located on the northern end of Upper Sugarloaf.

Freshwater Marsh. Small isolated freshwater wetlands makeup 4.8 percent of habitat types found in the Service Area and are limited to Upper Sugarloaf Key, Ramrod Key and Big Pine Key.

WWTF Site. The proposed WWTF located on Cudjoe Key is in close proximity to estuarine wetlands. However, the limits of the construction footprint are located solely within previously developed land associated with the former Monroe County landfill. No estuarine or freshwater wetland habitats occur on the proposed WWTF site.

3.5.4 Marine and Benthic Habitats

Marine habitats are characterized by high productivity and biodiversity and are essential to many commercially and recreationally important fisheries (Livingston 1990), as well as recreational activities such as Self Contained Underwater Breathing Apparatus (SCUBA) diving, snorkeling, and boating, all of which are in turn important to the local and regional economy. Marine habitats, particularly seagrasses and coral reefs, are susceptible to water quality degradation. The affects of water quality degradation in these habitats are described in the PEIS (Section 3.4).

Service Area. Acreages and percentages of each marine habitat type were calculated based on the FFWCC South Florida Benthic Habitats data (FWRI 2001). A 500-meter buffer zone was used to calculate the nearshore benthic habitats surrounding the Service Area (**Figure 3-2** and **Table 3-5**). The buffer zone includes approximately 21,509 acres of benthic habitat. Florida Wildlife Research Institute (FWRI) data indicate the presence of benthic habitats such as seagrass beds; hard-bottom communities with seagrass; continuous and patchy seagrass; and bare substrate in the buffer zone. The general ecology and characteristics of these communities in the Florida Keys, such as typical vegetation and wildlife occurring within the communities, were described in greater detail in the PEIS (Section 3.5.4).

Benthic Habitat Type	Area (acres) of Interest	Percent
Hardbottom with Seagrass	10869	50.5 %
Continuous Seagrass	8300	38.6 %
Patchy (Discontinuous) Seagrass	2079	9.7 %
Bare Substrate	252	1.2 %
Hardbottom	9	<1 %
Total	21509	100 %

Patchy and continuous seagrasses together comprise approximately 48.3 percent of the benthic habitat in the Service Area (**Table 3-5**) and occur within tidally-influenced areas. Hardbottom habitat with seagrass and bare substrate comprise approximately 50.5 percent and 1.2 percent of the Service Area’s benthic habitats, respectively. These habitat types are mapped in **Figure 3-2**.

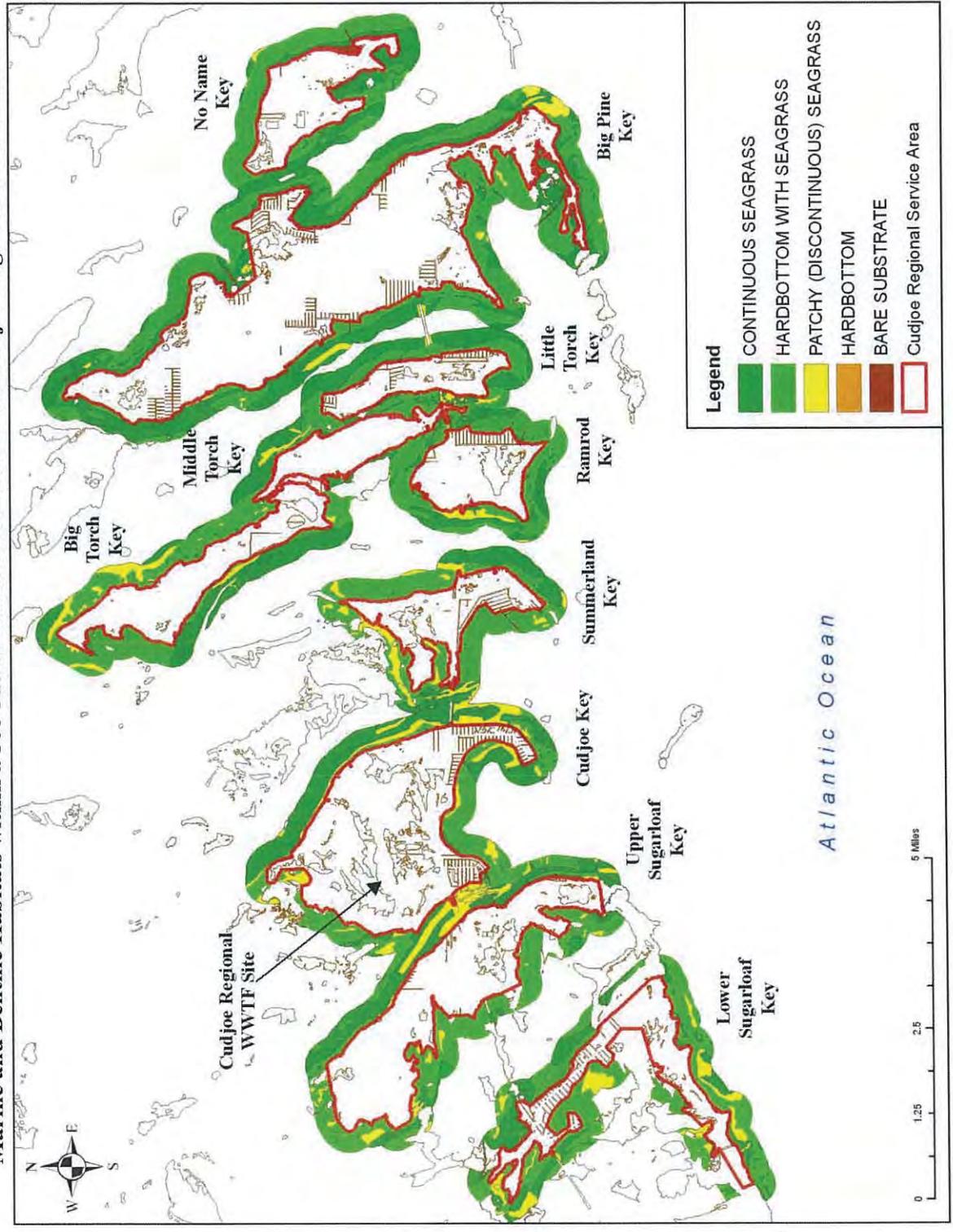
WWTF Site. None of these benthic habitat types occur on the proposed WWTF site.

3.6 Protected Species

The Florida Keys provide habitat for many rare, threatened, and endangered plants and animals. In addition, the limited remaining undeveloped natural habitat in the Florida Keys makes these areas and associated species vulnerable to development. Any project that results in the loss of

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Figure 3-2
Marine and Benthic Habitats within a 500-Meter Buffer Zone around the Cudjoe Regional Service Area



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natural areas has the potential to impact protected species. Protected species refers to both federally and state listed species considered endangered, candidate, proposed, threatened and species of special concern.

3.6.1 Regulatory Framework

The Endangered Species Act (ESA) of 1973 was created to protect those species at risk of extinction throughout all or a significant portion of their range and to conserve the ecosystems on which those species depend. Section 7 of the ESA prohibits activities that would jeopardize a protected species or destroy or modify its critical habitat.

The USFWS is responsible for listing and conserving federally protected terrestrial and freshwater animals and plants, while the National Marine Fisheries Service (NMFS) is responsible for most marine and anadromous species. If the proposed wastewater project has the potential to adversely affect or lead to incidental taking of a federally protected species, a formal Section 7 Consultation with the USFWS, and/or NMFS would be required.

Similarly, state lists of animals are maintained by the FFWCC and designated as endangered, threatened, and of special concern, per Rules 39-27.003, 39-27.004 and 39-27.005, respectively, FAC. Any actions that may adversely impact a state-listed animal require individual consultations with the FFWCC. Plants also may be designated endangered, threatened, or commercially exploited, and are listed by the Florida Department of Agriculture and Consumer Services (FDAC) (Chapter 5B-40, FAC).

3.6.2 Federally and State Protected Species in the Cudjoe Regional Service Area

Protected species data for Monroe County were obtained from the FNAI database, FDAC, and Atlas of Florida Vascular Plants (AFVP). Protected species potentially occurring in Monroe County include 82 animal and 91 plant species, although fewer have a documented presence (FFWCC and FNAI). Several state protected species, such as the white-crowned pigeon and the red rat snake, are not federally protected and consultation is limited to the state level if adverse impacts to these species are anticipated as a result of the proposed project. Documented occurrences of protected species in the Cudjoe Regional Service Area are summarized in **Table 3-6**.

Taxonomic Group	Federally and State Protected	State Protected Only	Total
Birds	1	10	11
Fish	0	2	2
Invertebrates	1*	1	2

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Mammals	4	0	4
Plants	8	28	36
Reptiles	3	6	9
Amphibians	0	0	0
Total	17	47	64

*Bartram's Scrub-Hairstreak is federally listed only.

3.6.3 Protected Species Occurrences

The FNAI database was reviewed to identify species occurrences in the Service Area recorded since 1985. This database provides listings within FNAI Biodiversity Matrix Units: 46444, 48916, 4817, 49248, 49250, 49580, 49581, 49908 and 49909.

Service Area. The FNAI database records for the Service Area include 64 rare and protected species. Of the 64 species, 16 are protected by the State and Federal government (**Table 3-7**). The Bartram's Scrub-Hairstreak is federally listed only.

Table 3-7 Protected Species Occurrence Records				
Common Name/Scientific Name	Fed Status	State Status	Observed	Habitat
Birds				
Roseate Tern <i>Sterna dougallii</i>	N	LT	No	Estuarine and Terrestrial: bare limestone, sand-shell mixes, rock-marl fill, broken coral, dredge-material islands
White Ibis <i>Eudocimus albus</i>	N	LS	Yes	Estuarine and Terrestrial: various freshwater, brackish and saline environments
Brown Pelican <i>Pelecanus occidentalis</i>	N	LS	Yes	Estuarine: islands for nesting, open water. Marine: open water
Bald Eagle <i>Haliaeetus leucocephalus</i>	LT	ST	No	Estuarine: marsh edges, tidal swamp, open water. Lacustrine: swamp lakes, edges. Palustrine: swamp, floodplain. Riverine: shoreline, open water. Terrestrial: pine and hardwood forests, clearings
Great Egret <i>Ardea alba</i>	N	N	Yes	Estuarine: marshes, shorelines, tidal swamp. Lacustrine: lake edges. Palustrine: swamp, floodplain, ruderal. Riverine: shoreline
Snowy Egret <i>Egretta thula</i>	N	LS	Yes	Estuarine: marshes, shorelines, tidal swamp. Lacustrine: lake edges. Palustrine: swamp, floodplain, ruderal. Riverine: shoreline

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Tricolored Heron <i>Egretta tricolor</i>	N	LS	Yes	Estuarine: marshes, tidal swamps, shoreline. Lacustrine: lake edges. Palustrine: swamps, floodplain, ruderal. Riverine: shoreline
Least Tern <i>Sterna antillarum</i>	N	LT	No	Estuarine: various. Lacustrine: various. Riverine: various. Terrestrial: beach dune, ruderal
Osprey <i>Pandion haliaetus</i>	N	LS	Yes	Riverine and Palustrine: swamp forest, riparian woodlands, belts of cypress trees
Reddish Egret <i>Egretta rufescens</i>	N	LS	Yes	Terrestrial: coastal islands (nesting), sand and mud flats (feeding)
White-crowned Pigeon <i>Patagioenas leucocephala</i>	N	LT	Yes	Terrestrial: mangrove covered islands (nesting), tropical hardwood forest (feeding)
Florida Burrowing Owl <i>Athene cucularia floridana</i>	N	LS	No	Terrestrial: uplands
Mangrove Cuckoo <i>Coccyzus minor</i>	N	N	Yes	Mangrove swamps
Fish				
Key Silverside <i>Menidia conchorum</i>	C	LT	No	Marine: salt to brackish water, coarline pools surrounded by mangroves and organic debris
Mangrove Rivulus <i>Rivulus marmoratus</i>	C	LS	Yes	Marine: salt to brackish water, coarline pools surrounded by mangroves and organic debris
Invertebrates				
Florida Tree Snail <i>Ligguus fasciatus</i>	N	LS	No	Terrestrial: rockland hammock
Bartram's Scrub-Hairstreak <i>Strymon acis bartrami</i>	C	N	Yes	Terrestrial: pine rockland and rockland hammocks
Big Pine Key Ataenius Dung Beetle <i>Ataenius superficialis</i>	N	N	Yes	Terrestrial: rockland hammocks
Howden's Copris Beetle <i>Copris howdeni</i>	N	N	Yes	Terrestrial: rockland hammocks
Antillean Spreadwing <i>Lestes spumarius</i>	N	N	Yes	Terrestrial: pine rockland and rockland hammocks
Mammals				
Manatee <i>Trichechus manatus</i>	LE	LE	No	Estuarine and Marine: open water, submerged vegetation. Riverine: alluvial stream, blackwater stream, spring-run stream
Lower Keys Rabbit <i>Sylvilagus palustris hefneri</i>	LE	LE	Yes	Terrestrial: salt marsh or freshwater marsh, mangrove communities, shrubby edges to wetlands

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Key Deer <i>Odocoileus virginianus clavium</i>	LE	LE	Yes	Terrestrial: salt marsh or freshwater marsh, mangrove communities, shrubby edges to wetlands
Key West Raccoon <i>Procyon lotor incautus</i>	N	N	Yes	Terrestrial: salt marsh or freshwater marsh, mangrove communities, shrubby edges to wetlands
Lower Keys Cotton Rat <i>Sigmodon hispidus exsputus</i>	N	N	Yes	Terrestrial: salt marsh or freshwater marsh, mangrove communities, shrubby edges to wetlands
Key Rice Rat <i>Oryzomysys palustris pop. 3</i>	LE	LE	Yes	Terrestrial: salt marsh or freshwater marsh, mangrove communities, shrubby edges to wetlands
Plants				
Garber's Spurge <i>Chamaesyce garberi</i>	LT	LE	Yes	Sandy soils over limestone in pine rockland, hammock edges, coastal rock barrens, grass prairies, salt flats, beach ridges and swales
Brittle Thatch Palm <i>Thrinax morrisii</i>	N	LE	Yes	Terrestrial: rockland hammock, pine rockland
Florida Thatch Palm <i>Thrinax radiata</i>	N	LE	Yes	Terrestrial maritime hammock, upland hammock, coastal scrub
Sea Lavender <i>Argusia gnaphalodes</i>	N	LE	Yes	Terrestrial: beach dune, coastal strand
Joewood <i>Jacquinia keyensis</i>	N	LT	Yes	Terrestrial: coastal salt flat, coastal scrub, maritime hammock, pine rockland
Pride-of-big-pine <i>Strumpfia maritima</i>	N	LE	Yes	Terrestrial: coastal strand, upper dunes, pine rockland, coastal rock barren
Big Pine Partridge Pea <i>Chamaecrista lineata var. keyensis</i>	C	LE	Yes	Terrestrial: edges of pine rockland, rockland hammock and coastal berm
Golden Leather Fern <i>Acrostichum aureum</i>	N	LT	Yes	Terrestrial: mangrove swamp, saltmarsh hydric hammock
Sand Flax <i>Linum arenicola</i>	C	LE	Yes	Terrestrial: pine rockland and marl prairie
Silver Palm <i>Coccothrinax argentata</i>	N	LT	Yes	Terrestrial: pine rockland hammock, pine rockland, coastal scrub
Devil's Smooth-claw <i>Pisonia rotundata</i>	N	LE	Yes	Terrestrial: pine rockland and rockland hammocks
Porter's Broad-leaved Spurge <i>Chamaesyce porteriana</i>	N	LE	Yes	Terrestrial: pine rockland, rockland hammock, coastal rock barrens and marl prairie
Christmas Berry <i>Crossopetalum ilicifolium</i>	N	LT	Yes	Terrestrial: rockland hammock, pine rockland, coastal scrub

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Rhamcoma <i>Crossopetalum rhacoma</i>	N	LT	Yes	Terrestrial: rockland hammock, pine rockland, coastal scrub
West Indies Mahogany <i>Swietenia mahagoni</i>	N	ST	Yes	Terrestrial: rockland hammock, maritime hammock
Milkbark <i>Drypetes diversifolia</i>	N	LE	Yes	Terrestrial: tropical hammock
Tree Cactus <i>Pilosocereus robinii</i>	LE	LE	Yes	Terrestrial: tropical hardwood hammock, cactus hammock, thorn scrub
Wild Dilly <i>Manikara jaimiqui</i>	N	LT	Yes	Terrestrial: upland hammock
Wedge Spurge <i>Chamaesyce deltoidea ssp. Serpyllum</i>	C	LE	Yes	Sandy soils over limestone in pine rockland, hammock edges, coastal rock barrens, grass prairies, salt flats, beach ridges and swales
Bahama Sachsia <i>Sachsia Polycephala</i>	C	LE	Yes	Terrestrial: tropical hammock
Locustberry <i>Byrsonima lucida</i>	N	LT	Yes	Terrestrial: pine rockland and coastal hammocks
Blodgett's Wild-mercury <i>Argythammia blodgettii</i>	C	LE	Yes	Terrestrial: coastal rock barren, uplands, pine rockland and rockland hammock
Florida Five-petaled Leaf-flower <i>Phyllanthus pentaphyllus var. floridanus</i>	N	N	Yes	Terrestrial: uplands, marl prairies and pine rockland
Small-flowered Lily Thorn <i>Catesbaea parviflora</i>	N	LE	Yes	Terrestrial: coastal berm, coastal strand and pine rockland
Rockland Painted-leaf <i>Euphorbia pinetorum</i>	N	LE	Yes	Terrestrial: pine rockland
Florida Pinewood Privet <i>Forestiera segregata var. pinetorum</i>	N	N	Yes	Terrestrial: coastal berm, coastal strand, maritime hammock, mesic hammock, pine rockland and shell mounds
Skyblue Clustervine <i>Jacquemontia pentanthos</i>	N	LE	Yes	Terrestrial: bayhead, coastal rock barren, marl prairie, pine rockland and rockland hammock
Bahama Brake <i>Pteris bahamensis</i>	N	LT	Yes	Terrestrial: marl prairie, pine rockland, rockland hammock sinkholes
Pineland Noseburn <i>Tragia saxicola</i>	N	LT	Yes	Terrestrial: uplands and pine rockland
Worm-vine Orchid <i>Vanilla barbellata</i>	N	LE	Yes	Epiphytic: coastal berm, marl prairie, rockland hammock, tidal marsh and tidal swamp
Bahama Maidenbush <i>Savia bahamensis</i>	N	LE	Yes	Terrestrial: rockland hammocks
Few-flower Caesalpinia <i>Caesalpinia pauciflora</i>	N	LE	Yes	
Manchineel <i>Hippomane mancinella</i>	N	LE	Yes	Terrestrial: coastal berm and rockland hammocks

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Small-fruited Varnishedleaf <i>Dodonaea elaeagnoides</i>	N	LE	Yes	Terrestrial: pine rockland and rockland hammocks
Pineland Pencil Flower <i>Stylosanthes calcicola</i>	N	LE	Yes	Terrestrial: Uplands, marl prairie and pine rockland
Cupania <i>Cupania glabra</i>	SAT	LS	Yes	Terrestrial: rockland hammocks
Mangrove Berry <i>Psidium longipes</i>	N	LT	Yes	Terrestrial: upland, marl prairie, pine rockland and rockland hammocks.
Banded Wild-pine <i>Tillandsia flexuosa</i>	N	LT	Yes	Epiphytic: numerous
Reptiles				
American Alligator <i>Alligator mississippiensis</i>	SAT	LS	Yes	Palustrine: freshwater to brackish wetlands and ponds. Estuarine and Marine: Open water, canals, bays (seasonal)
Key Mud Turtle <i>Kinosternon baurii pop. 1</i>	N	LE	Yes	Palustrine: freshwater to slightly brackish ponds. Terrestrial: elevated hardwood hammocks
Key Ringneck Snake <i>Diadophis punctatus acricus</i>	N	LT	Yes	Terrestrial: pine rockland, tropical hardwood hammocks, near sources of fresh water
Red Rat Snake, FL Lower Keys Pop <i>Elaphe guttata pop. 1</i>	N	LS	Yes	Terrestrial: pine woods, mangrove forest, edificarian situations
Loggerhead <i>Caretta caretta</i>	LT	LT	No	Terrestrial: sandy beaches, nesting
Florida Keys Mole Skink <i>Eumeces egregius egregius</i>	N	LS	Yes	Terrestrial: sandy shorelines
Eastern Indigo Snake <i>Drymarchon couperi</i>	LT	LT	Yes	Upland and wetland habitats
Lower Keys Brown Snake <i>Storeria dekayi pop. 1</i>	N	LT	Yes	Upland and wetland habitats
Lower Keys Ribbon Snake <i>Thamnophis sauritus pop. 1</i>	N	LT	Yes	Upland and wetland habitats

C: Candidate N: Not Currently Listed SAT: Treated As Threatened
LE: Listed Endangered LT: Listed Threatened LS: Species of Special Concern

3.6.4 Existing and Potential Habitat Areas for Protected Species

Identification of habitats of particular interest or importance allows these habitats to be avoided during implementation of this and other FKWQIP projects. Existing and potential wildlife habitats in the Florida Keys have been identified by the FMRI, based on habitat and numbers of key species, many of which are protected. Importantly, biodiversity *hot spots* and Strategic Habitat Conservation Areas (SHCAs) have been developed by Cox *et al.* (1994) to identify conservation targets considered necessary to meet conservation goals in Florida.

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The FFWCC biodiversity *hot spots* data (FFWCC 2002b), reviewed for the Service Area, represent areas of overlap among potential habitats of 64 rare or focal species of wildlife and several important natural communities, including pine rocklands, tropical hardwood hammocks and mangrove swamps. Overlap among greater numbers of species indicates higher biodiversity. Numerous biodiversity hot spots, consisting of seven or more focal species, have been identified throughout the entire Service Area (**Figure 3-3**).

Biodiversity *hot spots* were analyzed in relation to the proposed WWTF (**Figure 3-3**). The proposed WWTF is in close proximity to *hot spots*, however, the proposed site is located on previously developed land. No adverse impacts to SHCA are anticipated. Individual species data are not available for this data set.

3.7 Essential Fish Habitat

Coral reefs and other benthic habitats identified as Essential Fish Habitat (EFH) must be considered as part of any federal action. Federal agencies must also comply with the Magnuson-Stevens Fishery Conservation and Management Act (MSA) (16 U.S.C. 1801 *et seq.*) that requires implementation of measures to conserve and enhance this habitat per the Sustainable Fisheries Act (SFA) Public Law 104-297. EFH in the Service Area and the Florida Keys is described in the PEIS (Section 3.7).

The MSA requires federal agency consultation on activities that may adversely affect EFH. The NMFS, a service of the U.S. Department of Commerce-National Oceanographic and Atmospheric Administration (NOAA), is responsible for implementing this mandate. Informal consultation with NMFS was initiated as part of the preparation for the PEIS. Species and associated habitats identified as relevant to the proposed project include panaeid shrimp (e.g. pink and brown shrimp) and rock shrimp, red drum, snapper, the grouper unit, golden crab and spiny lobster.

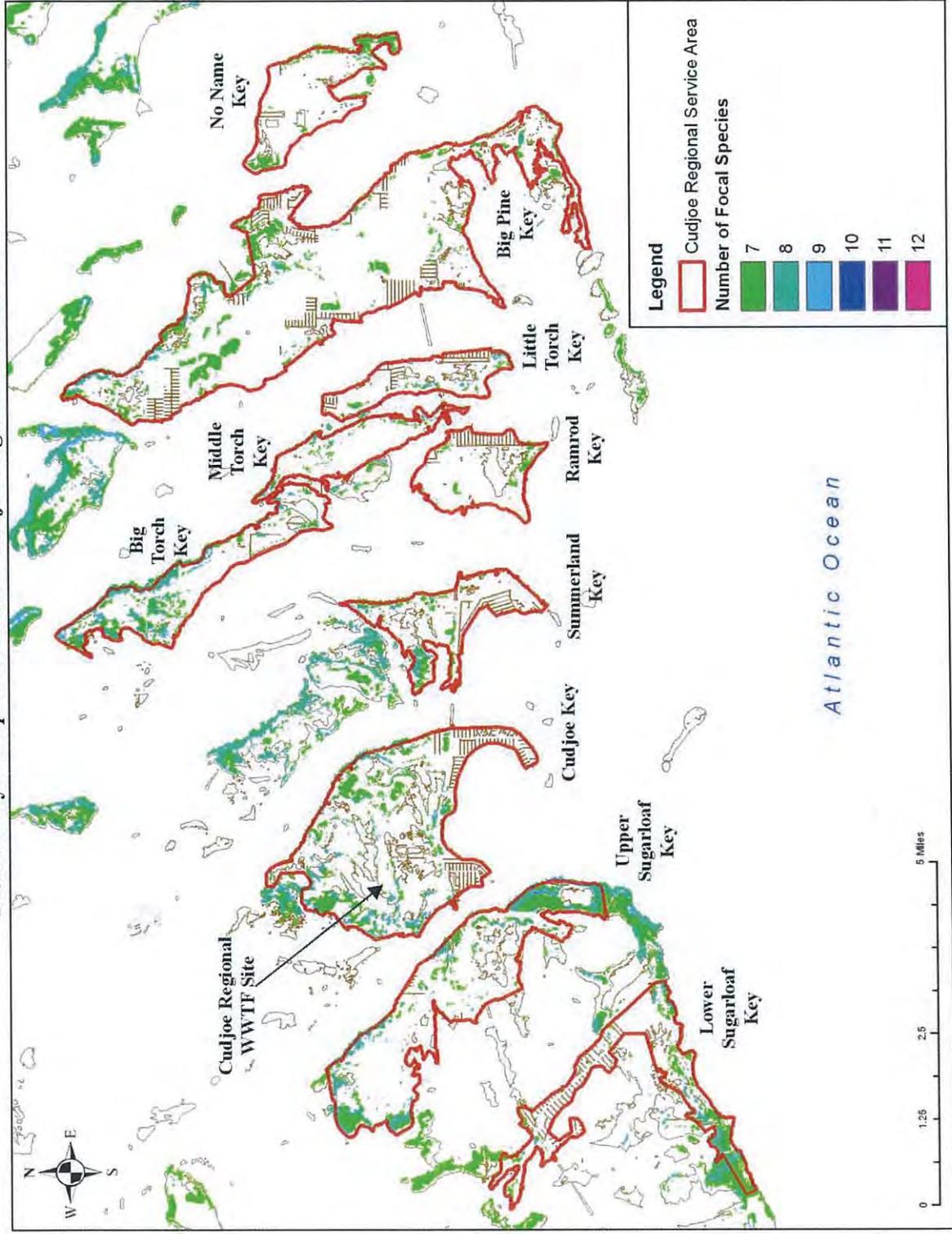
3.8 Air Quality & Noise

The Cudjoe Regional Service Area currently meets or exceeds all federal air quality standards. Noise levels are typical of urban areas dominated by commercial and recreational activities.

Air Quality. The affected environment for air quality is similar to that described in the PEIS (Section 3.8.1). Air pollution within the Service Area has not been extensively documented, however the FDEP has designated Monroe County as an air quality attainment area, which means that air quality standards set by both FDEP and the USEPA are maintained countywide (Monroe County 1995). FAC 62-604.400 and 62-296.320 require reasonable assurance from the applicant that the facility will not cause objectionable odors, such as those resulting from WWTF hydrogen sulfide discharges, at levels that would adversely affect neighboring residents or commercial uses.

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Figure 3-3
Biodiversity Hot Spots within the Cudjoe Regional Service Area



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Air quality in the Florida Keys is generally excellent, and data from two FDEP ambient air monitoring stations in Key West and Marathon indicated that particulate matter concentration remain well below Florida standards. Motor vehicles are generally the main source of emissions.

Noise. Noise in the Florida Keys is typical of areas with urban activities such as traffic, construction, aircraft (near airports), and boats, as described in the PEIS (Section 3.8.2). Since 1982, responsibility for noise abatement and control has been delegated to State and local governments, but noise levels and exposure recommendations developed by the USEPA under the Noise Control Act (NCA) are still relevant. The State of Florida addresses noise control in Title XXIX, Chapter 403 (Public Health, Environmental Control) of Florida Statutes (FS). Chapter 62-600 of the FAC addresses rules for siting and operation of WWTFs and requires that new facilities are located to minimize noise from the facility that may impact sensitive noise receptors such as residence, schools, hospitals, churches and parks.

Noise levels over a 24-hour period should be less than 70 decibel (dBA) to prevent any measurable hearing loss over a lifetime. Likewise, maximum levels of 55 dBA outdoors and 45 dBA indoors are identified as preventing activity interference and annoyance. Monroe County has adopted an ordinance that prohibits noise equal to or exceeding 60 dBA (typical of a residential area) beyond the property line of the sound source and may collect fines up to \$500 per day from violators.

3.9 Cultural Resources

The protection of cultural, archaeological and historical resources in the Florida Keys is described in the PEIS (Section 3.9). Major federal laws protecting cultural resources include the National Historic Preservation Act (NHPA), Archaeological Resources Protection Act (ARPA), Native American Graves Protection and Repatriation Act (NAGPRA) and American Indian Religious Freedom Act (AIRFA) of 1978. Section 106 of the NHPA requires federal agencies to consider the affects of the *Proposed Action* on identified and potentially present cultural resources. In addition, the SHPO, Tribal Historic Preservation Officers and the Advisory Council of Historic Preservation (ACHP), could review and comment on a *Proposed Action*.

The results of a Florida Master Site files review indicated a total of 39 archaeological sites and 49 historic structures throughout the Service Area (**Table 3-8**). However, no known archaeological or historic sites are located on, or in direct proximity to, the proposed WWTF site. Additionally, the proposed wastewater infrastructure will be constructed within previously distributed ROW. Consequently, no affect on historic, archaeological, or cultural resources is anticipated as a result of the proposed project. Should any historic or archeological item be discovered during project work, all activities would be terminated and the FCAA would consult with the Corps, SHPO and other appropriate agencies for further guidance.

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Table 3-8 Documented Archaeological and Historic Sites in the Cudjoe Regional Service Area		
Site Name	Site ID	Cultural Resource Type
Archaeological		
Sugarloaf Key 1	MO00004	Unknown
Cudjoe Key 1	MO00005	Prehistoric midden(s)
Ramrod Key 6	MO00006	Prehistoric
Watson's Hammock	MO00007	Glades IIa
No Name Key 1	MO01278	Prehistoric shell scatter
No Name Key 2	MO01279	Artifact scatter-low density (< 2 per sq meter)
No Name Key 3	MO01280	Twentieth century American, 1900-present
Big Pine Key 2	MO00008	Prehistoric
Niles Channel	MO00129	American, 1821-present
Bow	MO01253	Unknown
Railroad Section Camp 1	MO01254	Historic refuse / Dump
Railroad Section Camp 2	MO01255	Historic refuse / Dump
Big Pine Key 9	MO01262	Twentieth century American, 1900-present
Big Pine Key 10	MO01263	Unknown
Big Pine Key 11	MO01264	Twentieth century American, 1900-present
Big Pine 13	MO01266	Variable density scatter of artifacts
Cudjoe Key 4	MO01269	Historic well
No Name Key 4	MO01281	Artifact scatter-low density (< 2 per sq meter)
No Name Key 5	MO01282	Twentieth century American, 1900-present
No Name 7	MO01284	Twentieth century American, 1900-present
No Name Key 8	MO01285	Historic well
Ramrod Key 4	MO01286	Historic well
Ramrod Key 5	MO01287	Artifact scatter-low density (< 2 per sq meter)
Sugarloaf Key 3	MO01291	Twentieth century American, 1900-present
Sugarloaf Key 4	MO01292	Historic town
Cudjoe Key 3	MO01296	Twentieth century American, 1900-present
Crane Road Cisterns	MO01480	Historic well
Singleton Homestead	MO02100	Historic well
Big Pine Key 3	MO02101	Twentieth century American, 1900-present
Big Pine Key 6	MO02104	Nineteenth century American, 1821-1899
Big Pine 7	MO02105	Historic well
Big Pine Key 8	MO02106	Historic refuse / Dump
Little Torch Key 1	MO02109	Unknown
Little Torch Key 2	MO02110	Homestead

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Ramrod Key 1	MO02111	Nineteenth century American, 1821-1899
Ramrod Key 2	MO02112	Historic refuse / Dump
Ramrod Key 3	MO02113	Homestead
Cudjoe Key 2	MO02114	Twentieth century American, 1900-present
Sugarloaf Key 2	MO02115	Homestead
Historic Sites		
Bat Tower	MO00228	Frame Vernacular
Big Pine Key #12	MO01265	Unspecified by Surveyor
Water Metering Station	MO01485	Moderne ca. 1920-1940
Squires Homestead	MO01947	
Arenson	MO03622	Masonry vernacular
No Name Pub	MO03623	Frame Vernacular
31131 Avenue D Big Pine Key	MO03733	Frame Vernacular
31336 Avenue E, Big Pine Key	MO03734	Frame Vernacular
Tackle and Bait Shop	MO03735	Frame Vernacular
30371 Poinciana Road, Big Pine Key	MO03736	Frame Vernacular
30457 Palm Drive, Big Pine Key	MO03737	Frame Vernacular
30423 Oleander Boulevard, Big Pine Key	MO03738	Masonry vernacular
30434 Oleander Boulevard, Big Pine Key	MO03739	Frame Vernacular
30458 Oleander Boulevard, Big Pine Key	MO03740	Frame Vernacular
423 Barry Avenue, Little Torch Key	MO03741	Frame Vernacular
433 Barry Avenue, Little Torch Key	MO03742	Frame Vernacular
580 Barry Avenue, Little Torch Key	MO03743	Other
1257 Warner Road, Little Torch Key	MO03744	Frame Vernacular
1269 Mills Road, Little Torch Key	MO03745	Frame Vernacular
1263 Mills Road, Little Torch Key	MO03746	Frame Vernacular
26936 Shanahan Road, Ramrod Key	MO03747	Frame Vernacular
24915 Horace Street, Summerland Key	MO03748	International ca. 1925-present
24945 Center Street, Summerland Key	MO03749	Masonry vernacular
25063 Center Street, Summerland Key	MO03750	Masonry vernacular
13 Center Street, Summerland Key	MO03751	Frame Vernacular

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Horace and Center Streets, Summerland	MO03752	Frame Vernacular
Restaurant and Fish Market	MO03753	Masonry vernacular
637 2 nd Street, Summerland Key	MO03754	Masonry vernacular
25044 45 th Street, Summerland Key	MO03755	Frame Vernacular
Galley Grill Restaurant	MO03756	Masonry vernacular
60 Dobie Street, Summerland Key	MO03757	Frame Vernacular
21074 Overseas Highway, Cudjoe Key	MO03758	Frame Vernacular
Mangrove Mamas	MO03759	Frame Vernacular
81 Johnson Road, Sugarloaf Key	MO03760	Frame Vernacular
71 Johnson Road, Sugarloaf Key	MO03761	Frame Vernacular
19556 Navajo Street, Sugarloaf Key	MO03762	Frame Vernacular
19580 Mayan Street, Sugarloaf Key	MO03763	Frame Vernacular
19674 Indian Mound drive, Sugarloaf Key	MO03764	Frame Vernacular
19591 Aztec Drive, Sugarloaf Key	MO03765	Frame Vernacular
19616 Aztec Drive, Sugarloaf Key	MO03766	Frame Vernacular
19582 Aztec Drive, Sugarloaf Key	MO03767	Frame Vernacular
19572 Aztec Drive, Sugarloaf Key	MO03768	Frame Vernacular
19583 Seminole Street, Sugarloaf Key	MO03769	Frame Vernacular
19658 Seminole Street, Sugarloaf Key	MO03770	Frame Vernacular
19520 Tequesta Street, Sugarloaf Key	MO03771	Frame Vernacular
19525 Date Palm Drive, Sugarloaf Key	MO03772	Frame Vernacular
19545 Date Palm Drive, Sugarloaf Key	MO03773	Frame Vernacular
Chasehouse	MO03774	Frame Vernacular
Sugarloaf Lodge	MO03775	Masonry vernacular

3.10 Demographics & Socioeconomics

Like most of the Florida Keys, the economy of the Lower Keys is largely dependent on the continued health of the coral reefs in the Sanctuary. The coral reefs support a major recreational industry that attracted more than three million tourists to the Keys and South Florida by the early 1990s who then spent an estimated \$1.3 billion (Crosby 1997), figures that are no doubt substantially greater today. SCUBA and free diving are the principal recreational activities revolving around the coral reef, attracting over 1.2 million divers annually to the Florida Keys and generating more than \$220 million in economic benefit. Commercial fishing contributes about one-half the economic benefit as diving, and constitutes the second largest of the water-

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based economic contributors. While these figures are for the entire Florida Keys, they indicate the importance of the health of the coral reef to the Florida Keys, including the residents and businesses of the Lower Keys.

3.10.1 Demographics

The Cudjoe Regional Service Area lies within an unincorporated area in Monroe County and is designated by the U.S. Census Bureau as Zip Code Tabulation Areas (ZCTAs) 33042 and 33043. The demographic data presented here is specific to the above ZCTAs. The permanent population of the Service Area in 2000 was 11,256 (14.1 percent of Monroe County) (**Table 3-9**) and has not substantially changed. Other characteristics of the Service Area are summarized below.

- Number of permanent residents over 65 is 15 percent, compared to 14.7 percent for Monroe County and 17.6 percent for the State of Florida. The median age of the Service Area's population is between 44.5 and 47 years, compared to 42 years in the county, and 38 in the state.
- The population is 95.3 percent white, compared to 90 percent in the county and 78 percent in the state. Hispanics make up 6.4 percent and African Americans make up 1.1 percent of the remaining population.
- Women make up 47.5 percent of the population in the Service Area, compared to 46.8 percent in the county and 51.2 percent in the state.
- Temporary residents make up a large portion of the population: 33.8 percent of the housing is used seasonally, for recreational or occasional use, compared to 24 percent for the county and 6 percent for the state.

Table 3-9
Demographic Characteristics for Year 2000, Cudjoe Regional Service Area

General Characteristics	Service Area		Monroe County		State of Florida	
	Number	Percent	Number	Percent	Number	Percent
Total population	11,256	(X)	79,589	(X)	15,982,378	(X)
Male	5,906	52.5	42,379	53.2	7,797,715	49
Female	5,350	47.5	37,210	46.8	8,184,663	51
Median age (years)	46	(X)	42.6	(X)	39	(X)
Under 5 years	388	3.4	3,462	4.3	945,823	6
18 years and over	9,480	84.2	65,984	82.9	12,336,038	77
65 years and over	1,688	15	11,648	14.6	2,807,597	18
One race	11,088	98.5	78,171	98.2	15,606,063	98
White	10,732	95.3	72,151	90.7	12,465,029	78
Black or African American	123	1.1	3,795	4.8	2,335,505	15
American Indian and Alaska Native	54	0.5	301	0.4	53,541	0
Asian	70	0.6	657	0.8	266,256	2

3.0 Affected Environment

Native Hawaiian and Other Pacific Islander	5	0	35	0	8,625	0
Some other race	104	0.9	1,232	1.5	477,107	3
Two of more races	168	1.5	1,418	1.8	376,315	2
Hispanic or Latino	722	6.4	-	-	-	-
Household population	11,195	99.5	-	-	-	-
Group quarters population	61	0.5	-	-	-	-
Average household size	2.21	(X)	2.23	(X)	2.46	(X)
Average family size	2.59	(X)	2.73	(X)	2.98	(X)
Total housing units	7,644	(X)	51,617	(X)	7,302,947	(X)
Occupied housing units	5,062	66.2	35,086	(X)	6,337,929	(X)
Owner-occupied housing units	3,986	78.7	21,893	62.4	4,441,799	70
Renter-occupied housing units	1,076	21.3	13,193	37.6	1,896,130	30
Vacant housing units	2,582	33.8	16,531	32	965,018	13
Social Characteristics						
Population 25 years and over	9,007		61,161	(X)	11,024,645	(X)
High school graduate or higher	7,972	88.5	-	84.9	-	79.9
Bachelor's degree or higher	2,342	26	10,256	16.8	1,573,121	14.3
Civilian veterans (civilian population 18 years and over)	2,345	26	64,846	(X)	12,283,486	(X)
Disability status (population 5 years and over)	2,598	28.8	13,700	(X)	2,199,021	(X)
Foreign born	911	10.1	-	-	-	-
Male, Now married, except separated (population 15 years and over)	3,200	35.5	-	-	-	-
Female, Now married, except separated (population 15 years and over)	3,015	33.5	-	-	-	-
Speak a language other than English at home (population 5 years and over)	1,622	18	-	-	-	-
Economic Characteristics						
In labor force (population 16 years and over)	6,118	63.3	43,838	64.9	7,471,977	58.6
Mean travel time to work in minutes (workers 16 years and older)	27	(X)	18.4	(X)	26.2	(X)
Median household income in 1999 (dollars)	47,896	(X)	42,283	(X)	38,819	(X)
Median family income in 1999 (dollars)	53,696	(X)	50,734	(X)	45,625	(X)
Per capita income in 1999 (dollars)	25,738	(X)	26,102	(X)	21,557	(X)
Families below poverty level	188	5.6	1,403	(X)	383,131	(X)
Individuals below poverty level	869	7.7	7,977	10.2	1,952,629	12.5

3.0 Affected Environment

Housing Characteristics						
Single-family owner-occupied homes	3,135		-	-	-	-
Median value (dollars)	226,750	(X)	241,200	(X)	105,500	(X)
With a mortgage	2,761	(X)	8,480	60.1	2,323,452	71.7
Not mortgaged	903	(X)	5,624	39.9	918,750	28.3

(X) Not applicable

Source: U.S. Census Bureau

Tourism. Tourism is the largest export of Monroe County. An export is goods and services which, through their sales, introduce new money into an economy. In this case, the goods and services sold are tourism products, i.e. lodging, recreation, food, beverage, etc. Tourism directly employs more workers than any other industry in Monroe County (Monroe County 2006). Through a series of visitor surveys, NOAA calculated the amount of new money introduced into the Florida Keys economy via tourism, or direct visitor spending. NOAA's conclusion was tourism introduced into the economy \$833.57 million new dollars in sales, \$316.26 in income and 13,655 jobs in direct employment over the time period of their study (1995-1996). Monroe County's Tourism Development Council (TDC) estimates the direct and indirect effect of tourism in Monroe County in 2005 was \$2.2 billion in gross sales. These numbers demonstrate the significance of the tourism industry in Monroe County's economy.

3.10.2 Socioeconomics

Cost of Living. One of the principal factors affecting the cost of living in the Florida Keys and a factor that would be impacted by the proposed project is the cost of utility services. Utility service and sewer rates for residents in the Keys are higher due to the long distances of utility lines required to provide service and the infrastructure costs for wastewater, treatment, collection, and disposal.

The principal factors that contribute to the high cost of living in Monroe County, including the Service Area, are elevated costs of real estate, insurance, transporting goods and services, sales tax, and utilities. With no rail transportation or commercial seaport, virtually all goods are shipped by truck from the mainland and are more expensive than elsewhere in Florida. The 2009 Florida Price Level Index identified Monroe County as having the highest cost of living in Florida, with an index value of 112.3 (Bureau of Economic and Business Research 2010), more than ten percent higher than the national average.

Home Ownership. Within the Service Area, about 78.7 percent of the residents own their homes, compared to 62 percent for Monroe County and 70 percent for the State of Florida (U.S. Census Bureau 2002). The lower home ownership rate is attributable to the much higher cost of housing units in Monroe County and the transient nature of the population.

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Poverty Level. Approximately 7.7 percent of the residents within the Service Area were living below the U.S. Census Bureau designated poverty level in 2000 (U.S. Census Bureau 2002), compared to approximately ten percent in the county and 12 percent in the state. However, because the cost of living in Monroe County is more than ten percent higher than the national average, the actual proportion of residents living below the poverty level is probably also higher.

Based on the U.S. housing and Urban Development (HUD) income level system (FEMA 2000) for identifying residents eligible for financial assistance, low-income residents have 80 percent of the median family income, and very low-income residents have a household income of 50 percent of the median. Using these definitions, very low-income residents have no discretionary income and low-income households have discretionary income levels of about \$750 per month.

Utility Costs. The residents of the Lower Keys rely primarily on low cost septic systems for wastewater treatment. Owners of cesspools incur virtually no cost for operation and maintenance, and almost all systems have been in place for many years. Septic tank systems cost very little to maintain and operate and generally require only pumping every few years. Current developments must use advanced treatment units, On-Site Wastewater Nutrient Reduction Systems (OWNRS), or central WWTFs.

For comparison purposes, customers of Key Haven Utilities, Ocean Reef Club and KW Resort Utilities pay a total of \$1,215 to \$2,700 toward the cost of wastewater treatment and transmission and from \$55 to \$64 per month for sewer service. Costs for connecting residences and businesses and maintaining WWTFs and associated infrastructure is often very high.

3.11 Recreation

While local geology limits the formation of sandy beaches in the Florida Keys, the primary natural attraction is the coral reef, as described in the PEIS (Section 3.11). The approximate 2.29 million visitors to the Florida Keys rely on clean water and beaches as well as the abundant fish and wildlife that characterize this popular vacation spot. These visitors provide the basis of the tourism industry on which the economy of the Florida Keys relies. Consequently, potential impacts to recreational amenities and tourism that may result from the implementation of FKWQIP must be examined.

Ninety percent of visitors to the Florida Keys visit for recreation or vacation. In addition to water sports, historical and cultural resources associated with the Florida Keys support tourism. Historical attractions include the remnants of the Overseas Railroad constructed in the early 1900s, Fort Zachary Taylor in Key West, and Fort Jefferson in the Dry Tortugas. Recreation days in Monroe County (**Table 3-10**) indicate that most activities are related to saltwater.

Table 3-10
Recreation Days in Monroe County: 12-Month Period 1995-1996

Activities	Recreation Days Reported	Percent of Total Day Reported
Boating Activities		
Snorkeling	1,010.8	7.9
SCUBA diving	190.0	1.5
Offshore fishing	859.2	6.7
Personal watercraft	239.8	1.9
Viewing nature & wildlife	796.0	6.2
Non-Boating Activities		
Snorkeling from shore	548.1	4.3
Fishing from shore	359.9	2.8
All beach activities	2,867.6	22.4
Swimming in outdoor pools	2,489.2	19.4
Wildlife & nature studies	1,789.8	14.0
Museums & historic sites	1,665.9	13.0

Leeworthy and Wiley 1996.

3.12 Environmental Justice

Federal EO 12898 (1994), requires a federal agency to make environmental justice a part of the planning process, ensuring greater public participation, and identifying differences in resource consumption patterns of minority and low-income portions of the population. The USEPA Office of Environmental Justice has defined environmental justices as:

The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, policies.

While the Mean Household Income (MHI) in the Service Area is above that of the county and state, 7.7 percent of residents in the Service Area live below the poverty level. This percentage may actually be larger given that the cost of living in Monroe County is more than ten percent higher than that of the nation.

In addition, the proportion of residents over the age of 65 in the Service Area is greater when compared with the county and the state, and 15 percent of the portion of the population lives below the poverty level, compared with 9.8 percent in the county and 8.1 percent across the state. This segment of the population often lives on fixed income and, while their income may not be below the poverty level, they are affected by cost of living changes.

These factors suggest that while the majority of the residents within the Service Area are above poverty levels, there are considerable impacts to residents associated with the costs of the Cudjoe Regional Wastewater System, raising potential environmental justice concerns.

3.13 Land Use and Planning

This section addresses the land use patterns and regulations in the Cudjoe Regional Service Area. Many of the water quality issues in the Florida Keys are closely associated with land uses implemented prior to existing environmental regulations. Consequently, untreated stormwater runoff and improper wastewater disposal practices continue to adversely affect wetlands and nearshore waters. Greater detail regarding land use regulations and controls in the State of Florida and Monroe County is provided in the PEIS (Section 3.14).

To ensure the sustainability of resources unique to the Florida Keys, Monroe County comprehensive land use planning provisions have been developed and include a Permit Allocation System and the Rate of Growth Ordinance (ROGO) to control future growth (explained in further detail in Section 3.14.3). In addition, the FKCCS, sponsored jointly by the Florida Department of Community Affairs (FDCA) and the Corps, developed a planning tool to assist in determining the level of development activities that will provide a means to avoid further irreversible and/or adverse impacts to the Keys (Florida Administrative Weekly 1996).

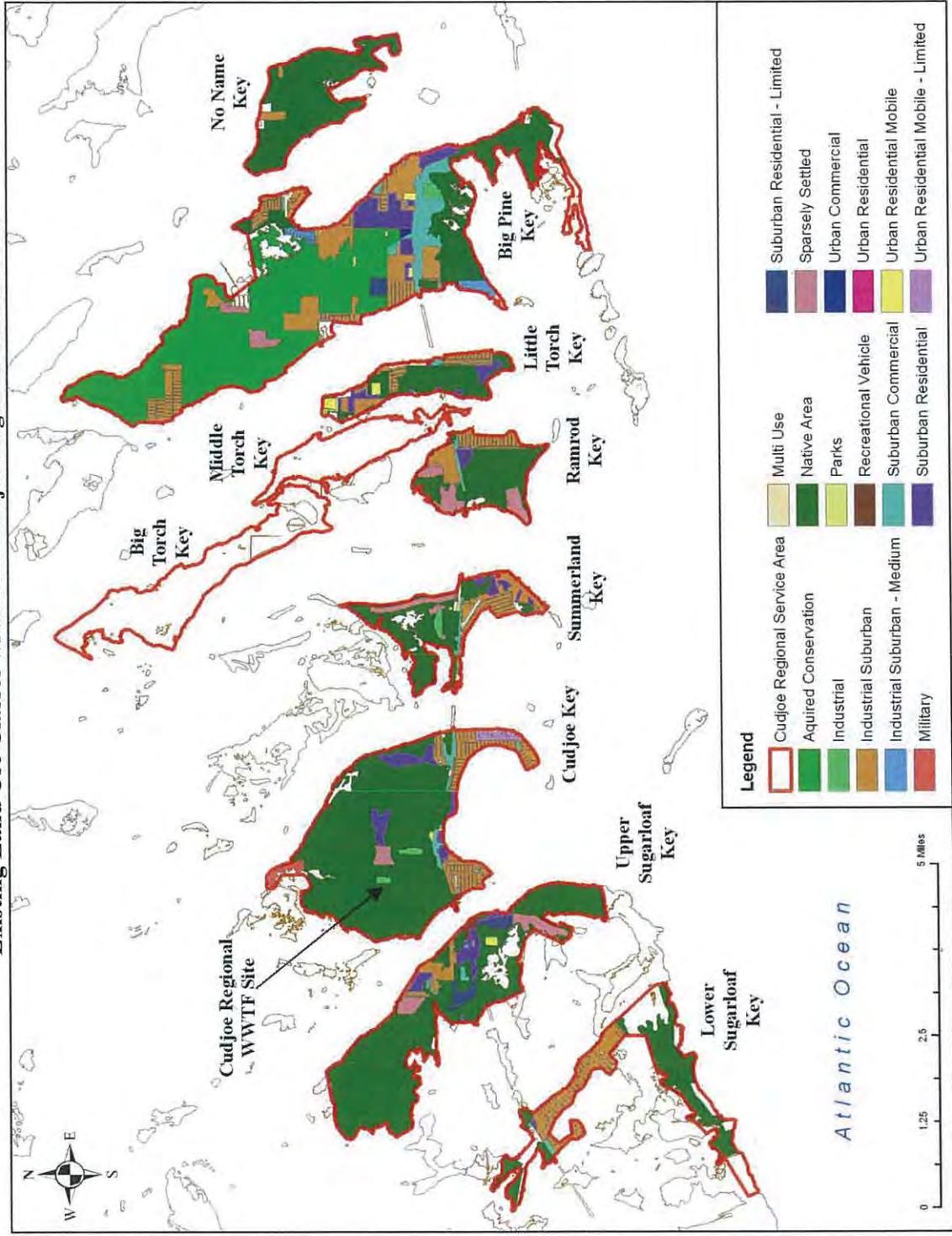
3.13.1 Land Use

Land use classes in the Cudjoe Regional Service Area are illustrated in **Figure 3-4** (Monroe County 2010). Residential land uses account for 8.7 percent of the land area in the Service Area and accommodate permanent residents as well as seasonal and recreational residents. Residential land uses along the shoreline of Florida Bay or the Florida Straits make the most of the scenic resources and recreational access afforded by these waterfront locations. The Service Area is comprised primarily of mangrove habitat (33.8 percent). Commercial land uses include general commercial, commercial and recreational boating and fishing, as well as tourist-based land uses.

The proposed WWTF will be constructed on approximately 3 acres of a larger 10.2 acre parcel and is located on Cudjoe Key at the decommissioned landfill owned by Monroe County. Monroe County has authorized the land-use change of decommissioning cells A & B of the landfill and utilizing the area for the proposed WWTF (Permit Minor Modification, No. 0067347-005-SO/MM).

3.0 Affected Environment

Figure 3-4
Existing Land Use Classes within the Cudjoe Regional Service Area



3.13.2 Conservation Areas

The Sanctuary surrounds the Florida Keys and the Service Area and includes the most extensive coral reef in North America and the third largest reef system in the world. Under Public Law 101-605, 2,600 square nautical miles of coastal waters are designated under the Sanctuary.

The USFWS is the largest land owner in the Cudjoe Regional Service Area, controlling nearly 39 percent of the total land area. Additionally, most of the Service Area lies within the fragmented boundaries of the Florida Keys Wildlife Refuges Complex, which includes the National Key Deer Refuge and the Great White Heron National Wild Refuge. The State of Florida and Monroe County also own conservation lands within the Service Area, controlling approximately 16 percent and six percent of the total land area, respectively (**Figure 3-5**).

3.13.3 Future Land Use

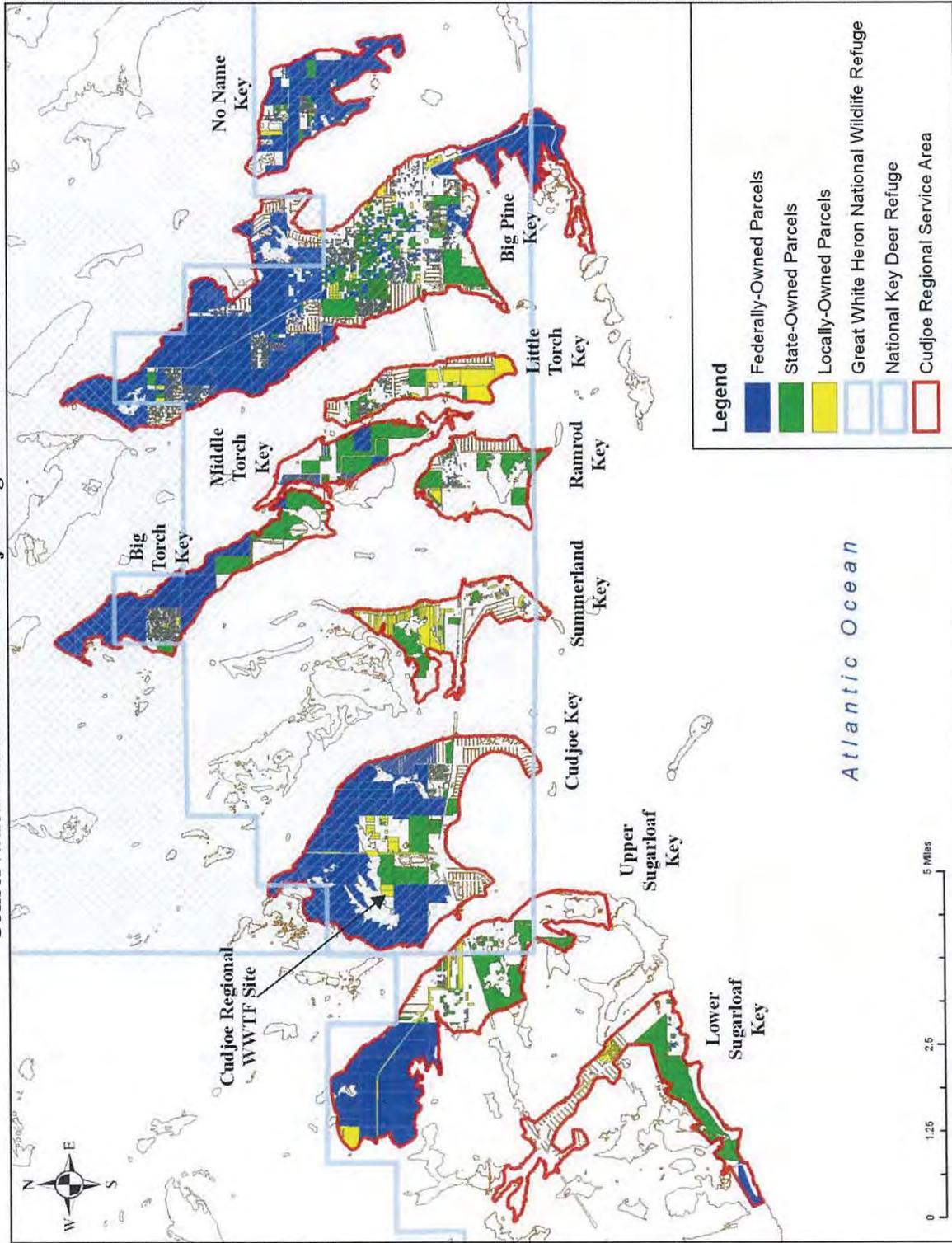
The comprehensive plans of Monroe County and the incorporated cities of Islamorada, Marathon, Layton, Key Colony Beach, and Key West are specifically structured to control and direct future land use development to areas with sufficient services to accommodate the growth (Chapter 163 F.S. Public facilities must serve the development at the adopted LOS standards concurrent with the impacts of the development). LOS standards are established for traffic and circulation, potable water, solid waste, sanitary sewer, drainage, and recreation and open space (Monroe County 2000).

Under the Monroe County Comprehensive Plan, the total number of building permits issued per year is limited by Monroe County's ROGO permit allocation system, not the presence of specific infrastructure. Policy 101.2.13 of the Monroe County Comprehensive Plan established an interim permit allocation system to control growth based on hurricane evacuation, public safety and environmental needs including water quality and habitat protection. To implement this policy, Monroe County has adopted a ROGO that specifically allocates credits towards obtaining building permits. Nutrient reduction credits are necessary to qualify for a building permit. Each year this interim permit allocation system limits the number of building permits issued for new residential development to the number of nutrient reduction credits earned within the same ROGO area.

Future land uses in the Cudjoe Regional Service Area are primarily conservation (40.1 percent) and residential conservation (29.9 percent), which together make up 70.1 percent of the future land use mapped for the Service Area (**Figure 3-6**). Additional future land uses within the Service Area include: agriculture, airport district, education, industrial, institutional, military, mixed use/commercial, public facilities and recreation (Monroe County, 2010). The proposed WWTF would be located on a parcel identified as public facilities on the Future Land Use Map (FLUM).

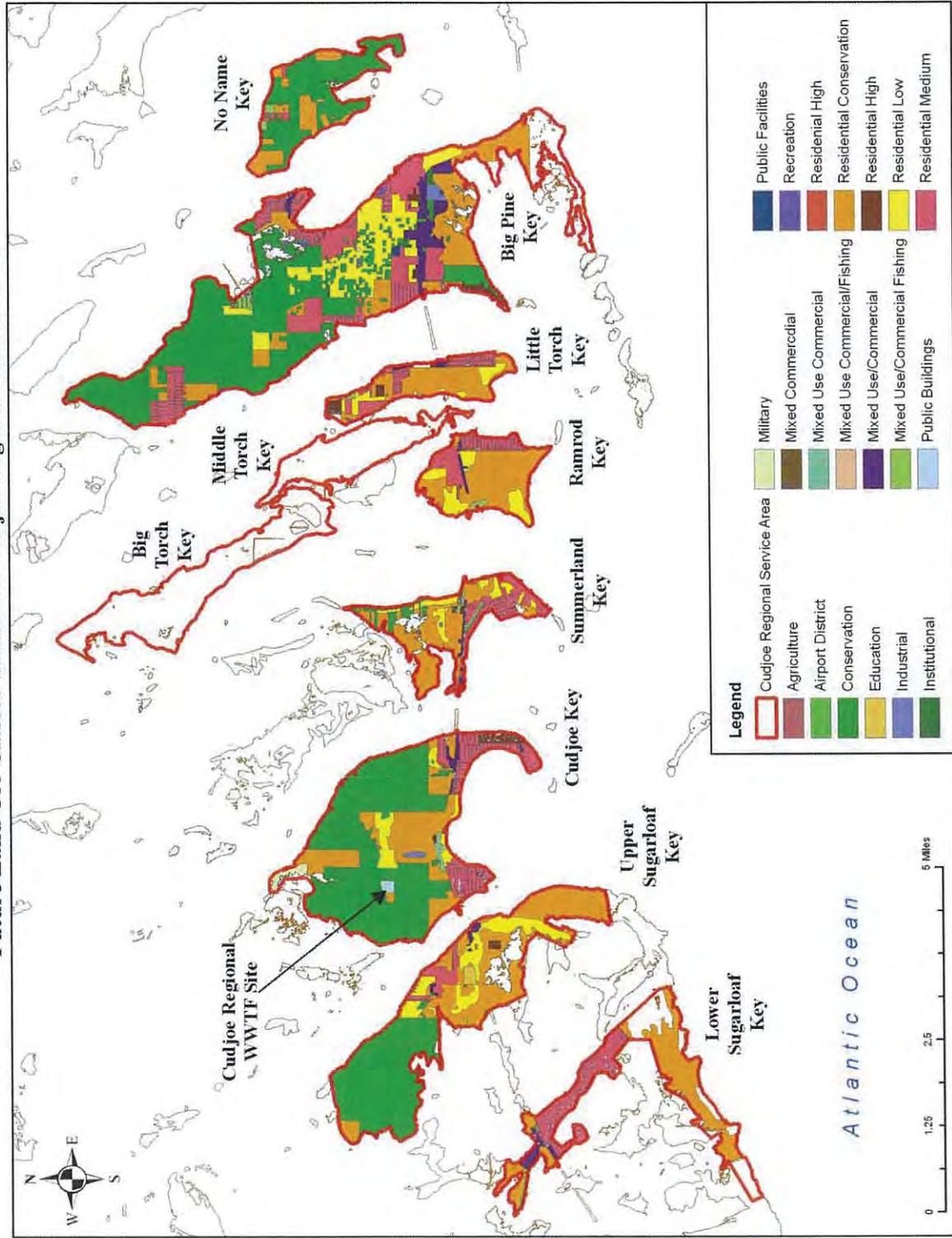
3.0 Affected Environment

Figure 3-5
Conservation Lands within the Cudjoe Regional Service Area



3.0 Affected Environment

Figure 3-6
Future Land Use Classes within the Cudjoe Regional Service Area



3.13.4 Coastal Zone Management Act (CZMA)

The Cudjoe Regional Service Area is located in the State of Florida's designated coastal zone. The Florida Coastal Management Program (FCMP), the State of Florida's federally approved management program, was approved by the NOAA in 1981.

The Coastal Barrier Improvement Act of 1990 (CBIA) reauthorizes and amends the Coastal Barrier Resources Act (CBRA) of 1982 (16 U.S.C. 3501-3510) and is described in the PEIS (Chapter 3.0). Although the CBIA restricts federal expenditures for coastal barrier development, Section 6(a)(6)(A) contains a broad exemption for projects relating to the study, management, protection, or enhancement of fish and wildlife resources and habitats, including recreational projects. Under the 1990 amendments, the Secretary of the Interior has consultation responsibilities for additional exemptions from funding prohibitions under CBRA, including water resource development projects.

A review of the Coastal Barrier Resource System (CBRS) maps shows that three designated CBRS units lie within the Cudjoe Regional Service Area (FL-50, FL-52 and FL-54, see **Figure 3-7**). The Federal CBRS designation has been incorporated into the Monroe County Year 2010 Comprehensive Plan. Monroe County discourages the extension of facilities and services, such as telephone or electricity, to designated coastal barrier areas. Construction of the proposed WWTF and all of the infrastructure and transmission lines needed to convey centralized wastewater to the facility will occur outside the boundaries of these CBRS units. However, several decentralized cold spots, located on Summerland Key, Big Torch Key and No Name Key, are within the CBRS units.

3.13.5 Floodplain Management

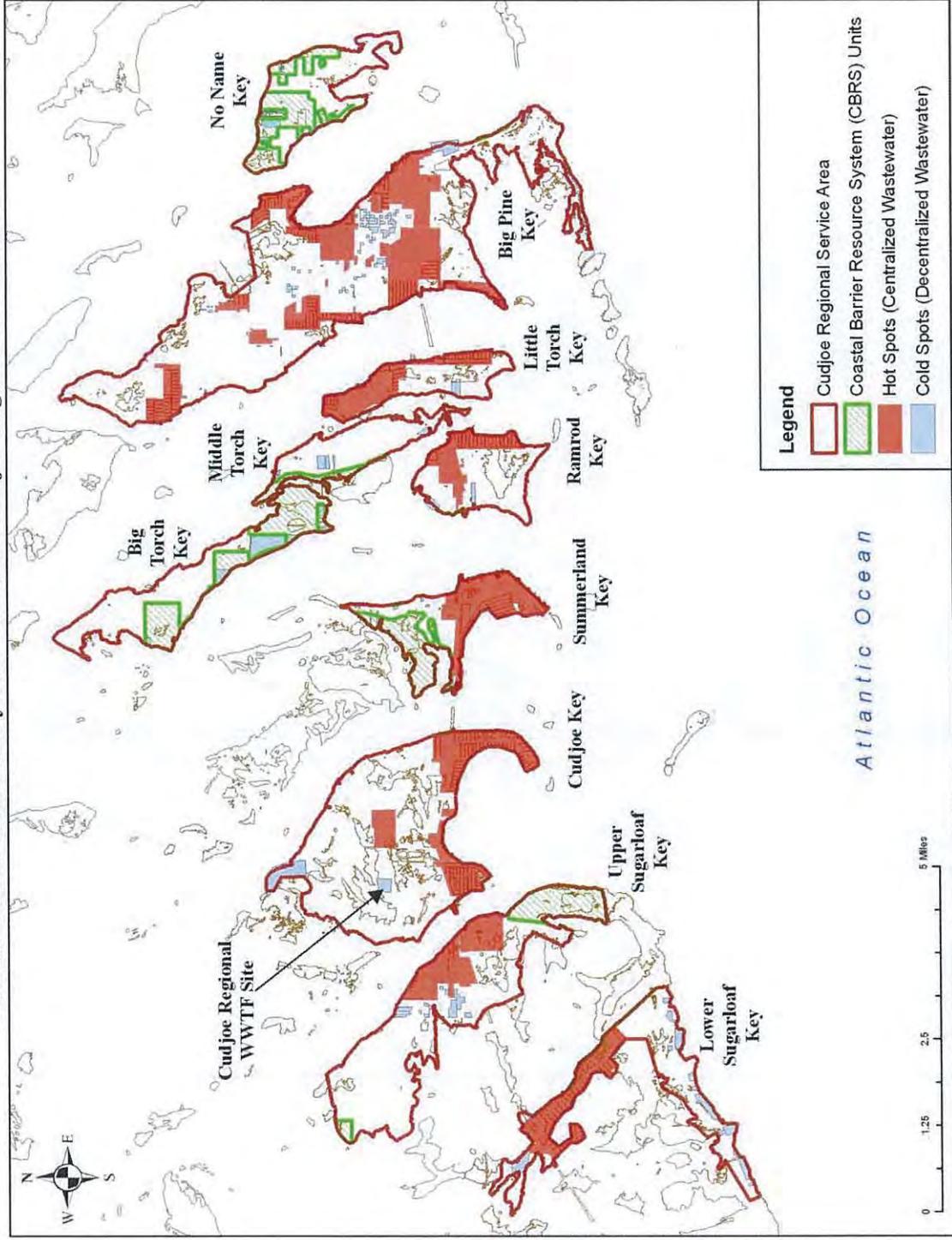
EO 11988: Floodplain Management mandates that federal agencies evaluate the potential effects of any actions it may take in a floodplain. If an agency proposes to allow an action to be located in a floodplain, the agency must consider alternatives to avoid adverse affects or must design or modify its action to minimize potential harm to or within the floodplain.

Service Area. The overall Cudjoe Regional Service Area occurs within the AE Zone, within the 100-year floodplain (areas inundated by 100-year flooding for which Base Flood Elevations [BFE] have been determined)(FEMA 1996).

WWTF Site. The proposed WWTF site is located within the 100-year floodplain (Zones AE). Consequently, provisions of the Monroe County Floodplain Ordinance would apply. In addition, federal funding, per EO 11988 requires that WWTFs, because they are designated critical facilities, are subject to more stringent construction requirements. Specifically, FKAA would flood-proof the WWTF and when practical construct critical operating components to the 500-year floodplain standards per CFR Part 9.11.

3.0 Affected Environment

Figure 3-7
Coastal Barrier Resource System within the Cudjoe Regional Service Area



3.14 Infrastructure

Transportation service and corridor access for conveyance of potable water and electrical service from the mainland are provided to the Florida Keys via U.S. Highway 1. The lack of centralized WWTFs in the Keys is one of the contributing factors to degradation of nearshore waters due to the discharge of nutrients and other pollutants.

3.14.1 Transportation

Transportation infrastructure in the Service Area includes roadways that link the mainland with the Lower Keys via the Overseas Highway/U.S. Highway 1. This route allows vehicle traffic, as well as boat transportation through the numerous waterways. However, the primary transportation objective of Monroe County is to reduce the time required for hurricane evacuation to 24 hours by the year 2010 (Monroe County 1997b).

Roadways. U.S. Highway 1 is the primary roadway in the Cudjoe Regional Service Area. Within Monroe County, the highway stretches 112 miles from Key West to the Miami-Dade County line and provides a means of transporting food, supplies, and tourists between the mainland and the Florida Keys. Approximately 80 percent of U.S. Highway 1 is a two-lane roadway, including much of the roadway located within the Service Area. Portions of U.S. Highway 1 located on Big Pine Key are four-lane.

Public Transportation. With the exception of the Lower Keys Shuttle, which connects Key West to Florida City, there is no public transportation within the Service Area.

Air Transportation. The two municipal airports in Monroe County are the Florida Keys Marathon Airport and the Key West International Airport. Both airports have regularly scheduled commercial passenger service and provide services for private aircraft at general aviation fixed-base operations. While major carriers often route passengers through Miami International Airport, some smaller carriers offer direct flights to Key West and Marathon from major Florida cities and the Bahamas. The Cudjoe Regional Service Area includes two private airstrips, located on Lower Sugarloaf Key and Summerland Key.

Waterways. There are no deep-water ports in the Service Area. The Coast Guard station at Key West maintains navigational aids, provides emergency search and rescue services, and patrols coastal waters to promote boating safety. The network of waterways, proximity to deep waters, and the numerous marinas and boating facilities makes water transportation an important function in the Florida Keys. There are several marinas located within the Service Area.

3.14.2 Utilities and Services

Electrical Power. Two electrical service providers serve the Florida Keys. To the south and east of the Seven Mile Bridge service is provided by Keys Energy Services (KEYS). KEYS is a municipal utility operated by a state authorized utility board and imports most of its power from the mainland, but has an on-island emergency generator that can provide 60 percent of its power in case of power interruption (KEYS 2003). KEYS power is distributed along a transmission line paralleling U.S. Highway 1, jointly owned with Florida Keys Electric Cooperative (FKEC) to the north of the Seven Mile Bridge.

The second electrical service provider is the FKEC, which provides electrical power to the northern portion of the Keys. In 2001, FKEC had over 30,000 customers in Monroe County and supplied 639,000,000 kilowatt hours of electricity to those customers (FKEC 2002). FKEC purchased power generated on the mainland by Florida Power and Light (FPL). This power is distributed to the Keys by two 138,000-volt transmission lines.

Potable Water. The FKAA is the sole provider of potable water for the Florida Keys. The potable water supply system extends 130 miles from Florida City to Key West and is approximately 3 miles wide at its widest point. This system includes 187 miles of transmission mains and 690 miles of distribution mains. The current transmission system in the Middle and Upper Keys consist of 36-inch- and 30-inch-diameter transmission mains along U.S. Highway 1 and a 12-inch-diameter transmission main along Route 905 to Ocean Reef, which were constructed in the early 1980s. The transmission system continues into the Lower Keys with a 24-inch-diameter transmission main, which was constructed in the late 1980s and mid-1990s.

The water supply for FKAA is the Biscayne aquifer from a well field west of Florida City in Miami-Dade County. The well field contains some of the highest quality ground water in the State of Florida. The water is pumped to the Florida Keys, with diesel pumps as backup. Water storage facilities are located at various locations throughout the Keys in case of a pipeline rupture. Desalination facilities have been constructed in Marathon, Stock Island and Florida City.

Wastewater Treatment. No centralized wastewater treatment system or facilities currently provide uniform service to the Service Area. Systems currently operating in the Keys are administered by municipal governments or private developments.

The four basic methods for wastewater management and treatment presently used in the Keys include cesspools, septic tanks, ATUs and OWNRS. These methods were described in detail in the PEIS (Section 3.15).

At the time a development permit is issued, adequate sanitary wastewater treatment and disposal facilities, including WWTFs and on-site sewage treatment and disposal systems (OSTDS), must

be available to support the development at the adopted LOS, concurrent with the impacts of the development (Monroe County 1997b). The Monroe County Comprehensive Plan includes provisions for eliminating cesspools and improving failing septic systems and package treatment facilities (Monroe County 1997b).

3.15 Hazardous Materials and Domestic Waste

The Resource Conservation and Recovery Act (RCRA) of 1974, Subtitle C, established a federal program for the handling of hazardous wastes in a manner that would prevent impacts to human health and the environment. The FDEP Division of Waste Management Bureau of Solid and Hazardous Wastes oversees RCRA for the state. Florida Statutes, Chapter 403, Florida Public Health Section, Resource Recovery and Management, and FAC, Rule 62-730 provide the regulations for the handling of hazardous materials and waste.

Monroe County collects solid wastes at three locations: Key Largo, Cudjoe Key and Long Key. Waste material is collected at these locations by four private contractors and then separated and either shipped to a landfill in Southeast Florida, or recycled. Household hazardous wastes are collected at these three locations and handled separately. Hazardous wastes from commercial, institutional, and industrial facilities in the Keys are collected at the generation site and disposed of according to stringent regulations regarding the specific material. Treated wastewater sludge materials are not considered hazardous wastes. Adequate collection, disposal, and resource recovery for solid waste are essential for future developments. No building permits would be issued unless adequate solid waste collection and disposal facilities needed to support the development are available concurrent with the impacts of the development.

The proposed WWTF is located on Cudjoe Key at the decommissioned landfill owned by Monroe County, which is a known source of contamination. Monroe County has authorized the land-use change of decommissioning cells A & B of the landfill and utilize the area for the proposed WWTF (Permit Minor Modification, No. 0067347-005-SO/MM). Prior to construction of the WWTF, the FKAA will remove the existing liner.

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4.0 Environmental Consequences

This portion of the Draft EA presents an analysis of the environmental consequences anticipated as a result of implementing the alternatives described in *Chapter 2, Description of Alternatives*. The comparative analysis focuses on issues identified as concerns during initial scoping meetings and communications with regulatory agencies and stakeholders. The environmental consequences are summarized in **Table 4-1**. The three project alternatives under consideration are briefly outlined below.

- **Alternative 1: No Action.** No federal agency would provide funding to the FKAA for implementation of wastewater treatment improvement projects that would address state mandates to meet wastewater treatment standards. Public entities would not construct or operate WWTFs. Lower Keys residents, communities, and businesses would be responsible for addressing state mandates aimed at improving water quality in the Sanctuary.
- **Alternative 2: Proposed Action.** Provide federal financial assistance from the Corps, as part of the FKWQIP, to develop and implement a regional wastewater collection and treatment system for the Cudjoe Regional Service Area that would address mandatory state wastewater treatment standards.
- **Alternative 3: Pursue Other Sources of Funding for Project Implementation.** In the absence of federal funding, provided by the Corps, alternative funding sources would be pursued to implement projects for the FKAA that would address state mandates and improve water quality in the Sanctuary. Sources of monies may include other state and federal funding mechanisms (other than Corps) and/or additional costs levied against Florida Keys residents.

Like most of the Florida Keys, residents in the Cudjoe Regional Service Area rely primarily on septic tanks and cesspools, resulting in little or no treatment of wastewater that ultimately flows to adjacent nearshore waters. Continuing research has identified these discharges as major contributors to declining water quality in the canals and nearshore waters in the Florida Keys and Sanctuary.

Application of the Florida Keys Carrying Capacity Study (Corps 2002). Importantly, the Corps' model provided a means of quantifying the affects of wastewater improvement projects, specifically the reductions in nutrient loads, within the Sanctuary. An independent contractor from the team who originally developed the FKCCS model coordinated with and assisted the South Florida Regional Planning Council in running the mode for FKWQIP projects, specifically for Key Largo, Islamorada and Marathon. These similar wastewater districts provided the basis for calculating the anticipated range of nutrient reductions associated with construction of the Cudjoe Regional WWTF.

The goal of the FKCCS is to “determine the ability of the Keys ecosystem, and the various segments thereof, to withstand all impacts of additional land development activities.” The study focused on establishing relationships between land development activities and carrying capacity indicators and used these relationships to model impacts to terrestrial and marine ecosystems and species, human infrastructure, socioeconomics, fiscal conditions, and water resources. Results were integrated into a spatially explicit automated computer model that then characterized

4.0 Environmental Consequences

current conditions as a baseline scenario as well as six additional scenarios with varying levels of development and a scenario with the MCSWMP implemented.

The Alternatives. Implementation of the *No Action* alternative is expected to result in continued adverse impacts to, and the persistence of, existing conditions described in *Chapter 3, Affected Environment* due to discharges for septic systems (including substandard systems) and cesspools in the Service Area. The *Proposed Action* and *Alternative Funding Sources* alternatives, call for a new WWTF and associated infrastructure for the Cudjoe Regional Service Area, but vary due to availability of funding and entities that would implement projects. The vast majority of benefits under both alternatives are positive, consistent with the intent of the FKWQIP and other federal, state, and local initiatives to improve water quality in the nearshore waters of the Florida Keys and the Sanctuary.

Under the *Proposed Action*, federal financial assistance would be provided to construct a WWTF that would improve wastewater treatment in the Cudjoe Regional Service Area and address state mandates to improve water quality in the Sanctuary. Under the *Proposed Action*, discharges to soils and nearshore waters from septic systems (including substandard septic systems), and cesspools in the Service Area would be eliminated and TN, TP and TSS loads would be subsequently reduced.

In contrast, under *Alternative Funding Sources*, Lower Keys residents and businesses would pursue alternate funding options for wastewater treatment improvements and implement projects as funding becomes available. Although long-term benefits under *Alternative Funding Sources* are the same as those described for the *Proposed Action*, the absence of Corps funding may delay the implementation of projects, impede the integration of individual wastewater components, and decrease cost effectiveness. Potential adverse impacts due to implementation of the *Proposed Action* are relatively minor and are related to environmental justice and protected species and associated habitat.

Potential Issues of Concern. Potential issues addressed in this Draft EA include environmental justice and protected species and associated habitat. Approximately eight percent of the population in the Cudjoe Regional Service Area was living below the poverty level in 2000, and the proportion of residents over the age of 65 is approximately the same as that of the county and state (14.7 percent and 17.6 percent, respectively). Consequently, the capital costs and monthly service fees for wastewater treatment improvements may be disproportionately large for this group and may require mitigation.

Although impacts to wetlands from the proposed wastewater infrastructure will be avoided and/or minimized as the improvements will generally occur within existing ROW corridors, some avoidable impacts to mangrove habitat along U.S. Highway 1 may occur as a result of installing the transmission main. Coordination with FDEP is on-going and an ERP will be obtained should avoidable impacts occur.

4.0 Environmental Consequences

**Table 4-1
Comparison of Environmental Consequences
Resulting from the Alternative Actions**

Issue	Alternative 1 <i>No Action</i>	Alternative 2 <i>Proposed Action</i>	Alternative 3 <i>Alternative Funding Sources</i>
Centralized Sewer	Elimination of cesspools, septic tanks and associated nutrient and contaminants. Cesspool elimination will progress slowly.	Expedited removal of cesspools, septic tanks and associated pollutants in pollutant hot spots throughout the Florida Keys.	Treatment will be less affective due to fragmented and delayed construction.
Effluent Disposal	Effluent disposal practices will essentially remain the same.	WWTF would have shallow well injection of treated water, reducing untreated effluent discharge to the Sanctuary. Disinfection would reduce bacteria concerns.	Fewer and smaller WWTFs without central management, potentially greater reliance on injection wells.
Air Quality	Continued odors associated with existing or new treatment facilities, cesspools and septic tanks.	Temporary, minor adverse impacts due to construction.	Reduced impacts due to fewer WWTFs. Remaining cesspools, septic tanks, and odors would be less when compared with the <i>Proposed Action</i> .
Biological Environment			
Habitats, Fish and Wildlife Resources	Continued pollutant inputs may alter soils and habitat and adversely impact vegetation and wildlife, through toxins and bioaccumulation and food chain transfer. Phosphorus additions may benefit mangroves.	Potential minor adverse impacts to mangroves. Avoidance, minimization and mitigation will result in no significant adverse impacts to protected species' habitat. Net environmental benefits to seagrasses and corals due to fewer algal blooms, improved water clarity and light penetration.	Conditions for Alternative 1 would continue until projects are implemented. Delays and smaller scale projects anticipated under this alternative may result in similar, but less expansive benefits, when compared with those for the <i>Proposed Action</i> .
Protected Species	Potential adverse impacts due to continued habitat degradation related to cesspools and septic tanks, and subsequent nutrient and other pollutant inputs into nearshore coastal waters.	Minimal, to no, adverse impacts due to infrastructure construction. Section 7 USFWS consultation and review by FFWCC for state protected species is ongoing.	Potential adverse affects as described under <i>No Action</i> would continue until water quality improvement projects are implemented.
Essential Fish Habitat	Adverse impacts due to continued pollutant discharges into canals and nearshore waters.	Anticipated reductions in nutrient loadings and discharge volumes and improved nearshore habitats, directly benefiting EFH. NMFS supports development of AWT.	Potential adverse impacts as described under <i>No Action</i> , until projects are implemented.

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Coastal Barrier Resources	Continued pollutant inputs and water quality degradation would adversely impact benthic corals and seagrasses.	No adverse impacts anticipated. Benefits include improved water quality and improved water quality and improvements in associated benthic, coral and seagrass habitats.	Continued nearshore water quality degradation as described under <i>No Action</i> until project implementation.
Human Environment			
Cultural Resources	No impacts to unidentified cultural resources are anticipated.	No documented occurrences of archaeological or historic sites on the proposed WWTF site.	Similar to <i>Proposed Action</i> if alternative funding becomes available.
Demogra phics	Constrained growth in land development and population.	Moderate growth expected for wastewater improvements for current residents.	Constrained growth in land development and population.
Environmental Justice	Residents may be responsible for WWTF project costs. Potential impacts to the number of residents >65 on a fixed income.	Federal funding would alleviate some costs for implementing WWTF projects, although additional costs of infrastructure would still potential impact residents >65 on a fixed income.	Similar to the <i>No Action</i> alternative if alternative funding sources not obtained. Once alternative funding sources are available, impacts would be similar to those under the <i>Proposed Action</i> .
Tourism	Beach health advisories due to poor water quality would continue, adversely affecting immediate recreational and tourist opportunities.	Improved water quality, fewer beach advisories and closings, and increased opportunities for saltwater-based recreation. Temporary transportation delays due to construction activities.	Some growth in tourism due to improved nearshore water quality could be expected, however, at a slower rate as compared with the <i>Proposed Action</i> .
Wastewater Management Costs	Existing wastewater management costs will remain the same.	Increased utility service costs due to connection charges and monthly fees, particularly for low-income households. Potential mitigation would include low-cost financing and subsidies.	Cost of wastewater management would increase at a slower pace as compared with the <i>Proposed Action</i> .
Public Health	Potential decrease in public health due to higher levels of bacteria.	Reduced incidences of water borne disease, health advisories, and beach closings related to wastewater discharge.	Similar to the <i>Proposed Action</i> , except beach health advisories and closings would continue until project implementation.
Infrastructure	No impacts to transportation or utilities and services would occur.	Minor, temporary impacts to traffic, utilities and services could occur during construction of WWTF and associated infrastructure.	Impacts would be similar to those under the <i>Proposed Action</i> , but impacts would be staggered (construction activities would occur at a slower pace.)

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Land Use and Planning	No impacts anticipated. Future land use would be delayed or limited to developments with approved on-site wastewater facilities.	No adverse impacts due to compatibility with land use designations. Future development would proceed per ROGO and Monroe County Comp Plan.	Impacts of <i>Alternative Funding Sources</i> on land use would be similar to those of the <i>Proposed Action</i> , occurring more slowly and possibly at a lower level.
Regulatory	Florida Statutory Treatment Standards of 2015 would not be met.	Florida Statutory Treatment Standards mandated for 2015 compliance would likely be met.	Difficult for county to meet the treatment standards mandated by Florida Statute.

4.1 Climate

Climate is a regional environmental characteristic and will not be affected by any of the project alternatives under consideration. Climate was discussed in Chapter 3, *Affected Environment* to describe the environmental setting for the project site, including seasonal rainfall patterns.

4.2 Topography, Geology and Soils

Topography and geology would not be affected by the project alternatives. Potential impacts to soils are important in the Florida Keys due to the relative absence of topsoil and seepage of untreated wastewater into the limited amount of topsoil in the Florida Keys and the Cudjoe Regional Service Area would be minor.

4.2.1 Alternative 1 (*No Action*)

Impacts to geology and soils under the *No Action* alternative would continue as described under Chapter 3, *Affected Environment*. Existing wastewater and associated seepage from cesspools and septic tanks in the Cudjoe Regional Service Area would continue to elevate soil nutrient levels. Under the *No Action* alternative, the transport of accumulated soil contaminants such as heavy metals, polychlorinated biphenyls (PCBs), pesticides and herbicides in surface water runoff to marine, estuarine and freshwater environments would continue and may be long-term.

Sinkhole formation is infrequent in South Florida as a result of the relative absence of soil and overlying sediments, compared with mainland areas with 50 to 100 feet of overlying soils, in addition to declining water tables. Sinkholes occur when underlying limestone is dissolved by acidic rainfall moving through soil, especially along the fractures and weak layers. A cavity forms and subsequently collapses under the weight of the overlying soils. Water also exerts hydrostatic pressure on the clay layers that separate the shallow surficial aquifer from the deeper Floridan aquifer and supports the limestone matrix. The direct connection of the aquifer to, and interaction with, the marine environment via the porous limestone in the Florida Keys makes the water source non-potable and maintains the hydrostatic pressure.

4.2.2 Alternative 2 (*Proposed Action*)

Under the *Proposed Action*, the proposed WWTF and associated collection, treatment and disposal facility would be constructed and discharges from cesspools and septic systems into soils, and subsequently into wetlands and nearshore waters, would decrease or be eliminated. Consequently, water quality in the Service Area and in the Sanctuary would be improved. Effects on soils and geology in the Service Area would be minor. Disturbances to soils would occur as a result of excavation and fill required to install the collection and transmission lines along Service Area roads as well as the removal of cesspools and septic tanks.

The Cudjoe Regional WWTF currently includes four shallow injection wells. Shallow injection wells are governed by Chapter 62-528 FAC. Shallow injection wells would be constructed to meet both FDEP Class V reliability standards and FDEP UIC Class V well construction and monitoring requirements, as authorized by FDEP Permit No. FLA671932-001.

Under the *Proposed Action*, soils would be disturbed during construction and other activities associated with the proposed WWTF. When appropriate, clean suitable fill would be applied to the WWTF site and excavated ROWs. Excavated material would be used for backfill and remaining material would be transported to an appropriate offsite disposal facility.

Under the *Proposed Action*, appropriate BMPs, an approved Erosion and Sediment Control Plan and conventional site preparation techniques will be implemented to ensure protection of surface waters. As a result, no long-term adverse affects on soils are anticipated. Sediment controls to eliminate discharge to nearshore surface waters may include silt dams, barriers, and straw bales placed at the foot of sloped surfaces. Soil erosion controls may include, but are not limited to, grassing, mulching, watering, and seeding. Site preparation may include vegetation and topsoil removal, followed by surface compaction and fill placement to attain the required construction elevation.

4.2.3 Alternative 3

Effects on the soil under this alternative would be similar to those described under the *No Action* alternative until the FKAA acquires sufficient alternative funding to implement the regional WWTF system. The delay would result in continued soils impacts, as described under the *No Action* alternative. Once the proposed wastewater project is implemented, the effects would be similar to those described under Alternative 2.

4.3 Water Resources

Potential impacts to water resources as a result of implementing the *Proposed Action* are limited to beneficial water quality effects. The proposed WWTF project is expected to improve water quality in wetlands and nearshore waters of the Service Area and the Sanctuary by reducing or eliminating nutrient inputs from inadequately and untreated wastewater. No adverse impacts to potable water supplies are anticipated with respect to the proposed project. Potential impacts to water resources under the *No Action* alternative are the same as those described in detail in *Chapter 3, Affect Environment* and the PEIS (Section 4.3).

4.4 Water Quality

Water quality improvements in the Sanctuary are the primary objective of the Cudjoe Regional Wastewater improvement project specifically and the FKWQIP in general. This section makes a clear distinction between the environmental consequences of the *No Action* alternative (continued reliance on septic tanks and cesspools and inadequate wastewater treatment) and the benefits of implementing the proposed regional WWTF system in the Service Area. The *Proposed Action* would eliminate the most significant sources of nearshore contamination.

4.4.1 Alternative 1 (*No Action*)

Under the *No Action* alternative, residents within the Cudjoe Regional Service Area would continue to rely on individual treatment systems (septic tanks and cesspools) and privately owned cluster or package treatment facilities, as described under *Chapter 3, Affected Environment*. Individual property owners and businesses would be responsible for meeting the defined LOS standards prescribed by county ordinance or state regulation.

Ground Water Quality. Under the *No Action* alternative, continued adverse impacts to the shallow waters of the Biscayne Aquifer due to existing wastewater practices are anticipated. Seepage from cesspools and septic tanks would continue to elevate nutrient levels and negatively impact the water quality of the canals and nearshore waters of the Service Area and surrounding Sanctuary. Effluent disposal through shallow well injection into the underlying aquifers would continue and would not meet 2015 water quality mandates would not be met.

Inland Waters, Nearshore and Offshore Water Quality. Under the *No Action* alternative, continued adverse impacts to nearshore water quality are anticipated as a result of existing inadequate wastewater practices. The effect of continued nutrient inputs to the nearshore system may extend to offshore areas (Kruczynski and McManus 2002) and can only exacerbate historic problems related to coral reef health in the Sanctuary.

4.4.2 Alternative 2 (*Proposed Action*)

Under the *Proposed Action*, the proposed WWTF and associated infrastructure would be constructed and discharges from cesspools and septic systems would be reduced or eliminated, resulting in improvements in water quality in the Sanctuary.

Ground Water Quality. Replacing existing cesspools and septic systems with a centralized WWTF in the Cudjoe Regional Service Area would meet Florida statutory treatment standards and reduce the nutrient and contaminant loads seeping or discharged into the aquifer. Subsequent benefits would include improved water quality in canals and nearshore waters and a reduced potential for human health concerns. Improvements in water quality are anticipated to be between 85-88, 79-81 and 77-91 percent reductions in TN, TP and TSS loadings, respectively (FKCCS 2004, Table 4-3), following implementation of the proposed WWTF. Construction of the transmission system for the WWTF would minimally and temporarily impact groundwater resources due to construction disturbances.

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The maximum flow to the proposed WWTF is anticipated to be 0.94 MGD and effluent disposal through shallow injection wells is proposed. The shallow well injection system will include pumps and a pumping surge control system, four shallow injection wells and several existing monitoring wells.

Potential impacts of highly treated effluent on groundwater resources are of concern to federal, state, and local agencies and shallow injection wells constructed as part of the proposed project would comply with all applicable and relevant standards for disposal. Public comments regarding injection wells of AWT facility effluent were addressed in the PEIS.

Permitting and construction of shallow injection wells are governed by Chapter 62-528 FAC. Shallow injection wells would be constructed to meet both FDEP Class V reliability standards and FDEP UIC Class V well construction and monitoring requirements, as authorized by FDEP Permit No. FLA671932-001. Monroe County falls within the jurisdiction of the FDEP Fort Myers office UIC program.

Inland, Nearshore and Offshore Water Quality. Improved water quality in the Service Area, particularly canals, would be expected under the *Proposed Action*. The environmental consequent to inland, nearshore and offshore waters are closely related to those described above for groundwater because of the direct link between groundwater, canal and nearshore waters. As described for groundwater, 85-88, 79-81 and 77-91 percent reductions in loadings of TN, TP and TSS, respectively, are anticipated. Affects of the WWTF also include 100 percent reductions in TN, TP and TSS to canals. Parameters including length of flush time, localized hydrogeological characteristics, and affectiveness of limestone in removing phosphorus from injected effluent would affect the exact extent of anticipated improvements.

The proposed WWTF would reduce nutrient loading, improve human health and welfare concerns in canals, meet federal and state regulatory water quality standards, and ultimately assist in protecting water quality in the Sanctuary. Nutrient and TSS reductions would reduce the potential for algal blooms, and water clarity and dissolved oxygen (DO) concentrations would improve, possibly improving the overall health of seagrass habitats of nearshore and offshore communities. Although implementation of the Proposed Action would not provide quantifiable improvements to the quality of offshore waters, the benefits would contribute to a healthier coral reef system due to improved water clarity and increased oligotrophic (nutrient poor) conditions necessary for a healthy coral reef system.

No wetlands would be disturbed for the construction of the proposed WWTF. Undisturbed salt marsh and mangroves would remain intact and undisturbed. Erosion control BMPs would be employed during construction to reduce soil erosion and prevent discharge of sediments to nearshore waters. NPDES permits would be required from the FDEP to control treated effluent during operations.

Potential impacts to offshore water quality as a result of shallow well injection and the subsequent potential discharge of nutrients via SGD are possible. Patterns of potential groundwater input into Florida Bay from shallow wells have been established using natural tracers of SGD (Burnett and Chanton 2000). A groundwater velocity estimate of approximately

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1.9 cm day⁻¹ was estimated for three sites and results suggest that the interactions between groundwater and surface water are greatest nearshore along the Florida Bay side of the Florida Keys. Other studies of discharges from shallow injection wells indicate that the nutrients are taken up by seagrasses and phytoplankton before reaching the coral reefs.

4.4.3 Alternative 3 (*Alternative Funding Sources*)

Benefits under *Alternative Funding Sources* would be similar to those described under the *Proposed Action*, albeit with possible delays while the FCAA secures other funding sources. This time delay would affectively allow further water quality degradation, particularly of nearshore waters, increasing the cost and time to implement recovery. The delay in implementing water quality improvements may also reduce the likelihood of meeting 2015 treatment standards.

4.5 Ecological Habitats

Implementation of the *Proposed Action* (Alternative 2) and subsequent water quality improvements will reduce nutrient loadings and improve water quality in terrestrial and nearshore environments in the Florida Keys. Minimal avoidable impacts to mangrove habitat may occur as a result of installing portions of the transmission main along U.S. Highway 1. The long-term benefits of this program would substantially offset any unavoidable impacts to habitat. Importantly, the *No Action* alternative will continue to adversely impact ecological habitats. Under *Alternative Funding Sources* (Alternative 3), water quality degradation will continue until alternate funding is available to implement the proposed wastewater treatment improvements.

The habitat categories addressed here include, upland, freshwater and estuarine wetlands, marine and benthic habitats, coral reefs and floodplains. The importance of each of these habitats was discussed in detail in *Chapter 3, Affected Environment*. Potential environmental consequences of implementing the alternatives presented in this document are described in detail in this chapter.

There are no wetlands on the proposed WWTF site, and no Corps 404 Permits or state Environmental Resource Permits (ERP) would be required.

4.5.1 Alternative 1 (No Action)

Upland Habitats. Under the *No Action* alternative, adverse impacts to upland habitats described in Chapter 3, *Affected Environment* would continue. Adverse impacts to the upland habitats within the Cudjoe Regional Service Area (pine rocklands and hardwood hammocks) would be limited to locations with direct upland discharges and seepage and increased nutrient levels would stimulate plant growth and lead to changes in plant species composition over time.

Estuarine and Freshwater Wetlands. Untreated wastewater from adjacent uplands would continue to flow or seep into mangroves, buttonwoods, salt marsh, freshwater hardwoods, and canals in the Service Area under this alternative. Elevated nutrient inputs from terrestrial runoff would initially enhance the growth (height and biomass) of mangroves (Lugo and Snedaker 1974), as discussed in Section 3.5.3 of the PEIS. However, nutrient rich conditions can also

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inhibit growth and resistance to infection in plants. Sediment from terrestrial runoff could lead to changes in estuarine wetlands elevations and subsequent shifts in species composition, including replacement of salt marsh by upland invasive native and non-native plants. Changes in vegetation composition would directly affect wildlife habitat and use. For example, increased nutrient loading from groundwater and commensurate increases in macroalgal growth have been shown to decrease eelgrass cover and impact benthic fauna composition in Waquoit Bay, Massachusetts (Valiela *et al.* 1992).

Freshwater hardwoods would continue to experience indirect impacts such as altered hydrology, increased pollutant loading, and/or altered natural vegetation, resulting from continued wastewater discharges in the Service Area. As described in Section 3.5.3 of the PEIS, increased nutrients and toxins would likely adversely affect freshwater wetland vegetation and could lead to bioaccumulation and biomagnification of toxins in aquatic and marine organisms. Elevated nutrient levels could be exploited by opportunistic species and species composition may shift. Sedimentation from terrestrial runoff could potentially change the elevation of freshwater wetlands and possibly displace or shift the species composition.

Marine and Benthic Habitats. Marine and benthic habitats in the Service Area include seagrass beds, hardbottom communities, and bare substrate. These communities are sensitive, complex ecosystems influenced by many different sources. Under the *No Action* alternative, continued adverse impacts to marine habitats, including seagrasses, are anticipated as a result of continued wastewater practices in the Service Area. Nutrients that are transported from cesspools and septic tanks to nearshore waters in the Service Area would increase existing nutrient levels and subsequently adversely affect water quality in the nearshore waters of the Sanctuary.

Changes in water temperature, pH, and clarity affect the health and survival of marine and benthic communities. With respect to the proposed wastewater improvements, adverse impacts to benthic and marine habitats would occur as a result of land-based activities and changes in water quality through discharges to inland and nearshore waters. While direct impacts of diver contact, overfishing, or boating contribute to the decline of seagrasses, indirect impacts, such as eutrophication of local waters, result in the increased growth of algae and subsequent shading and gradual decline of seagrass beds.

As described in Section 4.5.1 of the PEIS, elevated nutrient levels can lead to algal blooms which in turn reduce water clarity, decrease light penetration, and potentially result in hypoxic (low oxygen) or anoxic (oxygen depleted) conditions in shallow, poorly flushed locations. These conditions would adversely affect light-dependent organisms such as seagrasses, and can result in adverse impacts such as fish kills and species shifts. In addition, the release of contaminants and pathogens from wastewater can result in pollutant bioaccumulation and biomagnification in the food chain, affecting human health and safety concerns.

The impact to marine habitats as a result of the lack of adequate wastewater treatment in the Florida Keys has not been and may never be quantified. However, water quality degradation in the nearshore waters and the substantial decline of these habitats are well documented. For the

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most part, impacts to the marine habitats as a result of the implementation of the proposed project would be highly beneficial, indirect, and long-term.

Coral Reefs. As discussed in *Section 3.5.4*, no coral reefs were identified within the 500-meter buffer zone surrounding the Service Area. However, coral reefs are located within the Sanctuary and will be affected by this FKWQIP project. Under the *No Action* alternative, continued adverse impacts to nearshore waters in which coral reefs occur are anticipated as a result of nearshore water quality degradation associated with nutrients from untreated wastewater. Corals typically thrive in marine environments where oligotrophic (nutrient poor) conditions include clear waters and low turbidity. Excess nutrients, whether from natural or anthropogenic sources, may negatively impact marine and coral reef ecosystems in several ways. Consequently, coral reefs would be adversely affected by continued nutrient loading to nearshore waters of the Sanctuary caused by continued use of septic tanks and cesspools for wastewater treatment in the Service Area.

Excess nutrients in the water column can increase the growth of phytoplankton and result in algal blooms that reduce water clarity, decrease light penetration, and decrease seagrass and coral growth. Additionally, high nutrient concentrations tend to favor the growth of non-symbiotic mat-forming macroalgae that are not symbionts with the coral and will shade the coral, eliminating the ability of the zooanthellae to photosynthesize, causing bleaching and eventual death of corals.

Floodplains. Continued adverse impacts to habitats in floodplains (as described above) as a result of inadequately treated wastewater are anticipated under the *No Action* alternative. Without the implementation of the Cudjoe Regional WWTF and associated infrastructure, water quality degradation in the habitats described above would continue. In addition, EO 11988 and 11990 would not apply under this alternative and compliance with wastewater system designs with Monroe County Floodplain Ordinance would be required to protect the 100-year flood plain.

4.5.2 Alternative 2 (Proposed Action)

Upland Habitat. Implementation of the proposed WWTF and associated infrastructure would decrease or eliminate the seepage of nutrients and contaminants from cesspools and septic systems. In addition, a reduction in the seepage of nutrients and contaminants to the Sanctuary would improve water quality.

Under this alternative, no adverse impacts to upland communities are anticipated due to construction activities associated with the new WWTF and associated infrastructure. The proposed WWTF will impact approximately 3 acres of developed lands. This project abides by the USFWS recommendation, as described in the PEIS (*Section 4.2.1.2*), for wastewater improvement sitings.

Estuarine and Freshwater Wetland Habitats. Implementation of the proposed WWTF and associated infrastructure would decrease or eliminate nutrient and contaminant seepage from cesspools and septic systems into wetlands in the Service Area and consequently decrease

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pollutant loadings into adjacent nearshore waters. Commensurate decreases in pollutant loadings into the aquifer, both directly and indirectly, would also improve water quality and habitat in general in the Service Area, as discussed in the PEIS (Section 3.5.3).

No wetlands occur on the WWTF site. Therefore, no adverse impacts to wetlands are anticipated as a result of the construction and implementation of the proposed WWTF. Impacts to wetlands from the proposed wastewater infrastructure will be avoided and/or minimized as the improvements will generally occur within existing ROW corridors. Some avoidable impacts to mangrove habitat along U.S. Highway 1 may occur as a result of installing the transmission main. Coordination with FDEP is on-going and an ERP will be obtained should avoidable impacts occur. This project abides by the USFWS recommendation, as described in the PEIS (Section 4.2.1.2), for wastewater improvement sitings.

Marine and Benthic Habitats. No adverse impacts to marine and benthic habitats are anticipated as a result of the *Proposed Action*. Under the *Proposed Action*, construction of the proposed WWTF and associated infrastructure to service the Cudjoe Regional Service Area would decrease or eliminate existing inputs of contaminants, nutrients, and other pollutant inputs from cesspools and septic systems into nearshore waters surrounding the Service Area. Consequently, water quality in nearshore waters of the Sanctuary would be improved.

Substantial benefits to the marine habitats in the Service Area would be anticipated under this alternative. Reductions in nutrients would improve, and commensurate improvements in the overall health of benthic marine communities would be expected. No mitigation would be required due to the positive affects of this program.

Coral Reefs. As discussed in Section 3.5.5, no coral reefs were identified within the 500-meter buffer zone surrounding the Service Area. However, coral reefs are located within the Sanctuary and will be affected by this FKWQIP project. No adverse impacts to coral reefs in the Sanctuary are anticipated as a result of the proposed project. Benefits of the Proposed Action include improved water quality of nearshore waters in the Service Area and commensurate improvements in ecosystem health in the Sanctuary.

As described in Section 4.5.2 of the PEIS, marine flora and water quality dependent marine organisms, including corals, in nearshore waters of the Sanctuary will benefit from reduced nutrient levels. Implementation of the proposed project would potentially contribute to the recovery of the only living coral barrier reef system in North America. Consequently, implementation of this alternative would benefit the coral reef tract of the Florida Keys and contribute to recovery of this important national treasure.

Floodplain. Under the Proposed Action, potential temporary adverse impacts to floodplains in the Service Area may occur as a result of temporary construction activities.

Construction and implementation of the proposed WWTF and associated water treatment improvements are anticipated to benefit the habitats associated with these floodplains (as described above). However, there is public concern that the proposed WWTF and associated improvements under the Proposed Action would lead to further floodplain development. The

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Monroe County ROGOs are based on hurricane evacuation times, public safety, and environmental needs (including water quality and habitat protection) (Section 4.14). Since the primary limiting factor in these ordinances is hurricane evacuation time, the permit allocation should not change as a direct result of construction of a new WWTF.

The proposed WWTF will provide a means to effectively treat existing wastewater flows, not a means to introduce or support floodplain development. Therefore, if growth and development in the floodplain occur after implementation of either alternative, they are the result of established municipal planning and are not directly related to this proposed wastewater project. Because much of the Florida Keys is in the 100-year floodplain, there are no other practical alternatives for these facilities.

4.5.3 Alternative 3 (Alternative Funding Sources)

Upland Habitats. Affects on upland habitats under this alternative would be similar to those described under the *No Action* alternative until alternative funding is acquired for the proposed WWTF and associated infrastructure. Once alternative funding sources are available and the proposed wastewater improvement project is implemented, the benefits would be similar to those described under the *Proposed Action*.

Estuarine and Freshwater Wetland Habitats. Adverse impacts to wetlands under this alternative would be the same as those described under the *No Action* alternative until alternative funding is acquired and the wastewater improvement project is implemented. The delay in implementation would allow continued wetland habitat degradation with potential adverse effects as described under the *No Action* alternative. Once the proposed wastewater improvement project is implemented, the benefits would be similar to those described under the *Proposed Action*.

Marine and Benthic Habitats. Adverse impacts to marine habitats under this alternative would be the same as those described under the *No Action* alternative until the proposed wastewater improvement project is implemented with alternative funding sources. The time delay would allow continued marine habitat degradation with potential adverse effects as described under the *No Action* alternative. Once alternative funding sources are available and the proposed wastewater improvement project is implemented, the benefits would be similar to those described under the *Proposed Action*.

Coral Reefs. Delayed implementation of the FKWQIP under this alternative would result in continued adverse impacts to water quality in nearshore environments and associated coral reefs. Once alternative funding sources are available and the proposed wastewater improvement project is implemented, the benefits would be similar to those described under the *Proposed Action*.

Floodplains. Under *Alternative Funding Sources*, implementation of the proposed WWTF and associated infrastructure would not occur until alternative funding is acquired. Consequently, water quality degradation in the habitats described above would continue until the proposed wastewater treatment improvements are made and floodplains would be protected under the Monroe County Floodplain Ordinance.

4.6 Protected Species

Existing adverse impacts to protected species and their habitat that have occurred due to nutrient and other pollutant inputs into nearshore waters in the Sanctuary are anticipated to continue under the *No Action* alternative. Minimal adverse impacts to protected species or their habitat may occur under the *Proposed Action* as a result of proposed WWTF and associated infrastructure that would serve the Cudjoe Regional Service Area. However, the long-term benefits of this program would substantially offset the unavoidable impacts to habitat. Consultation with federal, state, and local agencies is an integral part of the planning process for this project.

A majority of the Service Area lies within the fragmented boundaries of the Florida Keys Wildlife Refuges Complex, with the USFWS controlling nearly 38 percent of the total land area. Additionally, the State of Florida and Monroe County control approximately 13 percent and five percent of the total land area with the Service Area, respectively. Consequently, any construction on natural lands could potentially impact a protected species or associated habitat. Protected species in the Service Area include a minimum of 64 federally or state protected plants and animals, as described in section 3.6.2 and 3.6.3. Protected species can be impacted directly through a “take” (actual loss of an organism) or loss of federally designated critical habitat. Indirect impacts would include the loss or degradation of the habitat that the organism requires to sustain its population.

4.6.1 Alternative 1 (*No Action*)

Adverse impacts to protected species are not expected to occur within the Service Area under the *No Action* alternative. However, protected species that rely on or live in nearshore waters of the Sanctuary adjacent to the Service Area may be adversely affected as a result of continued discharges of untreated wastewater into nearshore habitats. As described previously, continued nutrient and other pollutant discharges into local canals and nearshore waters would likely increase the potential for algal blooms, impair water clarity and light penetration, decrease dissolved oxygen, increase the likelihood of fish kills, and encourage macroalgal growth. This would in turn decrease light penetration and adversely affect benthic habitats and those protected species using them.

4.6.2 Alternative 2 (*Proposed Action*)

Under the *Proposed Action*, beneficial and minimal adverse impacts (if any) to protected species are anticipated due to the construction and implementation of the proposed wastewater improvement project. The WWTF within the Service Area is proposed to be built on developed land. Reductions in nutrients, contaminants, and other pollutants would improve water quality and result in commensurate improvements in habitat in the nearshore waters surrounding the Service Area. These improvements would directly benefit the health and status of protected species in these nearshore habitats.

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Among the species of wildlife that would benefit under the *Proposed Action* are numerous state listed piscivorous birds and the manatee. The long-term benefits of the proposed water quality improvements would substantially offset the unavoidable impacts to habitat.

There is the potential for adverse impacts to occur, but are not anticipated as a result of construction of the proposed WWTF and associated infrastructure. Based on FNAI database records, 64 protected species may occur within the Cudjoe Regional Service Area. Adverse impacts to these species could potentially occur as a result of the *Proposed Action*. However, construction for the WWTF and associated infrastructure will be aligned within existing ROW corridors and, consequently, impacts to protected species from the proposed wastewater infrastructure will be avoided and/or minimized.

Coordination with the appropriate local, state, and federal agencies will occur for this project. Compliance with USFWS recommendations for avoiding areas of tropical hardwood hammock, pine rocklands, buttonwood grasslands, mangrove habitats, or freshwater marshes would also occur.

Any action by the FCAA that results in the loss of natural areas has the potential to impact protected species due to the few remaining natural areas in the Florida Keys. Biological surveys for the proposed WWTF will be conducted prior to project initiation to provide observational field data.

Construction activities are limited to terrestrial areas resulting in no adverse impacts to marine resources. Consequently, it has been determined there would be no affect to federally listed threatened or endangered species or critical habitat under the jurisdiction of NMFS.

4.6.3 Alternative 3 (*Alternative Funding Sources*)

Under *Alternative Funding Sources*, nutrient and other pollutant discharges into local canals and nearshore waters, as described under the *No Action* alternative, would continue until alternative funding sources are available and water quality improvements are implemented. With the delay in implementation, the discharge of untreated wastewater and associated water quality degradation in nearshore waters of the Cudjoe Regional Service Area and the Sanctuary would continue. The affects on protected species would be similar to those described in the *No Action* alternative. However, once the proposed wastewater project is implemented with funds from alternative sources, the benefits to protected species would be similar to those described under the *Proposed Action*.

4.7 Essential Fish Habitat

The MSA requires federal agency consultation with the NMFS on activities that may adversely affect EFH. Informal consultation was initiated as part of the preparation effort of the PEIS (Section 3.7) and several relevant species and associated habitats were identified.

4.7.1 Alternative 1 (*No Action*)

Until the wastewater improvement projects are implemented, adverse impacts to nearshore waters and dependant fisheries would continue as described under the *No Action* alternative.

4.7.2 Alternative 2 (*Proposed Action*)

Under the *Proposed Action*, beneficial and minimal adverse impacts (if any) to EFH are anticipated due to the construction and implementation of the proposed wastewater improvement project. The WWTF is proposed to be built on developed land. Reductions in nutrients, contaminants, and other pollutants would improve water quality and result in commensurate improvements in habitat in the nearshore waters surrounding the Service Area. These improvements would directly benefit the health and status of EFH in these nearshore waters.

4.7.3 Alternative 3 (*Alternative Funding Sources*)

Under *Alternative Funding Sources*, nutrients and other pollutant discharges into local canals and nearshore waters, as described under the *No Action* alternative, would continue until alternative funding sources are available and water quality improvements are implemented. With the delay in implementation, the discharge of untreated wastewater and associated water quality degradation in nearshore waters of the Service Area and the Sanctuary would continue. However, once the proposed wastewater project is implemented with funds from alternative sources, the benefits to EFH would be similar to those described under the *Proposed Action*.

4.8 Air Quality and Noise

Air quality and noise impacts resulting from the construction and operation of the facilities proposed for the FKWQIP would not differ from any other typical WWTF and associated infrastructure. The operation and maintenance of these facilities would have less impact than the construction.

4.8.1 Alternative 1 (*No Action*)

No additional impacts to air quality or noise levels would occur as a result of implementing the *No Action* alternative. Under this alternative, conditions would continue as described for the affected environment.

4.8.2 Alternative 2 (*Proposed Action*)

Air Quality. The construction of the new WWTF would result in minor, temporary impacts to the air quality in the vicinity of construction sites. The operation of heavy equipment during construction may result in minor, temporary adverse impacts to local air quality from heavy equipment engine exhaust. In addition, heavy equipment operation during construction can also result in windblown dust and particles. Dust can be minimized by adding moisture to the soil, mulching, and landscaping soon after construction completion. The *Proposed Action* consists of the construction of the WWTF and collection system. The schedule for construction would be

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dependent upon available funding. Operation of the facilities would also produce minor, long-term impacts and mitigation would consist of odor abatement measures integrated into the design of the facility. Monroe County is an air quality attainment area. Consequently, anticipated air emissions from construction activities are minimal.

Noise. The construction of the new WWTF would result in temporary noise impacts to land uses in the vicinity of the construction sites. Heavy equipment operation and heavy trucks accessing construction sites would add additional noise to the ambient noise levels described in Section 3.8 of this Draft EA. Operation of the facilities would also produce minor, long-term impacts and mitigation would consist of the noise abatement measures appropriated for the WWTF or each specific pump station.

4.8.3 Alternative 3 (*Alternative Funding Sources*)

Air Quality. Under the Alternative Funding Sources, impacts would be similar to the *Proposed Action*. However, impacts would be staggered (construction activities would occur at a slower pace, and may be drawn out for an extended period of time).

Noise. Under Alternative Funding Sources, impacts would be similar to the *Proposed Action*. However, potential impacts would be staggered (construction activities would occur at a slower pace, and may be drawn out for an extended period of time).

4.9 Cultural Resources

The protection of cultural, archaeological, and historical resources in the Florida Keys is described in the PEIS (Section 3.9). Major federal laws protecting cultural resources include the NHPA, ARPA, NAGPRA, and the AIRFA of 1978. Section 106 of the NHPA requires federal agencies to consider the affects of the *Proposed Action* on identified and potentially present cultural resources. In addition, the SHPO, Tribal Historic Preservation Office, and the ACHP would review and comment on a *Proposed Action*.

4.9.1 Alternative 1 (*No Action*)

Under this alternative, impacts to historic, archaeological, and cultural resources would only occur as described for the existing environment in *Chapter 3, Affected Environment*. Implementation of projects by individual residents or businesses may disturb buried and undocumented historical resources. Those individuals or business owners would be responsible for compliance with relevant federal, state, and local regulations.

4.9.2 Alternative 2 (*Proposed Action*)

To ensure the protection of archaeological or historical resources, construction activities in close proximity of documented occurrences of cultural and historical resources would be supervised by a qualified archeologist who meets criteria set forth in the Secretary of the Interior's Standards and Guidelines for Archaeology and Historic Preservation and 36 CFR. Appropriate steps would

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be taken in accordance with applicable federal and state laws and the procedures recommended by the SHPO during construction in potentially sensitive area.

No significant archaeological or historic resources or known archaeological or historic sites occur on or adjacent to the proposed WWTF location. The wastewater collection would be constructed within developed, public ROWs which are not anticipated to contain any significant archaeological sites. If historic or archaeological items are found during project work, all activities on the site would be terminated and consultation with the Corps, SHPO, and other appropriate agencies would occur to identify actions necessary to comply with NHPA Section 106 and other applicable requirements. If human remains are discovered, the Florida unmarked human burial law (F.S. Title XLVI 872.05 Unmarked Human Burials) would be implemented.

4.9.3 Alternative 3 (*Alternative Funding Sources*)

Under this alternative, the proposed WWTF and associated infrastructure would not be constructed and implemented until alternative funding is acquired. If funding is obtained through non-federal entities to comply with Florida Statutory Treatment Standards, compliance with Section 106 of the NNHPA would not be required. Once FKAA secures funding and the project proceeds, affects on cultural resources would be similar to those described under the *Proposed Action*.

4.10 Demographics and Socioeconomics

4.11 Recreation

The 2.2 million annual visitors to the Florida Keys provide the basis of the tourism industry on which the economy relies. Tourism is based on clean water and beaches as well as the abundant fish and wildlife that characterize this popular vacation destination. Consequently, potential impacts of the proposed project on recreation amenities are examined below.

4.11.1 Alternative 1 (*No Action*)

Under the *No Action* alternative, a decline in recreation opportunities would be expected as inadequately treated wastewater discharges to nearshore waters of the Sanctuary and subsequent water quality impacts continue, as described in *Chapter 3, Affected Environment*. Anticipated adverse impacts include additional beach advisories and closings and, potentially, further damage to coral reefs.

4.11.2 Alternative 2 (*Proposed Action*)

Most of the outdoor recreation in Monroe County (and the Service Area) relates directly to marine resources. Implementation of the Proposed Action would decrease loadings of nutrients and other pollutants into nearshore waters, improve water quality, and subsequently, benefit recreation resources. Improvements in nearshore water quality, combined with fewer incidences of beach advisories and closings, would increase recreation opportunities as well as the perception of these opportunities, thereby improving the local economy in the Service Area.

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Construction activities associated with completing the proposed project would result in minor, temporary impacts to recreation activities. Discontinuing use of septic tanks and cesspools and construction of the WWTFs and infrastructure would result in temporary traffic delays and construction disturbances (e.g. staging sites, equipment). All of these construction related impacts would be temporary and minor, and state parks and other recreation areas would remain open during these activities. Reducing nuisance odors (by discontinuing use of septic tanks and cesspools) in Lower Keys would enhance the recreation opportunities as well.

4.11.3 Alternative 3 (*Alternative Funding Sources*)

Under Alternative Funding Sources, delayed implementation of the proposed project would delay improvements in nearshore water quality, beach health and recreational opportunities in the Service Area described under the *Proposed Action*. The eventual benefits would be significant because of the importance of the marine environment to recreation in the Keys. Construction related impacts would also occur over an extended period of time under this alternative.

4.12 Open Space and Aesthetic Resources

Visitors to the Florida Keys enjoy a unique sightseeing experience over the miles of U.S. Highway 1 that link the numerous islands across open water. Water quality is important to the maintenance of healthy ecosystems and the open spaces of the Keys and the Cudjoe Regional Service Area.

4.12.1 Alternative 1 (*No Action*)

Under the *No Action* alternative, wastewater treatment would continue to rely primarily on individual treatment systems and no impacts to aesthetic resources beyond those described in *Chapter 3, Affected Environment* are anticipated. Nuisance odors and views associated with increased algal blooms and fish kills caused by continued nutrient loading from wastewater discharges would continue.

4.12.2 Alternative 2 (*Proposed Action*)

The proposed WWTF will be constructed on approximately 3 acres of a larger 10.2 acre parcel and is located on Cudjoe Key at the decommissioned landfill owned by Monroe County. Impacts to the open space and aesthetic resources would be minimal under the *Proposed Action*. The construction of a WWTF would be beneficial to the Cudjoe Regional Service Area by reducing the water quality degradation of the nearshore waters of the Marine Sanctuary.

4.12.3 Alternative 3 (*Alternative Funding Sources*)

Under *Alternative Funding Sources*, benefits to open space and aesthetic resources would be delayed until alternative funding is acquired and wastewater improvement projects could be implemented. However, once projects are implemented, benefits would be similar to those under

the *Proposed Action*, albeit at a slower pace. Nuisance odors and sights due to algal blooms and fish kills would be reduced over time.

4.13 Environmental Justice

As required by EO 12898, this section focuses on potential impacts to minority and low income residents as they relate to environmental justice (see *Section 3.13* for a description of federal requirements). Impacts to minority and low income populations that may occur as a result of the proposed alternatives include:

- Siting of wastewater and stormwater improvements, especially treatment facilities, in minority or low income neighborhoods.
- Increase costs for wastewater management services in the form of sewer charges and property taxes that disproportionately impact low income residents.
- Abandonment fees for outdated onsite treatment facilities.

Under both State of Florida statutes and Monroe County ordinances, residents of the Florida Keys are required to replace existing cesspools and failing septic tanks with adequate wastewater treatment facilities. The financial impact to residents for these improvements would be uniformly applied in accordance with Monroe County Codes and Tax Structure.

4.13.1 Alternative 1 (*No Action*)

Under the *No Action* alternative, residents would make wastewater improvements in the form of on-site treatment systems sufficient to meet the county 2015 wastewater treatment requirements. Estimated costs for these on-site treatment systems ranges from \$18,000 to \$22,000 per household, and monthly costs range from \$63 to \$118 (FEMA 2002). Due to a lack of discretionary income, low income and fixed income residents would be adversely impacted by these costs. Residents who comply with the 2015 requirements by meeting interim requirements would partially offset the costs of implementing the *Proposed Action* alternative.

4.13.2 Alternative 2 (*Proposed Action*)

The *Proposed Action* would impose an adverse economic impact on residents of the Cudjoe Service Area, particularly on lower income residents. While facility siting is not considered an environmental justice issue under the *Proposed Action*, the increased costs to lower income residents under the *Proposed Action* does constitute a potential environmental justice issue.

The implementation schedule for the proposed wastewater improvement project is accelerated in comparison with the Alternative Funding Sources alternative (below) and would therefore eliminate the need to install costly interim treatment facilities and allow residents to connect directly to a central sewer system. Once the proposed facility is completed, residents would be connected to the new facility over an anticipated two to three year period of time. The potential to reduce, or address, the financial impact imposed on residents to replace cesspools and any other substandard wastewater management system could benefit all residents, regardless of income.

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Under the Proposed Action alternative, residents and businesses in the Cudjoe Regional Service Area would be subject to higher utility costs in comparison with the No Action alternative. Without subsidies residents and businesses connecting to the central wastewater system would incur a system development charge as high as \$15,000 to \$20,000 per residence or EDU in addition to a connection cost that could cost as much as \$5,000 per residence. Finally, the approximately recurring service cost could be as high as \$60 per month per residential unit. While this cost is generally comparable to that for an OWTS, the initial costs to residents and businesses would be significantly greater.

The system development costs and cost of connecting to the wastewater transmission system would be an especially difficult financial burden for lower income residents in the Lower Keys regardless of whether the cost is evaluated alone or compared with OWTS costs. This is an important consideration, even though the residents of the Lower Keys enjoy a median household income greater than that of Monroe County as a whole and considerably higher than the State of Florida. While the median household income in the Service Area is relatively high, about seven percent of the residents live below the poverty line. This percentage may actually be larger given that the cost of living in Monroe County is higher than ten percent higher than that of the state.

The Service Area has a proportion of residents over the age of 65 comparable to the county and the state. This segment of the population often lives on fixed income and, while their income may not be below the poverty level, they are more affected by cost of living changes. These factors suggest that while the majority of the residents are financially secure, there is considerable disparity in wealth and income among residents, raising potential environmental justice concerns. Three potential approaches that the FKAA may use to address this issue are presented below, as previously outlined in the PEIS.

Subsidize Initial Connection Costs. With other central wastewater systems previously constructed in the Florida Keys, lower income residents have received subsidies, mainly from two sources: Community Development Block Grants (CDBGs) and the FEMA. For certain projects, Monroe County made CDBG funds available to help defray the combined cost of service development fees and connecting residences to the wastewater transmission system (Mark Bell 2004). These subsidies have been in the range of \$5300 per qualifying resident. For projects receiving funding from FEMA, grant funds have themselves been used to subsidize residents' initial costs, and utility systems have pursued other funds, such as general fund revenues, to provide the remaining system development costs. Presently, the only known funding source is the federal government through the Corps. No CDBG funding is currently available.

Subsidize Cost of Sewer Service. While the *Proposed Action* alternative will not have a significant net impact on recurring charges for wastewater services, lower income residents will be faced with a major financial burden from those charges regardless of whether they are incurred for on-site treatment facilities or the central facilities developed under the *Proposed Action* alternative. The only known source of funding for subsidizing those costs is Monroe County general fund revenues. Such funding would probably not be practical over an extended period of time, however.

Implement an Increasing Block Rate Structure. Generally viewed as another form of subsidy, a graduated rate structure can also provide water conservation benefits when it is based on metered water use. A rate structure that provides a lifeline sewer bill would include a lower base charge and volume charge for the first 3,000 gallons, for example, of water use per month, with an increasing charge for more water use. Such a rate structure links sewer charges to metered water use, a common method for charging for sewer services. This type of rate structure has several drawbacks. First, it runs counter to the prevailing practice of charging on the basis of the cost of service. Under most conditions, the cost of providing sewer service is relatively fixed, especially in an older system with significant amounts of inflow and infiltration, so a cost of service based rate normally has a high base charge and flat volume charge. Second, a low base charge and low charge for the first two or three thousand gallons of water use places the sewer utility at financial risk because its revenue is tied to water use by larger customers. Any significant reduction in water use has a magnified affect on sewer utility revenues and, equally important, the very factors that lead to a decline in water use often cause increased wastewater management expenses. Third, higher rates for larger water users are arbitrary and discriminatory, with no basis other than providing a subsidy for low volume customers. Finally, such a rate structure subsidizes all low volume water customers, regardless of ability to pay.

4.13.3 Alternative 3 (*Alternative Funding Sources*)

With delayed implementation of central wastewater systems, *Alternative Funding Sources* alternative would result in many of the same impacts described for the *No Action* alternative, albeit more slowly. However, similar to the *No Action* alternative, any such impacts would not be related to the proposed federal action.

4.14 Land Use and Planning

The *Proposed Action* directly addresses the Monroe County Year 2010 Comprehensive Plan mandated reductions in nutrient loadings to the marine ecosystem, and EO 98-309, which directed local and state agencies to coordinate with Monroe County in the implementation of the Year 2010 Comprehensive Plan to eliminate cesspools, failing septic systems, and other substandard on-site sewage systems.

4.14.1 Alternative 1 (*No Action*)

Land use and planning in the Service Area would continue as described in *Chapter 3, Affected Environment*. The absence of federal funding for implementation of improved wastewater treatment infrastructure under the *No Action* alternative is not anticipated to impact existing land uses. However, planned future land use development would be limited under the *No Action* alternative. Without wastewater treatment improvement projects, the Lower Keys risks non-compliance with EO 98-309 and the Year 2010 Comprehensive Plan. In turn, noncompliance with these plans could jeopardize the allocation of credits for new development.

4.14.2 Alternative 2 (*Proposed Action*)

No adverse impacts to land use are anticipated under the *Proposed Action*. The proposed WWTF parcel is designated on the FLUM as public facilities (**Figure 3-6**).

The proposed project is consistent with the Monroe County ROGOs developed to control growth and maintain a high standard of living while protecting remaining natural resources. Although the proposed WWTF would support and facilitate planned growth, it would not induce growth, increase permit allocations, or facilitate floodplain development beyond that which is already planned. While county ROGO considerations include public safety and environmental needs (including water quality and habitat protection), the primary limiting factor in the ROGO is hurricane evacuation time. Consequently, the proposed project would not affect permit allocation and associated development in the Service Area.

The proposed WWTF site on Cudjoe Key would be compatible with adjacent land uses, as the adjacent site is a decommissioned landfill. Construction activities would result in minor, temporary impacts to land use (anticipated to last 24 months). Short-term traffic delays as well as general construction disturbances would occur during construction.

4.14.3 Alternative 3 (*Alternative Funding Sources*)

Under *Alternative Funding Sources*, impacts on land use would be similar to those described for the *Proposed Action* once alternative funding is acquired and wastewater improvement projects are implemented. However, potential impacts would occur at a slower pace. Prior to implementation, residents and businesses in the Service Area remain at risk of non-compliance with the 2015 treatment standards.

4.15 Infrastructure

The affects of the *Proposed Action* and other alternatives on transportation and utilities and services in the Lower Keys are discussed in this section.

4.15.1 Alternative 1 (*No Action*)

Under the *No Action* alternative, residents within the Cudjoe Regional Service Area would continue to rely on individual treatment systems (septic tanks and cesspools) and privately owned cluster or package treatment facilities, as described under *Chapter 3, Affected Environment*. Individual property owners and businesses would be responsible for meeting the state or county defined LOS standards. Residents and businesses would risk non-compliance but have no impacts to transportation or infrastructure; or they would implement many smaller projects, which would in turn result in larger numbers of small traffic and infrastructure disruptions.

4.15.2 Alternative 2 (*Proposed Action*)

Transportation. The construction of the new WWTF would result in minor, temporary impacts to traffic in the vicinity of the proposed project due to heavy equipment and trucks accessing the construction site. In addition, the construction of the wastewater collection system could affect traffic patterns. Depending on available ROWs, transmission lines are generally constructed under roadways, and segments of U.S. Highway 1 would be closed during construction. A traffic maintenance plan would be prepared to accommodate residential and business traffic during construction of the WWTF, pump stations, and associated sewer lines.

The operation of the WWTF would result in additional traffic due to workers traveling to the facility site. However, the impacts on the area roadway system of the trips produced by the WWTF would be insignificant.

Utilities and Services. The construction of the centralized WWTF and collection systems would result in minor, temporary impacts to utilities at various locations and times throughout the Service Area. Utility transmission lines are often constructed under roadways or in roadway ROWs. Consequently, it may be necessary to relocate buried transmission lines during construction thus impacts would be localized and short in duration.

4.15.3 Alternative 3 (*Alternative Funding Sources*)

Transportation. Under *Alternative Funding Sources*, impacts would be similar to those described for the *Proposed Action*. Although potential impacts would be delayed while alternative funding is acquired to implement the proposed project, delayed funding could result in a larger number of small projects and therefore greater traffic disruptions.

Utilities and Services. Under *Alternative Funding Sources*, wastewater treatment improvement projects would not be constructed until alternative funding is acquired. Consequently, impacts would be similar to those described for the *Proposed Action* but would be delayed (construction activities would occur at a slower pace, and may be drawn out for an extended period of time).

4.16 Hazardous and Toxic Materials

This section addresses the potential impacts of hazardous and toxic materials relevant to the proposed project. Specifically, known areas of hazardous contamination would be avoided and mitigation necessary should hazardous contamination be encountered and identified.

4.16.1 Alternative 1 (*No Action*)

Without federal funding for the *Proposed Action*, responsibility for implementing wastewater treatment improvement projects would remain with individual property owners and businesses. Disturbance or lands would be limited to individual actions and conditions would continue as described in *Chapter 3, Affected Environment*.

4.16.2 Alternative 2 (*Proposed Action*)

Under the *Proposed Action*, construction and implementation of the proposed WWTF site and the associated transmission lines and pump stations would include soil disturbance, grading, and moving, and may, as a result, uncover or expose hazardous materials. For individual infrastructure improvement projects, the non-federal sponsor would be responsible for investigating the potential presence or extent of a hazardous substance regulated under the CERCLA.

The construction of the proposed WWTF and the infrastructure and normal Operations and Management (O&M) of the treatment facility would not generate hazardous wastes under normal circumstances. Contractors would be required to provide pollution prevention plans and contain any petroleum spills that may occur during construction. If hazardous wastes should enter the system, a monitoring system typically identifies the malfunction and corrective actions are taken to prevent the discharge.

Effluent disposal via shallow well injection would not generate hazardous wastes during the operation of the WWTF, nor would it result in the discharge of hazardous wastes into the groundwater. Treated effluent would be monitored for hazardous material contamination.

4.16.3 Alternative 3 (*Alternative Funding Sources*)

Impacts would be similar to those described under the *No Action* Alternative until the FKAA acquires sufficient alternative funding sources to implement the proposed WWTF. Once the proposed wastewater project is implemented, the impacts would be similar to those described under the *Proposed Action*.

4.17 Predicted Attainment of the Program Objectives

The primary goal of the FKWQIP is to provide federal funding for local municipalities and entities to implement wastewater treatment projects that would result in commensurate water quality improvements in the Sanctuary. The proposed WWTF and associated infrastructure would provide improved wastewater treatment for the Lower Keys and associated Service Area and decrease pollutant loads to local canals and nearshore waters. As a result, water quality improvements in the nearshore waters of the Sanctuary would be anticipated, thereby meeting federal, state and local goals and objectives.

4.18 Predicted Cumulative Impacts

Cumulative impacts are those that “result from the incremental consequences of an action when added to other past and reasonably foreseeable future actions”. The cumulative impacts of an action may be undetectable, but can add to other disturbances and eventually lead to a measurable environmental change.

Potential cumulative impacts of the proposed project are primarily beneficial and should be considered in the spatial and temporal context of the wastewater and stormwater improvement

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projects funded by federal, state, and local source. Multiple wastewater projects in the Keys would be located closely both spatially and temporally and the cumulative impacts of these facilities would be beneficial in terms of improved water quality in the Sanctuary. Improved water quality would in turn enhance marine habitats, and would increase recreation and tourism opportunities.

Due to construction activities, minor cumulative adverse impacts to protected species or protected habitat, terrestrial habitat loss, or both, may occur, depending on the locations of the individual projects. Appropriate measures would be taken to minimize or mitigate for these impacts at the individual project level. Implementation of multiple FKWQIP projects would not have a cumulative environmental justice impact, since each community's financial impact would be limited to its individual project.

While there is an overall trend to balance development and resource protection, development trends continue to pressure South Florida. These trends include increased development within the constraints of ROGOs, transportation corridor widening, and changes in land uses from trailer parks to single family homes and multi-family units. Consequently, this cumulative impacts analysis addresses the affects of the proposed FKWQIP projects in the context of larger trends in South Florida, including the Comprehensive Everglades Restoration Plan (CERP), anticipated development, as well as other wastewater improvement projects. Issues and potential impacts are outlined in **Table 4-2** and described below.

CERP. Importantly, the WWTF and other proposed FKWQIP projects are consistent with the effort of the CERP, and in combination with CERP, would cumulatively benefit the restoration, protection, and preservation of water resources in South Florida. The CERP covers 16 counties in central and South Florida, including the Everglades and the Keys, addresses water quality through the multi-step Everglades Construction Project, and also focuses on species diversity and habitat protection.

Cumulative adverse impacts to water quality and habitat would be greatest under the *No Action* alternative due to the continued discharge of inadequately and untreated wastewater into the shallow aquifer, canals and nearshore waters in the Service Area and in the Keys in general. Under the *No Action* and *Alternative Funding Sources* alternatives, the conservation of relatively larger, contiguous habitats would be unlikely in the absence of regional planning and facilities. In contrast, conservation of sensitive lands would be more likely as part of a regional plan under the *Proposed Action*. Cumulative adverse impacts to water quality would be reduced under the *Proposed Action* as a result of reduced discharges of nutrients, suspended solids, and pathogenic organisms into the aquifer, canals, and nearshore waters of the Keys.

Urban Growth and Development. Cumulative adverse impacts of urban development include increased impervious surface and stormwater runoff and fragmented habitat. Adverse cumulative impacts of wastewater loads, although stormwater runoff and habitat fragmentation are not expected to change as a direct result of the proposed project, would be reduced under the *Proposed Action* and *Alternative Funding Sources* due to improved wastewater treatment.

Although the proposed WWTF, as well as other FKWQIP projects, would support and facilitate planned growth, they would not induce growth and no specific future development activities are

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currently identified that would not proceed without the proposed project. The FKWQIP is consistent with Monroe County ROGOs developed to control growth and maintain a high standard of living while protecting remaining natural resources. ROGOs are based on several conditions, including hurricane evacuation times, public safety, and environmental needs (including water quality and habitat protection). FKWQIP implementation would not increase permit allocations and would not contribute to or support floodplain development beyond that which is already planned. Cumulative adverse impacts to land use and planning in the Keys are not anticipated under any of the alternatives.

Ecological Habitats and Protected Species. Under the *Proposed Action*, beneficial cumulative affects of the proposed wastewater improvement projects on marine biological resources are anticipated due to reduced nutrient and pathogen inputs and subsequent improvement in quality of groundwater, surface water, and nearshore waters, as discussed in Section 3.3 and 3.4 of this Draft EA.

Cultural Resources. Cumulative impacts to cultural resources are not anticipated as a result of the *Proposed Action* because federally funded actions would include coordination and review of projects at the state (SHPO) and local (Monroe County Historic Preservation Society) level. Under the *No Action* alternative, projects would not be reviewed for potential impacts to cultural resources and cumulative impacts to these resources would be anticipated. Potential affects on cultural resources and potential cumulative affects on historic and cultural resources may occur.

Table 4-2 Potential Cumulative Impacts as a Result of the Proposed Wastewater Improvement Projects			
Issue	No Action: No Federal Funding for FKWQIP	Proposed Action: Implementation of FKWQIP	Alternative Funding Sources
Water Quality			
Nutrients	Cumulative increases in nutrient loads to soils, aquifer, canals and nearshore waters that reduce water clarity and may adversely impact offshore coral reefs.	Anticipated nutrient reductions are between 85-88, 79-81 and 77-91 percent in TN, TP and TSS loadings, respectively, using AWT. Post-treatment nutrient levels may pose ecological risks for surface water, but cumulative reductions in nutrients are anticipated.	Cumulative water quality benefits, similar to the <i>Proposed Action</i> , except that there may be delays in improvements until alternative funding is acquired, as well

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Bacteria, viruses, pathogens	Potential long-term and cumulative adverse impacts to human and ecological health in absence of wastewater disinfection and treatment and continued discharges of untreated or inadequately treated effluents.	Cumulative improvements in water quality in soils, canals and nearshore waters, and possibly offshore marine waters anticipated due to combined wastewater and stormwater improvements throughout the Keys as well as the CERP.	as less effective implementation due to fragmented approach.
Metals, organics	Potential release from aquifer matrix and discharge into nearshore environment via SGD due to injected freshwater effluent. However, no tracer studies available for evaluation.	Unknown, but potential release from aquifer matrix due to interaction of injected freshwater effluent with saline aquifer and subsequent discharge into nearshore environment is possible.	
Overall risk to human health	No USDWs, therefore no risk to potable water supplies. However, cumulative adverse impacts to soils, canals and nearshore waters. Potential non-compliance with 2010 treatment standards.	No USDWs present. Also, proper siting, construction and operation restrict fluid movement and physically isolate potential stressors. In all cases, the risk would be further reduced with disinfection and treatment to AWT standards.	
Habitat and Protected Species			
Protected Species	Continued cumulative decrease in habitat for protected species anticipated due to habitat loss and fragmentation, within constraints of county regulations.	Cumulative loss of habitat associated with construction of projects, although minor. Coordination with federal, state and local agencies will ensure avoidance, minimization and mitigation.	Cumulative habitat loss, as in the <i>Proposed Action</i> , but impacts greater when compared with other alternatives due to less centralization, greater habitat fragmentation.
Vegetated Habitat	Continued cumulative loss and fragmentation of vegetation under existing county regulation.	Short-term cumulative reduction in amount of vegetation, however, conservation areas will decrease fragmentation and guard against future losses that may occur, consistent with county regulations.	
Growth and Development Requirements			

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Land Use	Existing land uses may be inconsistent with future conservation areas and may be incompatible with adjacent resource protection efforts.	Cumulative increase in conservation lands, consistent with future land uses. Proposed projects are outside existing conservation areas, therefore adverse impacts to these lands are not anticipated. No cumulative impacts in combination with CERP, Comprehensive Plans.	Cumulative increases in development and impervious surfaces, similar to other alternatives, consistent with ROGO. Multiple projects could result in multiple road closures and subsequent impacts to tourism. Also, adverse impacts more likely due to less coordination with state and federal agencies and larger number of smaller, less centralized facilities and greater disruption of existing or proposed land use plans.
Future development	New development would remain limited by existing ROGOs. Existing residences and businesses would continue to operate without centralized WWTFs. Would not comply with 2010 Treatment Standards.	Consistent with Monroe County ROGO and Floodplain Ordinance. Would facilitate planned growth, but would not induce growth and no specific future development activities are currently identified that would not proceed without the proposed project.	
Water use	No impacts to potable water supplies. Little change in number of EDUs to be treated anticipated.	No impacts to potable water supplies. Changes in land use, e.g. from trailer park to multifamily residential, may change EDU volumes and improve connection/treatment efficiency.	
Cultural resources	No state and federal coordination required and disturbance and/or removal of cultural resources during construction and development activities could occur.	Increased protection due to compliance with state and federal agencies during construction and development activities.	
Tourism Economy			
Recreation	Continued health advisories and beach closings, and subsequent decreases in beach visitors, potential for adverse cumulative impacts to related economy. Loss of recreational opportunities under some scenarios.	Cumulative improvements to tourism and related economy due to reduced numbers of health advisories and beach closings. Improved fisheries. Cumulative affects of strong tourism on the Keys economy would be positive, with a commensurate increase in demand for goods and services.	Similar to Alternative 2, with potential delays until funding is acquired.

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Environmental Justice			
Minority and Low Income	No impacts beyond those presently occurring.	Cumulative water quality improvements would benefit all demographics. Cost may pose economic hardships in some municipalities and, to help local municipalities address low income and fixed income issues, approaches have been proposed to assist with the capital costs associated with 2010 treatment standards compliance. Cost may pose economic hardships in some municipalities.	Overall impacts to employment, income, population and housing would be minor. Short-term construction gains would be greater due to larger number of facilities being constructed.
Economy	Short-term economic gains from construction activities. Long-term gains dependant on intensity of development.	Both short-term and long-term beneficial economic affects would be expected from project construction, although minor.	

4.19 Unavoidable Adverse Environmental Impacts

The Cudjoe Regional WWTF would be constructed on Cudjoe Key, adjacent to Monroe County’s Solid Waste Transfer Station. Fugitive dust from vehicle traffic and earth moving would be unavoidable but temporary and short-term in nature. Temporary disruption of soils is expected from the construction of sewer systems and clearing and grubbing of the WWTF site. Unavoidable adverse environmental impacts may include the loss of the some mangrove habitat, resulting from installation of the transmission may along U.S. Highway 1.

No historic or archeological sites are documented to occur on the proposed WWTF site. The protection of potentially occurring cultural, archaeological, and historical resources is ensured via major federal laws including the NHPA, ARPA, NAGPRA, and AIRFA of 1978. In addition, the SHPO, relevant tribal historic preservation officers, and if necessary, the Advisory Council on Historic Preservation, would review and comment on a *Proposed Action*.

4.20 Indirect Affects

Substantial environmental benefits are anticipated due to indirect affects of the proposed project on physical, human, and biological environments, primarily due to improved water quality in nearshore waters of the Sanctuary. The only identified negative indirect consequence of program implementation is increased potential growth as a result of constructing centralized sewer and wastewater treatment systems. However, a number of local ordinances regulate growth, both for private residences and new businesses. Advocates for property rights are very active in the Keys and support continued growth and development of private property. Changes to the rate of

growth and building permit allocation system are at the discretion of the Monroe County Board of County Commissioners (BOCC) and the FDCA.

4.21 Compatibility with Federal, State and Local Objectives

As a result of declining nearshore water quality in the Keys, a number of federal, state, and local laws and regulations have been implemented to improve wastewater management, monitor water quality, assist in financing water quality improvements, and establish new water quality monitoring standards. In particular, the Monroe County 2010 Comprehensive Plan, as well as Florida EO 98-309 and FAC. 99-395, mandate that nutrient loading levels be reduced in the marine ecosystem of the Keys by the year 2015. Specific actions include eliminating cesspools, failing septic systems, and other substandard on-site sewage systems as well as requiring all wastewater discharge be treated to Florida Statutory Treatment Standards. In response to the mandated water quality improvements, a number of master plans have been prepared by Monroe County and municipalities within Monroe County and these have been compiled into the Master List of Projects provided in Appendix C of the PEIS.

The proposed project is part of the FKWQIP and therefore directly supports federal, state, and local objectives for improvement of water quality in the Keys. The program is a direct result of the Act of 2001 that directed the USEPA and the State of Florida to develop a water quality protection plan for the Sanctuary.

4.22 Conflicts and Controversy

Controversial issues associated with the FKWQIP are the cost of program implementation, the means of recovering initial capital investment, and the means of generating revenues to support maintenance and operational activities. New urban development in the Florida Keys is limited by the ROGO, consequently the number of new users would increase too slowly to share the cost of new and improved wastewater infrastructure. A significant portion of the population in the Keys is classified as low-income and/or fixed income. Many of the typical measures of affordability are based on median family income which does not adequately reflect the abilities of those least able to afford the capital costs associated with the installation of new treatment systems or connecting to a new public sewer system.

Some users may be subject to the cost of immediate replacement of individual systems as well as future sewer connections. Users with cesspools or septic tanks may be required to replace existing systems with an OWNRS before a public sewer system can be made available to their neighborhood. However, once a public sewer system is available, the user would be required to connect to the public system, adding additional costs to the user. Under this scenario, the user would be required to pay for both an OWNRS and for connection to the sewer system.

The disposal of wastewater effluent into the groundwater through injection wells and the potential for groundwater contamination is of concern to the public. Most wastewater in the Service Area remains untreated or inadequately treated. Disinfecting and treating the effluent to AWT standards and disposing of it via shallow injection wells is an acceptable alternative. The

proposed wastewater improvements for the Cudjoe Regional Wastewater System would use shallow well injection.

Average estimated reductions in wastewater loading to nearshore waters in the Keys due to implementation of FKWQIP are on the order of 69 and 73 percent in TN and TP loadings, respectively, using AWT standards. Reductions in TN, TP, and TSS loadings between 85-88, 79-81, and 77-91 percent, respectively, are anticipated for the Service Area as a result of implementing the proposed wastewater improvements.

4.23 Uncertain, Unique, or Unknown Risks

The Act (2001) was passed with an authorization of up to \$100 million to implement the program. To date, however, limited funding has been appropriated for program implementation. Without Congressional appropriation or identification of other funding sources, water quality degradation would continue within the Sanctuary and the Florida Keys would not meet state mandated statutory effluent standards for wastewater treatment systems. Without program implementation, the number of health advisories in beaches and canals in the Keys can be expected to increase. Local municipalities must also identify how they plan to raise the necessary funding to meet the cost requirements (i.e. the 35 percent match required for the non-federal sponsor).

4.24 Energy Commitments and Conservation Potential

Implementation of the *Proposed Action* would result in the expenditure of energy resources to construct treatment facilities, pump stations, and central sewers. These energy resources would include fuel for construction vehicles and equipment. Once the facilities are built and placed into operation, there would be an increase in energy demands to operate the treatment and pump stations. Energy available within the Service Area is adequate to accommodate the minimal increase in energy demand required for the *Proposed Action*. Conservation potential for any of the alternatives would be minimal.

4.25 Relationship between Short-Term Uses and Long-Term Productivity

While water quality improvements in the Sanctuary are anticipated as a result of the proposed project, short-term, or localized, adverse impacts would undoubtedly occur. For example, the construction of centralized sewer systems throughout the Keys would disrupt local traffic conditions. These construction activities would be sequenced to minimize traffic congestion.

4.26 Environmental Commitments

Habitat and protected species surveys have not been conducted on the proposed WWTF sites, but would be conducted prior to implementation of the project. Appropriate measures would be implemented to minimize adverse effects.

4.27 Compliance with Environmental Requirements

This section of the Draft EA addresses compliance with applicable laws and regulations under the *Proposed Action*. All environmental regulatory requirements are being addressed as part of this NEPA documentation, as described in individual sections pertaining to protected species, habitats, wastewater treatment, and other relevant issues.

National Environmental Policy Act of 1969. Early identification of issues was conducted as part of the FKWQIP, of which the Cudjoe Regional wastewater project was a component. Scoping, a Notice of Intent to prepare a draft PEIS, and a draft and final PEIS were all released for the FKWQIP between September 2002 and September 2004.

Environmental information on the Cudjoe Regional WWTF project has been compiled and an EA has been prepared and released for public and agency review. The project is in compliance with the National Environmental Policy Act.

Endangered Species Act of 1973. Coordination with the USFWS under Section 7 of the ESA will occur during the NEPA review of the Draft EA. The Draft EA will constitute the Corps' Biological Assessment and Section 4.6 addresses the affects to threatened and endangered species. Section 7 coordination will be completed prior to construction. Because construction activities are terrestrial and there would be no adverse impacts to marine resources, the Corps has determined there would be no affect to federally-listed threatened or endangered species or critical habitat under the jurisdiction of National Marine Fisheries Service. No further coordination with NMFS is required. The project will be in compliance with the Act.

Fish and Wildlife Coordination Act (FWCA) of 1958. The FKWQIP PEIS has been coordinated with the USFWS and the protection of sensitive ecological resources, federal land resources, protected species and critical habitat have been addressed in Sections 3.5, 3.6, 4.5, and 4.6 of this Draft EA. Coordination under the FWCA will be conducted during the NEPA review of the Draft EA. This project is in full compliance with the Act.

National Historic Preservation Act of 1966 (Inter Alia) (PL 89-665, the Archeology and Historic Preservation Act [PL 93-291] and Executive Order 11593). A review of the Master Site Files was completed for the proposed WWTF site and is addressed in Sections 3.9 and 4.9 of this Draft EA.

Clean Water Act of 1972. All state water quality standards will be met. The project is in compliance with this Act. There are no wetlands on the proposed facility sites therefore, a 404 Permit is not required.

Clean Air Act of 1972. The Service Area is in a Clean Air Act compliance area. No air quality permits would be required for this project. To comply with Section 309 of the Act, this Draft EA will be reviewed by concerned agencies including the USEPA, other stakeholder agencies, and the public.

4.0 Environmental Consequences

Coastal Zone Management Act of 1972. A federal consistency determination in accordance with 15 CFR 930 Subpart C has been included in this Draft EA as Appendix A. The consistency review, delegated to the state of Florida, was performed during the public review of this Draft EA. The state has determined that at this stage, the project is consistent with the Florida CZMP.

Farmland Protection Policy Act of 1981. Implementation of the proposed project would not impact any prime or unique farmland. The proposed project is in compliance with the Act.

Wild and Scenic River Act of 1968. No designated wild and scenic river reaches would be affected by project related activities.

Marine Mammal Protection Act of 1972. No construction work would be conducted in the water. Therefore, project related activities would not result in take as defined by Marine Mammal Protection Act.

Estuary Protection Act of 1968. Implementation of the proposed WWTF and associated infrastructure would decrease or eliminate nutrient and contaminant seepage from cesspools and septic systems within the Service Area and consequently decrease pollutant loadings into adjacent estuarine habitats. This project is in full compliance with the Act.

Fishery Conservation and Management Act of 1976. The proposed project has been coordinated with the National Marine Fisheries Service and is in compliance with the Act.

Submerged Lands Act of 1953. The proposed project would not occur on submerged lands of the State of Florida. This Act is not applicable.

Coastal Barrier Resources Act and Coastal Barrier Improvement Act of 1990. A review of the Coastal Barrier Resource System (CBRS) maps shows that three designated CBRS units lie within the Cudjoe Regional Service Area (FL-50, FL-52 and FL-54). Construction of the proposed central WWTF and all of the infrastructure and transmission lines needed to convey wastewater to the facility will occur outside the boundaries of these CBRS units. However, several decentralized cold spots, located on Summerland Key, Big Torch Key and No Name Key, are within the CBRS units. The project will be in compliance with these Acts.

Rivers and Harbors Act of 1899. The proposed work would not obstruct navigable waters of the United States. The proposed project is in full compliance.

Anadromous Fish Conservation Act. Anadromous fish species would not be affected. The project has been coordinated with the National Marine Fisheries Service and is in compliance with the Act.

Migratory Bird Treaty Act and Migratory Bird Conservation Act. Migratory birds do not currently use the proposed WWTF site and therefore would not be affected by proposed activities. The project is in compliance with these Acts.

Marine Protection, Research and Sanctuaries Act. The term "dumping" as defined in the Act (33 U.S.C. 1402[f]) does not apply to this project. Therefore, the Marine Protection, Research and Sanctuaries Act does not apply to this project.

4.0 Environmental Consequences

Resource Conservation and Recovery Act of 1976. A preliminary records search completed for the Service Area during the preparation of this Draft EA found limited potential for hazardous, toxic or radioactive waste substances to be encountered during implementation of the proposed project. Hazardous waste for this project is addressed under Sections 3.16 and 4.16 of this Draft EA. The project is in compliance.

Toxic Substances Control Act of 1976. No substances regulated under this Act and related laws have been identified in project lands. The project is in compliance.

Magnuson-Stevens Fishery Conservation and Management Act. No adverse affects to Essential Fish Habitat (EFH) are anticipated by implementing the proposed project. Implementation of the proposed WWTFs and associated infrastructure would decrease or eliminate nutrient and contaminant seepage from cesspools and septic systems within the Service Area and consequently decrease pollutant loadings into adjacent marine and estuarine habitats, therefore benefiting EFH. This Draft EA will be coordinated with the NMFS for concurrence. The project is in full coordination of the Act.

E.O. 11990, Protection of Wetlands. There are no wetlands on the proposed WWTF sites. Overall, implementation of the proposed WWTF and associated infrastructure is anticipated to benefit wetland habitat throughout the Service Area by decreasing or eliminating nutrient and contaminant seepage from cesspools and septic systems. This project is in compliance with the goals of this Executive Order.

E.O. 11988, Flood Plain Management. The project has been evaluated in accordance with this Executive Order. This project is in compliance.

E.O. 12898, Environmental Justice. Executive Order 12898 requires the Federal Government to achieve environmental justice by identifying and addressing disproportionately high adverse affects of its activities on minority or low-income populations, and by involving potentially affected minorities in the public coordination process. Environmental justice is specifically addressed in Sections 3.13 and 4.13 of this Draft EA. The project is in compliance with the Executive Order.

E.O. 13089, Coral Reef Protection. This Executive Order applies to coastal projects that might directly or indirectly impact coral reefs. The Executive Order refers to "those species, habitats, and other natural resources associated with coral reefs." This project will not adversely impact coral reefs or coral reef resources and may, in fact, benefit these resources by improved water quality of the nearshore waters adjacent to the Service Area. The project complies with this Executive Order.

E.O. 13112, Invasive Species. Much of the vegetation within the WWTF footprints consists of non-native invasive species, which will be removed within the immediate footprint as a consequence of construction of the impoundment. Construction equipment will use standard measures to avoid the spread of invasive species. This project will not authorize, fund, or carry out any action that might spread or introduce invasive species. Therefore, this project complies with the goals of this Executive Order.

5.0 Public Involvement

The topics of wastewater degradation in the Sanctuary and the need to reduce nutrient loading in the nearshore waters of the Keys are of particular interest to regulatory agencies and citizens alike. For this reason, public participation throughout the previously prepared PEIS included actions by the Corps to accomplish the goals listed below.

- Comply with the intent of NEPA and other applicable statutes
- Solicit and address public and agency opinions during this process
- Document the process and characterize the project accurately

5.1 Public Involvement for Master Plans

As described in Chapter 1, the Corps did not undertake planning activities to delineate alternatives in this Draft EA, but rather relied upon results of planning initiatives of Monroe County municipalities. Thus, it is important to recognize the extensive public outreach and involvement associated with these efforts.

Public involvement was an integral component of the Monroe County wastewater planning process and the development of the MCSWMP. Public involvement activities conducted as part of this master plan included over 30 meetings with key stakeholders and the public, hosted by the FKAA and the county between 1998 and 2000. Public forums in the Upper, Middle, and Lower Keys were held to allow key stakeholders and interested citizens of Monroe County the opportunity to participate in, and influence, the outcome of the Master Plan. Interaction with the public throughout the development process significantly assisted in the development of the contents of the Master Plan. Numerous public involvement efforts were implemented as part of the Master Plan development process and are outlined below.

- Public forums and workshops
- Meetings with civic, business, and environmental groups throughout the Keys
- Preparation and distribution of project fact sheets and brochures
- Media coordination
- Production of two videos
- Development of a project web site

Interested citizens and key stakeholders directly influenced the development of the decision and evaluation processes, identified key issues to be addressed, and defined the elements of the MCSWMP guiding Monroe County to achieve compliance with the Florida Statutory Treatment Standards of 2010. Comments provided by participants generally expressed concerns regarding:

- Implementation costs
- Extent of improved water quality
- Implementation approaches
- Alternative wastewater conveyance/treatment technologies
- Measure of project performance
- County responsiveness to public input

5.2 Public Involvement for PEIS

Applicable regulatory agencies, affected stakeholders, and interested members of the Keys community have been provided opportunities to participate in the decision-making process during the development of this Draft EA. The Notice of Intent (NOI), scoping letter, and the responses to the scoping process can be found in Appendix G of the PEIS. A public meeting was held in Marathon, Florida, on February 27, 2003 to solicit comments and input on issues to be addressed during the NEPA documentation process. Issues raised at this public meeting are listed below.

- Need for federal funding to support wastewater infrastructure development in the Keys
- Engineering and environmental issues associated with specific projects
- Cost of implementing wastewater improvements to residents of the Keys

5.3 Scoping and Public Involvement for Cudjoe Regional EA

On December 8, 2008 and December 11, 2008 public meetings were held in Big Pine Key and Summerland Key, respectively.

Additional means of public outreach are planned following issuance of the Final EA. In accordance with Corps procedures and NEPA public notification requirements, the Final EA will be advertised in local newspapers and made available at local repositories for a 45-day comment period. Public comments submitted to the Corps during this time will be reviewed and addressed, as appropriate.

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6.0 Conclusion

This Draft EA provides the basis for examining and evaluating potential environmental impacts of the proposed Cudjoe Regional Central Wastewater Treatment System on the physical, biological, and human environment in the Sanctuary. Three project alternatives were evaluated as part of this Draft EA, premised on the need to implement water quality improvement projects that would reduce nutrient loadings to nearshore waters and result in commensurate improvements in water quality of the Sanctuary. The three alternatives are briefly summarized below.

- **Alternative 1: No Action.** No federal agency would provide funding to the FKAA for implementation of wastewater treatment improvement projects that would address state mandates to meet wastewater treatment standards. Public entities would not construct or operate WWTFs. Lower Keys residents, communities, and businesses would be responsible for addressing state mandates aimed at improving water quality in the Sanctuary.
- **Alternative 2: Proposed Action.** Provide federal financial and technical assistance from the Corps, as part of the FKWQIP, to develop and implement a regional wastewater collection and treatment system for the Cudjoe Regional Service Area that would address mandatory state wastewater treatment standards.
- **Alternative 3: Pursue Other Sources of Funding for Project Implementation.** In the absence of federal funding, provided by the Corps, alternative funding sources would be pursued to implement projects for the FKAA that would address state mandates and improve water quality in the Sanctuary. Sources of monies may include other state and federal funding mechanisms (other than Corps) and/or additional costs levied against Florida Keys residents.

The preferred alternative, based on an analysis of potential environmental impacts associated with each alternative discussed in detail in Chapter 4, is the *Proposed Action* (Alternative 2), under which a regional WWTF would be constructed to serve the Cudjoe Regional Service Area. The WWTF is designed to reduce nutrient loading to nearshore waters and subsequently improve water quality in the Sanctuary.

Importantly, the Corps' previously developed FKCCS model provided a means of quantifying the affects of wastewater improvement projects, specifically the reductions in nutrient loads, within the Sanctuary. An independent contractor from the team who originally developed the FKCCS model coordinated with and assisted the South Florida Regional Planning Council in running the mode for FKWQIP projects, specifically for Key Largo, Islamorada and Marathon. These similar wastewater districts provided the basis for calculating the anticipated range of nutrient reductions associated with construction of the Cudjoe Regional WWTF. Improved treatment technology is anticipated to reduce TN, TP, and TSS loads by an estimated 85-88, 79-81, and 77-91 percent, respectively. The use of federal funds to assist in the construction of the WWTF is the best means to reduce this nutrient source and protect the Sanctuary.

Most of the residents and businesses within the Cudjoe Regional Service Area are connected to septic tanks and outdated on-site package plants that, if not properly operated, can result in harmful bacteria and nutrient inputs to nearshore waters. Under the *No Action* alternative,

6.0 Conclusion

wastewater inputs and commensurate water quality degradation of the Sanctuary would continue. As a result, businesses, property owners, and residents within the Cudjoe Regional Service Area may risk non-compliance with federal and state regulatory treatment standards for wastewater. Under *Alternative Funding Sources*, federal funding would be unavailable and the FKAA would pursue alternate funding for water quality improvement projects. Consequently, project implementation, management, and expenditures would be less affective.

The *Proposed Action* addressed by this Draft EA is the construction of a centralized wastewater treatment system to service residents and commercial businesses located in the Lower Keys. The proposed WWTF would use a five-stage Bardenpho system capable of meeting the Monroe County effluent standards. This technology is considered appropriate for the Cudjoe Regional Service Area because it is very stable and capable of operating over a range of influent flow rates, which is important in consideration of the Lower Key's seasonal fluctuations in population and tourism. The anticipated plant capacity is less than one MGD, so the WWTF will use shallow well injection for effluent disposal. The *Proposed Action* is anticipated to accomplish the following goals and objectives.

- Meet objectives of the Florida Keys Water Quality Improvements Act;
- Address regional water quality issues;
- Achieve reductions in nutrient loadings and commensurate improvement in water quality in the nearshore waters of the Sanctuary associated with the Cudjoe Regional Service Area; and
- Comply with federal and state regulatory water quality treatment standards in a timely manner.

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Appendix

Alfisols. A class of soils that have light colored surface horizons, low organic matter content and loamy subsoil horizons, with moderate to high base saturation. They occur throughout the physiographic provinces in the south Florida ecosystem.

Aquifer. An underground layer of water-bearing permeable rock or unconsolidated materials (gravel, sand, silt, or clay) from which groundwater can be usefully extracted using a water well.

Brackish Water. Water that has more salinity than fresh water, but not as much as seawater. It may result from mixing of seawater with fresh water, as in estuaries, or it may occur in brackish fossil aquifers. Brackish water contains between 0.5 and 30 grams of salt per liter—more often expressed as 0.5 to 30 parts per thousand (ppt or ‰).

Caliche. A sedimentary rock, a hardened deposit of calcium carbonate. This calcium carbonate cements together other materials, including gravel, sand, clay, and silt.

Category I Pest. Plant or animal species that alter native plant communities by displacing native species, changing community structures or ecological functions, or hybridizing with natives.

Central and Southern Florida (C&SF) Project. A multi-purpose project authorized by Congress in 1948, that provides flood control, water supply for municipal, industrial and agricultural uses, prevention of saltwater intrusion, water supply for Everglades National Park, and protection of fish and wildlife resources. The primary system includes approximately 1,000 miles of levees, 720 miles of canals and approximately 200 water control structures.

Class I Deep Injection Well. The first of five well classifications developed by the U.S. Environmental Protection Agency under their underground disposal control program to categorize the injection of various types of liquid wastes. Class I wells are typically used by hazardous waste generators and operators, as well as industrial and municipal disposal systems, to inject fluids into a geologic formation that is beneath the lower-most formation containing an underground source of drinking water within one quarter mile of the well bore. A Class I Well must meet siting, construction, operation, and maintenance criteria specific to this well class, as established by the U.S. Environmental Protection Agency and the Florida State regulating agency.

Comprehensive Everglades Restoration Plan (CERP). Plan developed to modify the Central and Southern Florida Project. The Plan was approved in the Water Resources Development Act (WRDA) of 2000. It includes more than 60 elements and will take more than 30 years to construct. The goal of CERP is to capture fresh water that now flows unused to the ocean and the gulf and redirect it to areas that need it most. The majority of the water will be devoted to environmental restoration. The remaining water will benefit cities and farmers by enhancing water supplies for the south Florida economy.

Degasified. To remove dissolved gases from water, or other liquid.

Demineralized. To remove dissolved mineral salts from water, or other liquid.

Desalination. The process of removing dissolved salt and other minerals from seawater to create freshwater.

Endangered [species]. A plant or animal that is in danger of becoming extinct through loss of habitat, habitat degradation, over hunting or harvesting, or other reasons. In the United States, animals and plants are added to the Endangered Species List by the Fish and Wildlife Service, part to the Department of Interior (DOI).

Endemic [species]. A plant or animal that is found exclusively in a particular area, and are naturally not found anywhere else.

Entisols. A class of soils that have a minor or undeveloped soil profile. Entisols are found in nearly all of the physiographic provinces in the south Florida ecosystem.

Environmental Assessment (EA). A study of land to determine any unique environmental attributes, considering everything from endangered species to existing hazardous waste to historical significance. Depending on the findings of an EA, and Environmental Impact Statement (EIS) may or may not be needed.

Essential Fish Habitat (EFH). Waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity (Magnuson-Stevens Act, 16 U.S.C. 1801 et seq).

Herbaceous. A plant that has leaves and stems that die down at the end of the growing season to the soil level. They have no persistent woody stem above ground. A herbaceous plant may be annual, biennial or perennial. Annual herbaceous plants die completely at the end of the growing season or when they have flowered and fruited, and they then grow again from seed.

Histosols. A class of soils that are dominantly organic, consisting of peat and muck deposits of varying thickness over sand, marl, or limestone. These soils usually are found in swamps, mangroves, and fresh and saltwater marsh environments. They are less frequently found in rockland areas.

Lower East Coast (LEC) Water Supply Plan. Plan developed by the South Florida Water Management District (SFWMD) to meet future water demands of urban and agricultural uses, while meeting the needs of the environment. The process identified areas where historically used sources of water will not be adequate to meet future demands, and evaluates several water source options to meet those demands.

Natural Forest Community. All stands of trees, including their associated understory, which were designated as Natural Forest Communities on the Miami-Dade County Natural Forest Community Maps and approved by the BOCC, pursuant to Resolution No. R-176-84.

National Environmental Policy Act (NEPA). A Congressional act established in 1969 that directs all federal agencies to consider the environmental effects of their programs, projects, and funding decisions. NEPA considers the effects on all resources of natural and built environments and includes compliance requirements with all other applicable federal laws, such as the Endangered Species Act and the Environmental Justice Executive Order.

Oolitic Facies. A formation of rocks consisting mostly of small, spherical calcium carbonate grains.

Phsiography. Physical geography.

Pine Rocklands. A plant community unique to southern Florida and the Bahamas. In Florida they are found on limestone substrates on the Miami Rock Ridge, in the Florida Keys, and in the Big Cypress Swamp. Pine rocklands are dominated by a single canopy tree, South Florida slash pine (*Pinus elliottii* var. *densa*), a diverse hardwood and palm subcanopy, and a very rich herbaceous layer. The flora of pine rocklands is composed of a diverse assemblage of tropical and temperate taxa.

Programmatic Environmental Impact Statement (PEIS). A concise public document prepared pursuant to NEPA. It contains sufficient analysis to determine the likely significance of a group of similar *Proposed Actions* (projects) and alternatives' impacts, to aid decision making. A project- and site-specific affects evaluation document supplements the PEIS, generically called a Supplemental NEPA documentation.

Reverse Osmosis (RO). A method of obtaining pure water from water containing a salt, as in desalination. Pure water and the salt water are separated by a semi permeable membrane and the pressure of the salt water is raised above the osmotic pressure, causing water from the brine to pass through the membrane into the pure water.

Reverse Osmosis (RO) Concentrate. Brine solution that has not passed through the semi permeable membrane.

Reverse Osmosis (RO) Permeate. Freshwater that has passed through the semi permeable membrane.

Saltwater Intrusion. The migration of saltwater into freshwater, resulting when water is withdrawn from an aquifer system at a rate that exceeds its recharge capacity

Siliciclastic. Non-carbonate rocks that are almost exclusively silica-bearing, either as forms of quartz or other silicate minerals, and are formed by inorganic processes, or deposited through some mechanical process, such as stream deposits that are subsequently lithified.

Spodosols. A class of soils characterized by a spodic horizon, a zone where organic matter combined with aluminum and/or iron has accumulated due to downward leaching. These soils usually are associated with flatwoods and dry prairies, sandhill and sand pine scrub, mixed hardwood forests, swamps, marshes, and infrequently in salt marsh and mangrove ecosystems.

Total Dissolved Solids (TDS). A measure of the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular suspended form.

Transmissivity. The rate at which limestone allows the transmission of water into an aquifer system.

