APPENDIX G
ECONOMIC AND SOCIAL CONSIDERATIONS

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G.0 APPENDIX G

G.1 ECONOMIC AND SOCIAL CONSIDERATIONS

G.1.1 Introduction

The C-111 Spreader Canal (C-111 SC) Western project's Recommended Plan is an integral component of the south Florida ecosystem improvement efforts that together make up the overall Comprehensive Everglades Restoration Plan (CERP). This appendix presents the socio-economic issues related to the C-111 SC Western project implementation.

The primary effects of the project are the costs of implementation (National Economic Development [NED] cost), and the environmental benefits (i.e. ecosystem restoration and improvements). These costs and benefits are incorporated into a Cost Effectiveness/Incremental Cost Analysis (CE/ICA) which is a main tool used in the socio-economic evaluation of an environmental restoration project.
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The primary effects of the project include the costs of implementation as well as the ecosystem restoration and improvement benefits. Project implementation costs are monetarily expressed in terms of the net national project cost (NED costs). Project costs have regional impacts as expenditures on the project within the regional economy that could cause changes in local and regional earnings, sales, and employment. While the costs of implementation are expressed in traditional monetary terms, ecosystem improvement, the most significant beneficial effect of the project is not expressed in monetary terms. Ecosystem improvement is expressed in terms of National Ecosystem Restoration benefits in accordance with U.S. Army Corps of Engineers (USACE) policy. For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the federal objective shall be selected.

The potential economic impacts of the alternative restoration plans are secondary consequences of the environmental improvements and hydrologic changes that are expected to result from the proposed structural and operational modifications to the project study area. These projected impacts are contingent upon the successful implementation and operation of restoration plans and subsequent outputs and therefore, subject to the uncertainties inherent in ecosystem restoration activities. Due to the challenges inherent in quantifying National Ecosystem Restoration (NER) effects or benefits, quantifying the resulting NED impact is also a challenge. Nonetheless, there are methods for evaluating the economic efficiencies of producing these alternative restoration plans.

In order to evaluate the economic efficiencies of the span of project alternatives, an analysis of the NED costs and NER benefits of each alternative is undertaken.

Specifically, a CE/ICA is utilized to determine the alternatives that provided the least unit cost per unit of benefits.

This appendix is responsible for considering a variety of social conditions relevant to the project. These social conditions are intricately interconnected with the economics of the project. They include elements such as population, water demand, recreation, environmental justice, and a variety of other considerations.

G.1.2 Elements of the Socio-economic Investigation

This investigation assesses the economic effects of the alternative ecosystem restoration plans formulated in the feasibility phase of the C-111 SC Western project. The economic evaluation of the alternative restoration plans includes five principal elements:

G.1.2.1 Socio-economic Profile of the Study Area

This profile includes population and economic forecasts for the region, as well as projections of future water demand.

G.1.2.2 Anticipated Effects of Alternative Plans on the National Economic Development Account

Alternative plans could result in positive or negative effects on net national economic efficiency due to project-induced impacts on the following economic activities in south Florida:

- Agricultural water supply
- Municipal and industrial (M&I) water supply
- Flooding potential
- Recreation
- Commercial and recreational fishing

G.1.2.3 Evaluation of Project Costs

Project costs include all expenditures required to implement the alternative plans. The federal government and the State of Florida would share these costs. C-111 SC Western project costs include those for initial construction; lands; relocations; rights of way; rehabilitation, replacement, and repair; and operations and maintenance (O&M) (including the costs of post-construction monitoring and adaptive management).

G.1.2.4 Regional Economic Development Effects

The potential Regional Economic Development (RED) effects of the Selected Alternative Plan (SAP) include changes in income, employment, or economic output of the region.

G.1.2.5 Other Social Effects

The potential social effects of the SAP include effects on minority, elderly, and disadvantaged groups, population displacement, and effects on community cohesion.

The economic analysis for the C-111 SC Western project was conducted in a manner consistent with Federal Statutes and U.S. Army Corps of Engineers (USACE) policy. Procedures for estimating NED and RED effects are specified in the Economic and Environmental Principles and Guidelines for Water and Related Land Resources Implementation Studies (U.S. Water Resources Council, 10 May 1983), Engineering Regulation (ER) 1105-2-100 (22 April 2000), and other USACE guidance.

The potential economic impacts of the alternative restoration plans are secondary consequences of the environmental improvements and hydrologic changes that are expected to result from the proposed structural and operational modifications to the C-111 SC Western project study area. These projected impacts are contingent upon the successful implementation and operation of restoration plans and subsequent outputs and therefore, subject to the uncertainties inherent in those ecosystem restoration activities. Due to the challenges inherent in quantifying NER benefits, quantifying the resulting NED benefit is also a challenge. Nonetheless, there are methods for evaluating the economic efficiencies of alternative restoration plans.

G.1.3 Methodology

A number of factors were considered prior to developing the methodologies used to evaluate the economic effects of the alternative restoration plans. These factors include: available analytical tools, economic theory, federal policy, obtainable data, and time and budgetary constraints. These factors are discussed below.

G.1.3.1 Without-Plan and With-Plan Conditions

Proper definition of the without-plan and with-plan conditions is critical to the planning process. The without-plan condition is the most likely condition expected to exist in the future in the absence of a proposed project. The future without plan condition is the benchmark against which alternative future with-plans are evaluated. National and regional socio-economic parameters considered include income, employment, population and other aggregate projections such as land use trends, water supply and water demand. Comparisons of conditions with the

implementation of alternative plans to future without-plan conditions were performed to identify the beneficial and adverse effects of the proposed plans. Depending on the alternative and the type of economic impact changes resulting from implementation of a restoration plan, it may be desirable or undesirable when compared to the future without-plan condition. For example, alternatives that include modifications to the current system to provide additional water storage areas may result in fewer economic losses associated with agricultural (irrigation) water shortages. This would be a desirable ancillary benefit of restoration.

G.1.3.2 Economic Analysis Methodology

Consistent with USACE guidance, neither a traditional benefit-cost ratio nor a net NED analysis is required for NER plans. For ecosystem restoration projects, a plan that reasonably maximizes ecosystem restoration benefits compared to costs, consistent with the federal objective shall be selected. The methodologies used to conduct economic analysis studies for the project were based on a combination of factors, including: economic theory, USACE's ecosystem restoration and economic evaluation policies, and the characteristics of methodologies used by economists to value ecosystem benefits. For this study, the alternative restoration plans were compared using information in monetary and non-monetary units. The economic analysis of the C-111 SC alternative restoration plans include: (1) the NED costs (in monetary terms), (2) the anticipated environmental benefits resulting from restoration measures (in non-monetary terms), (3) the NED benefits and impacts attributable to the following: agricultural water supply, municipal and industrial (M&I) water supply, commercial navigation, recreation, and commercial fishing (in monetary and non-monetary terms) and (4) the positive and adverse regional economic effects (RED) and social effects resulting from project implementation.

This section of the report addresses the above items. The economic basis for making policy decisions about whether to invest public funds in ecosystem restoration for the C-111 SC Western project is comparing monetary costs and non-monetary benefits in order to determine whether the expenditure is justified and to select the plan which minimizes the cost of obtaining ecosystem benefits. The costs of ecosystem restoration projects include: initial construction costs; major rehabilitation and repair costs; O&M costs; post construction monitoring costs; and adverse NED effects. Typically, these costs can be expressed in monetary (i.e., dollar) terms.

The principal challenge of ecosystem restoration economics is estimating the value of restoration benefits. The primary purpose of each alternative plan is ecosystem restoration. The benefits of ecosystem restoration are usually expressed by ecologists in non-monetary units, such as acres of specific habitat created, indices of biological productivity associated with habitat improvement, or increased abundance and/or diversity of particular species of plants or animals. For decision-making purposes, it would be desirable to express ecosystem restoration

benefits in monetary terms, in order to compare them with project costs. Expressing the costs and benefits of alternatives in a common, monetary metric would facilitate selection of the best restoration plan for a given site. However, calculating the monetary value of environmental amenities is both difficult and controversial. Environmental amenities are public goods that are generally not exchanged in the marketplace. For marketable commodities (i.e., items that people buy and sell), the demand and prices paid for these goods can be used as "proxies" for determining their value to consumers. In the absence of data on consumers' expenditures for environmental amenities, resource economists have attempted to develop techniques that can be used to estimate their value using indirect indicators of consumers' "willingness to pay" for ecosystem restoration. For goods and services that are not purchased in the marketplace, non-market valuation approaches must be used to infer their value to the public. There are direct and indirect use values for these goods and services. Use values refer to the value consumers obtain from using a good that is related to an environmental amenity. For example, recreational fishermen obtain direct use value from the freshwater fisheries. The fishermen also obtain indirect use values from the ecosystem, since it provides ecological functions that contribute to the productivity of the fisheries. Use values can be either consumptive or non-consumptive. Consumptive use values refer to the cases for which the good is consumed by the user and is no longer available to others, such as waterfowl hunting. Non-consumptive use values refer to the value obtained by a user in cases for which the good remains to be used by others in the future, such as catch-and-release fishing or bird watching. It is reasonable to expect that the alternative restoration plans will generate additional use values to the public. Non-market activities that would benefit from restoration plans include recreational fishing, subsistence activities, and a variety of eco-tourism related activities (e.g., bird watching, hiking and canoeing).

Non-use values include the values the public obtains from simply knowing that the good or resource is available, even if they have not used it previously. Individuals may value a good simply from knowing it exists (existence value) or because they may want to have the opportunity to use it at some future time (option value). Again, it is reasonable to expect that the alternative restoration plans will generate additional non-use values to the public. The tremendous interest in and support for ecosystem restoration, not just in south Florida but throughout the country (and the world), is an indication that a broad segment of society values the ecosystem, even though most have never experienced the area first hand.

Theoretically, it should be possible to determine the value of restoring the C-111 Basin ecosystem by asking people what they would be willing to pay for different levels and types of restoration projects, or by observing what they spend on ancillary costs (e.g., travel, subsistence, equipment) when they engage in these non-market experiences. Economists have developed a variety of techniques to estimate society's willingness to pay for these types of non-marketable environmental

amenities. These economic valuation techniques include market-based, surrogate market, and non-market methodologies (Freeman, 1993). Market-based approaches estimate the value of environmental resources using information generated in the marketplace. These approaches include changes in factors of production, valuation of complimentary goods and services, defensive expenditures, and market valuation of the next best alternative. Surrogate-market techniques estimate value based on preferences revealed in surrogate markets. These techniques include the travel cost method and hedonic valuation. The contingent valuation method (CVM) is the most widely accepted non-market valuation methodology. CVM is perceived as the most effective technique to determine society's willingness to pay for environmental protection and/or restoration and is the only technique able to estimate non-use (i.e., option and existence) values. This method is based on carefully designed surveys that solicit respondent's willingness to pay for a specific environmental resource in a given condition. The survey is intended to reveal both users' and non-users' willingness to pay for the resource.

Unfortunately, these surrogate-market techniques, including CVM, have significant shortcomings that lead to concerns about their reliability and validity. They are especially problematic in cases for which respondents are unfamiliar with the environmental amenity, when the issue is controversial, or where it generates strong reactions, based on ethical, rather than economic motivations. Most importantly for the C-111 SC effort, the reliability and validity of these techniques are especially questionable in situations in which the actual changes that would result from the restoration efforts are difficult to precisely describe or visualize. Finally, stated preference methods, such as CVM, can be expensive to implement, especially when multiple alternatives are being evaluated.

As specified in USACE's ecosystem restoration policy (EC 1105-2-210: Ecosystem Restoration in the Civil Works Program), ecosystem restoration projects are not subject to traditional benefit-cost analyses. An ecosystem restoration proposal must still be justified by comparing the monetary costs and non-monetary benefits of restoring degraded ecosystems. USACE ecosystem restoration evaluation procedures focus on the non-monetary benefits of restoration, comparing these benefits to monetary costs using CE/ICA procedures.

The sections that follow evaluate the economic impacts of the alternative restoration plans. ***Section G.2*** develops a socio-economic profile for the region, and ***Section G.3*** contains the water demand forecasts for the region. The following sections develop the basis for critical physical and socio-economic effects of the future conditions, with-plan and without-plan. The costs and the incremental analysis of the alternative plans are presented in ***Section G.6***. The regional economic effects and other social effects (OSE) of the alternative plans are explored in ***Sections G.9 and G.10*** respectively.

G.2 POPULATION AND ECONOMY

G.2.1 Overview

The people who live in the study area, and the economic activity, in which they are engaged, comprise important components of the area's total environment. In addition to the direct use of this data for the water use projections and OSE mentioned above, residents of the study area represent the socio-economic environment for the other impact topics of flooding, water use shortages, fishing, recreation, and navigation.

Any course of action forthcoming from this study will have effects throughout an economic system as well as the natural ecosystem(s), the health and sustenance of which are the impetus for this investigation. The economic system is connected with the natural ecosystem and in general is ultimately dependent upon it for survival. This connection is especially strong in the study area.

Adverse changes in the health and condition of the natural system can cause severe negative impacts on the economic system, particularly in the study area for this feasibility study. Conversely, in this study area, beneficial changes to the natural system are expected to have a strong positive effect on the economic system. It is significant, therefore, to describe and understand the general economic and social environment within which such changes could take place. Although the main focus of economic impact evaluation efforts undertaken for this study has been to describe the economic impacts and benefits of alternatives being considered for implementation, describing the broader context for these evaluation efforts is also necessary and important.

G.2.2 Economic and Social Well–Being Problems and Opportunities

In the 1940s the Central and Southern Florida Flood Control project (C&SF project) provided flood protection and an available supply of drinking water to the south Florida region. These provisions contributed to a major surge in population of the region. The population has grown from approximately 900,000 as reported in 1950 to a population of over 5.5 million in 1995. By the year 2050, the population of south Florida is projected to grow to 11.6 million. The increased growth in population can be attributed to an inflow of retirees and immigrants; not as a result of high birth rates for this area. The coastal areas in these counties have become highly urbanized. As a result, this urbanization has caused development to move westward into areas that were once agricultural or natural.

The Governor's Commission for a Sustainable South Florida identified agriculture and tourism as "critical industries" for maintaining the economy in the southern part of the state. A rapidly expanding human population demanding more developable lands and advancing agricultural development now threatens the

relatively pristine natural areas. The tourism industry is also dependent upon the region's ability to sustain its economy and its quality of life through management of its resources. Agriculture and tourism depend on a system that can provide vital water supply needs and flood protection.

Competition for regional water resources has intensified with the increase in population and agriculture industry growth. This places a strain on existing resources, which will eventually surpass the readily available sources. When the needs of the natural system are then factored in, demands become greater and conflicts among competing water users would become even more severe. While most people recognize the need for a healthy ecosystem to support the region's economy and jobs, many people are concerned that restoration projects would displace farms and other businesses, limit development, reduce available water supply and reduce job opportunities. By contrast, continued degradation of the south Florida ecosystem would adversely affect the tourism and recreational industry that are important to the regional economy.

G.2.3 Land Use

The existing land use within the study boundaries varies from preserve lands to agriculture and industrial urban uses. A large portion of south Florida remains natural, although much of it is disturbed land. The dominant natural features are the federally protected Everglades National Park (ENP) and Biscayne National Park, along with Biscayne and Florida Bay and remnant freshwater and coastal wetland and upland systems within and adjacent to the developed areas along the coast. Generally, urban development is concentrated along the lower east coast of Miami-Dade County.

Although there remains substantial agricultural acreage in southwestern Miami-Dade County (62,000 acres), rapid population growth and land development practices have resulted in notable western and southern urban sprawl; the predominant land use is single-family residential. The once significant rural population in the western areas of Miami-Dade County is rapidly evolving into an urbanized makeup in population. A breakdown of the overall land uses in Miami-Dade County is included on the following table.

TABLE G-1: LAND USES IN MIAMI-DADE COUNTY, 2006

Land Use	Area (sq mi)	Percentage
Environmental Protection*	660,104	53%
Urban Development	274,005	22%
Water Conservation	211,731	17%
Agriculture	62,274	5%
Vacant/Private	37,364	3%
Total Land Area	1,245,478	100%

*Includes government-owned lands

The existing use of the land that is being purchased primarily consists of mixed open land with agriculture, degraded wetlands and fallow fields. Card Sound Road borders the study area on the east (with one minor exception) and the ENP borders the study area on the west and south. Much of the southwest border of the project area is adjacent to Little Card Sound and Manatee Bay, adjacent to Barnes Sound. The northern boundary of the study area is just south of Florida City and the City of Homestead. Actual canal placement could range anywhere from just south of Florida City to a track parallel or nearly parallel to Southwest 424th Street. Inside of this uncertain area is a major industrial site as well as many privately owned agricultural, commercial and residential parcels.

The Turkey Point Nuclear Power Plant is located on the shoreline east of the C-111 SC Western project area. Some water used in the reactor is piped in from the Miami-Dade municipal water supply. A separate supply of water that cools the turbine steam supply for reuse comes from a unique, closed system of 36 interconnected canals totaling over 168 miles on length. This power plant is an integral part of the power supplied to Miami-Dade County, providing energy to over 450,000 homes (FP&L Website).

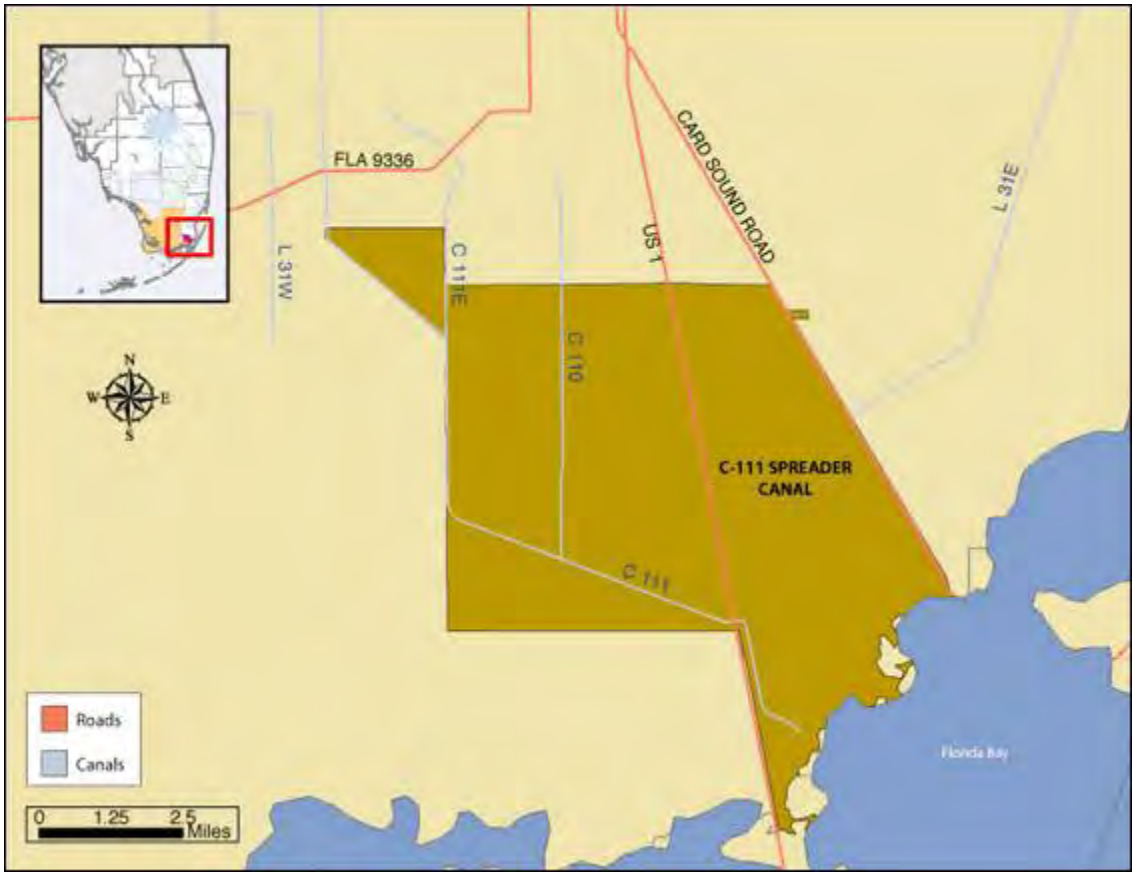

FIGURE G-1: MAP OF C-111 SPREADER CANAL STUDY AREA

G.2.4 General

Socio-economic and demographic data for the three-county south Florida area indicate higher than average income when compared to the rest of the state and nation, and much greater economic and population growth than for the rest of the nation. Additional characteristics of the study area include a strong service sector, fishing, tourism, and recreation. Florida's economy is generally characterized by strong wholesale and retail trade, government and service sectors. Florida's warm weather and extensive coastline attract vacationers and other visitors and helps to make the State a significant retirement destination for people from all over the country. Easily developed land, accessible water supply, abundant natural resources, and the aesthetic beauty of the region are the fundamental building blocks of the local economy. Relative to the national economy, the manufacturing sector has played less of a role in Florida, including the study area. However, high technology manufacturing has begun to emerge as a significant sector in the State over the last decade.

G.2.5 Population

This section includes a description of the local economy and demographics of the study area. This descriptive information provides insight into the study area's socio-economic characteristics, and provides part of the basis for different facets of the economic impact evaluation work in the rest of this document

G.2.5.1 Population: Historic Trends and Existing Condition

Describing the demographic characteristics for the project site's census tract, Miami-Dade County, and the State of Florida, helps to provide a basis for understanding the existing socio-economic context in which plan implementation will take place. Some of these characteristics are outlined below.

The C-111 SC Western project site does not coincide exactly with any census tracts but it is contained entirely within two tracts. The tract-level analysis provides an area for which data is available, and is closer to the relatively small sub-county component site footprint. This census tract data provides a blueprint for the surrounding area, not exact characteristics of the project site. The C-111 site has few permanent residents or existing businesses, and most of the owners of the land do not occupy the property and in many instances reside outside of the region, and therefore may not mirror the demographics of the local area residents. The most current information regarding the detailed demographics of the C-111 census tracts was published in 2000. A map of census tracts in the area is provided below. The C-111 study area is contained completely within tracts 114.02 and 114.01.

More recent data are available for the county and state levels, but such data are not comparable with the year 2000 census tract data which is only published on a decennial basis.

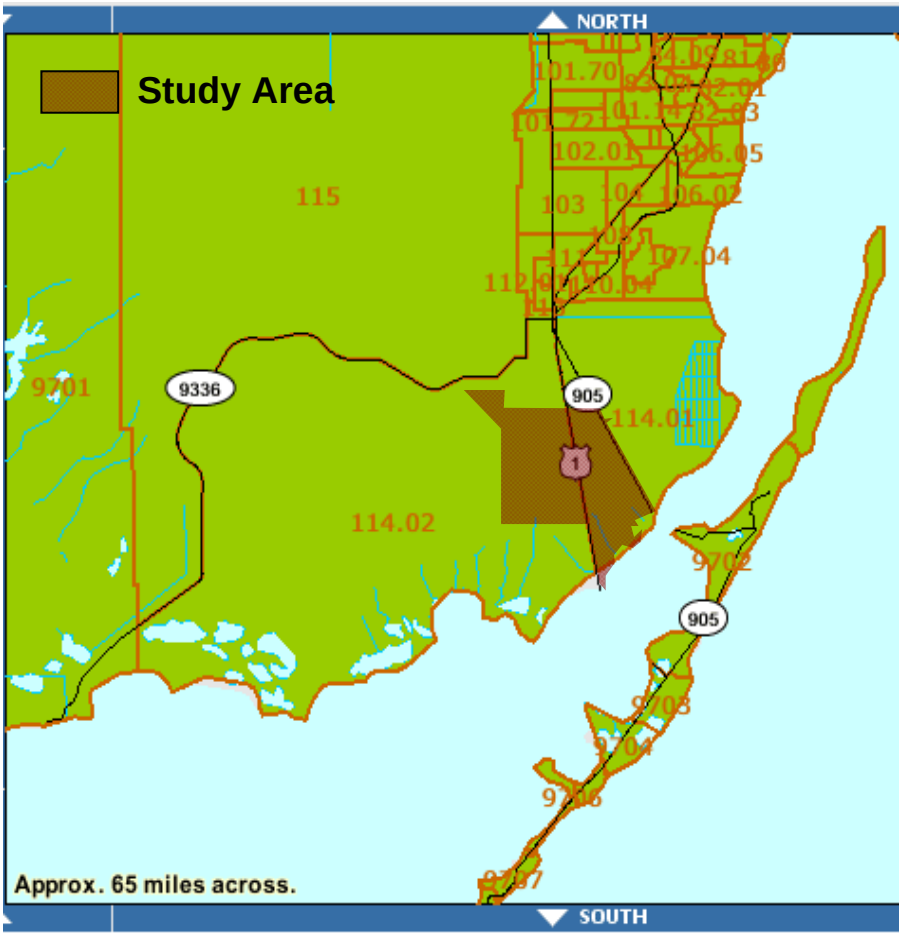

FIGURE G-2: CENSUS TRACT MAP OF C-111 STUDY AREA

TABLE G-2: C-111 STUDY AREA CENSUS TRACTS, 2000

Census Tract	114.02	114.01	Total
Population	10,305	4,330	14,635
Percent below poverty level	40%	9%	24%
White	54%	77%	65%
Black	31%	12%	21%
Some other race	15%	11%	13%
Hispanic origin	47%	31%	39%

Florida:	
Population 2000	15,982,378
Change in population, 1990-2000	23.5%
Below poverty level, 1999 estimate	12.5%
White, 2000	78.0%
Black, 2000	14.6%
Other, 2000	7.4%
Hispanic origin, 2000	16.8%
Miami Dade County:	
Population 2000	2,253,362
Change in population, 1990-2000	16.3%
Below poverty level, 1999 estimate	18%
White, 2000	69.7%
Black, 2000	20.3%
Other, 2000	10%
Hispanic origin, 2000	57.3%

Population in Miami-Dade County increased 16.3 percent during the period from 1,937,540 in 1990 to 2,253,362 in 2000. The population of Florida and the United States increased 23.5 and 13.1 percent respectively over the same period. Population in Miami-Dade County is expected to increase nearly 70 percent from 2000 to 2050. Despite this population growth, Miami-Dade County will fall short of the projected growth of the south Florida nine-county area, which is projected to grow at 78 percent between 2000 and 2050.

G.2.5.2 Population: Projections

Current statistics demonstrate that countywide, Miami-Dade is characterized by a slower population growth rate than the rest of the State, but a larger population growth than the nation as a whole. However, for lands within and adjacent to Miami-Dade County's Urban Development Boundary near the C-111 study area, growth rates are projected to be much higher.

Miami-Dade County had a 2000 census population of 2,253,362. The population of this county had relatively modest increase of 16.3 percent from 1990 to 2000, although it should be noted that Hurricane Andrew in 1992 had a significant impact on population growth during this period due to mass emigration. The population of Florida and the United States increased 23.5 percent and 13.1 percent respectfully during the same period. The State of Florida added over three million persons from 1990 to 2000, ranking third in the nation in numerical change.

Population in Miami-Dade is expected to increase by almost 1.5 million people from 2000 to 2050. Due to this anticipated population growth, the county is expected to

remain the most populated county in Florida. The dense urban area of the Lower East Coast of Florida has contributed to development pressure and population increases in Miami-Dade County. Miami-Dade County is expected to grow faster than the national trends until at least 2050. Conversion of agricultural and other unimproved lands in southern Miami-Dade County including large areas within the C-111 study area would continue to be fueled in significant part by this population growth.

TABLE G-3 summarizes existing and projected population in Miami-Dade County (2000 figures are from the U.S. Census). The future census estimates to 2030 were based on the University of Florida Bureau of Economic and Business Research (BEBR) projections in *Projections of Florida Population by County, 2001-2030*, dated February 2002. The Miami-Dade County Department of Planning and Zoning developed the long-term projections from 2030-2050. These population projections were calculated for, and accepted by, the Initial CERP Update. ***TABLE G-3*** displays the population rates of growth for each decade from 2000 to 2050. ***TABLE G-4*** indicates the population growth rate of the study area is expected to be lower than that of the State from 2000-2050.

TABLE G-3: POPULATION ESTIMATES, 2000-2050

Population (1,000's)						
	Year					
	2000	2010	2020	2030	2040	2050
Miami-Dade	2,253	2,554	2,862	3,148	3,499	3,811
Share of Florida Total	14.10%	13.54%	13.13%	12.83%	12.90%	12.83%
Florida Total	15,982.40	18,866.70	21,792.60	24,528.60	27,118.70	29,714.50

TABLE G-4: STUDY AREA POPULATION RATES OF GROWTH 2000-2050

	Average (% Per year) Population Growth				
	2000-2010	2010-2020	2020-2030	2030-2040	2040-2050
Miami-Dade	1.3%	1.2%	1%	1.1%	0.9%
Florida Total	1.8%	1.55%	1.26%	1.06%	0.96%

TABLE G-5: STUDY AREA POPULATION GROWTH 2000-2050

	% Change 2000-2050*
Miami-Dade	70%
Florida	85.9%

* Note: Florida population projections are only published until 2050

G.2.6 Economy

Generally, a strong wholesale and retail trade, government and service sectors characterize Florida's economy. Florida's warm weather and extensive coastline attracts vacationers and other visitors and helps make the state a significant retirement destination for people all over the country. Agricultural production is an important sector of the state's economy, and is especially significant to portions of the study area. Compared to the national economy, the manufacturing sector has played less of a role in Florida, but high technology manufacturing has begun to emerge as a significant sector in the State over the last 15 years.

The three most significant employment sectors in the Miami-Dade economy are administrative support, retail trade and health care and social assistance. In 2002 administrative support employed 127,865 in the county; retail trade in employed 110,975; health care and social assistance employed 110,539. These three top industries paid aggregate 2002 salaries of 2.89 billion, 2.32 billion and 3.74 billion respectively (data from the 2007 economic census has not yet been published).

Homestead Air Reserve Base is a major economic presence in the southeast Miami-Dade region. Since 1994 the Department of Defense has expended approximately $100 million in new construction infrastructure improvements on the base. The military provides an economic boost of $120 million a year for Homestead and Florida City. In 2003 there were 1,776 total personnel at the base with an annual payroll of $84,000,000. The base is a 2,200-acre stand-alone, Air Force Reserve Command-owned and operated installation.

The unemployment rate for Florida is 5.5 percent (2006), while the unemployment rate for Miami-Dade County was 5.8 percent (2006).

As discussed previously, the C-111 study area is encompassed within two census tracts (tract 114.02 west of U.S. Highway 1 and tract 114.02 east of U.S. Highway 1). However, the economic profile of these census tracts is not necessarily representative of the population living within the study area. It is only representative of a population living within relatively close proximity to the study area. The actual population contained within the study area is probably extremely small. The study area does not conform to tract blocks or block groups, thus a more narrow level of analysis was not practical.

Personal per capita income in Florida is $25,297 (2006), but is somewhat lower in Miami-Dade County, at $21,716. The personal per capita income in the study area is lower than the state and county levels, $20,366 in tract 114.01, and $7,911 in tract 114.02 (2000).

Despite having a considerably lower than average per capita income, the study area's median household income is somewhat more comparable to that of the county

and state. The median household income for census tracts 114.01 and 114.02 are $35,430 $24,306, respectively. These are still significantly lower than the county median household income ($41,237) and the state ($45,495). These numbers suggest greater household size within the study area to account for the increased household income over per capita income.

In 2000 it was reported that 12.6 percent of Florida's population lived below the poverty level, while 6.4 percent of Miami-Dade County were below the poverty level. In tract 114.01, 9.1 percent of individuals were living below poverty level in 2000. In tract 114.02 however, that number was 39.9 percent, considerably higher. Within the tracts that encompass the study area a total of 3,697 individuals live below the poverty level while the state reported 1,952,629 and the county reported 396,995.

These economic indicators can be seen in ***TABLE G-6***, following:

TABLE G-6: ECONOMIC INDICATORS IN STUDY AREA

	Florida	Miami-Dade	Tract 114.01	Tract 114.02
Population	15,982,378	2,253,362	4,330	10,305
Unemployment	5.5%	5.8%	6.5%	23.3%
PerCapita Income	$25,297	$21,716	$20,366	$7,911
HH Income (Median)	$45,495	$41,237	$35,430	$24,306
Below Poverty Level	12.6%	6.4%	9.1%	39.9%
White	78.0%	69.7%	77.0%	53.9%
Black	14.6%	20.3%	11.8%	31.0%
Hispanic origin	16.8%	57.3%	31.0%	46.5%

G.2.7 Agriculture Economy

Despite its continued population growth and urban expansion, agriculture in Miami-Dade County remains a valuable industry and employer. In the latest census of agriculture, it is reported that the market value of agricultural products from Florida exceeded six billion dollars per year. Florida ranks number one nationally in sugar cane production and number one in the quantity of all nursery acres. Additionally, Florida ranks number two in fruit, nursery/greenhouse crop and vegetable production. Statewide, agriculture employs 34,800 individuals. There are 1,576 persons employed by agriculture in the county. There are 2,244 farms in the county. The market value of agricultural products sold in Miami-Dade County is 578 million annually.

Because of the temperate climate, Miami-Dade County and south Florida are a major source of traditional vegetables for the rest of the nation during the colder months. Traditional vegetables include pole beans, tomatoes, squash, potatoes, corn, bell peppers and other more common vegetables. For the 2001/2002 growing season, Miami-Dade County produced a traditional/winter vegetable harvest that had an estimated value of over 197 million dollars. Of these crops, the value sold outside Miami-Dade County was over 98 percent. Additionally, Miami–Dade County is the number one producer of nursery/greenhouse crops and the number one producer of sweet potatoes in the state.

Aside from the extended growing season of traditional crops, the climate of south Florida is favorable for the growth of many different tropical fruits. These fruits include lychee, avocado, mango, Persian limes, carambola, mamey sapote, guava, papaya and bananas. Additional smaller yield tropical fruits are harvested as well. In 2001/2002 1,122 farms reported producing fruit in the county. The estimated total value of the yield during that same time period was 35.8 million dollars, with nearly 87 percent sold outside Miami-Dade County.

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G.3 MUNICIPAL AND INDUSTRIAL WATER DEMAND

In the study area, surficial aquifers supply the majority of water for urban use. Rainfall is the primary supporter of the agriculture water demand in south Florida and surficial waters (canals, shallow groundwater, and ponds) provide the majority of the irrigation demands in the watershed. Salinity intrusion is becoming a predominant problem for water supply. In the Lower East Coast area, salinity intrusion has resulted from two major causes. The first is the lowering of the ground water table in the area due to drainage and reduced recharge as well as the increased withdrawal of water by pumping. The second reason is the construction of numerous drainage and navigation canals from inland areas to the coastal waters. Currently, water shortages and restrictions are implemented during low rainfall periods or droughts. Sea level rise is likely a third cause.

Municipal and Industrial Water Usage

The U.S. Geological Survey (USGS) estimates annual water withdrawals for Florida at the county-level every five years. The most recent publication of findings was entitled *Water Withdrawals, Use, Discharge, and Trends in Florida, 2000.* Water use estimates for 2005 were not published at the time of this analysis. Water use estimates for 2000 for the nine counties included in this analysis were obtained from the USGS. These uses are distributed as public-supply and self-supply domestic (residential), commercial, industrial, government, and recreational water use estimates, along with unaccounted-for water loss estimates. ***TABLE G-7*** presents the USGS estimated 2000 water use for the nine-county area, excluding mining and power generation water use. Total public-supply water use for the region is estimated at 960.51 million gallons a day (mgd), and total M&I water use

is estimated at 1,176.79 mgd. The addition of the 1,901.14 mgd of agricultural water use increases total water demand for the region to 3,077.93 mgd. Agricultural water use accounts for 62 percent of the total use, and all M&I uses accounts for 38 percent ***(TABLE G-7***). The county that corresponds to the C-111 study area is Miami Dade, although it is a relatively small footprint within the county. Total water demands are presented in the following table.

TABLE G-7: USGS TOTAL WATER USE, FOR SELECTED COUNTIES, 2000, EXCLUDING MINING AND POWER GENERATION (IN MGD)

NOTE: Recreation self-supply water use includes golf course irrigation.

	Municipal and Industrial							
	Public	Self-Supply				Sub		Grand
County	Supply	Domestic	Commercial	Industrial	Recreation	Total	Agriculture	Total
Broward	258.06	2.11	0.54	0.00	37.00	297.71	4.10	**301.81**
Glades	0.55	0.61	0.04	0.00	0.42	1.62	69.02	**70.64**
Hendry	4.72	1.67	0.21	0.51	1.09	8.20	503.91	**512.11**
Lee	52.37	8.86	0.46	0.09	22.66	84.44	60.51	**144.95**
Martin	18.45	4.20	0.37	2.78	7.88	33.68	140.02	**173.70**
Miami-Dade	377.27	4.85	1.29	0.00	13.39	396.80	110.35	**507.15**
Monroe	17.02	0.08	0.10	0.00	1.85	19.05	0.03	**19.08**
Okeechobee	2.23	1.52	0.36	0.00	0.68	4.79	67.04	**71.83**
Palm Beach	229.84	10.17	0.59	15.81	74.09	330.50	946.16	**1,276.66**
Total	**960.51**	**34.07**	**3.96**	**19.19**	**159.06**	**1,176.79**	**1,901.14**	**3,077.93**

Source: USGS unpublished data, 2002.

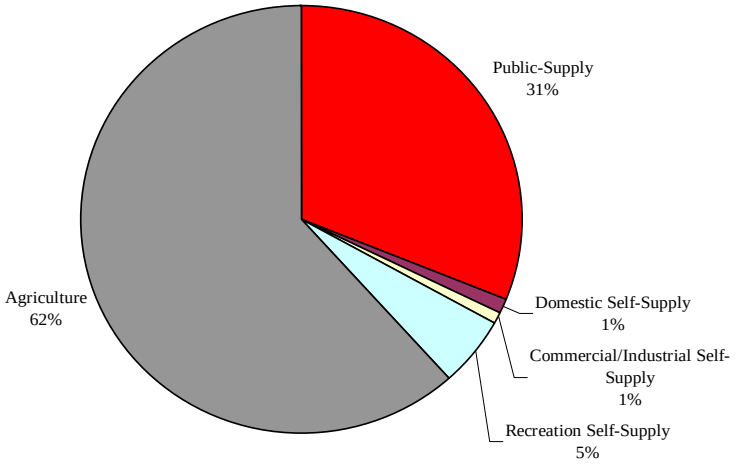

FIGURE G-3: DISTRIBUTION OF U.S. GEOLOGICAL SURVEY ESTIMATED 2000 WATER USE FOR THE NINE-COUNTY

FIGURE G-3 presents the distribution of USGS estimated 2000 total and M&I water use, by county in the Lower East Coast (LEC). Combined, total water use in the four counties of the LEC -- Broward, Miami-Dade, Monroe, and Palm Beach was 2,104.7 MGD, which accounted for 68 percent of the nine-county region. The LEC M&I water use was estimated at 1,044.06 MGD, or 89 percent of the region's total M&I water use.

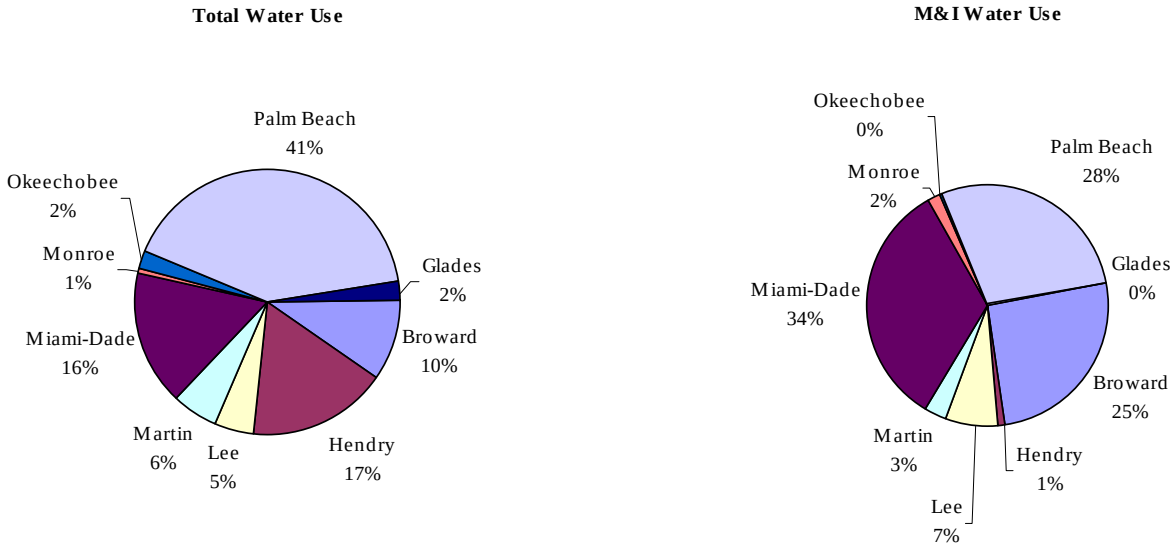

FIGURE G-4: DISTRIBUTION OF U.S. GEOLOGICAL SURVEY ESTIMATED 2000 TOTAL AND M&I WATER USE, BY COUNTY

An M&I forecast is required as input to modeling that will be the basis for planning and optimally designing the C-111 SC Western project. The planning horizon is the year 2050. Water use estimates from the present to 2050 for natural area environmental purposes, agricultural irrigation purposes, M&I use, and other purposes are needed. The results of the IWR-MAIN effort are a set of projections through the year 2050 for M&I use only.

The M&I water use forecasts were developed using the IWR-MAIN Water Demand Management Suite, a computerized water resource planning tool that allows the development of water use forecasts and the evaluation of water conservation programs. The IWR-MAIN software allows water use forecasts to be developed based on existing water use patterns and existing or forecast socioeconomic parameters and then allows the impact of water conservation measures on those water uses to be evaluated. In the Initial CERP Update (ICU), residential water use was forecast using a multiplicative forecast model and nonresidential water use was forecast using a constant use rate model.

The Lower East Coast region M&I water demand forecast is shown in the following table. Figures are derived from the BEBR population and employment projections, and were collected for the 2000 ICU. The section of the ICU that applies to the C-111 study area is Service Area 3, which encompasses Miami-Dade and Monroe counties. Water demand projections estimated for Service Area 3's most likely population scenario, conservation–adjusted water use in 2050 at 505.6 mgd. Service Area 3 is expected to be using one third of the total water demanded in the nine-county ICU region. Due to the exceptionally small rate of growth projected between 2050 and 2060, it is not expected that 2060's water demands would be substantially higher than in 2050, after taking into account strong conservation measures.

The South Florida Water Management District (SFWMD) requires the development of water conservation plans as a prerequisite for water utilities to obtain a water use permit. With the implementation of conservation plans, water demand should change. Most conservation plans incorporate passive water conservation measures that include increasing block rate structures, the required use of ultra-low flow water fixtures on new or renovated construction, restrictions on lawn watering, required use of rain sensors on automatic sprinkler systems, a leak detection program, and public education concerning water conservation measures.

With the increase in population and infrastructure, the demand for water would increase and the shortages and restrictions would become more prominent, leading to both economic and environmental damages. In the Lower East Coast region groundwater is the predominant source of water for M&I uses. This trend is expected to continue in the future. The groundwater levels would continue to decrease, leading to increased shortages of water and increased salinity levels in

wells in the study area. With more persons drawing water and less water available for recharge, migration of the underlying salt wedge leading to increased saltwater intrusion and shortages to wells and well fields would become more prevalent.

TABLE G-8: ESTIMATED 2050 SERVICE AREA 3 CONSERVATION ADJUSTED, MOST LIKELY POPULATION SCENARIO (MGD)

End Use	2000 Demand	2050 Demand
Service Area 3	373.2	586.6

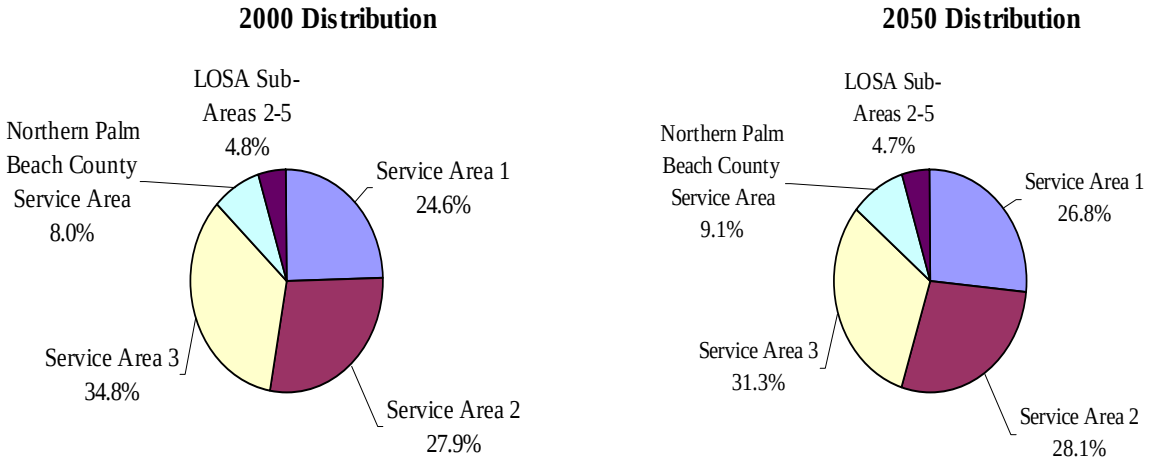

FIGURE G-5: DISTRIBUTION OF TOTAL CONSERVATION-ADJUSTED MUNICIPAL AND INDUSTERIAL WATER USE, BY SERVICE AREA, 2000 AND 2050, MOST-LIKELY POPULATION SCENARIO

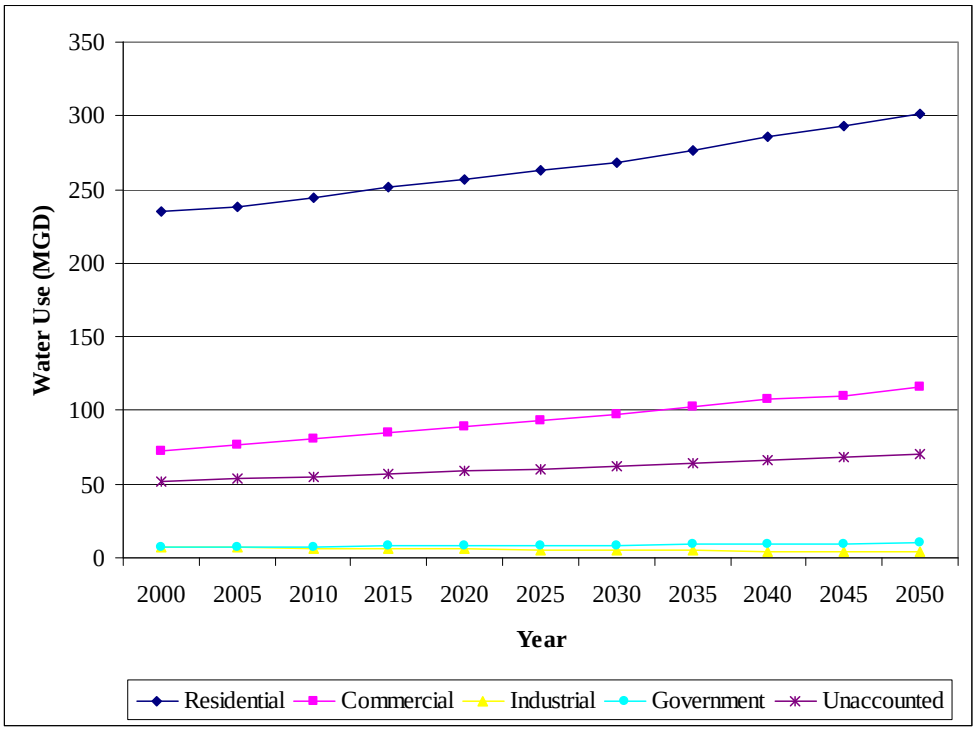

FIGURE G-6: SERVICE AREA 3, MOST-LIKELY POPULATION SCENARIO MUNICIPAL AND INDUSTRIAL CONSERVATION–ADJUSTED FORECAST, BY WATER USE SECTOR

G.3.1 Agricultural Water Demands

Agriculture is a significant irrigated land use of the Lower East Coast region. Agricultural land use represents less than one-quarter of the land use in the service area, and in many areas will be virtually non-existent in the future.

Rainfall is the primary supporter of the agriculture water demand in south Florida approximately 59 inches per year along the Lower East Coast. Surficial waters (canals, shallow groundwater, and ponds) provide the majority of the irrigation demands in the watershed. Unfortunately surficial supplies are inadequate at some time nearly every year. During droughts, agricultural water users have higher irrigation water demands; however, water supplies are usually at their lowest levels during droughts. Consequently, water shortage management policies are implemented which restricts use of water so that agricultural water users do not always receive as much water as they need. This can lead to reduced crop yields and economic damages.

The Lower East Coast receives significant groundwater recharge via easterly seepage from the Water Conservation Areas under the north-south levee system; however, during prolonged droughts, significant volumes of water from Lake

Okeechobee can be required by the Lower East Coast to supplement local water supplies and prevent saltwater intrusion into well fields.

G.4 FLOOD DAMAGE REDUCTION IMPACTS

A key design criterion and goal throughout the development of the project components has been that flooding of developed areas will remain the same or improved with the plan implemented as compared to without the plan. No flooding of residential or commercial properties will be caused by implementation of the plan.

G.5 RECREATION

Recreation is a major contributor to the economy. According to the Outdoor Industry Foundation, Active Outdoor Recreation has the following economic benefits:

- Contributes $730 billion annually to the United States' economy
- Supports nearly 6.5 million jobs across the United States
- Generates $88 billion in annual state and national tax revenue
- Provides sustainable growth in rural communities
- Generates $289 billion annually in retail sales and services across the United States
- Touches over eight percent of America's personal consumption expenditures—more than 1 in every 12 dollars circulating in the economy

The report does not take into account non-market benefits, the increased value of land associated with recreation opportunities or economic benefits from environmental consequences of reserving land for recreation opportunities.

This section examines the potential effects of the Recommended Plan on outdoor recreation in the study area. Outdoor recreation in Florida includes many different activities. A common way of differentiating outdoor recreation activities is to classify them based as "user-oriented" or "resource-based" activities. User-oriented activities, such as individual and team sports, are not dependent on any natural resource setting and can be located, space permitting, on any open site. These facilities are provided for the convenience of the user. For example, a basketball court can be added to a playground. Resource-based activities, such as hunting and fishing, depend on the existence and quality of supporting natural or historical resources. The economic value of resource-based recreation is determined by the users' willingness to pay for a recreation occasion. The willingness of current and potential users to pay for resource-based recreation of specific quantity and quality constitutes the demand for that type of recreation. The interaction of demand with the quantity and quality of recreation resources available determines the recreation use or "participation" levels for that resource-based activity. When the quantity or

quality of recreation resources is modified by a project, such as the alternative restoration plans, the change in value of resource-based recreation is based on the difference in the willingness of users to pay under the with- and without-project conditions.

The C-111 SC Western study area provides a unique and extensive natural resource-based recreational resource. The restoration of the ecosystem could potentially have important impacts on the value of outdoor recreation in the study area. The hydrologic changes associated with the alternative restoration plans have been designed to improve the structure and function of the ecosystems. These improvements can be expected to provide resource-based recreational opportunities compatible with the protection of the natural systems. Many tourists and residents recreate in the natural areas surrounding the study area. If the alternative restoration plans improve the ecology of the study area, the quality of the study area related recreation and/or the number of people who participate in study area related recreation could increase as well. Consequently, the value of outdoor recreation in the study area could also substantially increase.

However, precisely estimating the future value of recreation in the study area is problematic, and anticipating the incremental changes in value associated with restoration is even more challenging. There are four principal uncertainties that challenge forecasting the future quantity and quality of outdoor recreation under with- and without project conditions. Perhaps the most important uncertainty concerns the timing and character of the ecological changes that are expected to result from the alternative restoration plans. At this time, the outcomes of the restoration actions cannot be predicted. Consequently, secondary effects, such as associated changes in recreation patterns and the resulting effect on industries supporting recreation (e.g., marine industry) cannot be accurately quantified.

Another uncertainty regarding the future value of recreation is the marketing of tourism and study area related recreation. If the restored ecosystem is used to market tourism and recreation in the study area, the value of recreation could change dramatically relative to the without-project future conditions.

A third uncertainty is the degree to which recreational facilities and recreational access would be developed as part of a restoration plan. Recreation facilities and access, such as visitor centers, scenic overlooks, nature trails, and roads, can greatly affect participation levels.

Finally, there are a variety of economic factors at the national level that can influence tourist and resident recreation demand. These factors include the health of the national economy, levels of disposable income, and the availability and costs of competing recreation opportunities. In 2007 Florida welcomed a total of 84.5 million visitors. However, Florida tourism and its economic implications are

sensitive to national economic and energy policies. "The dynamic nature of the industry causes uncertainty in tourism forecasting, making it difficult to accurately project visitation levels for more than one or two years at a time" (Florida DEP, 2000). As evidence of the challenges of tourism and recreation forecasting, the Florida Tourism and Industry Marketing Corporation limits its tourism forecasts to three years.

The State Comprehensive Outdoor Recreation Plan (SCORP) is the best source of information on recreation demand and supply at the state and regional scales. It divides the state into 11 planning regions, each with clusters of counties. As indicated in ***TABLE G-9***, Region 11 is comprised of Broward, Miami-Dade and Monroe counties.

TABLE G-9: COUNTIES WITHIN SCORP PLANNING REGIONS POTENTIALLY AFFECTED BY ALTERNATIVE RESTORATION PLANS

Region	**Counties**
Region 11	Broward
	Miami-Dade
	Monroe

Source: Florida Department of Environmental Protection, 2000

The SCORP organizes outdoor recreation in Florida into 47 categories that encompass a variety of recreation activities including team sports (e.g., basketball and baseball), individual sports (e.g., golf and tennis), hunting, fishing, swimming, and boating. ***TABLE G-10*** presents descriptive information on the recreation facilities in SCORP Regions 11 for study area specific recreation categories. These resource-based categories were selected as those that could potentially be affected by the hydrologic changes or ecological changes associated with the alternative restoration plans. This table also includes percentages of the statewide totals for the recreation categories.

TABLE G-10: REGIONAL OUTDOOR RECREATION FACILITIES REGION 11, 1998

Resource / Facility	Region 11	% of State Total	State Total
Outdoor Recreation Areas	2,080	16%	13,097
Outdoor Recreation Acres	3,038,475	28%	10,850,904
Land Acres	1,831,363	20%	9,077,004
Water Acres	1,207,112	68%	1,773,900
Hunting Acres	871,151	14%	6,168,716
Land Acres	869,573	14%	6,046,955
Water Acres	1,578	1%	121,761
Camping			
RV / Trailer Camp Sites	10,603	8%	138,576
Tent Camp Sites	1,081	11%	10,214
Trails			
Hiking Trails (miles)	277	7%	3,904
Horseback Riding Trails (miles)	91	6%	1,443
Nature Trails (miles)	107	10%	1,043
Freshwater Catwalks	40	5%	748
Boating			
Canoe Trails (miles)	296	11%	2,587
Freshwater Boat Ramp Lanes	235	12%	1,973
Freshwater Marinas	6	1%	511
Freshwater Slips / Moorings	303	3%	11,758
Saltwater Marinas	366	33%	1123
Saltwater Marina Slips	14,470	32%	45,839

Source: Florida Department of Environmental Protection. 2000

G.5.1 Recreation Demand

Profiles of existing and future recreation demand in the study area can be developed by drawing on a variety of information at the national, state, regional, and local levels. In general, the variety of recreational interests in the United States appears to be increasing along with recreational participation rates. As future recreation needs and interests develop, it is important to recognize that participation in specific types of recreational activities is often linked to demographic factors such as age and income. For example, participation in activities requiring vigorous exercise is considerably higher for young people than for senior citizens. However, the elderly population has increasing recreation participation because of the growing awareness of the importance of physical fitness. Participation in most activities is low for those with family incomes below $25,000 per year. Interestingly, participation is also low for those with family incomes greater than $100,000 per

year. Most outdoor recreational activities appear to be enjoyed largely by the middle class, those with family incomes between $25,000 and $75,000 per year.

G.5.1.1 Regional Recreation Demand

Recreation demands were developed for the SCORP through surveys of residents and tourists. The Division of Recreation and Parks conducts periodic surveys of resident and tourist participation in recreation activities to estimate outdoor recreation in Florida. The recreation participation information was derived from the 2000 surveys conducted by the University of Florida, Department of Recreation, Parks, and Tourism. Participation in outdoor recreation activities is expressed in terms of user-occasions, which occur each time an individual participates in a single outdoor recreation activity. The number of user-occasions was calculated for each planning region as well as the entire state by type of activity. Demand was estimated for 1997, 2000, 2005 and 2010 by applying the per capita participation rates to population projections.

TABLE G-11 presents 1997 and projected 2010 demands for the selected recreation activities in SCORP Planning Region 11. This table includes user-occasions as well as facility/resource needs. As part of the without-project conditions, all of the regions are expected to have significant increases in demands for the selected recreation activities with a commensurate need to increase development of the regions' recreation resources and facilities.

TABLE G-11: DEMAND AND FACILITY NEEDS (1997 AND 2010)– SELECTED RECREATION ACTIVITIES (SCORP REGION 11)

Activity	Units	Demand (user-occasions)		Resources / Facility Needs	
		1997	2010	1997	2010
Hunting	Acres	663,841	772,849	79,348	235,427
RV / Trailer Camping	Camp Sites	2,203,445	2,779,565	0	0
Tent Camping	Camp Sites	888,761	1,136,981	10	317
Hiking	Miles	1,282,041	1,672,767	252	413
Horseback Riding	Miles	1,780,575	2,189,849	0	0
Nature Study	Miles	1,456,739	1,988,143	0	0
Canoeing	N/A.	108,405	142,253	N/A.	N/A.

Source: Florida Department of Environmental Protection, 2000.

In sum, the C-111 SC Western study area ecosystems support a significant amount of outdoor recreation in the Lower East Coast of Florida. A significant portion of the expenditures comes from tourists. It is not possible at this time to anticipate precisely how expenditures and consumer surplus associated with C-111 SC Western project study area related recreation would change if restoration occurred.

However, based on the adverse effects related to environmentally damaging releases of waters into the natural ecosystem, it can be concluded that improving the environmental quality of the C-111 SC Western study area ecosystem would substantially support and sustain local recreation-based businesses. Given the potential levels of expenditures and consumer surplus in the future, a small percentage increase in the quantity or quality of C-111 SC Western study area recreation could represent an increase in recreation value.

Local Parks and Recreation

There are no known, significant local parks within the study area.

As development continues in the southern tier of the county and in particular in the area just south of the UDB, there could be pressure to acquire additional park land in order to meet the county's level of service for local park and recreation acres.

G.5.2 National Recreation Trends

National trends in recreation may help to identify potential or expected changes in the demand for Florida recreation as the result of ecosystem restoration. Two recent national surveys of outdoor recreation have particular relevance for this investigation.

G.5.2.1 National Survey of Recreation and the Environment

The Outdoor Industry Foundation of America conducted a National Survey of Recreation and the Environment in 2005. Approximately 4,000 Americans, 16 years old or more, were interviewed in a random sample telephone survey. The respondents provided information regarding their participation in 22 outdoor activities.

TABLE G-12 presents 2005 participation rates for the 22 outdoor activities. Of the selected activities, the four most popular groups of activities were bicycling (38.2%), fishing (34.5%), hiking (34.2%), and camping (30.4%). Over 160 million Americans participated in some sort of human powered outdoor activity in 2005. The survey did not include more passive activities such as walking and site-seeing, such activities have traditionally show very high participation rates.

TABLE G-12: PARTICIPATION RATES FOR SELECTED RECREATIONAL ACTIVITIES BY U.S. POPULATION 16 YEARS OR OLDER, 2005

Activity	Participation (2005)	Population (Millions)
Human Powered Activities - Any Type	72.1%	161.6
Backpacking	6.0%	13.5
Bicycling - Any Type	38.2%	85.6
Bicycling - Paved Road	35.0%	78.5
Bicycling - Mountain Biking	22.3%	50.0
Bicycling - Single Track Dirt	17.4%	39.0
Bicycling - Wide Track Dirt	17.0%	38.1
Bird Watching	7.0%	15.6
Camping - Any Type	30.4%	68.1
Car Camping	23.1%	51.7
Camping (Away from Car)	7.9%	17.7
Climbing with Rope/Harness - Any Type	4.1%	9.2
Climbing - Natural Rock	2.2%	5.0
Climbing - Artificial Wall	3.0%	6.7
Climbing - Ice	0.5%	1.0
Cross-Country/Nordic Skiing	4.5%	10.0
Fishing - Any Type	34.5%	77.3
Fishing (Non-Fly)	33.1%	74.2
Fly Fishing	6.6%	14.7
Hiking	34.2%	76.7
Paddlesports - Any Type	15.3%	34.3
Canoeing	9.3%	20.8
Rafting	4.7%	10.6
Kayaking - Any Type	5.6%	12.6
Kayaking (Non-Whitewater)	5.3%	11.9
Kayaking - Recreation/Sit-on-Tope	4.0%	9.0
Kayaking - Touring/Sea	2.5%	5.6
Kayaking - Whitewater	1.0%	2.2
Snowshoeing	2.4%	5.5
Telemark Skiing	1.6%	3.5
Trail Running	18.0%	40.4

Source: Outdoor Industry Foundation, Outdoor Recreation Participation Study, eighth edition,2006

G.5.2.2 National Survey of Fishing, Hunting, and Wildlife Recreation

The U.S. Fish and Wildlife Service conducted the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation in 2006. As part of this survey, 85,000 anglers and hunters were surveyed and 21,938 were interviewed. Additionally 11,279 wildlife watchers were interviewed. The purpose of the survey was to gather information regarding participation and expenditures for wildlife-related activities, including fishing, hunting, and wildlife watching. National participation and expenditure data for sportsmen and wildlife watchers are presented in

TABLE G-13. The survey revealed that 87.5 million Americans aged 16 or older (40 percent of the adult population) enjoyed some form of wildlife-related recreation in 2006 with total expenditures exceeding $122.3 billion.

Wildlife watching activities primarily included observing, photographing and feeding wildlife for two types of participants: residential and nonresidential. The residential category included those activities that occurred within one mile of the residents' homes, while the non-residential group included those who took trips or outings for the primary purpose of observing, photographing, or feeding wildlife. Based on the National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, in 2006 over 71.1 million people in the United States participated in wildlife watching.

TABLE G-13: TOTAL UNITED STATES WILDLIFE-RELATED RECREATION PARTICIPATION AND EXPENDITURES, 2006

Category	Indicator
Total Participants	87.5 million
Total Expenditures	$122.3 billion
Sportspersons	
Total Participants*	33.9 million
Anglers	30.0 million
Hunters	12.5 million
Total Days	737 million
Fishing	517 million
Hunting	220 million
Total Expenditures	$76.7 billion
Fishing	42.0 billion
Hunting	22.9 billion
Unspecified	11.7 billion
Wildlife Watchers	
Total Participants**	71.1 million
Around the home	67.8 million
Away from home	23.0 million
Total Expenditures	$45.7 billion

Source: 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, US Fish & Wildlife Service

The sum of residential and non-residential subcategories does not equal the total due to an overlap in participation.

The National Survey of Fishing, Hunting, and Wildlife-Associated Recreation also contains state-level information on recreation participation and expenditures. In 2006, approximately 5.9 million of Florida's 18.1 million residents (32.6%) participated in wildlife-related recreation with the following distribution: 4.2 million (23.2%) participated in wildlife watching, 2.8 million (15.5%) fished and 236 thousand (1.3%) hunted. These data are summarized on ***TABLE G-14***, below.

TABLE G-14: PARTICIPANTS IN WILDLIFE-RELATED RECREATION IN FLORIDA, 2006

Type	Participants	%
Total	5.9 million	32.6%
Sportspersons		
Total	2.8 million	15.5%
Anglers	2.8 million	15.5%
Hunters	236 thousand	1.3%
Wildlife Watchers		
Total	4.2 million	23.2%
Away from home	1.6 million	8.8%
Around the home	3.3 million	18.2%

(US Residents 16 years old and older)

Source: 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, US Fish & Wildlife Service

More detailed data, including expenditures, day and other information is included on ***TABLE G-15***, below. Most notable are expenditures in the order of magnitude of billions on fishing and wildlife watching.

TABLE G-15: TOTAL WILDLIFE-RELATED ACTIVITIES IN FLORIDA, 2006

Anglers (Fishing)	2,767,000
Days of fishing	46,311,000
Average days per angler	17
Total expenditures	$4,308,583,000
Trip-related	$1,973,985,000
Equipment and other	$2,334,598,000
Average per angler	$1,536
Average trip expenditure per day	$43
Hunters	236,000
Days of hunting	3,769,000
Average days per hunter	16
Total expenditures	$377,394,000
Trip-related	$155,116,000
Equipment and other	$222,278,000
Average per hunter	$1,442
Average trip expenditure per day	$41
Total Wildlife-Watching Participants	4,240,000
Away-from-home participants	1,560,000
Around-the-home participants	3,274,000
Days of participation away from home	16,551,000
Average days of participation (away from home)	11
Total expenditures	$3,081,496,000
Trip-related	$887,942,000
Equipment and other	$2,193,554,000
Average per participant	$720
Average trip expenditure per day	$54

Source: 2006 National Survey of Fishing, Hunting, and Wildlife-Associated Recreation, US Fish & Wildlife Service

G.5.2.3 State Tourism Trends

84.5 million domestic and international visitors to Florida per year comprise a significant portion of the overall demand for outdoor recreation resources in Florida. Their participation in resource-based recreation and their relatively high incomes (compared to resident recreationists) make tourists a significant component of project-related recreation in the study area. The Comprehensive Review Study detailed the importance of tourism on the recreation in Florida.

G.5.2.4 Potential Changes in Value of Recreation

The C-111 SC Western project can support a significant amount of outdoor recreation in the Florida Lower East Coast, with a significant portion of expenditures coming from tourists. Based on the recent adverse effects related to environmental damage of the ecosystem, it may be concluded that improving the environmental quality of the ecosystem would substantially support and sustain local recreation-based businesses. Given the potential levels of expenditures and consumer surplus in the future, a small percentage increase in the quantity or quality of project-related recreation could represent an increase in recreation value.

There are potential recreation resources that would be associated directly with the construction of the impoundment. The uses presently considered compatible with resource protection and passive recreation include: freshwater fishing, horseback riding, hiking, off-road bicycling, wildlife viewing and nature study.

G.6 COST EFFECTIVE/INCREMENTAL COST ANALYSIS

Cost effectiveness and incremental cost analyses (CE/ICA) reveal information about good financial investments given the dollar costs and non-dollar outputs ("benefits") of alternative investment choices for an ecosystem restoration project. This analysis is useful in lending support to identifying the National Ecosystem Restoration (NER) plan. The analyses are conducted in a series of steps that progressively identify alternatives that meet specified criteria and screen-out those that do not. Corps Engineer Regulation 1105-2-100 requires cost effectiveness and incremental cost analyses to support recommendations for ecosystem restoration.

A cost effectiveness analysis is conducted to ensure that least cost alternatives are identified for various levels of environmental output. Cost effectiveness analysis begins with a comparison of the annual costs and annual outputs of alternatives to identify the least cost plan for every level of output considered. Alternative plans are compared to identify those that would produce greater levels of output at equal or lower costs than other alternatives. Next, through incremental cost analysis (ICA), the cost effective alternative plans are compared to successively identify the alternative plans with the least additional cost per additional output that is, the plans that are the most efficient in production of output. The results of these calculations and comparisons of costs and outputs between alternative plans provide a basis for addressing the decision question "Is it worth it?" i.e., are the additional outputs worth the costs incurred to achieve them?

This analysis is based on and follows guidance from the USACE Institute for Water Resources publication, Evaluation of Environmental Investment Procedures Manual, Interim: Cost Effectiveness and Incremental Analyses, May 1995, IWR Report #95-R-1. As per this guidance, CE/ICA analysis compares the alternative plans' average annual costs against the appropriate average annual habitat unit

estimates. The average annual outputs are calculated as the difference between with-plan and without-plan conditions over the period of analysis (through year 2050). The following sections present the average annual costs, average annual benefits and the results of cost effectiveness and incremental cost analysis for the alternative plans.

G.6.1 Average Annual Costs

Data for initial construction/implementation, land acquisition, monitoring, and periodically recurring costs for operation, maintenance, repair, replacement, and rehabilitation (O&MRR&R), have been developed through engineering design and cost estimation, and real estate appraisal efforts. Details of that data development are explained and discussed elsewhere in this report. The main issues requiring economic evaluation attention include equivalent time basis calculations, price levels, and timing of project spending.

For purposes of this report and analysis, NED costs (as defined by Federal and USACE policy), are expressed in October 2008 (FY09) price levels, and are based on costs estimated to be incurred over a 40 year period of analysis. Costs of a plan represent the value of goods and services required to implement and operate and maintain the selected alternative plan.

The following table displays the costs associated with the alternatives. The costs presented in ***TABLE G-16*** are preliminary rough order of magnitude (ROM) estimates and include total initial costs of construction features, real estate, Interest During Construction (IDC), and total average annual costs for each alternative. These costs were used to formulate and evaluate plans to identify the Recommended Plan. The costs for the Recommended Plan were further refined based on additional engineering and environmental evaluations, as noted in the main report and can be found in the MCACES cost estimates The O&M cost is an annual estimate for fully implemented components.

The timing of a plan's costs is important. Construction and other initial implementation for component costs cannot simply be added to periodically recurring costs for project operation, maintenance, and monitoring. Also, construction costs incurred in a given year of the project can not simply be added to construction costs incurred in other years if meaningful and direct comparisons of the costs of the different components are to be made. A common practice of equating sums of money across time with their equivalent at an earlier single point in time is the process known as discounting. Through this mathematical process, which involves the use of an interest rate (or discount rate) officially prescribed by Federal policy for use in water resource planning analysis (4 3/8% at the time of analysis), the cost time stream for the alternative plans were mathematically translated into a equivalent time basis value.

There is some admitted uncertainty as to how the plan, if approved and adopted, would be implemented. It is recognized that the plan would likely be implemented over a considerable period of time, little by little. For purposes of this evaluation, construction costs are assumed to be incurred on an equal monthly basis during the implementation of the alternative plan as defined.

ER 1105-2-100 requires that IDC be computed which represents the opportunity cost of capital incurred during the construction period. Interest was computed for construction and PED costs from the middle of the month in which the expenditures were incurred until the first of the month following the estimated construction completion date. Interest during construction was computed for both real estate and construction costs. Interest during construction was computed for the total real estate cost starting from the month prior to construction commencing.

The cost of a project is the investment incurred up to the beginning of the period of analysis. The investment cost at that time is the sum of construction and other initial cost such as real estate and PED cost plus interest during construction. ***TABLE G-16*** summarizes the total investment cost and total annual equivalent costs of each alternative plan.

TABLE G-16: COSTS USED IN COST EFFECTIVENESS FOR PLAN SELECTION

C-111 SC INVESTMENT COST						
	Alt 1C	Alt 1D	Alt 2DS	Alt 2DL	Alt 3D	ALT 6D
Total Construction (Including PED &S/A)	$44,000,000	$47,000,000	$62,000,000	$64,000,000	$72,000,000	$252,000,000
Construction Schedule (Months)	16	16	22	22	24	36
Real Estate	$43,721,000	$53,196,000	$47,657,000	$40,553,000	$44,849,000	$25,299,000
Certification for IDC (Months)	19	19	25	25	27	39
Total First Cost	$87,721,000	$100,196,000	$109,657,000	$104,553,000	$116,849,000	$277,299,000
IDC Construction	$1,350,000	$1,450,000	$2,640,000	$2,730,000	$3,360,000	$64,628,397
IDC Real Estate	$3,240,000	$3,950,000	$4,710,000	$4,005,465	$4,800,000	$4,000,000
TOTAL INVESTMENT	$92,311,000	$105,596,000	$117,007,000	$111,288,465	$125,009,000	$345,927,397
O&M	$706,000	$953,000	$1,201,000	$1,213,000	$1,381,000	$264,000
Period of Analysis	40	40	40	40	40	40
Annualization	$5,106,000	$5,840,000	$6,470,000	$6,160,000	$6,920,000	$19,140,000
Year For First Benefits	2010	2010	2010	2010	2010	2010
Average Annual Cost	$5,812,000	$6,793,000	$7,671,000	$7,373,000	$8,301,000	$19,404,000

G.6.2 Ecological Evaluation

In practice, USACE ecosystem restoration studies typically measure the ecosystem benefits of alternative plans in terms of physical dimensions (number of acres of wetlands, for example), or population counts (number of wading birds, for example), or various habitat-based scores (habitat units based on the FWS's Habitat

Evaluation Procedures, or "HEP", for example). This study uses habitat units that represent the ecological lift achieved by each alternative. In accordance with policy, the economic analysis of environmental restoration projects does not use monetary benefits when comparing alternative plans. Rather, environmentally quantified benefits are used.

Habitat units are basically the product of acreage and a Habitat Suitability Index (HSI). The HSI is scaled from 0 to 1, with 1 being a pristine acre. The with-project and without-project habitat units are calculated and the difference between the two is known as the habitat unit lift. This habitat unit lift is the primary benefit used by economists in the CE/ICA to determine best buys and cost-effectiveness among possible alternative plans.

A more thorough discussion of the habitat unit evaluation is located in Appendix C and a detailed description of the project features can be located in Appendix F.

G.6.2.1 Average Annual Benefits

CE/ICA requires a comparison of average annual costs and average annual benefits. The average annual outputs were calculated as the difference between with-plan and without-plan conditions over the period of analysis (through year 2050). The period of analysis for benefit amortization that was utilized is 40 years. The base year, or the first year benefits begin to accrue, is in 2010. The average annual habitat unit lift is calculated as subtracting the future without project habitat units from the future with project habitat units for each year and averaging over the life of the project, which in this case is 40 years. Note that the output values shown reflect the differences between without project and with project on an average annual basis (i.e., ecological "lift" provided by each of the alternatives).

The analysis of ecological response times for large, diverse ecosystems is extremely difficult to calculate. For example, when analyzing an estuarine system, certain attributes would have to be examined when predicting the response to changes in salinity. Oysters may provide responses within a year of salinity change towards normal conditions. Seagrasses would normally respond quickly, but these responses are difficult to measure since there would be relocation of certain populations in response to specific currents and salinity concentrations. Small invertebrate and fish species should respond quickly; however, large vertebrate species would take longer to increase as they take longer to mature and reach reproductive ages.

The same difficulty occurs in the examination of freshwater systems. Different attributes, such as sawgrass marshes, periphyton mats, and bayheads respond differently in time to changes in hydroperiods and hydropatterns. Sawgrass marshes are in intense competition with other grasses, sedges and freshwater marsh species. Changes in the content of certain species could occur fairly rapidly

in certain areas; however, the competition of populations and/or communities in others areas could take a much greater amount of time for species, populations and communities to become established. As such, the team took a linear approach to predict ecological response time for the three combined Performance Measures for both future without and future with project conditions. The ecological response time was estimated to be 10 years until full impact was realized.

The average annual habitat unit lift can be seen in ***Table G-17*** below.

TABLE G-17: AVERAGE ANNUAL HABITAT UNIT LIFT FOR SELECTED ALTERNATIVES

(1) Scenario	Habitat Units (HU)	Average Annual HU Lift
Pre-Drainage/Target	**252,400**	**NA**
Future Without (2050)	**159,891**	**NA**
Alt1C	162,292	1,859
Alt1D	175,714	12,649
Alt2D	177,203	13,858
Alt3D	177,417	13,781
Alt6D	181,786	17,619

G.6.3 Cost Effectiveness Analysis

Cost effectiveness analysis begins with a comparison of the annual costs and annual outputs of alternatives to identify the least cost plan for every level of output considered. Alternative plans are compared to identify those that would produce greater levels of output at equal or lower costs than other alternative plans. The three criteria for cost effectiveness screening:

1. The same output level could be produced by another plan at less cost;
2. A larger output level could be produced at the same cost; or
3. A larger output level could be produced at less cost.

The CE process involves arraying alternatives by increasing costs with their corresponding output. ***TABLE G-18*** displays the final array of alternative utilized in the C-111SC cost effectiveness analysis.

The lowest cost plan with positive output was identified as the first cost effective plan, in this case Alternative 1C. The next plan (Alternative 1D) was then

compared against this plan. Since Alternative 1D contains greater output than Alternative 1C, this plan was also identified as cost effective. The next plan (Alternative 2DL) would then be evaluated against this plan and so on. As can be seen from this analysis the first four plans (Alternatives 1C, 1D, 2DL and 2DS) were identified as cost effective plans, but upon examination it was evident that Alternative 3D cost more than Alternative 2DS while providing less output, rendering it non-cost effective. The final plan (Alternative 6D) provides the greatest output at the greatest cost identifying it as the final cost effective plan.

TABLE G-18: FINAL ARRAY OF ALTERNATIVE UTILIZED IN THE C-111SC COST EFFECTIVENESS ANALYSIS

Alternative	Annual Cost	Annual HU Lift	Cost Effective
Alt 1C	$5,812,000	253	Yes
Alt 1D	$6,793,000	881	Yes
Alt 2DL	$7,373,000	3,556	Yes
Alt 2DS	$7,671,000	5,003	Yes
Alt 3D	$8,301,000	2,067	No
Alt 6D	$19,404,000	9,108	Yes

The following graph contains a visual depiction of the cost effectiveness analysis. The graph plots the output of each plan against the cost of each plan. The "cost effectiveness frontier" is indicated by a line passing through all cost effective plans. Any plans above and to the left of plans on the "frontier" line are non-cost effective, Alternative 3D can clearly be seen to lie above the "cost effective frontier" line. .

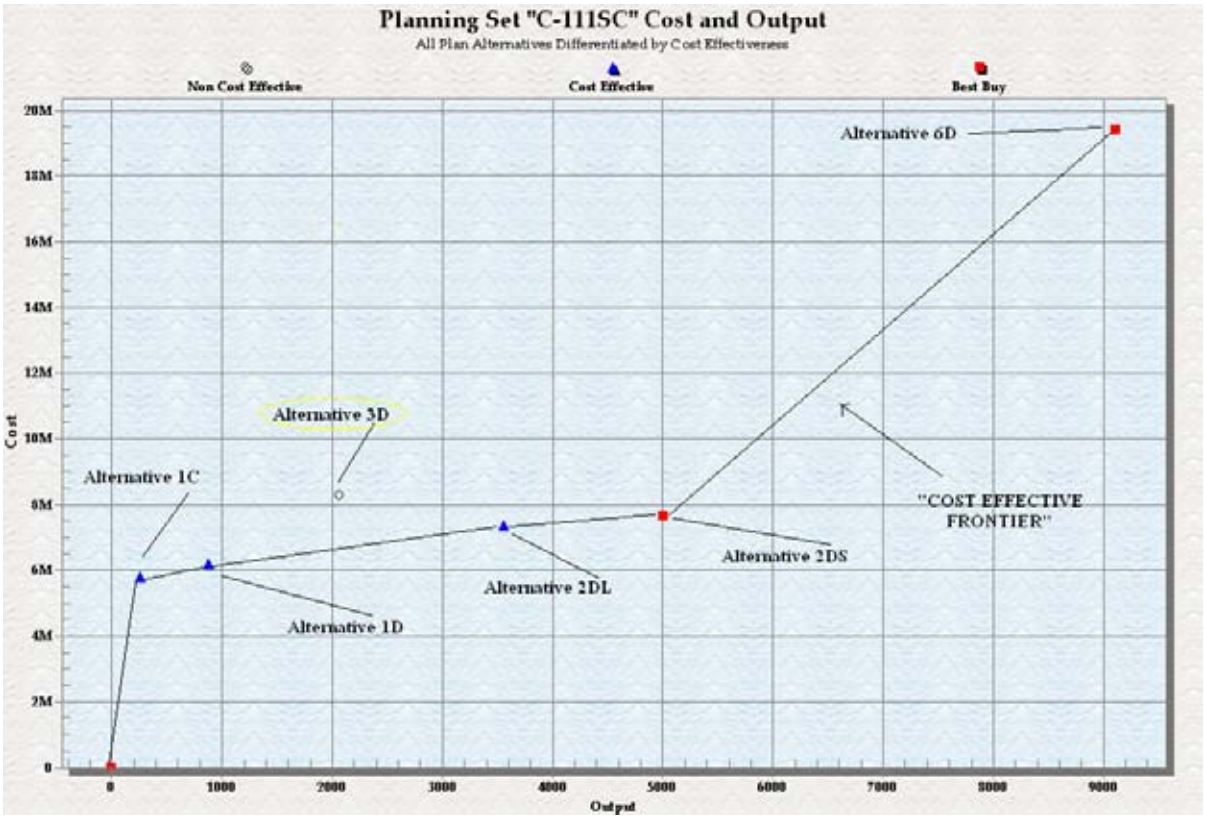

FIGURE G-7: C-111 SPREADER CANAL ALTERNATIVE PLANS–CE/ICA RUN

G.6.4 Incremental Cost Analysis

This section presents the results of incremental cost analysis for the C-111 SC Western project alternative plans for the optimization of the site. From the remaining cost effective alternatives, the plan with the lowest incremental costs per unit of output of all plans is the first best buy plan (Alternative 2DS). After the first best buy plan is identified, all larger cost effective plans are compared to the first best buy plan in terms of increases in (increments of) cost and increases in (increments of) output. The alternative plan with the next lowest incremental cost per unit of output (for all cost effective plans larger than the first best buy plan) is the second best buy plan. In this case Alternative 6D is the second and final best buy plan.

TABLE G-19: FINAL ARRAY OF ALTERNATIVE UTILIZED IN THE C-111SC BEST BUY ANALYSIS

Alternative	Annual Cost	Annual HU Lift	AAC/AAHU	Cost Effective
Alt 1C	5812000	253	$22,972	Yes
Alt 1D	6793000	881	$7,711	Yes
Alt 2DL	7373000	3556	$2,073	Yes
Alt 2DS	7671000	5003	$1,533	Best Buy
Alt 6D	19404000	9108	$2,130	Best Buy

TABLE G-20 shows these results of the incremental cost analysis. The first best buy plan, Alternative 2DS, exhibits an incremental cost of $1,533 per habitat unit, delivering a total of 5,003 average annual habitat units. The other best buy plan, Alternative 6D, delivers an additional 4,105 average annual habitat units at an incremental cost of $2,589 per habitat unit. *Error! Reference source not found.*

TABLE G-20: RESULTS OF INCREMENTAL COST ANALYSIS: BEST BUY PLANS ARRAYED BY INCREASING OUTPUT BY INCREASING OUTPUT FOR COMBINED HABITAT (ALL PLANS)

Alternative	Average Annual Cost	Output	Average Cost Per Output	Incremental Average Annual Cost	Incremental Output	Incremental Cost Per Output
2DS	$7,671,000	5,003	$1,533	$7,671,000	5,003	$1,533
6D	$19,404,000	9,108	$2,130	$11,733,000	4,105	$2,859

G.6.4.1 Summary of Cost Effective/Incremental Cost Analysis

As can be seen in the following table, Alternatives 2D and 6D are both cost effective and a best buy. Alternative 1C, 1D and 2DL are cost effective, but not a best buy plan.

TABLE G-21: RESULTS OF CE/ICA

Alternative 1C	Alternative 1D	Alternative 2DS	Alternative 2DL	Alternative 3D	Alternative 6D
Cost Effective	**Cost Effective**	**Cost Effective/ Best Buy**	**Cost Effective**		**Cost Effective/ Best Buy**

Alternatives 2DS and 6D are both identified as plans of interest and warrant further analysis. Alternative 2DS is recognized as the plan that is most efficient in the production of habitat units, while Alternative 6D has been identified as the next likely incremental choice.

G.7 REGIONAL ECONOMIC IMPACTS

G.7.1 Overview

This chapter examines the potential effects of the SAP on the RED account. The RED account registers indirect and secondary effects to the region that are expected

to result from the direct economic effects of the alternative plans. Direct economic effects represent the impacts of economic stimuli in terms of changes in regional industrial output, earnings, or employment. Indirect economic impacts represent the resultant economic changes in the industries that support and rely upon the industries directly affected by the stimuli. In addition, induced economic impacts are those impacts experienced by all local industries as direct and indirect effects alter household income and ultimately change local household spending patterns.

G.7.2 Methodology

A regional input-output model, *IMPLAN*, was used to estimate the RED effects of the C-111SC Recommended Plan. Regional input-output (I-O) analysis provides the classic tool for tracing economic impacts throughout the regional economy. Based on the region's industrial structure, I-O analysis tracks the expected inter-industry flow of goods and services. For the RED analysis, the regional economy was defined as encompassing Miami-Dade County using *IMPLAN*. Using county-level economic data, which was procured from the software vendor, the model was used to estimate the economic effects of the SAP on wages, employment, and production output (sales). Specifically, *IMPLAN* was employed in a four-part methodology to: (1) describe the study area economy, (2) create economic scenarios, (3) introduce economic changes, and (4) estimate resulting direct, indirect, and induced economic effects.

G.7.2.1 Real Estate and Effects of Other Land Acquisitions

Real estate sales may result in various impacts to the local economy. The sale of land may be regarded as a simple change in which the owner held the value in real estate and now holds an equal value in cash. If the cash is spent locally or reinvested in regional enterprise, then new economic activity might be stimulated in the region and even more funds might be leveraged by the enterprise.

Alternatively, a real estate transaction resulting in a transfer of funds into a regional bank may experience a general economic expansion in the region as supported through the banking multiplier if the funds are invested locally. If, however, there is foreign or corporate land ownership, then the expansionary effects of large transfers of funds may not occur in the study area. A similar result would occur if funds were held in a foreign bank. Additionally, if the land is owned by a governmental agency, then it may just be a land transfer resulting in very little regional economic effect.

Due to the ambiguity of the ultimate use of real estate funds, the expenditures on land were not input into the IMPLAN model. Therefore, the regional impacts of real estate purchases were assumed to be minimal and not calculated. If it were possible to know more about the future use of these funds, expenditures for land, commissions, leases, appraisal fees, title fees, and other administrative activities involved with real estate, those values could be used in the *IMPLAN* analysis or

another model. However, even with a higher degree of certainty regarding the future of this knowledge, it is anticipated that the financial inputs would be marginal, and any regional impact model would have significant reliability concerns.

The total construction expenditures are listed in ***TABLE G-16***.

G.7.3 IMPLAN Regional Economic Effects Results

In ***TABLE G-22***, the direct economic effects and aggregated indirect and induced economic effects are presented for the selected alternative plan. RED effects have only been calculated for construction expenditures and not for changes resulting from impacts to navigation, water usage, flood control or real estate expenditures. Economic impacts to total industry output and employee compensation are expected to persist through each year of construction. Wages include salaries, non-wage compensation, and benefits. Employment is measured as the number of jobs, not necessarily full-time equivalents.

TABLE G-22 and ***TABLE G-23*** present the *IMPLAN* output for direct, indirect, and induced impacts of the SAP on employee compensation and regional output (sales), and ***TABLE G-24*** provides an indicator of the employment effects of the construction expenditures. These impacts account for less than one percent of total economic activity in each of the different output categories.

TABLE G-22: DIRECT, INDIRECT AND INDUCED IMPACTS ON EMPLOYEE COMPENSATION AS A RESULT OF IMPLAN MODEL RUNS (2006 DOLLARS)

	Direct	Indirect	Induced	Total
Alternative 2DS	$26,618,000	$6,588,000	$6,262,000	$39,468,000

TABLE G-23: DIRECT, INDIRECT AND INDUCED IMPACTS ON REGIONAL OUTPUT AS A RESULT OF IMPLAN MODEL RUNS (2006 DOLLARS)

	Direct	Indirect	Induced	Total
Alternative 2DS	$62,000,000	$18,648,000	$20,510,000	$101,158,000

TABLE G-24: DIRECT, INDIRECT AND INDUCED IMPACTS ON EMPLOYMENT AS A RESULT OF IMPLAN MODEL RUNS (2006 DOLLARS)

	Direct	Indirect	Induced	Total
Alternative 2DS	415	165	172	752

G.8 OTHER SOCIAL EFFECTS

G.8.1 Overview

The OSE account considers the effects of alternative plans in areas that are not already contained in the NED and RED accounts. The categories of effects contained within the OSE account include:

- Urban and community impacts
- Life, health, and safety factors
- Displacement

G.8.2 Potential Urban and Community Impacts

An urban and community impact is the principal category of potential OSE impacts associated with the alternative restoration plans. This category of impacts includes effects on income distribution, employment distribution, population distribution and composition, and quality of community life. Some urban and community impacts have previously been addressed in this appendix. For example, regional income effects and fiscal impacts were discussed in the RED analysis. In addition, the impacts of agricultural water supply and M&I water supply were discussed in detail in earlier sections. The OSE assessment of urban and community impacts considers both the potential for exposure to the effects of the alternative restoration plans and the degree of vulnerability to potential impacts. Exposure refers to whether an individual or community is subject to the OSE of the alternative plans. Vulnerability refers to the ability of that individual or community to respond or adjust to those effects.

Potential urban and community impacts of the alternative restoration plans could result from: (1) land acquisition and potential relocation of populations for reservoir and other project construction features, (2) reduced agricultural activity associated with taking the reservoir lands out of cultivation, and (3) construction activity associated with plan implementation. In general, construction activity is considered to have positive impacts. At the local scale, construction and O&M activities associated with the alternative restoration plans can have positive effects to local residents and communities by providing jobs, increasing local wages, increasing local sales, increasing tax revenues and generally benefiting the local economy.

There are a variety of social and economic factors that are important determinants of an individual or community's ability to cope with adversity. One of the most important economic factors in the ability of individuals and groups to respond is the number of employment alternatives available locally. The ability to find another job depends on the education and training of the work force as well as the needs of local economic concerns, such as other farms, agricultural-related services, or some other local business. The socio-economic makeup of the community is also an important

consideration of the ability of individuals and the community at large to cope with the adverse effects of large-scale agricultural land conversion. Some groups in society are recognized as having less opportunity to respond to adversity. These groups include ethnic and racial minorities, the elderly, and the poor. ***TABLE G-25*** presents a socio-economic vulnerability profile for the local counties. This profile contains information that indicates the ability of the county population to respond to social and economic adversity. It is important to recognize that the county scale may not accurately reflect the ability of any given community or groups within a community to accommodate potential changes associated with the alternative restoration plans.

TABLE G-25 contains the 2006 racial/ethnic mix of each county in the study area, as well as population over 65 years of age, unemployment, 2005 per capita income, and the expected changes in employment and income.

The surrounding counties have a wide range of ethnic compositions, proportions of elderly population, unemployment rates, and per capita incomes. These socio-economic characteristics suggest that the rural counties of the study area– those that are expected to provide locations for new storage reservoirs– are areas that are least able to accommodate the associated economic and social effects on local communities. However, in these rural areas the affected populations should be relatively small.

Although the restoration of the estuaries and construction of the reservoir is a unique undertaking, there have been other projects and programs with similar goals and socio-economic contexts. One study conducted by the U.S. Department of the Interior assessed the national and regional economic impacts of not allowing timber harvests in certain old-growth forests in Oregon in order to protect the northern spotted owl. One aspect of this study investigated the re-employment of timber workers who had been displaced by the cessation of local logging activities. Surveys of displaced loggers suggested that they found that 57 percent of displaced workers reported post-displacement wages equal to or above their previous wages. According to the bureau of labor statistics, 92 percent of displaced workers find new jobs within one year, and the remaining eight percent find jobs within two years.

TABLE G-25: 2005 C-111SC (2006) SOCIO-ECONOMIC VULNERABILITY PROFILE

	Asian	White	Black	American Indian	Hispanic	Population Over 65	Unemployment	2005 Per Capita Income**	Percent of Population Below Poverty Level (2004)
Miami-Dade County	1.5%	77%	20%	0.3%	61.3%	14.2%	3.8%	$31,347	17.1%

When running the model, there were five alternatives considered. For each alternative, this analysis estimated the regional impacts of construction costs of the C-111 SC Western project. Therefore, each alternative's regional impact analysis provided Employment, Outputs and Total GRP (Gross Regional Product) estimates for the construction expenditures. Real estate costs were not calculated in the model due to the complexity and uncertainty in predicting if there are benefits, and if so, how many.

G.8.2.1 Employment

Employment is quantified in terms of years of employment. It is important to note that these are not indefinitely recurring years of employment, but rather single, non-recurring years of employment. While the project will undoubtedly generate some permanent recurring jobs the vast majority of labor will be hired during the actual construction phase only. This can be observed on the tables below by comparing the employment figures for the first four years with those for the following seven years.

G.8.2.2 Output

Output is quantified as total gross sales. This includes all sales that are a direct or indirect result of the project expenditures. Gross sales include the total sales of producers, intermediaries, wholesalers and retailers. While this is a classic indicator of economic activity it is important to remember that this indicator includes 'double counting' of economic activity. That is, the production, distribution and consumption of any given product are counted every time it is sold throughout the chain of production and consumption, even if there is very little actual value added. This is contrasted with total GRP.

G.8.2.3 Total GRP

Total GRP is an economic measure of the total returns to the factors of production: land, labor and capital. GRP measures only the total value of end-user products

and services. By doing so GRP measures only value-added and avoids double counting products and they move through the production and consumption process.

The regional economic effects for the selected alternative plans are presented on the following tables. RED effects have only been calculated for construction and O&M expenditures and not for changes resulting from impacts to navigation, water usage, flood control or real estate expenditures. Economic impacts to total industry output and employee compensation are expected to persist through each year of construction.

TABLE G-26 shows the 38-year total impacts for the five alternative plans, in millions of 2008 dollars. This is an overall summary of the regional economic impact of the five alternative plans. The table presents economic impacts for Miami-Dade County, the rest of Florida (exclusive of Miami-Dade), and total Florida (inclusive of Miami-Dade), respectively. Since a large proportion of the impact occur during the first two years (the construction period), the two year total impacts are also included on the table.

G.8.2.4 Comparison of Plans' Economic Impact to Overall Economic Activity

These outputs are meaningless, unless there is a relative comparison of what this means for the regional economy. To demonstrate the importance of these effects, the estimations were compared to the county employment and GRP. Data were not available for county-level gross sales output.

TABLE G-26: COMPARISON OF PLANS' ECONOMIC IMPACT TO OVERALL ECONOMIC ACTIVITY

	Current	Plan	Project Impact	%
Employment Years	1,158,801	1-C	1361	0.12%
(38 Year Totals)		1-D	1606	0.14%
		2-D	2288	0.20%
		3-D	2480	0.21%
		6-D	9341	0.81%
Gross Regional Product	$97,200.0	1-C	$165.1	0.17%
(38 Year Totals)		1-D	$199.2	0.20%
(In Millions)		2-D	$278.7	0.29%
		3-D	$300.4	0.31%
		6-D	$922.1	0.95%

It can clearly be seen that the magnitude of the impact of the proposed plans on the overall economy of Miami-Dade County is very small. Only Alternative 6-D of the selected alternative plans' impact would be more than one-third of one percent of the overall Miami-Dade economy. The percentage effect on the overall economy of Florida is so small that it is negligible.

Furthermore, it should be noted that the regional economic impact of the Recommended Plan, Alternative 1-D, is by no means abnormally high. Moreover, these impact will in reality be spread over a 38-year period making the relative importance of their economic impacts in the regional economy that much smaller.

G.8.2.5 Other Social Effects

The Other Social Effects (OSE) account considers the effects of alternative plans in areas that are not already contained in the NED and RED accounts. The categories of effects contained within the OSE account include:

- Urban and community impacts
- Life, health, and safety factors
- Displacement, long-term productivity
- Energy requirements and energy conservation

The C-111 SC Western alternative plans could result in beneficial and adverse OSE within the study area. An urban and community impact is the principal category of potential OSE impacts associated with the alternative restoration plans. This category of impacts includes effects on income distribution, employment distribution, population distribution and composition, and quality of community life.

There are several possible social effects that the C-111 SC Western project could impact. The project has the potential to raise property values in the surrounding area, increase attractiveness to the community, increase recreational opportunities, and improve environmental health such as water and air quality among other impacts. All of these factors could change the surrounding demographics of the community. It may or may not affect Environmental Justice issues.

A major social impact is the change in land available for development. Urban sprawl may have led to this land being used for residential or commercial development. This could reduce the available housing opportunities and possibly raise housing prices. At the same time, since there would be no development on the project site, it could decrease energy demand and improve environmental quality. The footprints of the projects would determine to what extent these impacts could occur.

This project does require a considerably large amount of acres. Despite the large acreage needed, there is currently very little development and population in the immediate project area. Eventually, Miami will probably sprawl towards the project and this could limit available developable land. Any adverse effects social effects will be avoided or mitigated.

G.8.3 Overall Regional Economic Impact Conclusions

All of the selected alternative plans would have some positive effect on employment, gross output and the gross regional product of Miami-Dade County; and to a lesser extent, the State of Florida. The Recommended Plan, (which is the NER plan) will likewise have a positive economic effect on employment, gross output and gross regional product of Miami-Dade County. Moreover any social effects, negligible as they may be, would be entirely positive, improving the quality of life for any affected individuals.

The magnitude of impact, however, is not very large. Based on the analysis and results, it appears that no alternative for C-111 SC Western project, other than Alternative 6-D, would have more than one third of one percent impact on the total regional economy–even less if economic impacts are annualized over a 38-year period as they will actually occur.

G.9 ENVIRONMENTAL JUSTICE

Executive Order (E.O.) 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, requires the federal government to achieve environmental justice by identifying and addressing high, adverse and disproportionate effects of its activities on minority and low-income populations. E.O. 12898, Environmental Justice, states that the proposed action would not result in adverse human health or environmental effects. Any impacts of the action would not be disproportionate towards any minority or low-income population. The activity does not (a) exclude persons from participation in, (b) deny persons the benefits of, or (c) subject persons to discrimination because of their race, color, or national origin. The activity would not impact "subsistence consumption of fish and wildlife." It requires the analysis of information such as the race, national origin, and income level for areas expected to be impacted by environmental actions. It also requires federal agencies to identify the need to ensure the protection of populations relying on subsistence consumption of fish and wildlife, through analysis of information on such consumption patterns, and the communication of associated risks to the public.

Miami-Dade County has a large percentage of people that claim Hispanic origin. Of the 2.25 million residents in the county during the year 2000, over one half are of Hispanic origin. Miami-Dade County also comprises nearly half of the state's Hispanic population. Of the 15,159 population in the study area, 38 percent claim Hispanic roots. Florida's African-American population is 2,333,427, which is 14.5 percent of the State's total population. In Miami-Dade County the African-American population is 457,432, which makes up 20.3 percent of the county's population. The study area has a population that is 21 percent African-American (3,073). The Native-American population of the study area represents less than one percent of the aggregate population of the study area (71 persons).

The C-111 SC Western project would provide benefits to the quality of life by improving the natural environment. The project features of wetland restoration and improved water discharge are by design in locations remote from urban populations such that negative impacts are eliminated for all communities. In public outreach efforts to date, no potential environmental justice issues have been identified.

The project features are located based upon hydrologic characteristics, land availability and inter-connection to existing canals and structures to optimize operations. Furthermore, in the consideration of the project site, urban areas are avoided to eliminate the negative impacts typically associated with site location of large projects. Through "willing seller agreements" a variety of land rights have been or will be acquired that allow the use of land for the resulting improvements to the human quality of life and the intended environmental benefits intended by the impoundment.

These environmental benefits provide quality of life improvements to all people and primarily to people in the communities within the study area. By the nature of design, this operating procedure will maintain if not improve flood damage reduction. This would improve the quality of human life by providing increased wildlife activity; a special bonus for those who appreciate seeing increases in fish and bird populations. This logically translates to the increased benefits in enjoyment, aesthetics, and economics for recreational activities.

G.10 REFERENCES

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